Hacettepe University Graduate School of Social Sciences
Department of Translation and Interpretation

THE TRANSLATION OF MEDICAL TEXTS: A CASE STUDY ON ARTHUR C. GUYTON AND JOHN E. HALL'S *TEXTBOOK OF MEDICAL PHYSIOLOGY*

Mehmet Cem Odacıoğlu

Master's Thesis

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KABUL VE ONAY

Mehmet Cem Odacıoğlu tarafından hazırlanan "The Translation of Medical Texts: A Case Study on Arthur C. Guyton and John E. Hall's *Textbook of Medical Physiology*" başlıklı bu çalışma, 23.06.2011 tarihinde yapılan savunma sınavı sonucunda başarılı bulunarak jürimiz tarafından Yüksek Lisans Tezi olarak kabul edilmiştir.

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Mehmet CEM ODACIOĞLU

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ÖZET

ODACIOĞLU, Cem. The Translation of Medical Texts: A Case Study on Arthur C. Guyton and John E.Hall's *Textbook of Medical Physiology,* Yüksek Lisans Tezi, Ankara, 2011

Tıp çevirisinin önemi, tıp dünyasında yaşanan birtakım gelişmelere bağlı olarak günden güne artmaktadır. Buna paralel olarak, çevirinin bu özel türü yeni hastalık ve virüslerin ortaya çıkması, sağlığı olumsuz etkileyen koşullara çare bulunması vb. açısından tıbbi bilginin gerek doktorlar gerekse de hasta ve hasta yakınları arasında hızla yayılmasına katkı yapmaktadır.

Tıp çevirisi, tıpkı hukuk çevirisi ve teknik çeviri gibi uzmanlık gerektiren bir alan olup, insan sağlığı ile doğrudan ilişkili olması bakımından diğer çeviri türlerinden ayrılır. Bu yüzden tıp metinlerinin çevirisinde bilginin doğru ve eksiksiz aktarılması zorunluluğu vardır ve buna paralel olarak da konu alanı bilgisine sahip tıp uzmanları ya da çeviri tekniğini bilen deneyimli çevirmenlerce yapılmalıdır.

Tıp çevirisinin tarihi insanlık tarihi kadar eskidir. Bu yüzden tezde öncellikle tıbbın ve tıp çevirisinin tarihi ile ilgili genel bir inceleme sunulmuştur. Ayrıca tıp çevirisinin özellikleri, tıp dilinin tarih boyunca kaydettiği gelişmeler, bu uzmanlık dilinin özellikleri, tıp çevirisinde karşılaşılan zorluklar ve bu zorluklarla başa çıkma yolları hakkında ayrıntılı bilgiler verilmiştir. Buradan hareketle, çevirmenlerin veya tıp uzmanlarının çevirinin bu özel türüne olan ilgisini daha da artırmak hedeflenmiştir.

Tezin odağını ise, tıp metin türleri içinde yer alan tıbbi ders kitaplarının çevirisinde kullanılan çeviri yöntemleri oluşturmaktadır. Bu amaca yönelik olarak, çalışmada pek çok ödül kazanmış ve saygın bir Amerikan fizyolog olan Dr. Arthur Guyton'ın ilk kez 1956'da yayımladığı *Textbook of Medical Physiology* (*Tıbbi Fizyoloji*)'nin Türkçe çevirisi, Jean Paul Vinay ve Darbelnet tarafından 1958'de ortaya atılan yedi çeviri yöntemi ışığı altında değerlendirilmiş ve böylelikle bu yöntemlerin çeviri sürecinde nasıl uygulandığına ilişkin genel bir sonuca varılmıştır.

Anahtar Sözcükler:

Tıp çevirisi, tıbbi ders kitabı, Arthur Guyton, *Tıbbi Fizyoloji,* çeviri yöntemleri, Jean Paul Vinay ve Darbelnet, yedi çeviri yöntemi.

ABSTRACT

ODACIOĞLU, Cem. The Translation of Medical Texts: A Case Study on Arthur C. Guyton and John E.Hall's *Textbook of Medical Physiology,* Yüksek Lisans Tezi, Ankara, 2011

The importance of medical translation has continously been increasing in connection with some developments occurring in the medical world. In parallel with this, this special type of translation contributes to the dissemination of medical knowledge among doctors, patients, and their families in terms of the occurrence of new diseases and viruses, discovery of cures for conditions affecting health negatively and so on.

Similar to legal and technical translation, medical translation requires speciality as well and it is distinguished from other types of translation in the sense that it is directly related to human health. The information has therefore to be transferred accurately and completely in the translation of medical texts and in connection with this, it has to be done by either medical professionals with the knowledge of the subject matter or experienced translators having a mastery of translation techniques.

The history of medical translation is as old as the history of mankind. Hence, a general analysis of the history of medicine and medical translation has been primarily pointed out in the thesis. Afterwards, detailed information is given about the characteristics of medical translation, developments of the medical language through the ages and its characteristics, difficulties encountered in the medical translation and strategies to cope with them. From this point of view, the goal is to grow translators' or medical professionals' interest in this special field of translation more.

The thesis focuses on the translation methods applied in the translation of medical textbooks which are classified among the medical genres. To this end, in the study the Turkish translation of *Textbook of Medical Physiology,* which was first published by Dr. Arthur Guyton in 1956, a famous and award winning American physiologist, is

evaluated in the light of Jean Paul Vinay's and Darbelnet's seven translation methods, which were developed by themselves in 1958. Thus a general conclusion is reached about the application of these methods throughout the translation process.

Key Words:

Medical translation, medical textbook, Arthur Guyton, *Textbook of Medical Physiology*, translation strategies, Jean Paul Vinay&Darbelnet, seven translation methods.

TABLE OF CONTENTS

INTRODUCTION

Medicine is mostly known as the science and art focusing on the maintenance of a healthy life or dealing with prevention and alleviation of diseases by finding cure for them. In other words, it is regarded as a kind of scientific field in which new treatment methods or surgical procedures and any other developments come up progressively for the improvement of patients' health conditions and for the prevention of diseases. It may also be defined as a highly technical and complex science that is one of the most respected professions in the world. Medical knowledge has a tendency to change fast and constantly on account of the fact that new and updated information regarding health matters come to light continously. In parallel with this, new terms emerge to describe new techniques and materials as well as reclassification of diseases or renaming a virus. The dissemination of knowledge about such advancements occurring in the medical world from one society to the other is only possible via medical translation activity.

How can medical translation be defined then? Medical translation, as a term, covers the translation of any medical documents including patient information leaflets, case reports, clinical guidelines, medical questionnaires, summary of product characteristics, scientific editorials and so on. In other words, it can be defined as anything varying from patient information to highly specialized information and to disease diagnostics. The concept then implies the translation of a medical topic or any documents written for physicians or patients. According to Resurrecció and Davies, "medical translation is actually a type of medical writing" (2007:125).

Medical translation is one of the rapidly growing industries in the translation field and when new developments in technology including computers, electronic dictionaries, computer assisted translation and even the Internet are taken into consideration, there has been continously an increasing demand for the translation of medical documents, especially as of 21th century. However, it should be remembered that the translation of medical texts has already been practised from the past since the history of medicine is as old as the recorded history of human.

Though medical translation is counted as one of the specialized fields of translation such as legal or political translation or is accepted as a part of the technical translation, the translation process of medical texts is more challenging and complex as the language of medicine is still full of unusual terms some of which are derived from Greek and Latin and are unknown by laymen or ordinary people who are outside the medical world.

Furthermore, medical translation deals with a universal topic and its subject matter is directly related to human body, its functioning or malfunctioning. Therefore, medical translation is generally performed by those who are believed to be specialized in translating medical documents. In other words, medical translation is done by medical professionals, health care personnels or those graduating from translation and interpretation departments of universities and having a general background and knowledge of medical issues as well as having a powerful linguistic ability. The reason why medical translation must be done by experienced translators or field experts is that the objective of scientific texts is to translate what is included in the source text to the target text accurately (Erten, 2007:83) and this can only be achieved by their presence.

Dealing with the translation of medical texts, Törel also states in his book entitled *Medikal İngilizce- Medikal Çeviri* that "even the slightest difference between two words can endanger the patient's life and therefore medical translators are in charge of transferring the meaning of the source text to the target language completely" (1988:14).

As a matter of fact, the common way which should be followed by medical translators is to be able to keep accuracy of the content of the source text in the translated text and that's why factual comprehension is required throughout the translation process. In spite of the fact that medical translation has some similarities to other types of translation as a professional activity and sometimes as an adaptation of cultural differences between two languages it is still quite different from them, especially from the translation of literary texts. While a literary translator may be obliged to focus on such literary elements as rhythm, pun, character's attitude, rhyme and theme, all of which constitute some basic parts of the literary translation, a medical translator has to cope with factual complexity and accuracy as much as possible.

Gaps in the translator's medical knowledge and errors he or she can make in the translation process may frequently lead to serious comprehension problems which can affect patient's health condition negatively and even cause doctors or health care personnels in the profession to understand the issue incorrectly and inadequately, implying a faulty interpretation of diseases. For the achievement of accuracy, a broad and complete understanding of the source text is essential accordingly. Then, it would be appropriate to say that medical translators must be well specialized in medical translation and most importantly must have a great deal of knowledge about its precise terminology for the production of an accurate and complete translation and thus those who have professional medical training and medical experiences must be hired to translate such serious and vital documents as implied before.

There are many medical genres in both medicine and medical translation including research articles published for the purpose of informing physicians and medical professionals about a highly specialized topic, clinical guidelines for physcians, textbooks for medical students, clinical reports for new drug applications, biomedical papers, patient information leaflets, patient education brochures, TV documentaries or press releases about health, clinical trial protocols, drug registration dossiers, expert reports, informed consents, files for regulatory bodies, clinical trial documentation, product monographs, medical charts, history records, treatises, packaging inserts, medical encylopedias, official regulations governing drug manufacturing. Translation strategies determined for each of these medical genres are variable since not all of them have the same writing style and format and while some of these genres may be translated for professionals that is, specialized people such as physicians and academicians or semi professionals such as medical students, the rest may be intended for laymen that is, patients who are only interested in understanding the general information presented and in avoiding becoming sick or infected against infectious diseases in this way.

The language of medicine and medical translation is densely dominated by English today as this language is the new lingua franca. In addition, there are other international languages that can often be used in medical communication such as German, French, Spanish and so on. However, this does not mean that the effect of Latin and Greek on

medical terminology has totally perished even if their effects are not the same as in the past. In connection with this, Van Hoof states that "the remarkable number of medical language, whether English or French, fundamentally rests on a learned terminology made up of formants (roots, prefixes and suffixes) drawn from Greek and Latin" (1998: 49).

This thesis brings under focus the translation of a medical textbook about physiology from English into Turkish so as to find out the translation methods applied and hence to reach a general solution at the end of the study. In addition, the thesis analyzes the history of medicine and medical translation, characteristics of medical translation, history and characteristics of language of medicine, problems encountered in the translation process of medical texts and solutions to them by referring to the translation of medical textbooks, the term "physiology" in general, the author of the analyzed textbook and the textbook itself.

Purpose of the Study

The study analyzes medical translation in detail by referring to its history, characteristics, language, and difficulties. Similarly, the translation of each of the medical genres may follow different translation methods. Therefore, this master's thesis also analyzes the translation of a medical textbook in the light of Jean Paul Vinay&Darbelnet’s seven translation methods so as to find out which of them can be used in the translation of medical textbooks.

Limitations

In this thesis, the focus is placed on medical translation and the Turkish translation of Guyton and Hall's *Textbook of Medical Physiology* is analyzed along with the related original textbook in terms of the translation methods applied. The main reasons for choosing this textbook in the study are various. Textbooks are composed of many pages, which means that they are frequently written by a group of authors. However, the textbook analyzed in this master’s thesis is essentially written by Arthur C. Guyton

although John E. Hall has become the co-author beginning with the ninth edition. In addition, the analyzed textbook is used as a textbook of physiology at the faculties of medicine in Turkey such as at Hacettepe both in English and in Turkish languages. Similarly, translators of the related textbook are medical professionals who serve as academicians at different universities in Turkey.

There are 84 chapters both in the original textbook and its Turkish translation. For the study to be concise, only key examples are analyzed. To this end, translations of thirty seven translators are used in the study who are known as Mehmet Hanifi Emre, Nazan Uysal, Neslihan H. Dikmenoğlu, Bayram Yılmaz, Hızır Kurtel, Sema Yavuzer, Gülsen Öner, Gülseli Yıldırım, Lamia Pınar, Ersin Koylu, Abdullah Arslan, Berrak Yeğen, Osman Genç, Bilge Pehlivanoğlu, Lütfi Çakar, Özlem A.Yılmaz, Ahmet Ergün, Zeynep Solakoğlu, Günfer Turgut, Osman Açıkgöz, Hakkı Gökbel, Kubilay Uzuner, Gülseren Şahin, Kadir Kaymak, Abdurrahman Şermet, Sami Aydoğan, Güher Saruhan Direskenli, Nermin Yermen, Z. Dicle Balkancı, Günnur Yiğit, Berkant Muammer Kayatekin, Ayhan Bozkurt, Gönül Ö. Peker, Kasım Özlük, Ayşe Doğan, Sena Erdal and Refik Yiğit.

It should also be noted that the examples discussed under the translation methods are not distributed equally since the study does not have the same number of examples for each heading.

Research Questions

This master's thesis sets out to find answers to the research questions listed below:

1. How did medical science and medical translation develop throughout the history?

2. What are the characteristics of medical translation?

3. How did medical language develop throughout the history? What are the characteristics of medical language?

4. What are the difficulties encountered in the translation of medical texts? What are the solutions to cope with them?

5. What translation methods put forward by Vinay&Darbelnet are used by the translators of Guyton and Hall's *Textbook of Medical Physiology* in the translation process?

6. Is the translated textbook close to "direct translation" or "oblique translation"?

Method

In order to give answers to the abovementioned questions, a detailed analysis is carried out regarding the translation of medical texts. In addition, Guyton and Hall's *Textbook of Medical Physiology* and its Turkish translation are selected in terms of the translation methods applied.

Before analyzing the translation methods, a research on the history of medicine and medical translation, characteristics of medical translation, history and characteristics of language of medicine, difficulties encountered in the translation process of medical texts and solutions to them is carried out by also referring to the translation of medical textbooks. In addition, some information about the term "physiology", author of the analyzed textbook and the textbook itself is presented. All the sources are gathered from librariers and from the Internet. Later, the related theory is explained. In the core chapter of the thesis where the practical analysis is applied, Vinay&Darbelnet's seven translation methods, "borrowing", "calque", "literal translation", "transposition", "modulation", "equivalence" and "adaptation" are analyzed with examples taken from the source textbook and from its Turkish translation in detail and according to a hiearchical order in order to find out which of them can be applied to the target text and thus to reach a general understanding for their applications to the translation of other medical textbooks.

CHAPTER I

HISTORY OF MEDICAL TRANSLATION

HISTORY OF MEDICINE AND MEDICAL TRANSLATION

Fischbach states that

> Medical Translation is the most universal and oldest field of translation because of the homogenous ubiquity of the human body and the venerable history of medicine (1986: 16).

As stated in this quotation, the history of medicine and medical translation has quite a long history which is also obvious from Homeric poems. The reason why medical science and medical translation are regarded as universal by most of the people arises from the fact that human anatomy and physiological functions are universally the same. Therefore both medicine and medical translation may not be limited to only one country or region in the world. Similarly, it would not be wrong to say that what makes medical science and medical translation universal can be said to be their subject matter as both of them concern human health as mentioned before.

Throughout the ages, medical science and medical translation have attracted a remarkable attention due to their universality and their subject matter. Besides, any achievements and updated information on medical science and medical translation have paved the way for each of them to become the focus of interest regardless of language, religion, colour and race. From the past, people have always tended to communicate with other societies. In doing so, they have also contributed to the dissemination of what they know about medical science to other societies in need of learning new treatment conditions for the purpose of getting rid of infectious or fatal diseases and understanding their causes via translation activities. Medical translation has therefore the characteristic of an interlingual practice initiated by such contacts and interactions among people.

According to Bloom, "people have always been concerned with their health and many centuries ago, injury and diseases were attributed to possession by an evil spirit, a disturbance in the natural balance of physical and chemical forces, or the anger of the gods" (1982:4). Therefore, people always felt obliged to protect themselves from diseases, especially those living in the prehistoric periods. Before the modern medicine, people used to believe that they could recover from diseases with religious or magical ways since they believed the reason why they became sick arose from supernatural events.

It is highly possible to encounter medical writings which were stored in cuneiform symbols written on clay tablets and include any information about medical science in various languages like Sumerian, Hittite, Akkadian, Ugaritic and Hurria in the regions such as the cities of Ancient Mesopotamia. As shown by archaeological researches conducted for the purpose of discovering such places in the world, translation activity was made intensely in the past even if paper and the alphabet were still not invented (Resurrecció and Davies, 2007:15).

In connection with the development of medicine and medical translation in ancient times, sumerians discovered the connection, between seasons and diseases and explained how stars affect human life. According to them, the intelligence center of people was located near the heart but in the brain and the circulation system was on the other hand near the liver. As for the history of Heredotus, a sick person would be taken to the town square and others catching the same illness would give advice to the affected person (Nasuhioğlu, 1974:10-11). The Babylonian Code of Hammurabi, dated 2040 BC also contained statements about doctor-patient relationship and medical ethics (Bloom, 1982:4).

Greek Civilization

The distinctly scientific method which characterizes modern medicine in Europe and the America can be traced to Greek Civilization (500-30 B.C.) that succeeded in passing on its tradition first to the Roman Empire (100 B.C.-400 A.D.) and then to Medieval Europe (1200-1500 A.D.) In the process it created the heart of the contemporary

Western medical writing system (McMorrow, 1998: 13). Therefore, it is highly likely that the modern medicine started with the Greek civilization as they based medical profession on scientific studies and methods.

With the onset of the modern medicine, disease was no longer regarded as a supernatural phenomenon and besides it was approached from a rational, naturalistic and scientific point of view by the Greek medicine (Ackerknecht, 1982: 47). In addition in the "Golden Age" of Pericles, Hippocrates (460-377 BC) renowned for "the Great" and later "the Father of Medicine" became as much a representative of the Greek intellect in medicine as were his contemporaries, the great philosophers, in the other sciences (Fischbach, 1986: 17).

Hippocrates- as the author of one of the oldest volumes on medicine that exist, the *Corpus Hippocraticum*, written about 400 BCE- inherited a vast amount of knowledge from previous civilizations and founded a school of medicine where he produced works on anatomy, physiology, pathology, hygiene and medical ethics in collaboration with other scholars (Resurrecció and Davies, 2007: 15-16). Furthermore, Hippocrates wrote Hippocratic Oath which is thought to be one of the oldest documents in the past and it is still respected by physicians to be able to keep privacy of patients' history and to treat them as required or to train other medical students about the secrecy of medicine. Hippocrates was in favour of natural explanations while he was treating his patients and he was also the first doctor to distinguish medical science from superstitions in the period in which he lived. The reason why the modern medicine occured first in Greece can be understood from this perspectice well enough.

Hippocrates also wrote *On Hemorrhoids, On Fractures, On Ulcers, On the Surgery, On the Sacred Disease* and the Book of Aphorism (http://studenttheses.cbs.dk/bitstream/handle/10417/835/anette_thorup_pedersen_og_tanya_nielsen_halliday.pdf?sequence=1). The doctrine by Hippocrates was updated by Galen of Pergamum almost 400 years later. According to McMorrow,

> Galen (130-200 A.D.), the most widely known of the Greek traveling medical scholars, was also the most prolific and this enshrined his influence. His extensive writings were unknown in the West until translated between 1000 A.D. and 1200 A.D. from Arabic into Latin by Muslim, Jewish, and Christian scholars in the new

> Western European universities and medical schools at Salerno, Monptellier, Bologna, Padua, Toledo, and Paris (1998: 15).

Galen of Pergamum also studied in Alexandrian School and when he completed his medical training, he served as a surgeon for gladiators and went to Rome in 164 AD. He focused on anatomy and physiology.

Roman Empire

The prevailing language of medicine was still Greek during the Roman Empire and the Greek medicine was highly enriched by the schools of Alexandria and Pergamum. Therefore, the need for the translation primarily into Latin and into other languages such as Arabic and Hebrew increased. According to Resurrecció and Davies,

> Alexandria, founded by the Greeks in Egypt, became a melting pot for people and ideas, languages and cultures from the Mediterranean lands, the East and India. We know that its museum and library contained works on anatomical dissections and physiological experiments. Its zoological garden had collections of animals which were classified by scholars and which would have provided opportunities for veterinary research and the study of animal husbandry. Medicinal and other plants in the extensive botanical gardens were similarly classified and their properties were no doubt investigated both for medical and culinary purposes (2007: 16).

It is obvious that Greek medicine was brought into Roman Empire by physician-translators such as Aclepaides. The fact that the Greece was occupied by the Roman Empire also triggered the accelaration of the dissemination of medical knowledge in their regions, especially via translations from Greek into Latin. The whole body of medical literature going from Hippocratic to Alexandrian times was summarized into Latin by Aulus Cornelius Celsus, who was regarded as being the "father" of medical abstracting during the 1st century AD. Celsus, in addition to being called the "Cicero of Medicine" due to his impressive literary style, was the first medical writer to deal with the translations of Greek terms into Latin. Besides, another productive writer-translator during the Roman Empire was Pliny the Elder, having died in 79 AD when he was observing the eruption of Vesuvius which destructed Pompeii (Fischbach, 1986: 17).

It was not until the 3rd century that medicine began to be practised seriously in the Roman Empire. As a sign of this fact, licences were introduced to physicians and

medical students. Besides, medical students were now asked to obtain good conduct certificates from the local police and keep themselves away from illegal settings such as brothels. In addition, they were not allowed to go on long vacations and they had to finish their studies without being twenty. In parallel with such advancements, the need for the translation activity increased. (Fischback, 1986: 17).

Islamic Period

In 7th century, the world of Islam was on the rise and a united Muslim Empire was established in the 9th century. In such centers as Baghdad and Damascus, medical schools were established and therefore the need for the translation of Greek medical writings increased notably. Greek works were translated into Arabic language and therefore the Greek Medicine spread quickly to the Islamic world. Arabs actually launched a series of far reaching translations, interpretations and commentaries of works by Aristotle, Plato, Archimedes, Hippocrates, Euclid, and many of the outstanding philosophers and scientists of ancient Greece. Translations were done at their Baghdad House of Wisdom (Segura, 1998: 37).

With the contributions of Bagdad House of Wisdom, Arabs brought Greek medicine into their countries and created their own original works, leading to the improvement and dissemination of medical knowledge. In addition, it would be correct to assume that Arabic began influencing the medical science. The famous medical historian and translator called Martí Ibáñez writes that "Never in history have translators played as important a part as they did at the beginning of Islamic Expansion" (Martí Ibáñez, 1962: 118). In Baghdad, training schools for translators were established under the sovereignty of the Caliph al-Mansur. Al- Mansur ordered Johannes Masawayh (777-857) to direct his schools. When the debauched Byzantine emperor Michael III was defeated by Muslim forces, his penalty was to send Baghdad a camel caravan laden with ancient manuscripts from Constantinople's libraries (Fischbach, 1993: 97).

One of the well known figures for the dissemination of medical knowledge in Islamic period, Hunain who lived between 809 and 873 was born in Al-Hira, near Kufa, the son of a Nestorian pharmacist. As a young man, Hunain went to Baghdad, where he

enrolled in a medical school under the direction of Johannes Masawayh. He learnt Greek and began privately to translate Greek medical texts into Arabic (http://www.citizendia.org/Hunayn_ibn_Ishaq).

According to Fischbach, "the most eminent physician of the Islamic period was Persian born Rhazes (865-925), chief of the renowned hospital in Baghdad and author of more than 140 medical tomes, many of which were translated into latin by the Hebrew scholar Faraj ben Salim" (1993: 97). Besides, Rhazes was prominent due to the fact that he wrote a book about smallpox which was accepted as the first in the field of infectious diseases and also most of his works were printed in Venice and Milano and used as a textbook at Faculties of Medicine in Europe (Erten, 2007: 24).

Some of his major translations include *Kidney and Bladder Stones, Mofid al Khavas*, (*The Book for the Elite*), *The Book of Experiences, The Physicians' Experiments, The Cause of the Death of Most Animals because of Poisonous Winds* (http://www.pre-renaissance.com/scholars/al-razi.html).

Avicenna (980-1037) or also known as Ibn-Sina was another important figure of the Islamic period, mostly in the sense of his medical works. He was born in 980 near Bukhara and died in 1037. He is generally regarded as the most influential physician after Hippocrates and Galen in the history of medicine. His most famous works are known as *The Book of Healing*, a vast philosophical and scientific encyclopedia, and the *Canon of Medicine* or *Kitab al-Qanun fi al-tibb* in Arabic. *The Canon of Medicine* was accepted as a medical textbook by authorities for a long time and it was translated by the Latin West. Avicenna is also thought to be the pioneer of the shining era of Arab medicine in Spain between 10^{th} and 13^{th} centuries.

Al Zahrawi (936- 1012) was also a prolific physician in the Arabic world and he was especially very knowledgeable about surgery. He wrote *At-Tasrif* which was a medical encyclopedia about pharmacology, ortopaedics, surgery and ophthalmology.

Medieval Period

In the middle ages, celibacy was compulsory for medical students at the university of Paris until 1452 in a way similar to the pressures upon medical students in Roman Empire. Surgery became another profession for barbers and quacks. Besides, medicine was conducted by monks in monastic libraries other than laboratories or hospitals and most of the medicinal remedies were taught via translation activities. Upon the ending of brilliant period in Greece and since Roman Empire was not a powerful civilization as before, only translations made by Arabic translators were present to fill the gap before scientific studies and learning activities in the Renaissance period. Treaties published by medical writers of the major schools in regions where Arabic language was prevalent between 9th and 12th centuries were translated into Latin by both the Christian Gerard of Cremona (1114-1187) and the Jew Faraj ben Salim. Such activities paved the way for the motivation of the European intellect and also formed the core of the medieval university libraries in the West.

As pointed out by Fischbach, "early in the Middle Ages, medical school of Salerno acquired a far reaching reputation (William the conqueror visited it to restore his health) and its works were then translated into several European languages" (1993:98). In addition, the School of Salerno became popular due to the fact that it served as a bridge between ancient and modern medicine.

The school of Salerno was primarily established in collaboration with Greek, Jewish, Latin and Arabic doctors. *Regimen Sanitatis Salernitanum* was written in the School of Salerno in the 10th century. Son of William the Conqueror, Robert of Normandy took that book to England when he was returning from Crusades. The English version of the book entitled *Salerno Book of Health* was translated into English by John Harington (1561–1612) who was born in Kelston, around Bath. The book was used until the 19th century.

According to Newmark, "the West came into contact with Islam in Moorish Spain. The situation favoured the two essential conditions for large-scale translation: a qualititative difference in culture (The west was inferior but scientifically acquisitive and receptive

to new ideas) and continous contact" (1988: 3). After Toledo was conquered depending upon the fact that the Moorish supremacy collapsed in Spain, the School of Toledo (1125-52) was established by Archbishop Raymond in side by side collaboration with Islamic, Christian and, Jewish scholars.

In the school of Toledo, works by Aristotle (384-322 BCE), Archimedes (287-212 BCE), Pythagoras (569-475 BCE) and Hippocrates (460-377 BCE) were translated and commented upon by physicians such as Ibn-Rushd, also known as Averroes (1126-1198), Maimonides (1135-1204) and Ibn-Sina or Avicenna (Resurrecció and Davies, 2007: 16). Also, King Alfonso the Wise (1252-1284) contributed to the development of Toledo school in favor of Castillan Spanish since he was against translations into Romance and Latin. According to Segura,

> The procedure used for translating medical, scientific and philosophical texts in School of Toledo, was as follows: A jew who knew both Hebrew and Arabic first translated orally from these languages into Spanish Romance, the precursor of what later became Castillian Spanish. The Romance version was then translated into Latin by a Christian, to be disseminated throughout Europe (1998: 38).

What is truly remarkable about the Toledo school is that it attracted translators from other parts of Europe, the most prominent being the Italian Gerard of Cremona, the Englishman Adelard of Bath, and Herman the German (Sofer, 2002: 28). The enormous task undertaken by such figures of that period paved the way for the occurence of new languages and cultures and hence built the bridge to the Renaissance and the Modern World.

In addition, the Jewish scholars especially active in this work, often under the patronage of Christian bishops, were instrumental in founding the famous medical school of Montpellier early in the 12th century (Fischbach, 1993: 99). Furthermore, Muslim, Jewish and Christian scholars in collaboration with each other contributed to Western European medical schools of Bologna, Padua and Paris linguistically. Between the 12th and 14th centuries, medical texts were translated into many languages such as Italian, Spanish, French, Dutch, German and English respectively.

Rise of Medical Translation

As of 15th century, the invention of the printing began playing an important role for the translation and its status, so that remarkable changes occurred in the translation of medical texts and the number of accurate and reliable translations which accelerated the wider dissemination of Hippocratic and Galenic writings increased. In addition since the Greek language was not known by most of the physicians, many humanists tended to translate Greek medical works into Latin again.

Among these translations were those of the humanist and physician Thomas Linacre (1460?-1524), Henry VIII's personal physician who was instrumental in founding the Royal College of Physicians in London, and taught such brillant students as Erasmus and Sir Thomas More (Fischbach, 1993: 98). Some of the translations were done in English as well. *The Liber Uricrisiarum,* a 15th century treatise on uroscopy, provides scholars with the first major text in Middle English on this subject (Pilegaard, 1997: 160).

In addition, after the New World was colonized, ipecacuanha, cinhona and tobacco and such exotic plants were collected and brought to Europe. These plants were used for the purpose of manufacturing new drugs. Fischbach states that "an important serial work on these drugs by Nicolas Monardes (1493-1588) of Seville was not written in Latin, but bore the title *Historia medicinal de las cocas que se traen de nuestras Indias occidentales* and was translated into English in 1577 as *Joyfull Newes out of the Newe Founde Worlde* by John Frampton" (1986: 19).

These advancements in medicine and medical translation show that vernacular languages were on the rise as well and therefore the importance of English increased correspondingly and began to take the place of Latin over time unlike its inferior position in the past when the first major medical treatise entitled *Compendium medicinae* (1450) in England was written by Gilbertus Anglicus not in his native language but in Latin (McMorrow, 1998:18).

As they are linked to each other, the history of medicine and the history of medical translation have major turning points in the history. Breakthroughs in medical science occurred slowly in the past. However in parallel with advancements in the technology, medicine has now a more tendency to develop just as other scientific fields. Due to the fact that medical science has such a dynamism which can simply be seen from medical breakthoughs throughout the history despite a slow progress in the beginning, the number of scientific papers related to health care increases continously and people are attracted to read them to be well informed in health care issues and about their bodies as well. Thus, it can be stated that the more medical science develops, the more the need for medical translation increases. In this way, translated medical documents also perform a necessary purpose for patients in the pursuit of information from the medical world since they may not have the ability to read books or texts in the original or first languages.

CHAPTER II

CHARACTERISTICS OF MEDICAL TRANSLATION

Medical translation covers the translation of texts written for medical specialists and semi professionals or laymen that is, patients who are not the direct members of the medical community. It is actually a type of interlingual communication contributing to the dissemination of any innovations or new types of information in the health sector across language boundaries. According to Lee Jahnke, "medical translation today is a defined, separate field of study both for historical reasons and since it represents a big share of the market" (1998: 81).

Lynch also defines medical translation "as the transfer of meaning at the conceptual level and its representation at the lexical level" (1998: 147). Furthermore Newmark, one of the most renowned translation scholars, regards medical translation "as an exceptionally socially important occupation both nationally and internationally, and a modest growth industry" (1979:1406).

Medical translation can also be considered to be a part of the technical translation, especially when the translation of medical devices or user guides is in question and some people even categorize it in the translation of scientific texts in view of the similarities they both have. However, it is mostly thought to be a special field of translation like legal translation having its own characteristics as an interdisciplinary complex practice.

In the 21st century, the dissemination of knowledge and exchange of information is so fast that it would not be wrong to claim that medical translation which is one of the most respected fields of translation witness incredible advancements, once thought to be impossible in the medical world. Therefore, medical translation has become a versatile field of translation having a wide range of various texts which focus on or introduce any discoveries and news in the medical world by providing information for patients or even encouraging international companies to finance a product.

As stated before, the subject matter of medical translation is human body and its functions, making it universal and the oldest field of translation throughout the ages.

Newmark also confirms this statement in the following manner:

> The content of medical reports and articles will usually not be specific to the source language culture, provided both it and the target language culture are set in developed countries. Hence, some of the translator's problems- how to translate a word for a feature that does not exist in his own country, or the expression of the first writer's feelings, or a sound effect do not usually arise in medical translation (Newmark, 1979:1405).

Medical translation may be similar to technical translation in terms of its universality as well. It would therefore be appropriate to refer to Newmark's definition of technical translation: "I take technical translation as potentially (but far from actually) non-cultural, therefore 'universal'; the benefits of technology are not confined to one speech community" (1988: 151). As can obviously be understood from this statement, subject matters of medical and technical translations interest human beings since both of them could be accepted to be universal.

As Erten states,

> Medical translation is a special field of translation and it has a specific terminology. It is necessary that these texts be translated without any loss of meaning and without leaving out any information because medical translation is closely linkted to human health (1995: 44).

Törel also asserts that

> In most of the translated medical books, the translation production may have a tendency to show a serious deviation from the source document. This can bring about damages instead of benefits (1988: 14).

As a token of these two statements mentioned by Erten and Törel, it is obvious that accurate or erronous translation of medical texts may have a deterministic factor for patients' survivality. Medical translation never tolerates serious mistakes owing to the fact that human life is at stake and if the translated text contains a single but a serious error although having a perfect translation in general, it can terminate the patient's life or produce unexpected and undesirable results such as injuries, reprint of information, recall and repackage of products all of which may collectively undermine the

confidentiality, accuracy, completeness and impartiality of the text. In view of those possible dangers, translation of medical texts needs to be double checked, edited and validated when compared to other kinds of translation although having some similarities to them. In addition, a good command of medical knowledge and an effective understanding of the source text are of paramount importance so that any gaps in the translators' mind and possible comprehension problems that may occur would clear away. The translation of medical texts also requires a firm mastery of the source and target languages and of reading skills in order to avoid any ambiguities or difficulties creating confusion among patients. Furthermore, it tends to expect from translators to have certain levels of linguistic knowledge to be able to solve the problems in the translation process. It is essential that medical translators themselves always be in the pursuit of correctness and validity of information to produce error free translations even if some people argue that medical translation is actually the simplest type of translation in the sense of its grammatical structure.

Another implication that can be understood from the statement by Erten is that translation of medical texts have to be made semantically to preserve the source text meaning completely in the target language. "Semantic translation" by Newmark (1988: 39) attemtps to translate, as closely as the semantic and syntactic structures of the second language allow, the exact contextual meaning of the original.

The other concept contributed by Newmark to general translation theory "communicative translation" (1988: 39) however attempts to produce on its reader an effect as close as possible to that obtained on the readers of the original. This type of translation is also used in the translation of medical texts but the semantic translation is more privileged than the communicative translation.

It would also be beneficial to refer to what Lee Jahnke mentions about the translation of medical documents so that a more successful target text could be achieved at the end of the translation process:

> Who is likely to become a competent medical translator? By and large, two categories of people: those with a medical background-medical students and physicians; and secondly a good translator genuinely interested in medicine. The first category understands the subject matter but lacks the translation techniques.

> The second must acquire the specialized knowledge and should be in touch with the medical community to obtain essential feedback (1998: 82).

Despite the fact that medical translation seems to be a challenging type of translation, wealth and availability of medical documentation still attract translators to deal with medical translation, which makes them more privileged than their colleagues in other fields. Besides, medicine goes on keeping the position of being one of the oldest and most documented of the sciences. Fischbach confirms this view in the following manner:

> There is hardly a major culture with a medical literature requiring translation that does not have a plethora of medical textbooks, encylopedias, journals and dictionaries. Nor are there any medical translators who, if not physicians themselves, do not have access to a doctor or hospital librarian for ready consultation. By contrast, how many translators in aerospace, earth science or oceanography, to name but a few other scientific areas of translation, can find printed documentation or human resources with equal base in their fields? For the medical translator, such animate and inanimate references are invaluable tools for their accessibility (1986: 19-20).

The medical profession and medical translation are full of jargon and idiosyncratic phrases like other technical fields. Hence, medical translation may require more than a sound knowledge of both languages and the use of specialized dictionaries (Segura, 1998: 43). Furthermore, medical translation entails familiarity with the standard medical terminology specific to that field which each medical translator has to have in their minds in the translation process. The terms of the medical translation may be related to anatomical parts of the body, syndromes, drugs, medical devices and can give a clue about the difficulty or simplicity of the text to be translated because the more specialized the text is, the more the need for the use of complex terms increases, implying more time to check accuracy.

Lee Jahnke also claims that "medical translation is based on specific cognitive knowledge which is mainly concerned with information. Therefore, special care is needed when two or more fields overlap" (http://medtrad.org/panacea/IndiceGeneral/n20_editorial.pdf). Then, the task of the medical translator is much and demands full of detailed research on the topic to be translated.

Medical translation is a bridge for the communication primarily between professionals and the other professionals (doctor-doctor), professionals and semi professionals (doctor-medical student/health personnels), professionals and non professionals (doctor-patient or laymen), and finally non professionals and non professionals (journalist-reader). It may therefore be claimed that medical translation has mostly a scientific register that is different from daily language and has an impersonal, objective and logical style generally free of dilemmas and ambiguities. However, the communication in the medical translation can also occur among people who are outside the field or can depend on doctor-patient relationship as stated above.

Depending on the fact that the register of medical translation may contain a colloquial language as well, the target reader can include patients or the general public, which confirms the communicative aspect of medical translation. Owing to this reality, it would be appropriate to refer to the statement mentioned by Newmark considering that medical translation may be done for various purposes such as training and informing the public about health matters or preparing guidelines and procedures for everyone to follow.

> Medical writing is primarily for doctors and is also read by nurses and students, while general medical articles and advertising are written for intelligent laymen. In both of types of publication the translator is likely to have an aim similar to that of his author(s) unless he is translating for a medical readership with less knowledge than his author's (1979:1405).

What Newmark points out in this statement can be explained in two ways. First, the medical translator's task is to be able to achieve the same effect the source text has in the target text or create the same equivalence for the target reader who may be doctors, medical students or laymen. Secondly, it brings into the mind that medical translation covers a range of genres, from health information brochures and articles on health in magazines for the general public to medical textbooks, instructions accompanying prescription drugs, and specialized articles in medical journals (Wakabayashi, 1996: 356).

In connection with this, it can be claimed that the principles and rules for the production of medical texts are highly genre specific. For each of classical medical text genres-case report, treatment focused report, research paper, disease review, dissertation, medical

textbook and speech, we may identify specific characteristics on the lexical, syntactical, stylistic, pragmatic and cognitive levels (Pilegaard, 1997: 169). In other words, these medical texts and their translations may have been written for different purposes and for different target readers and therefore their contents, forms and structures differ from each other. They can be written or translated either in a complex or simple way such as the use of long or short sentences, and use of active or passive voice. In addition, degrees of formality each of them has may change as well. That's why, it can be said that medical translation may be conducted either formally or informally. Formal documents include those written or translated for physicians or medical personnels such as a scientific article about *AIDS* or a scientific paper on a journal. These kind of texts may also contain papers which are available at medical conferences. Informal ones, however, are intended for laymen or ordinary people such as a brochure or leaflet.

The translation strategy defined for the medical translation differs from that of the translation of a literary text as literature may include novel, drama and poetry whose aim is to give pleasure. Medical translation is however intended for the prevention, alleviation, treatment or diagnosis of a disease or presentation of information about a cure of a disease to target patients. It is therefore mostly accepted to be objective, informative, non literary and thus free of figurative language, connotations and sound effects.

As Herman states, "translation of a technical prose, though non literal, should convey the exact meaning of the source text as directly as possible" (1993:13). The same procedure can also be applied for the translation of medical texts since medical translation focuses heavily on transferring the denotative meaning of the source document and it deals with highly technical contents, facts, logical events, and ideas similar to technical translation and translations of other informative text types despite the fact that that there may be some exceptions due to the source author's stylistic arrangements.

Depending upon the reality that the translation of medical texts may occasionally be categorized in the translation of scientific texts in the sense of their similarities, it is essential to refer to what Finch thinks about the characteristics of scientific translation:

1. Scientific texts are intended to be read by scientists- and so are scientific

> translations.
>
> 2. A scientific translation is usually made from a recent original work, intended to be read immediately unlike literary translations which may be made from classical texts and used for centuries.
>
> 3. It is rare for more than one version of a scientific translation to be made. When this occurs it indicates failure of communication since a second version is unlikely to contribute any further significant information if the first has been satisfactory (1969: 4).

As stated before, medical translation is mostly accepted to be objective, impersonal and non-rhetorical which are actually the fixed characteristics of scientific translation but medical texts can also be written for laymen or patients and some exceptions may occur between two cultures. Resurrecció and Davies discuss this matter in the following manner:

> Traditionally, medical language has been regarded in the same way as any other kind of scientific language: objective, neutral and non-rhetorical, whose only function was to transmit information, a so called referential content. In this traditional, received image of medical language, words and texts are detached from society and from the individual. As a consequence, they contain no cultural or ideological references, and have a uniform and impersonal style. Furthermore, each concept is represented by one-and only one-term, (in the jargon of linguists 'univocal') and concepts are precise and remain stable and unchanging over time (2007:50) .

Actually Resurrecció and Davies imply in this statement that in medical translation may be cultural and ideological elements unlike the traditional thinking which claims that the scientific language must be free from proverbs, idioms or adages, sports references and so on since it is thought to have an objective, impersonal and non-rhetorical characteristics and certain cultural elements may create problematic situations, resulting in different interpretations of the matter.

Resurrecció and Davies also claim that cultural references such as systems of weight and measures, metaphors and so on can be found in medical texts and their translations. According to them metaphors are very common in medical texts, in which abstraction and fuzziness are available. The reason is that metaphorical thinking is always present in authors' minds and besides such a way of thinking may also contribute to the understanding of the intended message for readership in general. Then, the presence of such conditions as *baby blues*, *blue baby*, *scarlet fever*, *Spanish Flu*, and so on in

medical texts and in their translations may be regarded as metaphors, some of which can be associated with wars, sports, colours, spring, youth, food and hunting (Resurrecció and Davies, 2007: 174).

Hodkin agrees with Resurrecció and Davies in this matter because he also claims that medical language may be built around metaphorical words by giving such examples as "You’re in tip top condition", "He sank into a coma" or "Falling ill" which are constructed around the idea that health is up and illness is down (1985: 1820). In fact, what is implicitly stated by Resurrecció, Davies and Hodkin is that translators may have to take into account the expectations of target readers rather than the focus on uniform and the impersonal style of medical translation when they are translating medical texts.

CHAPTER III

MEDICAL LANGUAGE

HISTORY AND DEVELOPMENT OF MEDICAL LANGUAGE

Referring to the fact that the roots of modern medicine were established by Greek Civilization in the 5th century BC, Greek heavily influenced the language of medicine at the beginning. As McMorrow states, "writing was one of the accepted techniques of the Greek scholars in communicating ideas; in an imperial world with scattered centers of learning - Smyrna, Corinth, Alexandria, Ephesus- it was as understandable as the frequent travel required to keep up with new knowledge. It was also the preferred method of passing on esteemed knowledge across generations and cultures" (1998: 15).

Later, Roman Empire conquered Greece and the Eastern Roman Empire was turned into Byzantine Empire. However, Greek physicians could keep their technical language and their prestige and transferred their manuscripts to other socities. The fact that Greek physicians brought grounds especially in medical science led to the flourishing of Roman Empire in that field as well. With the contributions of schools of Alexandria and Pergamum, early sources of Greek medicine were translated heavily into Latin and also into Arabic and Hebrew. Therefore, it can obviously be understood that the importance of Latin and other languages such as Arabic and Hebrew was also on the rise despite their importance was still lower than Greek.

Teaching and researches conducted by Greek scholars were maintained for centuries till political events such as Muslim invasion, destroyed the Greek civilization. Besides, Greek medical works were translated into vernacular languages of the Eastern Roman and Byzantine Empires such as Syriac, Arabic, Farsi and Hebrew. Local popular medical languages had always existed in the oral tradition in the regions absorbed into the Roman Empire. When it collapsed, little education or tradition of writing or translation continued except in Western Asia. Latin remained the sole resource for written technical expression in Western Europe, and this was confined to the church

schools (McMorrow, 1998: 17).

Islamic world began to become strong in the 7th century, and a united Muslim Empire was established in the 9th century accordingly. Then, medical science became a focus of interest among Muslim scholars and they established medical schools in such centers as Baghdad and Damascus. Therefore, Arabic language began influencing the language of medicine but the influence was relatively weak and Arabic language was not seen as a scientific language and therefore did not draw the attention of Western Europe as it should be, leading to the loss of its importance over time probaby because of the fact that Arabs, in their translations, omitted knowledge of medicine showing images of the human body, or of dissected anatomy. These types of information were prohibited by Islamic rules. Therefore, little information was available about surgery and scientific matters in Arabic texts. As McMorrow also states, "Arabic language was "seen as the pathway to Greek scientific system until a second wave of more accurate translations, directly from the Greek manuscripts, occurred in the later medieval period, 1250-1500" (1998: 16).

Following the ending of the brilliant period in Greece and Roman Empire lost its power, translations were only made by Arabic translators before the Renaissance. Therefore, most of the medical books written by medical writers were translated in the regions where Arabic language was spoken from 9th to 12th centuries. Translations of these works were made by the Christian Gerard of Cremona and the Jew Faraj Ben Salim into Latin to contribute to the enlargement of Europen intellect. As having been metioned before, Arabic language, however, lost its significance over time.

In the 15th century, there was a need for more accurate translations of Greek writings on medicine and only a few scholars knew Greek language and therefore Greek manuscripts and writings began to be translated into Latin again. "Improvement in the medical texts was due largely to the fact that more reliable translations were now available," according to Singer and Underwood (1962: 103). This notably advancement contributed to the widespread dissemination of the Hippocratic and Galenic writings. The fact that the influence of Latin increased upon the language of medicine and it began to be accepted as a language of medicine in real terms was only possible after the

Renaissance of classical studies at the very beginning of 1500s. In parallel with this, McMorrow claims that "classical Latin as a medical language is available to us only in early translations from Greek or compilations of a few writers: Celsus, Pliny the Elder, Scribonius Largus; it never attained any status as a medium of medical scholarship before 1500s (McMorrow, 1998: 16).

During the Renaissance period, Latin became the lingua franca and was combined with Greek and Arabic medical terminologies. However, Latin had also been used as the language of medicine as stated before. In connection with this, McMorrow asserts that "the actual use of Latin as a medical language and as the standard of the professional elite started in 1000 and went on until the very beginning of 1800s that is, it had a life about 800 years in academic medicine" (1998: 16).

Fischbach states the influence of Latin in his article entitled "Translation, The Great Pollinator of Science: A brief Flashback on Medical Translation" in the following manner:

> Medieval physicians used Latin as a means of international communication. Even later, the Belgian Vesalius wrote his *De Humani Corporis Fabrica* (1543) and the Englishman Harvey his *Exercitatio de Motu Cordis et Sanguinis* (1628) in Latin because this was the only language universally understood by all Western scientists and scholars of their day and required no translation. The great work on direct percussion by the Viennese physician Leopold AvenBrugger, entitled Inventum Novum, is dated 1761, yet it was still written in Latin (1993: 94).

Latin however started losing its importance as the language of medicine over time primarily in Italy and later England. Due to the fact that cheap printing methods and popularization of education contributed remarkably to the growth of mass communication, the need for communication with medical students and patients or phycisians who were deprived of university training influenced Latin and wealthy people established their own libraries or "United States of Europe" were replaced by local cultures, Latin was on the verge of losing its significance as a teaching and writing language in the very beginning of the 19th century. But in Germany and in the Central European area Latin survived even in teaching until as late as the 19th century.

However, the well known German doctor L.Schonlein mentioned in one of his letters in

1839 that using Latin in clinical instruction was a considerable impediment. What remains is either sacrifice new discoveries to the genius of the ancient world or violate the language (www.smw.ch/docs/pdf200x/2002/41/smw-10027.pdf). Similarly, the printing press had been universally introduced, and scientific advances in Germany, France, Italy, Holland, and England led to greater popularity of the "vulgar" tongues (Fischbach, 1993: 94).

In parallel with this, vernacular languages were important in the Late Medieval period such as Middle English in England. Besides, terminologies had already been established such as Anglo Saxon medical terminology including basic terms for anatomy, physiology and many diseases. Therefore, the significance of Latin decreased as well as other medical languages in the history but professional commnunicative acts in the national languages have so far been still realised with the use of international Latin-Greek terms (www.smw.ch/docs/pdf200x/2002/41/smw-10027.pdf).

In addition although Latin and Greek languages seem to have lost their importance, it must be underlined that in the last twenty five centuries modern languages have borrowed scientific terminology from Greek and Latin, mainly through the activity of translators. From this perspective, Greek and Latin are not dead languages. Some parts of them are still alive (Resurrecció and Davies, 2007:232). Therefore it would not be wrong to say that Greek and Latin are still the underlying language of medicine.

Fischbach also asserts that "medicine, however, is the only science, as we understand the term today, to have spread throughout the Western world in its original linguistic stroma, its terminology resting firmly on the twin pillars of Latin and Greek" (1993: 94). Erten also thinks in the same way and states that "even if the supremacy of English in medicine is apparent in the 21st century, Greek and Latin are still dominant medical terminologies and the medical writing is under their influences" (2007:32).

So, it can be said that that neither Greek nor Latin have entirely lost their influences as a medical language. The fact that Greco-Latin prefixes, and suffixes still go on heavily influencing microscopic and macroscpoic terms and the only area where the Greco-Latin tradition of medical terminology continues unabated is the lists of anatomical terms

called the *Nomina Anatomica* and to a lesser extent the *Index Nominum Genericorum* (plantarum) and *the International Code of Nomenclature of Bacteria* supports this fact as well (McMorrow, 1998: 21). Similarly, the other areas where Latin has been used are pharmaceutical and pharmacological terminologies and Greek has never lost its dominance in pathology.

English as the new lingua franca of the medical science and its translation over the last two centuries started taking the place of Latin for the quick acqusition and dissemination of medical subject field in the last 30 years of the 20t^{h} century. This is caused by the fact that the dominant role of the USA in medical technology and computer science continues affecting the whole world strongly. However, this is not the case for Greek and Latin. While Greek and Latin undoubtedly set the character of medical writing for over 2,000 years, the reasons seem to have been circumstantial rather than prescriptive, social and political rather than linguistic or technological (McMorrow, 1998: 14).

Törel also claims that

> More than 90% of the world literature is published in English makes it special among other foreign languages. Although this is true of all the disciplines, it seems more dominant in health sciences as they deal with human life (1988:14).

Still, the fact that over the last two centuries English has become the new lingua franca of distribution does not necessarily mean that it is the only language of production. Biomedical researchers all over the world writing in many different languages try to get their work accepted by international journals published in English through translations (Resurrecció and Davies, 2007:18). Furthermore, medical professionals, while communicating in the national languages, have used international Latin-Greek terms. Even though English has to a great extent become the new lingua franca of medical communication, the privileged terminology position of Latin still remains unchanged (Kasprowicz, 2010, http://accurapid.com/journal/52abbreviations.htm).

CHARACTERISTICS OF MEDICAL LANGUAGE

Most of the time, language of medicine can be defined as the language of a professional group with which ordinary people are unfamiliar (Erten, 1997: 49). It may however be described as a type of register that is, a variety of language appropriate to different occasions and situations of use. Ranges of variation of this register have been described in terms of technicality, formality, and channel of communication (Pilegaard, 1997: 159).

Medical language is a versatile language belonging to the so-called language for special purposes (LSP) and therefore it has various types such as language of medical occupation (journal articles), language of medical journalism (popular medicine), doctor/patient language, and medical technical language (manuals). In addition, the influence of English as the lingua franca over the last two centuries and other international languages such as French, German, Spanish, Chinese and Danish has continously been increasing in medicine and new words are derived from these languages to take place of Latin and Greek. As Pilegaard confirms this as well, WHO (World Health Organization) has estimated that several thousand new terms are created annually. Many of these neologisms are the products of new discoveries in the biomedical and related sciences. Others are due to theoretical reorientations, as in the reclassification of viruses (1997: 162).

Pilegaard also claims that "the communicative purpose of medical language is first and foremost to provide a nonambigious language by means of terminologies in order to express relevant concepts, especially in the expert to expert tenor" (1997: 159-160). This also confirmed by Cabré and she states that "the final goal is achieving precise and unambigious professional communication" (1998:38). Medical language then must have a specialized terminology which is clear, understandable and free from mistakes and it is primarily intended for medical professionals since it is usually formal and has a technical and scientific register the characteristics of which are objective, neutral and non-rhetorical according to the popular opinion.

Due to the fact that medical language can be acquired by medical professionals through long periods of learning, it often sounds scary and complex to patients and their relatives

since it is usually accepted to be composed of an occupational code only used by doctors (Erten, 1997:49). However, while discussing sensitive subjects or delivering bad news, it is necessary to keep language simple and understandable. Medical professionals may still prefer to use complex language in medical communication, occasionally to conceal medical information from patients and to have control over them.

Similarly, doctors are accustomed to constantly using highly technical and scientific language full of long and complicated sentences. They therefore often tend to use it instead of a daily language such as the use of "myocardial infarction" instead of "heart attack" (Erten, 2007: 68). As a consequence, communication with the general public is sometimes undermined as laymen are only familiar with general medical terms, resulting in a lack of communication and making the situation worse than before. Considering the fact that medical language provides communication between patients and doctors as well, it has sometimes to be straightforward and concise or avoid excessive use of technical terms to make sure that the intended message is clearly understood by ordinary people. Then, the language of medicine needs to be simplified in some cases including medical translation by bearing in mind different communicative situations. According to Resurrecció and Davies, "the range of communicative situations where medical translation may be required is very broad, covering not only communication among researchers but also any kind of communicative interaction about health that involves health professionals, patients, and the general public" (2007: 21).

It can therefore be said that medical communication is not confined to only doctors and researchers and what is more it can be counted as a rich and dynamic process ranging from written research articles for specialized people to educational television documentaries about health matters and news in the press intended to give information about health and medicine to patients. Under these circumstances, the factor to decide whether a simple or complex language is to be used in medical translation and medical writing can only be determined by taking into consideration various settings as mentioned above.

In connection with this, based on the medical vocabulary, Newmark suggests the following levels as well:

> 1. Academic. This includes transferred Latin and Greek words associated with academic paper, e.g., 'phlegmasia alba dolens'.
>
> 2. Professional. Formal terms used by experts e.g., 'epidemic parotitis', 'varicella', 'scarlatina', 'tetanus'.
>
> 3. Popular. Layman vocabulary, which may include familiar alternative terms e.g., 'mumps', 'chicken pox', 'scarlet fever'; 'stroke', 'lockjaw' (1988: 153).

In medicine, the smallest unit relevant to meaning is not the word but the morpheme. More than five hundred Greco-Latin roots, prefixes and suffixes form the basis of fundamental medical terminology (Resurrecció and Davies, 2007: 232). *Aden*, *cephal, hepat*, *osteo* are some the of the Greco-latin roots. In addition, *ante*-, *hyper- pre*-, *epi*- are Greco-Latin prefixes whereas *-lysis, - spasm*- , *-algia*, - *genic* are suffixes (Erten, 2007:50-52).

The importance of morphemes is also confirmed by Erten. According to her, "medical terminology is formed by the use of Greco-Latin roots, prefixes and suffixes or via loan or borrowed words and derivational process" (1997: 51). Medical words may also be created by *compounding* of Latin and Greek radicals: the so called *neo classical compounds*.

> Medical terminology indeed heavily draws on derivation and compounding to form new words. A complete list of these words cannot be expected to be present in a lexicon. Furthermore, the decomposition of a word into its component elements or *morphemes* is a step towards its decomposition into atomic concepts. Therefore, it may lead to better indexing of medical texts and better structuring of medical terminologies (http://www-test.biomath.jussieu.fr/~pz/FTPapiers/Zweigenbaum:IMIA99.pdf).

Similarly, Resurrecció and Davies claim that "the use of Greek and Latin etymological forms still is and will continue to be one of the principal ways in which we can create, store and communicate new knowledge" (2007: 232). This statement also proves that Latin and Greek are still alive and go on constituting the basic building blocks of medical terminology or helping doctors and health care personnels to comprehend the underlying meaning completely with the contributions of their roots, prefixes and suffixes though their significance may seem to have been declined by the dynamism of the medical science.

All European languages still share the same Greco-Latin roots in medical terminology. Similarly, the preservation of the Latin language as the language of sciences until the 19th century, contributed to a great range of lexical similarities in medical nomenclature, and its effects can be observed until today (Herget and Alegre, 2009, http://accurapid.com/journal/49medical1.htm). It should also be noted that most of the medical terminology is composed of anatomical terms because anatomy is the most basic among others and the first anatomical terms were identified in Basel, Switzerland by German anatomists in 1895 (Erten, 2007: 48).

Medical terminology is not static and uniform. Therefore, it may change in space and time and may not be alike between languages. According to Resurrecció and Davies,

> Different languages and cultures vary in the structure of medical terminology as well. One of the most obvious examples is the fact that some languages, such as English, have a double-layered medical vocabulary- that is, most scientific words have popular counterparts- whereas others, like Spanish or French, do not have them at all or do not have them to the same extent. While "clotting" may be used in English instead of "coagulation", its equivalent term in French is only "coagulation" and subsequently "coagulación" in Spanish (Resurrecció and Davies, 2007: 242).

Medical language probably offers the richest proliferation of synonyms in any technical language. Innumerable concepts are synonyms or near synonyms but differ according to level, be it anatomic, clinical, pathogenetic, historic, or geographic (Pilegaard. 1997: 174). *Acute anterior poliomyelitis*, *acute atrophic paralysis*, *anterior spinal paralysis* and *spinal paralytic poliomyelitis* are synonyms of *infantile spinal paralysis* (Erten, 2007:56).

Similarly in medical writings it is also highly possible to come across polysemy describing those words composed of several meanings and possibly originating in eponyms, and in Greek and Latin roots, prefixes or suffixes as happens with synonym (Resurrecció and Davies, 2007: 246). Body fluids and *Goly body* are polysemous words as the former means the material part of a human whereas the latter means a substance or a thing.

Furthermore, homonym implying one of two or more words which are spelled and pronounced alike though they are different in meaning is also common in medical texts.

According to Resurrecció and Davies, "homonym normally derives from the formal coincidence of Greek and Latin roots such as *metr*- (measure and uterus), *cario*- (becoming rotten and nucleus), *hydr*- (sweat and water), *eco*- (house and echo), *brachy*- (slow and short), *aur*- (hearing and gold), *acu*- (needle and hearing), *sex*- (sex and six)" (2007: 247).

Neologisms or coined words may also be coincided from time to time even though they are not very common in medical writing. Neologisms can be used for the new discoveries or new medications. Pl*antibodies* (plant+bodies), *nutraceuticals* (nutrion+pharmaceuticals), *theranostics* (theraphy+diagnostics) are some of the examples of neologisms (Resurrecció and Davies, 2007: 247).

Acronyms

Newmark defines acronym "as the initial letters of words that form a group of words used for denoting an object, institution or procedure" (1988: 200).

Medical texts have countless acronyms, which are categorized into two groups: general and author specific. General acronyms can easily be found in all medical works. However, author specific acronyms can cause some misunderstandings if the author does not explain their meanings. Abridging or in other words acronyms may also enable medical professionals to code the true meaning of their utterances, making the content inaccessible to the patient, which at times is advisable for ethical reasons (Kasprowicz,2010, http://accurapid.com/journal/52abbreviations.htm).

In addition, acronyms are used among health care personnels for long expressions whose prounciations are highly difficult. Furthermore, they are generally kept untranslated in the same way as it is in the source text because of their universalities. The most vivid example could be *AIDS* (Acquired Immune Deficiency Syndrome), which though being a shortening from English words, has been fully integrated into other languages (Kasprowicz, 2010, http://accurapid.com/journal/52abbreviations.htm). *ABS* (Acute Brain Syndrome), *RBC* (Red Blood Count), *ADH* (Antidiuretic Hormone), *PAH* (Para-Aminohippuric Acid) can also be given as examples of acronyms.

Eponyms

According to Newmark, eponym is defined as "any word that is identical with or derived from a proper name which gives it a related sense" (1988: 198). In other words, eponyms are proper names used to designate syndromes, illnesses, research-related matters and devices (http://medtrad.org/panacea/IndiceGeneral/n20_editorial.pdf). In medical science it is commonly used to respect the person who discovers a disease or surgery.

The concept also implies a name (regarding a drug or a disease) relying upon or in other words coming from the name of a person in medical science or it refers to a person whose name is accepted to be the source of the name of something such as an object or invention. Eponyms are generally composed of English, French, Latin and Greek languages. *Parkinson's disease*, (named after James Parkinson (1755-1824)) can be given as an example of an eponym (http://users.tinyonline.co.uk/gswithenbank/eponyms.htm).

Medical Phraseology

According to Wakabayashi, "it is not just the terms of art which distinguish medical texts from general texts, but also certain turns of phrase that are commonly used by medical writers instead of daily or "lay" expression" (1996: 361). The example given by her is "on the same side" which is translated as *ipsilateral* in the medical translation. Its antonym "on the opposite side" also becomes *contralateral* when it is translated as a medical term. These examples obviously show that the medical science and medical translation have a specific phraseology.

CHAPTER IV

PROBLEMS IN TRANSLATING MEDICAL TEXTS AND POSSIBLE SOLUTIONS TO THEM

Since the subject matter medical translation deals with is directly human health, it is thought to be the most complex of arts and has therefore to be performed with precision. In addition, translation of medical documents needs correctness, experience, analytical thinking, ability to interpret, and a greal deal of linguistic background both in source and target languages. Unlike other types of translation, medical translation may not be modest enough to tolerate mistakes which possibly give rise to fatal or serious clinical consequences and sets of situations affecting patients' health conditions negatively or resulting in recall of products such as medical devices or medications. In this chapter, the possible problems of medical translation and solutions to these problems are explained in detail for a better understanding of the source text and the transfer of medical concepts to the target reader completely and with no loss of information.

It is claimed that grammatical structure of medical texts is the simplest of all and their authors are scientists willing to explain facts. Therefore, they do not bother for stylistic devices in general (http://www.upublish.info/Article/Professional-Translation-of-Medical-Texts--Locks-n Keys/112596). Segura also confirms this and states that "medicine is easier to write about or translate than other scientific and technical subjects, because much of its terminology is based on Latin and Greek words, prefixes and suffixes" (1998: 43). Therefore, what is actually important in medical translation is to be able to choose approriate equivalents for medical terminologies in the translation process because even a simple word can cause translators to feel themselves locked in the translation process or a tiny mistake can be the messenger of catastrophic incidents as implied before.

Medicine is a field of knowledge in accelerated scientific and technological developments that each year incorporates a large number of terms into the medical lexicon (http://www.gala-global.org/en/resources/CcapsAlfaro_EN.pdf). This statement

shows that new terms are continously coined to describe new techniques in medical science and due to the fact that they have never been translated before and they do not have suitable lexical correspondences on word level or translators are deprived of having references and updating of dictionaries may take years, translation problems may occur. International boundaries can also create problems as old terms are replaced by new ones in some parts of the world, but the old ones remain in use in other areas (Stahl, 1992:265).

In addition, it is essential that dictionaries be approached carefully because some of the general dictionaries may cover medical terms whose equivalents are misleading or totally incorrect and medical translators may not occasionally be able to find equivalents for terms in dictionaries. It would also be wrong to think that the equivalent term in a bilingual dictionary is appropriate in a particular context. On the contrary, it can create dilemma for translators by leaving them unsatisfied. Furthermore, as mentioned above, dictionaries will never be completely up to date, and even if the English equivalents they provide are correct linguistically, they may not be the terms physicians actually use (Stahl, 1992: 265).

The most obvious problem, though not necessarily the most difficult in medical translation, is the specialized terminology used (Wakabayashi, 1996: 358). In other words, medical terminology belongs to health care professionals with which ordinary people are not familiar. It can then be said that medical terminology is composed of unusual terms that are not present in daily language. Hervey and Higgins also confirm this fact and add that the ordinary vocabulary may be technical in medical texts or on the contrary may be confused as a technical term. All of these lead to certain problems for the translator during the translation process. To make the matter clear, it would also be beneficial to refer to what Hervey and Higgings mention about the matter:

> 1. There is the obvious problem of terms not used in everyday, ordinary language. Without specialist knowledge translators can neither guess the exact meaning of the term nor make an informed guess at its correct target language rendering.
>
> 2. There is the problem of terms whose ordinary, everyday uses are familiar to the translator but which are manifestly used in some other technically, specialized way in the source text. That is the familiar senses of the terms don’t help the translator to

> understand their technical sense. Knowing the common sense meaning of the term is no help at all in guessing what the technical meaning might be.
>
> 3. There is the problem of a term that may have an ordinary, everyday sense that is not obviously wrong in the context. This is the most dangerous sort of case because the translator can easily fail to recognize the term as a technical term and mistakenly render it in its ordinary sense (1992: 166).

Furthermore, it can be claimed that medical translators may run into the problem that there is no such thing as a systematised knowledge of the syntactic, semantic and pragmatic limitations of medical terminology because specialized registers in general and medical terminology in particular undergo constant innovation, adaptation and change (Pilegaard, 1997: 162). This situation therefore may imply terminological problems as well. Greco- Latin words may also lead to specific problems, such as the use of opaque words and it is certain that the health science is composed of such words.

Similarly, one of the most difficult obstacles to overcome is the handling of Greek and Latin terms because translators new to specialty often make assumptions which cause serious mistakes. Bearing in mind that Latin is the language of choice for anatomical nomenclature, one could misleadingly imagine that any anatomical Latin term on an English document would remain unchanged in the translation, which may be the messenger of series of mistakes in the translation process (Albin, 1999, http://accurapid.com/journal/09medic.htm).

The linguist with some knowledge of medicine may also succumb to errors of terminology or understanding, and produce a translated text that does not reflect the appropriate style (http://medtrad.org/panacea/IndiceGeneral/n25_semblanzas-marquez.pdf). Therefore, it should be noted that in the translation process more than half of the time is invested in detecting and solving terminological problems (Resurrecció and Davies, 2007: 21).

Furthermore, one of the major difficulties in the translation of medical texts concerning medical terminology has been the confusion of concepts and the words used to express those concepts, or more properly between the linguistic representations and the concept representations. The difficulties are made worse because the formalisms and language

used in linguistics and concept representation are often similar (http://www.cs.man.ac.uk/~rector/modules/cds/Why-is-terminology-hard-single-r2.pdf).

In addition to this, Newmark states that "in science the language is concept centred; in technology it is object centred" (1988: 155). Since medical language is a scientific language as well, medical translators may face conceptual problems if they are inexperienced in the terminology of the text they translate. The prefix "cardia" can be given as an example which creates confusion since it has multiple meanings. It can either imply the heart or the opening of the esophagus into the stomach.

Similarly during the translation of a medical term from the source text into the target text, the translated term may imply a different, a broader or a narrower concept, which may stand for ambiguity. This problematic situation can lead to the uncontrolled medical terminology because the terminology of clinical medicine is already very large (nearly 60 thousand terms some of which are event out-dated and worn out) although it falls into a relatively small number of categories such as anatomy, diagnostic procedures, surgical procedures, names of diseases and symptoms (http://cs.nyu.edu/sager/LSPonSNOMED.pdf). The alteration of the concepts may also cause target readers to face problems related to understanding and grasping the accurate information unlike source text readers.

Another problem that can create confusion in medical translation is the distinction between technical and descriptive terms as mentioned by Newmark. The author of the source text can use decriptive terms if:

1. The object is new and has not yet got a name.
2. The descriptive term is being used as a familiar alternative to avoid repetition.
3. Descriptive term is being used to make a contrast with another one (1988: 153).

Professional technical translators generally tend to use technical terms instead of descriptive term since technical or in other words standardised language is always more acceptable than a descriptive term.

However, Newmark also points out that

> Whilst the technical term may be a translator's find and will help to acclimatise the professional reader, it is I think mistaken to invariably prefer it, bearing in mind that the descriptive term in the SL text may serve other communicative purposes. In cases where the piece is technical and there is clear evidence that the descriptive, the more general and generic term is probably only being used because the narrower technical term is rare or lacking in the SL, the use of the technical term in the TL text is certainly preferable. However, where an SL technical term has no known TL equivalent, a descriptive term should be used (1988: 154).

It can then be said that a medical translator should also use descriptive term where it is necessary. However, if he or she insists on using a technical term instead of a descriptive one in such a case, he or she is doing it for the purpose of showing off, which in a way implies not being faithful to the source text author and the text itself (Erten, 1997:21). This can bring about some difficulties for translators during the translation process of medical texts.

In addition to these, the emphasis must be put on the fact that medical texts require a specific cognitive knowledge from translators themselves and when they encounter difficulties, they are the primary decision makers to be able to overcome problems. Hence, all of the troubles possibly occurring in the translation process may create a chaotic atmosphere for translators or discourage them from maintaning the task of translating. As stated by Hervey and Higgins (1992), terms can have different meanings from the daily language and therefore tend to prevent the translator from understanding the underlying meaning.

Similarly, the medical language register in European languages is a jungle of synonyms-different words being applied to the same condition, depending sometimes on whether the point of view is anatomical, clinical, or pathological, and sometimes on when and where the expression is used. Thus "brucellosis" has at least 25 (linguistic) synonyms in English alone (6-12 in other European languages) (Newmark, 1979:1405).

Besides, a single term may occasionally be used for different medical concepts. That is, medical homonymys such as *schizophrenia* and *chronic bronchitis* can be used in different meanings other than their common meanings in different languages (Pilegaard,1997:163) . Furthermore, it should be noted that the meaning of a medical

term does not always reflect the exact meaning of the individual components. That is to say, "ectasis" means "expansion and dilation", "atelectasis" means, however, only "collapse of the lung" (Wakabayashi, 1996: 359). All of these may imply ambiguities for medical translators in the translation process.

In addition to these, the original medical document may be full of grammatical mistakes, typing and typographical errors, incorrect use of terms, problematic format and layout, overuse of long and passive sentence structures or loan words, complex and poor syntax, vague pronouns and wordy sentences with too much information. All of these make the translation of medical texts more difficult.

Furthermore, faulty references from text to figures or missing references, translators' inability to understand the grammatical or lexical structures of the source text, failure to be aware of the fact that common vocabulary may have different meanings in medical documents like the verb, "administer" meaning to give someone a medication in medical sense, the genre shifts, use of trade names of medicines or the names of drugs, usage of words in different languages, false friends, collocations, proper or geographical names, polysemantic and homonymous words may all lead to extra difficulties in medical translation as well.

On account of the differences in the language systems such as peculiar syntactic structures or grammatical diversities, some problems may also come to light such as the failure in the transfer of the information in the source text into the target language via translation accurately or the alteration of the same information in one language in another language.

Resurrecció and Davies claim that "more often than not, medical authors are not professional writers. Besides, not all authors of texts about health write in their mother tongue" (2007: 22). Pilegaard has also the same point of view and states that "non-native physician writers also lack English writing skills and training in writing in English. When they write, their conscious rhetorical focus is on the subject" (1997: 163). This exactly means that translators sometimes have to cope with poor quality source texts as well. The fact that the text has a bad writing quality increases the risk of the lack of

communication. In addition if typographical, grammatical or semantic errors are not corrected in the translated document by the translator being master and knowledgeable over the language he or she uses habitually, such problems may give rise to understanding of the translated document inefficiently and may force the target reader to read the document several times before they can understand it.

All of these shortcomings either in a text segment (micro level) or in a text as a whole (macro level) make the communication difficult between translators and authors or between translators and the target reader and as a result there is a danger that medical document is translated with many mistakes and losses of meaning.

> Translation is a "risk opportunity" that is, an opportunity to introduce errors. When something goes wrong with the translation of a medical document, serious concequences may occur: a patient may die, or US Food and Drug Administration (FDA); its European counterpart, the European Medicines Agency (EMEA); or similar organizations in Asia may delay authorization for the marketing of a product. Such delays are rather serious, as they shorten the patent protection period during which the investment in the development of drugs or medical devices is earned back. Also, a delay in the authorization to market a drug or other products means that the patient who can benefit from its use must wait longer (Andriesen, 2006:157).

The above mentioned statement is also confirmed by the following which emphasizes the significance of the translation of medical texts over patients, users of medical devices or even companies.

> The certification process of medical devices and the marketing authorization application for medicines can be delayed if there is a serious problem with even just one of the translated documents. This delay means a loss of time and market and, in the case of medicines, a shortening of the patent protection period. If a translation problem ends up in printed documents distributed to patients or other users, the consequences may be more severe. If something goes wrong with a drug or a medical device and the patient or the user of the device feels that the information or the instructions were unclear, this lack of clarity in the translation may very well lead to lawsuits, which cost money, hurt the corporate image, and may eventually bring a company down (Andriesen, 2006:157).

Then, it is necessary that medical texts be translated properly because it is directly related to human life above all. However, translated document or interpretation may sometimes be more different than the originally intended in the sense that the former may leave out vital information by causing ambiguities or presenting erronous

information to the patient about the use of a medical device or about dosages and frequency of medications as a result of inappropriate translation of the source text or inappropriate interpretation of the source text information.

In addition to those mentioned above, translators who do not have enough experience in medical translation and have inadequate professional background without proper training or only deal with the superficial understanding of the source language trigger the process of translating medical texts negatively. Inexperience bilinguals may also impede the communication between doctors and their patients. Furthermore, amateur translators seldom perform in-depth research into terms that have already been translated in medical literature, which results in heterogenous translations from one publication to another (http://www.gala-global.org/en/resources/CcapsAlfaro_EN.pdf).

There are a few medical translators who are in real terms specialized in medical translation and have medical training or a background of health matters. Most of the time, translators or translation companies pretend to be the master of the domain and continously take the job offered even if they do not have a background knowledge of the topic to be translated into the target language, which lowers the quality of the translation. Andriesen also states that "very often, there is simply not enough time available for the translator to provide the amount of care that high-quality translation requires. No matter how well the source text has been written and no matter how qualified the translator is, if there is not enough time to do the work, the quality is jeopardized" (2006: 158).

It would also be logical to touch upon the difficulties faced by medical interpreters since they are very similar to those faced by medical translators. These may include the miscommunication among physicians, patients and interpreters themselves, the problems of different health beliefs, culture specific problems, lack of sufficient information and time, poor quality speech, omission of a vital piece of information, incorrect replacement of a word with the other, false fluency implying terms or words that are not actually found in a specific language, editorialization implying the addition of the interpreter’s view to the interpretation process that is not actually present in the original speech, deviation from the actual meaning and so on.

Problems in the Translation of Acronymic Terms and Eponyms

Medical translation, tend to contain abbreviations and acronyms, so the translator needs to know what these are, whether they need to be adapted or translated, and where he or she can find references to them (Gonzales, 2007:51). However, in some cases acronyms obscure the meaning, being the source of obscurity or ambiguity, for even within one speciality, several different terms may stand for one acronym (Kasprowicz, 2010, http://accurapid.com/journal/52abbreviations.htm).

Fischbach also confirms this by stating that "not only are there many books of medical abbreviations, but also many of the same abbreviations and acronyms may have different meanings, depending on the disease, anatomy or procedure being discussed" (http://medtrad.org/panacea/IndiceGeneral/n25_semblanzas-marquez.pdf).

Abbreviations and acroynms may be nonstandard and sometimes may cause confusion in the reading process since they are generally given in the middle of a sentence or near the end of the article and they are not explained throughout the text or do not belong to the source language. Acronyms can also be categorized under two major groups: general and author specific. General acronyms do not often represent translation problems but author specific acronyms may lead to comprehension problems if left unexplained by the author. Acronyms and abbreviations or shortened forms of terms may simply block medical communication and therefore it is claimed by some of the authorities that they are the most common medical translation problems.

Furthermore, eponyms may create translation problems as well in that they may be different or unfamiliar and may not have corresponding equivalents in source and target languages. A syndrome, may have been discovered simultaneously in various countries by different people and may therefore be named after the person who discovered it in different locations (http://www.medtrad.org/panacea/IndiceGeneral/n20_editorial.pdf).

As a consequence, it is anymore not enough for medical translators to depend only on their knowledge of Latin and Greek languages and numerous medical reference books. Technology is an ever growing subset- some would say superstructure- of medicine, and more than just cursory knowledge of, say, physics, chemistry, electronics and statistics

is demanded for sound medical translation. These forays of other disciplines into what has, for so long, been the uniform structure of medical science have complicated the task of the medical translator (Fischbach, 1986: 21).

POSSIBLE SOLUTIONS TO TRANSLATION PROBLEMS

Campbell states that

> To return to the matter of correctness, it would clearly be more fruitful to try to see behind apparent errors and characterize the processes that gave rise to them. Many researches in translation studies are currently concerned with the importance of process of translation rather than the product (1991: 331).

Translating is about thinking clearly and understanding a text before transferring it into another language. One of the main setbacks an inexperienced translator can come across is not spotting that there is a problem in the text (Resurrecció and Davies, 2007: 168). In this part are given useful solutions for medical translators and even translators of other fields of translation enabling them to detect and solve translation problems which may occur during the translation process and to understand the accurate meaning of the source text in this way.

First, a medical translator's intention should be actually to create a text that reads like an original by transferring the meaning of the source text into the target text without leaving out any information since such a type of translation may imply life and death issues. This view is also supported by Newmark, Fischbach and one of the founders of the translation studies in Turkey, Göktürk from different perspectives.

According to Newmark,

> In medicine, but not in all translation, the translator's object is to elicit equivalent effect-that is, to attempt to produce the same cognitive and to a lesser extent emotive impression on his reader as, to the best of his belief and imagination, the writer of the original produced on his own (average) reader (Newmark, 1979: 1405).

According to Fischbach,

> The foreign language reader of any advertising and promotional literature should be unaware that the text he is reading is a translation. He should not be confused by unusual turns of phrase, odd meanings, unfamiliar metaphors, or unknown background material. He should be made to feel that the copy was written originally in his own language. In other words, the translation should be "invisible" (http://jama.ama-assn.org/cgi/content/extract/285/6/722).

According to Göktürk,

> One of the most interesting definitions of equivalence is that the effect awakened by the original text on the source reader can also be produced by the translated text for target language readers (1998: 55).

At the end of the translation process, such a text can only be produced by attaching importance to the revision phase. It is essential that words and grammatical structures used in the translation be checked thoroughly to make sure there are no mistakes and the meaning or the style of the source text are transferred accurately, precisely, consistently and completely within the target language constraints. To achieve those explained above, some translators use back translation. A back translation is used when a translated document is translated back into the original language, without reference to the original source language version of the text (Andriesen, 2009:26). However, this kind of translation is only possible when the literal translation can be applied. It is therefore not advised in general since adaptations made by translators may be lost.

More important than the knowledge of equivalents for terms is the underlying meaning behind them. Then, it is not important to understand the words but to understand what the words are about. Therefore, understanding the source text completely is of major importance so as to enable the target reader to read the target text effectively. Besides, the complete and proper understanding of the source text is only possible provided that some background knowledge is acquired. According to Wakabayashi,

> Specialized knowledge is without doubt a great asset to the translator, making it easier to go beyond the surface meaning. Although such knowledge is desirable, however, a lack of formal medical training is not necessarily an insurmountable obstacle to the medical translator. What is essential is not a medical degree, but a broad understanding of the fundamentals and knowledge of how to acquire, in the most efficient manner, an understanding of other elements as and when necessary (1996: 357).

It should be noted that medicine is a not a static but a dynamic phenomenon just like other scientific fields and new terms are incorporated into the medical terminology continously. It is therefore impossible to control the entire medical terminology all the time, which thus requires a collective solidarity and collaboration including specialized teams of medical translators, editors, proofreaders, project managers, field specialists or health care personnels. Possible terminological problems such as the misleading use of

synonyms can be overcome in this way and as a result medical terminology can be standardised.

In addition, experienced translators and author's editors will demand background material from which to search for the terminology: previously published articles in the same speciality, preferably by the same author and from the same journal as that to which the commissioned translation or edited text will be submitted (Ruuskanen, 1992: 291-292). It is also beneficial to ask clients or manufactures of new medical devices or equipments about the medical terminology used in order to understand the text clearly.

It should also be stated that the translator must attempt to make his or her own text clear if it is obvious that the language of the source text is obscure or if the source language text is open to doubts deliberately, he or she must make it clear that such doubts exist and has to make decisions as how to express the same sentences and phrases within the target language (Erten, 1997: 19). Medical translators are also responsible for creating medical texts which are understandable and written in an appropriate register in the target language.

Similar to the explanation above, when medical translators feel that they may not be able to achieve the overall accuracy and clarity of the source text in the target text, it is essential that they take assistance from translation professionals and enable the translated document to have them proofread to minimize losses of information and mistakes. Whether they have medical training or not, medical translators may need to talk to and collaborate with health care personnels or medical experts to ask their questions and discuss meanings by considering the fact that collaboration and consultation may be useful in finding reliable sources of information of all kinds and in acquiring a very accurate idea of how the target text will be used, for what purposes, by whom, and in what situations as well as terminological problems (Resurrecció and Davies, 2007: 226). Similarly, consulting different subject matter experts and specialized translators as fas as possible are very important due to the fact that different kinds of views are possible on the problems encountered and their solutions in the translation process of medical texts.

Medical translators must become capable of transferring the meaning of the source text into the target text completely and must be well specialized in interlingual communication. Besides, they must be aware of the fact that new terms must have only one technical meaning, and a given concept must have only one name or closely related concepts must have similar names to avoid conceptual problems in the translation process (Finch, 1969:39).

Furthermore, medical translators must read similar subjects or parallel texts such as research articles, scientific letters, patient information leaflets, clinical trial protocols in the target language by comparing them with those of the source text for the purpose of gaining a specialized knowledge of the subject matter and an excellent knowledge of the source language technical writing or target language writing rules. This can also provide benefits for them to be specialized in the complex medical terminology which needs to be carefully checked everytime to be able to keep track of changes such as the use of new implant materials in the field or effectively understand medical terms.

Medical translators must really like and know what they have to do and they must understand not only the texts in hand, but also the physical world and culture in which they are produced originally. This implies that translators should be familiar with the daily life in the source location and that their activity is not merely a manipulation of linguistic data (Mercy, 2006: 268). It can be inferred from this statement that medical translators must be bicultural as well as being bilingual. Therefore, medical translators must take into consideration cultural differences between languages as well as linguistic differences.

Medical translators handling medical texts do not have to be trained as doctors or nurses, but it is necessary that they understand all the associated implications- the linguistic, medical, social, and cultural contexts in which they work (Mercy, 2006: 268). In addition, medical translators must be well specialized in understanding the contexts to be able to detect the meaning of medical terms and to make it clear that they differ from the daily language. Furthermore, they must translate medical terms by creating the same medical flavour of the source text has in the target language.

Research is of paramount importance for a successful medical translation.Medical translators must therefore have research and documentation skills and must be aware that they can also come across undecidability or ambiguity during the research, reading or translation processes. In addition, extensive bibliographical research must always be undertaken to search for terms that have already been published in earlier publications, making an effort to stick with the choice made by the first translator (http://www.gala-global.org/en/resources/CcapsAlfaro_EN.pdf).

Reference books are also of major importance to achieve the success in medical translation. Newmark explains this in the following manner:

> Reference books are a translator's main tool, and they are increasing in number and improving in quality, as they pay more attention to contexts and frequency. What is important is to show people how to use reference books, and to relate bilingual dictionaries first to monolingual dictionaries and then outside language to reality that is, to encylopedias and textbooks, and where possible to the relevant work sites and informants (1998: 85).

Awareness and consciousness raising to be able to surmount problems in the translation of medical texts may also be effective for medical translators to see the origins of mistakes easily and to determine the appropriate translation strategies relevant to the genre of the document.

To make the translation of medical texts more successful, translators must also be specialized in the linguistic and extra linguistic elements of the source text, target language's grammatical rules for the achievement of an equivalent text or in accession to useful tools such as dictionaries, encylopedias, computers and information networks as well as previous translations on the subject matter (Aksoy, 1999:23). In connection with this, it would also be important to mention about three main features of a translator defined by Uvarov which also covers medical translators in order to solve translation problems and create a successful translation production at the end:

> 1. Clear comprehension of (but not necessarily fluency in) the source language.
>
> 2. Knowledge of the subject to a high level, supported by access to reliable sources of the latest information on that subject.
>
> 3. Fluency in (ideally ability to think in) the target language (1988: 91).

When taking these steps, medical translators have also to be well-equipped with all the ways two languages work and they should be knowledgeable about and experienced in the translation procedures and techniques like translators of other fields, which is also confirmed by Kantarcıoğlu (1999.66).

According to Fischbach, when the translator is not a physician himself he must attach importance to research and checking activities. Indeed, medical translation is more easily solvable than other fields of translation. He explains the reason in the following manner:

> Libraries are well stocked with medical references. The medical field has always been well documented, even before there was easy Internet access to the Academy of Medicine. Either you knew a physician or librarian who didn't mind helping you out to solve your questions or guide you in the right direction (http://medtrad.org/panacea/IndiceGeneral/n25_semblanzas-marquez.pdf).

Considering the fact that the target reader can be professionals, semi professionals or laymen or the reader of the translated document may differ from the reader of the source text, a medical translator in collaboration with his client must have an excellent knowledge of target language's medical stylistics and bear in mind readers of the translated document for them to understand the medical terminology clearly. The translation of the source text can therefore depend on many factors such as education level, levels of knowledge and experience, linguistic abilities or reading context of the target reader.

In addition, as far as register is concerned it is important to use different terms depending on the target readership such as lay readers or readers with medical knowledge (Wakabayashi, 1996: 360). That is, if the text is translated for professionals to read, the language is mostly composed of a complex medical terminology. Professionals are generally used to long and passive sentences which are overcrowded with information or unusual acronyms. Explanatory footnotes or explanation of words in brackets for them are not necessary due to the fact that they are specialized in the subject matter.

However, if the intended audience is only composed of semi professionals or laymen long and passive sentences must then be chunked or paraphrased and converted into active to make them more intelligible and to avoid verbosity with too much knowledge

of the subject matter. Furthermore, it is essential that common terms instead of scientific or technical terms be used with explanatory footnotes and endnotes giving information about a specific disease and its symptoms in general. Unknown vocabulary must also be explained in brackets for such target readers to understand the accurate meaning of the source text. It is also important to make it clear which pronouns refer to which nouns and also to avoid too many acronyms to increase the readability for them (http://studenttheses.cbs.dk/bitstream/handle/10417/835/anette_thorup_pedersen_og_tanya_nielsen_halliday.pdf?sequence=1).

Similarly, Newmark asserts that

> A medical translator's first aim is factual textual accruracy and the second one is a natural, sympathetic way of writing that will interest his reader. He must therefore assess his reader (articles for laymen and for specialists have different styles) and has to translate effectively, removing "barbarisms"(unless the writer is well known and his way of expressing himself important), clarifying and pruning where necessary, checking any possible mistakes and misprints, and reducing longwinded jargon (Newmark, 1979:1405).

Newmark also proposes some steps for medical translators to be able to achieve an understandable and successful translation. These steps can be summarized as follows:

> 1. Translate the title last because it should designate the subject intention of the paper or both, and may not do so in the foreign text.
>
> 2. Treat any translated abstract at the end of the paper with reserve.
>
> 3. Trust the English titles in the bibliography which should give some of the theme-words.
>
> 4. Never accept a bilingual or multilingual dictionary as an authority. It often contains too many synonyms without their context, obsolete words or "dictionary" words (that is, those that are found only in dictionaries).
>
> 5. Check all unfamiliar words for accuracy and currency in two or more monolingual dictionaries in each language.
>
> 6. Never invent words or neologisms. Look for brand names of drugs in Merck or Martindale (1979: 1406).

Furthermore Resurrecció and Davies put forward some production stages which can help medical translators to overcome translation problems. These are classified as such:

> 1. Identify the audience and, in particular, the design needs of subgroups such as specialist or non-specialist readers.
>
> 2. Specify the decisions or actions that readers should be able to take using the information.
>
> 3. Determine the target text content and structure from an analysis of the full information needs of all the subgroups of users, if necessary dividing the content across sources- such as label and leaflet.
>
> 4. Prepare a draft translation that meets the design constraints.
>
> 5. Performance-test the draft with members of the target reader.
>
> 6. Revise the draft in the light of insights gained from performance testing.
>
> 7. Performance-test the revision.
>
> 8. Iterate stages 6 and 7 until the criteria specified in 2 are met (2007:190).

Lee Jahnke also mentions about four kinds of reading for medical translators so that they can cope with difficulties and solve them easily (http://medtrad.org/panacea/IndiceGeneral/n20_editorial.pdf).The first reading is about complete understanding of the content of the source text along with its general or specific aspects. In this reading, translators tend to evaluate if the text is complete or not, what its context is, who the writer is or who the receivers are, when the text is written and where it is published as well as the evaluation of the length of different paragraphs, the adequacy of titles and subtitles or the existence of footnotes, tables or cross references. In the second reading, translators deal with unfamiliar vocabulary, connectors or collocations. This reading is related to the evaluation of whether the same logical stucture is achieved in the target text or not. Third reading is related to the microstructure of the text. This reading contributes to understanding if each of the sentences provides a logical structure for the target reader and target language. In the third reading, translators also try to understand if the logic of the text is relevant to the succession of paragraphs or not. In the fourth reading, however, translation is completely made and therefore it is also known as "quality control" in which both source and target languages are compared by translators themselves and expert readers. If these steps are taken hiearchically throughout the translation process, the translation production mostly results in success and time and cost savings.

Useful Resources to Overcome Translation Problems

Dictionaries

Dictionaries can be printed, online or electronic. Besides, it should be underlined that there are several comprehensive bilingual medical dictionaries, which contain most of the medical terms translators will encounter (Wakabayashi, 1996: 358). It is likely that translators will find most of the terms they look up in dictionaries but only if they can find the corresponding word within the context of the original document, dictionaries are accepted to perform their functions.

Besides, dictionaries are used for the purpose of validating the counterparts of the terms in the target language. The best medical dictionaries *Dorland, Stedman* and *Gould* are in American English, and *Butterworth* must be used for British English spelling and usage (Newmark, 1979: 1406).

As mentioned before, dictionaries also bring about difficulties. Hence, it is essential that in any event, words in bilingual dictionaries always be checked with words in monolingual dictionaries (Newmark, 1998: 78) or on the world wide web that is, Internet.

Internet

Internet offers numerous resources of online medical dictionaries, online libraries providing digitized versions of books, health directories, international nomenclatures, online abbreviations or units of measurement, dissertations, patents, research journals, websites related to health topics and medical associations such as *British Medical Association*, databases such as *Medline or Excerpta Medica- EMBASE* that are invaluable tools while translating highly specialized documents, search engines including *Yahoo*, *Altavista*, and *Google* that can be used to find articles about the document translated or validation of the equivalents for source language terms.

Lynch asserts that "what some users would consider the primary advantage of web-served information is instant access via hyperlinks and search engines to related sources, allowing for greater coverage of information in a shorter period of time" (1998:149). All beneficial resources on the Internet for translators must however be approached logically and if possible, websites offering premium membership must be preferred for reliable information by considering the fact that information on free websites is often hastily assembled, roughly put together and sometimes poorly expressed and may have a somewhat "provisional" feel to it, which means poor quality information in general (Resurrecció and Davies, 2007: 200).

It should also be noted that the Internet is a huge world and may thefore lead translators into chaos since they may waste their time by searching too much information without knowing what is necessary for them. Therefore, they must determine their needs when they are searching and must be specialized in refining the search results to find reliable, easily accessible and error free resources.

Computers

Computers are important resources to offer word banks or standard phrases in the translation process although computerized or machine translation must always be checked and revised by a human for accuracy.

Libraries

Libraries are also great resources to overcome problems in front of medical translators. In libraries there are numerous bibliographies, newspapers, journals, pamphlets and printed documents that can help medical translators to find the information about the document they translate or even the equivalent term they could not find in dictionaries.

CHAPTER V

TEXTBOOK OF MEDICAL PHYSIOLOGY AND TRANSLATION OF MEDICAL TEXTBOOKS

PHYSIOLOGY

The word "physiology" is derived from Greek *physis*, meaning "nature", and *logos*, meaning "study of" (Hudson, 2006: 1). There are many definitions of it . First, it is the study dealing with the way living organisms function. It can also be described as one of the branches of science which centres on explaning the function of living matters such as organs, tissues or cells to prevent pathological conditions and discover the underlying reasons of diseases.

Furthermore, it is known as the subcategory of science focusing on the logic of life or functional characteristics of living systems including viruses, bacteria, human, animals and plants. According to *Illustrated Medical Dictionary* prepared by *British Medical Association*, it is defined as "the study of body functions, including physical and chemical processes of cells, tissues, organs, and systems, and their various interactions". Then it can be said that the goal of physiology is simply to explain the physical and chemical factors that are responsible for the origin, development, and progression of life (Guyton, 2006: 3).

Physiology deals with the dynamism of living systems and it concentrates on many topics including human anatomy, cell functions, cell membrane, genetic control of protein synthesis, contraction of skeletal muscle, heart muscle, coronary blood flow abnormalities, cardiac arrhythmias, blood pressure, lymphatic system, kidney diseases, motor functions of spinal cord, muscle blood flow, circulatory shock, respiration, urine formation, blood clotting, organ transplantation, aviation, space, deep sea diving and so on.

HISTORY OF HUMAN PHYSIOLOGY

History of human physiology goes back to Hippocratic era in the 5th century BC. Hippocrates wrote books on anatomy, physiology and pathology. Besides, Galen of Pergamum used living animals and made great strides in connecting anatomy with physiology and in holistic medicine (Hudson, 2006:2).

In the Medieval period, Muslim physicians contributed to human anatomy and physiology enormously. Ibn al-Nafis (1213-1288) discovered the pulmonary circulation. He was the first to correctly describe the constitution of the lungs and gave a description of the bronchi and the interaction between the human body's vessels for air and blood. He also elaborated on the function of the coronary arteries as suppliers of blood to the cardiac musculature (http://www.famousmuslims.com/IBN%20AL-NAFIS.htm).

In the 16th and 17th centuries, the Belgian Andreas Vesalius wrote his *De Humani Corporis Fabrica* (1543) and the Englishman William Harvey his *Exercitatio de Motu Cordis et Sanguinis* (1628) (Fischbach, 1993: 94). Vesalius is mostly regarded as the creator of the modern human anatomy because human anatomy was taught without studying or dissecting bodies before him. As Hudson states, "Harvey was also the first to realize blood has a pattern in its flow and does not originate from the liver" (2006:2). The research Harvey conducted proved that blood is pumped in the body through the heart and the venous valves. Therefore, it would not be wrong to claim that Harvey is also the creator of the human physiology and the first to show blood circulation.

In the 18th century, Pierre Cabanis (1757- 1808) who was a French physiologist produced important works such as *Rapports du physique et du moral de l'homme* or "Relations of the Physical and the Moral in Man" in English.

As for the 19th century, physiological knowledge enormously increased. In 1838, Theodor Schwann (1810-1882) together with Mathhias Schleiden (1804-1881) introduced cell theory defending that cell is the basis of animal and plant tissues. In addition, Claude Bernard (1813–1878), a French physiologist, was famous chiefly for his discoveries concerning the role of the pancreas in digestion, the glycogenic function

of the liver, and the regulation of the blood supply by the vasomotor nerves (http://www.britannica.com/EBchecked/topic/62382/Claude-Bernard).

What is more, Bernard played a role in establishing the principles of experimentation in life sciences, advancing beyond the vitalism and indeterminism of earlier physiologists to become one of the founders of experimental medicine. His most seminal contribution was his concept of the internal environment of the organism (http://www.britannica.com/EBchecked/topic/62382/Claude-Bernard).

The concept later began to be called "homeostasis", first used by Walter Bradford Cannon in 1920s. "Homeostasis" is generally defined as the tendency of an organism to keep constant internal conditions in spite of large changes in the external environment (http://www.scienceclarified.com/Ph-Py/Physiology.html).

The demand later shifted from the study on human anatomy to comparative physiology and ecophysiology of animals in 20th century. Comparative physiology implies the comparison of physiological adaptations among living organisms to various and different settings. Likewise, ecophysiology is defined as the science dealing with the relations of the physiological mechanisms of living organims in their biological and physical settings. Knut Schmidt Nielsen (1915–2007) can be considered as the pioneer of the comparative physiology in the second half of the twentieth century. He also dealt with ecophysiology of animals, one of the founders of whom is George A. Bartholomew (1919–2006), renowned emeritus professor at UCLA in the Department of Ecology and Evolutionary Biology.

ARTHUR GUYTON

Arthur Clifton Guyton is a famous American physiologist who was born in Oxford, Mississippi on September 8, 1919. His father Dr Billy S. Guyton was an ear, nose and throat specialist and served as the Dean of Mississippi Medical School. His mother Kate Smallwood Guyton was also a mathematician and physics teacher and stayed in China as a missionary for five years when she still was not married. Dr. Guyton had a successful life. He was really keen on what his father did that is, his occupation and he was good at building sailboats and mechanical and electrical devices helping him in the future. He graduated from the University of Mississippi as the top student in his department.

Dr. Guyton wanted to become a cardiovascular surgeon. He therefore attended Harvard Medical School and began his postgraduate surgical internship at Massachusetts General Hospital in Boston. However, he had to serve in the Navy in the National Naval Medical Center in Bethesda during World War II until January 1, 1944, and in 1946, in his final year of residency training, he suffered from poliomyelitis leaving him paralyzed in his right leg, left arm and shoulders. Therefore, he gave up becoming a surgeon. While he had to stay in Warm Springs for nine months during the recovery period, he invented devices that can be useful for disabled people such as the first motorized wheelchair controlled by a joystick, a motorized hoist for lifting patients and special leg braces. With his inventions, he was worthy of receiving a Presidential Citation. Later, he came back to Oxford to train medical students and became the chairman of the Department of Physiology and Biophysics at the university of Mississipi in 1948 when he was twenty nine. He retired from his position in 1989 but continued to be the emeritus professor until his death with his wife named Ruth Weigle Guyton on April 3, 2003, in an automobile accident. In 1951, he was selected by U.S. Junior Chamber of Commerce as one of the Ten Outstanding Young Men in his country.

Dr. Guyton focused on mathematics, physics, chemistry, physiology and medicine**.** He also dealt with cardiovascular systems, research programs, the study of the physiology of cardiac output and its connection with the peripheral circulation. To this end, he

carried out related experiments in 1950s. As a result of these experiments, he found out that it was the requirement of the body tissues for oxygen that was the real regulator of cardiac output unlike the traditional thought asserting that the heart itself controlled it.

In addition, explaining the connection between right atrial pressure and cardiac output, "Guyton Curves" also contributed to understanding the physiology of circulation. Dr. Guyton also developed some concepts of venous return, negative interstitial fluid pressure, regulation of tissue fluid volume and edema and regulation of tissue blood flow. These concepts developed by him are so popular that they are used in almost every major textbook of physiology and their origins are even forgotten.

In 1956, Dr. Guyton published *Textbook of Medical Physiology,* which suddenly became commonly used physiology textbook in the world as the author was good at communicating complicated ideas in a comprehensible and amazing manner. In 1966, an early computer model contributed to his "infinite gain" theory which claimed that the fluid volume control by the kidney as the long term regulator of blood pressure is more powerful than other systems which can only regulate pressure short term and will be overwhelmed by the key controller at the end. Such contributions by Dr. Guyton provided full understanding of clinical conditions including edema and congestive heart failure. Dr. Guyton also published more than 600 papers and 40 books making him legendardy and one of the greatest physiologists in the history. He lectured more than 150 scientists, nearly 29 of whom became chairs of their own departments and six of whom became presidents of American Physiological Society.

Dr. Guyton received many awards including the Research Achievement Award of the American Heart Association**,** the William Harvey Award from the American Society of Hypertension**,** CIBA Award from the Council for High Blood Pressure Research, the Merck Sharp and Dohme Award of the International Society of Hypertension**,** Scientific Achievement Award of the American Medial Association and Research Achievement Award of the American Heart Association**.** He also served as the president of American Physiological Society from 1974 to 1975 and became the president of Federation of American Societies of Experimental Biology from 1975 to 1976**.** Dr. Guyton was also a member of the International Society for Hypertension and contributed to American

Heart Association with his studies.

TEXTBOOK OF MEDICAL PHYSIOLOGY

Textbook of Medical Physiology which is regarded as the fundamental book of physiology was first published in 1956 and suddenly became the best-selling medical physiology textbook since Dr. Guyton used a comprehensible, clear and amazing language making complex physiologic principles, concepts and subjects easy and funny for medical students. In addition, his primary aim was only to instruct them rather than impress his colleagues.

Textbook of Medical Physiology was translated into 13 languages and it is still used at different faculties of medicine in the world, including Turkey. The textbook is composed of 84 chapters describing vital systems of human body and putting emphasis on homeostasis, system interaction and pathophysiology. The topics in the textbook which can help medical students throughout their medical studies and activities include functional organization of the human body, cell and its functions, membrane physiology, heart, circulation, body fluids, kidneys, blood cells, immunity, blood clotting, respiration, nervous system, gastrointestinal physiology, metabolism, temperature regulation, endocrinology, reproduction, aviation, space, deep sea diving physiology, sports physiology and so on.

Textbook of Medical Physiology took its shape as a textbook with the contribution of lecture notes by Dr. Guyton in the beginning of 1950s, when he was teaching students in physiology at the University of Mississippi. He felt that students found textbooks difficult and incomprehensible. Therefore, he decided to publish his own textbook and thus distributed copies of his lecture notes. According to him, "many textbooks of medical physiology had become discursive, written primarily by teachers of physiology for other teachers of physiology, and written in language understood by other teachers but not easily understood by basic student of medical physiology" (Guyton, 2006).

Textbook of Medical Physiology has twelve editions. John E. Hall, the Guyton professor focusing primarily on cardiovascular, renal, and endocrine physiology and currently serving as the chairman in the Department of Physiology and Biophysics at the university of Mississippi, has become the co-author of the textbook beginning with

the ninth edition. Former editions were completely written by Guyton himself, making the textbook unusual among many others which are generally written by 20 or more authors.

The analyzed edition of *Textbook of Medical Physiology* in this master's thesis that is, the 11th edition presents full color illustrations which are composed of 486 figures, 277 charts and graphs, 100 brand new line drawings and 36 ECGs. In addition, shaded summary tables are available for quick and easy references. Each of the chapters in the textbook are short and easy to read. Also, clinical vignettes make it possible for readers to check core chapters which are applied to real life situations.

TRANSLATION OF MEDICAL TEXTBOOKS

The word "textbook" is defined as a book that is used to teach students for formal study of a subject. It is also defined as "a book containing facts about a particular subject that is used by people studying that subject" according to *Collins Cobuild Advanced Learner's English Dictionary*. Similarly, medical textbooks cover books intending to educate medical students in universites or in other medical schools aiming to train health care personnels, medical professionals or nurses.

The most difficult part of the translation of medical textbooks is to avoid mixing up of similar words and a translator needs to know that foreign terms are occasionally imported to his/her language, but with a slightly different meaning. One of the examples concerning the matter is the adverb "eventually" which normally means "in the end" whereas its Sweedish version "eventuellt" implies "perhaps" (http://onlinelibrary.wiley.com/doi/10.1111/j.1651-2227.2009.01493.x/pdf).

The preface may be one of the most challenging parts of a textbook since the preface may include emotions, history, personal circumstances, citations of literary works and acknowledgements for loved ones. In addition to this, translating index literally is impossible in the translation of textbooks. Then, a medical translator has to make his/her own decision whether the new index must be similar to the old index in terms of length and content, or whether new terms must be incorporated and the index expanded.

Often the author of the original text cross cites other chapters and pages in the book. This must not be missed, since a cross citation to page 26, when the content of page 26 appears on page 28 in the translated edition may frustrate the reader (http://onlinelibrary.wiley.com/doi/10.1111/j.1651-2227.2009.01493.x/pdf). In addition, there may be errors in the original medical textbook that need to be avoided and corrected in the translated version. Therefore, it would be useful to talk to the original author about the detected errors for a successful translation most of the time.

Translators may sometimes find the original textbook unacceptable and not agree with his/her author. It is vital that they discuss risks with the local publisher so as to cope

with various opinions. The example is that snakebites may be claimed to be unusual among children by an Irish writer while it can be the greatest reason of child morbidity in some regions. Besides, treatment methods and investigation of diseases may not be alike in different parts of the world. Whereas peri anal examination and colonoscopy may not be performed due to cultural or religious reasons in some regions, they are routinely performed in other parts of the world (http://onlinelibrary.wiley.com/doi/10.1111/j.1651-2227.2009.01493.x/pdf).Then, the cultural identity of the target and source cultures are important in the translation process and it would sometimes be necessary to change the original version of the textbook or to adapt it into the target culture to be able to catch the local circumstances or local flavour.

Furthermore, translation of medical textbooks require patience as it may take time. The textbook may be composed of long, complex and wordy sentences covering illustrations, flowcharts or figures with explanations, all which imply too much time for understanding. What is more, it might be compulsory to talk to the publisher or the medical editor in the translation process, meaning benefit for translators but loss of time on the other hand. Researching and checking the content are also time consuming although they can be supportive for translators.

Consequently, some authorities argue that the translation of textbooks must be done by professional translators instead of physicians. However, textbooks are generally intended for medical students or other medical professionals. Therefore, the translation of such documents in which many complex concepts are present must be undertaken by field experts who have a deep knowledge of the subject matter and may possibly know where the translated version is to be marketed.

CHAPTER VI

TRANSLATION SHIFT APPROACH

The term "shift" was first used by Catford in his book entitled *A Linguistic Theory of Translation* (1965) and it refers to changes which may happen in the process of translating. In other words, translation shifts imply any small linguistic changes that the translator can come across in the translation process. Due to the fact that translation is considered to be a type of language use, the notion of shift can be said to belong to the domain of linguistic performance.

Since 1950s, numerous linguistic approaches to the analysis of translation have provided detailed lists or taxonomies for the categorization of the translation process. In parallel with this, many attempts occurred at detailed taxonomies of small linguistic changes or in other words shifts between ST and TT in 1950s and 1960s.

JEAN PAUL VINAY&DARBELNET'S MODEL

French translation scholars and linguists, Vinay (1910-1999) and Darbelnet (1904-1990) dealt with comparative stylistic or in other words external comparative stylistics and contrastive analysis of French and English. In addition, they studied texts written in these two languages by denoting differences between them and creating different translation methods. In doing so, they focused on transposing structures in these two languages and called their approach "stylistic".

The translation methods defined by Vinay&Darbelnet are present in detail in their book entitled *Stylistique comparée du français et de l'anglais* (1958), the English translation of which waited for thirty seven years to be published (1995) and bears the name of *Comparative Stylistics of French and English: A Methodology for Translation*. The book was the first classification of translation methods for a clear methodological purpose. Therefore, it is considered to be the touchstone in translation pedagogy world wide. In addition, the classical taxonomy formed by Vinay&Darbelnet is still

appreciated. Then, it would not also be wrong to claim that Vinay&Darbelnet's translation methods are the source of inspiration for various translation techniques.

Stylistique comparée du français et de l'anglais (*Comparative Stylistics of French and English: A Methodology for Translation)* also became the source of inspiration for the same series on French-German translation that is, *Stylistique comparée du français et de l'allemand* by Malblanc (1963) and two books on English-Spanish translation *Introducción a la traductología* by Vázquez-Ayora (1977) and *Teoría y práctica de la tradducción* by García Yebra (1982).

The model developed by Vinay&Darbelnet in their book actually deals with the translation product and intends to describe the process of translating or in other words translation shifts although they do not use the term "shift "directly. In addition, the translation methods in their book can be applied to professional translation as well as other uses of translation.

Acccording to Vinay&Darbelnet, translation can be done for various purposes. It can serve for language acquisition or the confirmation of knowledge. Besides, it can be used to make a more effective identification of the characteristics and the behaviour of two languages by comparing them systematically or enable target readers to know what has been said or written in the source text or culture.

Vinay&Darbelnet summarize some initial steps which translators must take in their book before applying the translation methods to the translation. These steps are listed as follows:

1. to identify the units of translation;

2. to examine the Sl text; this consists of evaluating the descriptive, affective, and intellectual content of the units of translation;

3. to reconstitute the situation which gave rise to the message;

4. to weigh up and evaluate the stylistic effects (1958/1995: 30).

The unit of translation constituting the first step is defined as the smallest segment of the utterance whose signs are linked in such a way that they should not be translated

individually (Vinay&Darbelnet, 1958/1995: 21). The emergence of the right TL unit is sometimes very sudden. Translators must therefore be sure of the fact that none of the elements from the SL text have been deleted before finishing the process of translating to recheck it. This actually shows the importance of units of translation or in other words lexicological units or units of thought. Vinay&Darbelnet also state that

> If there were conceptual dictionaries with bilingual signifiers, translators would only need to look up the appropriate translation under the entry corresponding to the situation identified by the SL message. But such dictionaries do not exist and therefore translators start off with words or units of translation, to which they apply particular procedures with the intention of conveying the desired message (1958/1995: 35).

After explaning the initial steps taken in the translation process, Vinay&Darbelnet give details about the translation methods that they analyzed in their book for translators to apply. They explain them under two headings that is, direct (literal) translation or oblique (indirect) translation. Direct translation covers "borrowing", "literal translation" and "calque" and can only be used when transposing the source language message literally, element by element or word by word is possible. This possibility is actually the result of parallel categories that is, structural parallelism or parallel concepts between language pairs.

However, direct translation may sometimes lead to gaps or "lacunae" implying words which do not have a counterpart in the TL. Furthermore, there may be structural or metalinguistic differences (a chain of relationships which connect social, cultural or psychological facts with the lingustic systems) between two languages. As a result transposing certain stylistic effects into the TL may be impossible without changing the syntactic order or refering to lexical changes.

Under these circumstances, direct translation must be replaced by oblique translation methods including "transposition", "modulation", "equivalence" and "adaptation". However, translators may also prefer oblique translation methods due to some personal choices throughout the translation process. The total number of translation methods in Vinay&Darbeknet's book is seven as it is clear from the explanations and what is interesting about the application of these seven translation methods in the process of

translating is that they follow a hierarhical order from a source oriented to a target oriented approach.

During the application of the seven translation methods, translators are also responsible for the relationships between the typical manifestations of two linguistic systems or in other words a language pair during the translation process. For this reason, they face a fixed starting point and focus on structuring the impression of the target they want to achieve in their minds while they are reading the message.

Furthermore, seven translation methods by Vinay&Darbelnet are applied to different degrees on the three planes of expression that is, lexis or lexicon, syntactic structure and the message (1958/1995: 40).

Lexicon is analyzed by substituting units of translation within the syntactic framework of a comparable structure (Vinay&Darbelnet, 1958/1995: 27). Units of translation, on the other hand, can be ordered in a horizontal way that is, in the sequence of the syntactic stucture of the utterance in order to put an emphasis on the idea of an ordered entity. Furthermore, message which constitutes the third plane serves to encompass the framework which the uttterance can fit into. It is directly related to "parole", a term coined by de Saussure and implying speaking and writing of words. Message can also be said to depend on the structure of the language with its constraints only when a particular linguistic system is in question.

In addition to these, translation methods by Vinay&Darbelnet can be used in isolated lexical and grammatical items and besides can be observed within the same sentence since they may be used simultaneously and generally on microcontextual level denoting smaller text segments frequently identified on the sentence or sentence fragment level.

In order to apply the seven translation methods in the process of translating properly, professional translators must be able to be specialized in foreign languages and must have a good command of all the resources of their first languages or mother tongues. The fact that translators in foreign countries study the customs and cultural life of people whose language they are translating is also important for the selection of the appropriate translation method because in such a case, translators may be forced to

adopt oblique translation methods in order to prevent themselves from losing an important detail in the source text.

The seven translation methods by Vinay&Darbelnet are hierarchically explained with their definitions and examples taken from *Textbook of Medical Physiology* and its translation into Turkish in the analysis section.

AN ANALYSIS OF JEAN PAUL VINAY&DARBELNET'S SEVEN TRANSLATION METHODS IN THE TRANSLATION OF *TEXTBOOK OF MEDICAL PHYSIOLOGY*

Vinay&Darbelnet's seven translation methods are analyzed in this master's thesis to be able to provide an insight into their applications to the translation of medical textbooks. In this framework, the Turkish translation of *Textbook of Medical Physiology* is analyzed along with the related original textbook. With this study, medical translators or students in translation and interpretation departments will be able to understand how often these translation methods are applied, which of them are used mostly, rarely or even not in the translation of medical textbooks.

DIRECT TRANSLATION

1. Borrowing

Borrowing is defined as the direct transfer of the SL word into the TL. To overcome a lacuna, usually a metalinguistic one (a new technical process or an unknown concept), borrowing is the simplest of all translation methods (Vinay&Darbelnet, 1958/1995: 31). Borrowing can also be applied to create the flavour of the source culture in the target culture. In addition, borrowings are brought to the TL lexicon via translation activities. Over time, borrowings become the part of the TL that is, fixed in that language since they are used widespread.

- "Many of the protein channels are highly selective for transport of one or more specific icons or molecules." (Arthur Guyton p. 47)
- "Çoğu protein kanalı bir veya daha fazla sayıdaki özgül iyon ve moleküllerin transportu için oldukça yüksek düzeyde seçicidir." (Mehmet Hanifi Emre p.47)

"Transport" means "the movement or transference of anything including biochemical substances in biologic systems" according to *Stedman's Electronic Medical Dictionary*. In the translated sentence, the translator seems to directly transfer the term into the TL

(that is, as "transport") instead of translating it literally as "taşınma" or "nakledilme". It can therefore be said that the translator refers to borrowing translation method in the translation process.

- "The time required for this diffusion to occur averages 200 to 300 miliseconds and is called the *latent period* before contraction begings." (Arthur Guyton p. 99)
- "Difüzyonun olabilmesi için gereken zaman genellikle 200-300 milisaniyedir ve buna kasılma başlamadan önceki *latent dönem* denir. " (Nazan Uysal p. 99)

In this example "latent" implies "the period elapsing between the application of a stimulus and the response" as pointed out by *Stedman's Electronic Medical Dictionary*. It is directly transferred by the translator into Turkish as "latent" instead of translating it as "gizli". Therefore, the translator actually applies borrowing translation method throughout the translation process because "latent" in its original version is so common among Turkish medical professionals and medical students that it is now fixed in the medical community in Turkey. Therefore, it would not be necessary to translate it in its Turkish denonative meaning.

- "Then an additional 0.02 to 0.03 second is required for the ventricle to build up sufficient pressure to push the semilunar (aortic and pulmonary) valves open against the pressures in the aorta and pulmonary artery." (Arthur Guyton p. 108)
- "Bu andan itibaren ventriküllerin aort ve pulmoner arterdeki basınçlara rağmen semilunar (aort ve pulmoner) kapakları iterek açmalarına yetecek kadar basıncı oluşturmaları için 0,02- 0,03 saniyeye daha gerek vardır." (Neslihan H.Dikmenoğlu p.108)

The term "semilunar" implies shapes looking like a crescent and its exact counterpart in Turkish is "yarım ay şekli gösteren" or "hilal şeklinde" Besides, according to *Stedman's Electronic Medical Dictionary* "semilunar valve" is defined as "a heart valve composed of three semilunar cusps (valvules); hence both the aortic and pulmonary valves are semilunar valves". Since the use of "semilunar" in the SL is also common in medical communities outside the regions where English is spoken or at least used, the translator

does not see it necessary to translate "semilunar" as "yarım ay or hilal şekli gösteren" to Turkish. Instead, she transfers the term into the TL directly (that is, "as semilunar") via borrowing translation method.

- "Ordinarily, the lateral walls of the two ventricles depolarize at almost the same instant because both the left and the right bundle branches of the Purkinje system transmist the cardiac impulse to the two ventricular walls at almost the same instant." (Arthur Guyton p. 139)
- "Genellikle ventriküllerin iki lateral duvarı hemen aynı anda depolarize olur. Çünkü Purkinje sisteminin hem sol hem de sağ demet dalları kalp uyarısını bu iki ventrikül duvarının endokardiyal yüzeylerine hemen hemen aynı anda iletir." (Bayram Yılmaz p. 139)

"Lateral" means relating to the sides of something On the other hand, "depolarize" implies to deprive of polarity. Also, lateral implies "yan tarafta" or "kenar/kenar üstü" and "depolarize" implies "kutuplaşmayı ortadan kaldırmak" in Turkish. Instead of translating them word for word or applying paraphrasing, the translator borrows these terms from the SL by attempting to transfer them directly that is, as "lateral" and "depolarize" respectively into the TL. In doing so, the translator also considers that the terms "lateral" and "depolarize" in their original forms can also be regarded as being widespread among medical professionals or medical students in Turkish.

- "When any tissue becomes highly active, such as an exercising muscle, a gastrointestinal gland during a hypersectory period, or even the brain during rapid mental activity, the rate of blood flow through the tissue increases." (Arthur Guyton p. 198)
- "Egzersiz halindeki kas, hipersekresyon dönemindeki gastrointestinal bez veya ani mental aktivite gösteren beyin örneklerinde olduğu gibi eğer bir doku aktif hale gelirse bu dokuya giden kan miktarı da artar." (Hızır Kurtel p. 198)

"Gastrointestinal" connotates anything which is associated with stomach and intestines. When it is translated into Turkish word for word or by applying paraphrasing strategy, "mide ve bağırsakla ilgili" or "sindirim sistemi" can be the equivalent terms for it.

Similarly, the term "mental" which means anything associated with the mind is the counterpart of "zihinle ilgili" or "zihin" in Turkish. Yet, the translator prefers to keep these words untranslated or in other words unchanged in the Turkish translation that is, as "gastrointestinal" and "mental" respectively by considering that their original versions are more fixed and preferred among medical professionals or medical students in the TL. Therefore it can be said that the translator applies borrowing translation method in the translated sentence.

- "One of the most common causes of congenital heart defects is a viral infection in the mother during the first trimester of pregnancy when the fetal heart is being formed." (Arthur Guyton p. 276)
- "Konjenital kalp defektlerinin en yaygın nedenlerinden biri gebeliğin ilk trimesterinde, fetus kalbi oluşurken annede bir virüs enfeksiyonu olmasıdır." (Sema Yavuzer p. 276)

"Trimester" as a term means a period of three months or one third of the length of a pregnancy period. In this example, the first three months of pregnancy is mentioned as it is clear and the term can also be translated into Turkish as "gebeliğin ilk üç ayı". Instead, the translator preserves the original word in the TL text and therefore it can be asserted that she transfers the word directly into the target setting via borrowing translation method (that is, as "trimester"). The translator also seems to consider in the proccess of translating that "trimester" as a term is fixed among medical professionals or students in the TL while determining the appropriate translation method that is, borrowing.

- "The transfer of fluid across the cell membrane occurs so rapidly that any differences in osmolarities between these two compartments are usually corrected within seconds or, at the most, minutes" (Arthur Guyton p. 299)
- "Sıvının hücre zarından transferi o kadar çabuk olur ki bu iki bölme arasındaki ozmolarite farkı genellikle saniyeler veya en fazla dakilalar içinde düzelir" (Gülsen Öner p. 299)

"Transfer" is known as the process of removal or transferral. It is compensated in Turkish language by the word "nakletme" or "aktarma" in general. However, the translator transfers the original form of the term into the TL directly (that is, as "transfer") without any changes and hence benefits from borrowing translation method.

- "With increasing renal blood flow, a lower fraction of the plasma is initially filtered out of the glomerular capillaries, causing a slower rise in the glomerular capillary colloid osmotic pressure and less inhibitory effect on GFR" (Arthur Guyton p. 319)
- "Renal kan akımı artışı ile başlangıçta daha az plazma fraksiyonu glomerüler kapiller dışına filtre edilir ve glomerüler kapiller kolloid ozmotik basınçta daha yavaş artışa neden olarak GFR üzerinde daha az baskılayıcı etki gösterir" (Gülsen Öner p. 319)

"Renal" means pertaining or related to the kidney and it is also the synonym of nephric. In this example, the translator is observed to preserve this term in the translation by leaving it untranslated (that is, as renal) by avoiding translating it as "böbrek" because "renal" is widely used among medical professionals or medical students in the TL. In addition, "GFR" implies "Glomerular Filtration Rate" as an acronym. The translator also keeps it unchanged in the TL instead of translating it as "glomerüler filtrasyon hızı or GFH" since the original version of the acronym (that is, GFR) is similarly not alien to medical students or other medical professionals in the TL. Then, it would not be wrong to say that borrowing translation method is applied by the translator in the process of translating.

- "The liver secretes moderate amounts of *apotransferrin* into the bile, which flows through the bile duct into duodenum." (Arthur Guyton p. 426)
- "Karaciğer ortalama bir miktarda *apotransferin*'i safraya salgılar ve bu safrakanalı ile duodenuma akar." (Gülseli Yıldırım p. 426)

According to *Illustrated Medical Dictionary*, "duodenum" is known as "the first part of the small intestine extending from the pylorus (the muscular valve at the lower end of

the stomach) to the ligament of Treitz, which marks the boundary between the duodenum and the jejunum (the second part of the small intestine)." The Turkish counterpart of "duodenum" is known as "onikiparmak bağırsağı". The translator nevertheless borrows the term from the SL. In other words, she attempts to transfer it into TL directly with no change (that is, as "duodenum") by applying borrowing translation method since the term is widely used in the medical community in Turkey.

- "Pain impulses also often originate in the parietal peritoneum where the inflamed appendix touches or is adherent to the abdominal wall. These cause pain of the sharp type directly over the irritated peritoneum in the right lower quadrant of the abdomen." (Arthur Guyton p. 605)
- "Diğer taraftan, iltihaplı apandisitin değdiği ya da abdominal duvara yapıştığı bölgelerdeki paryetal peritondan da ağrı impulsları kaynaklanabilir. Bu keskin ağrı, abdomenin sağ alt kadranında, doğrudan irite olmuş peritonun üzerinde ortaya çıkar." (Lamia Pınar p. 605)

As pointed out by *Stedman's Electronic Medical Dictionary*, "abdomen" as a term is denoted as "the part of trunk lying between the thorax and the pelvis and it forms the greater part of the abdominal cavity and it does not include the vertebral region posteriorly even if it is thought to include pelvis according to some anatomists". The adjective form of the term that is, "abdominal" also denotes anything which is related to the abdomen. Similarly, their Turkish equivalents are known as "karın" or "karna ait". In the translated sentence, the translator however transfers these terms directly (that is, as "abdomen" and "abdominal" respectively) because their original forms address medical community well and besides they are fixed among medical professionals or medical students in Turkey. Then, it would be correct to say that borrowing translation method is applied by the translator in the proces of translating.

- "The photoreceptors themselves, the *rods* and *cones*, which transmit signals to the outer plexiform layer, where they synapse with bipolar cells and horizontal cells." (Arthur Guyton p. 633)

- "Bipolar ve horizontal hücrelerle sinaps yaparak sinyalleri dış pleksiform tabakaya ileten fotoreseptörler, yani *basiller ve koniler."* (Ersin Koylu p. 633)

"Bipolar cell" means a neuron with two processes. On the other hand, "horizontal cells" of retina bring into the mind "the cells in the outer part of the inner nuclear layer of the retina lying with their axes more or less parallel with the surface. Horizontal cells are also believed to connect the rods of one part of the retina with cones of another part" as pointed out by *Stedman's Electronic Medical Dictionary*. "Bipolar" in Turkish implies "iki kutuplu" whereas horizontal implies "yatay". But, the translator does not see it necessary to give the Turkish counterparts of the terms in question and instead transfers them in a direct way that is, as "bipolar" and "horizontal" into the TL by applying borrowing translation method. In doing so, the common uses of the terms in the medical community in Turkey are also considered.

- "Immediately after the spinal nerve leaves the spinal canal, the preganglionic sympathetic fibers leave the spinal nerve and pass through a *white ramus* into one of the *ganglia* of the *sympathetic chain*." (Arthur Guyton p. 749)
- "Spinal sinir, spinal kanalı terk ettikten hemen sonra pregangliyoner sempatik lifler spinal sinirden ayrılır ve *beyaz kol* boyunca *sempatik zincirin gangliyonlarından* birine ulaşır." (Abdullah Arslan p. 749)

As is clear, "spinal" is a term which is related to spine itself or any spinous processes. It can also be associated with the vertebral colunm. In the source text, "spinal" is used with words such as nerve and canal. The translator assumes that medical students in Turkey can understand what is implied with "spinal" since it is fixed in the medical community in the TL. Therefore, he directly transfers the term in question into the TL (that is, as "spinal") instead of translating it as "omurga", "omurilik or omurilik ile ilgili". Then, the translator actually applies borrowing translation method during the translation process.

- "When a segment of the intestinal tract is excited by distention and thereby initiates peristalsis, the contractile ring causing the peristalsis normally begins on the orad side of the distended segment …" (Arthur Guyton p.777)

- "İntestinal kanalın bir segmenti gerilmeyle uyarıldığında ve peristaltizm başladığında, peristaltizme neden olan kasılma halkası gerilmiş segmentin ağzına doğru olan tarafı yönünde hafifçe hareket eder. " (Berrak Yeğen p.777)

In medical sense "segment" is defined as a section or a part of an organ. On the other hand, "intestinal" connotates anything which is related to intestines."Segment" may be translated into Turkish as "parça" or "bölüm" while "intestinal" may be translated as "bağırsakla ilgili or bağırsak". The translator however prefers to keep these terms untranslated in the Turkish translation (that is, as "segment" and "instestinal" respectively) by applying borrowing translation method because they are regarded as being fixed in the medical community in the TL.

- "When a person becomes dehydrated, large amounts of aldosterone almost always are secreted by the cortices of the adrenal glands." (Arthur Guyton p.814)
- "Kişi dehidre olduğu zaman, adrenal bezlerin korteksinden hemen her zaman büyük miktarda aldosteron salgılanır." (Osman Genç p. 814)

"Adrenal" means near or upon the kidney and it implies the suprarenal gland or in other words adrenal gland. The exact counter part of the term in Turkish is therefore known as "böbreküstü". In this example, the translator finds it more acceptable to keep the original term in the translation (that is, as "adrenal") by benefiting from borrowing translation method since this use is much more common among the medical community in the TL.

- "The hormone *oxytocin*, in accordance with its name, powerfully stimulates contraction of the pregnant uterus, especially toward the end of gestation." (Arthur Guyton p.929)
- "*Oksitosin* gebe uterusta özellikle gebeliğin sonlarına doğru kasılmaları kuvvetle uyarır." (Bilge Pehlivanoğlu p.929)

As is defined by *Stedman's Electronic Medical Dictionary*, uterus is known as "a hollow muscular organ in which the impregnated ovum is developed into the child; it is

about 7.5 cm in length in the nonpregnant woman, and consists of a main portion (body) with an elongated lower part (cervix), at the extremity of which is the opening (external os)". The counterpart of the word in Turkish is "rahim". The translator nonetheless prefers to transfer it into Turkish directly (that is, as "uterus") by using borrowing translation method because of the fact that the source text term is intelligible to semi professionals or other medical experts and now fixed within the medical community in the TL.

All examples of borrowings in the study have Turkish counterparts or equivalents. However, considering that the textbook is intended for semi professionals that is medical students or medical community having the ability to understand most of the medical terminologies used and for the purpose of making the translated textbook much more interesting, thereby drawing the attention of readers, translators prefer to use common scientific terms in the translation of the sentences analyzed.

2. Calque

Calque is a special kind of borrowing whereby a language borrows an expression form of another, but then translates literally each of its elements (Vinay&Darbelnet, 1958/1995: 32). In other words, it refers to a borrowed word or phrase from another language or culture which is translated literally or word for word into the TL. Calque contributes to the enhancement and enrichment of cultural integration between source and target cultures and it can be divided into two types: a lexical calque and structural calque.

A lexical calque brings a new mode of expression to the language without upsetting the syntactic structure of the expression. On the other hand, structural calque implies a new, unusual or strange construction into the language. As with borrowings, there are many fixed calques which after a period of time, become an integral part of the language. (Vinay&Darbelnet, 1958/1995: 32-33). In calque, the intention is to fill the gap in the language without having to apply an actual borrowing and a new calque is brought to the TL as a result.

- "This is attached anteriorly to the large *thyroid cartillage*, which is the cartillage that projects forward from the anterior surface of the neck and is called the "Adam's apple". " (Arthur Guyton p.481)
- "Bu ses telleri önde, boynun ön yüzeyinden öne doğru çıkıntı yapan ve "Adem elması" denilen büyük *tiroid kıkırdağın* ortasına bağlanır." (Lütfi Çakar p.481)

As pointed out by *Illustrated Medical Dictionary* "Adam's apple" is "a projection at the front of the neck, just beneath the skin, that is formed by a prominence on the thyroid cartilage, which is part of the *larynx* (voice box) and it enlarges in males at puberty". This term is composed of two words (Adam+apple). It is a universal eponym believed mostly to derive from the fact that human throat looked like apple after Adam had eaten the forbidden fruit. English language took this term from French "pomme d'Adam" as a calque and converted it to "Adam's apple" which is now a fixed calque in their own languages. Similarly, Turkish language borrowed the term from English. In parallel

with this, the translator can also be said to apply calque translation method in the translation process and therefore translates the term in the SL into Turkish literally. As a result, it takes the shape of "Adem elması" in the target text.

The calque in question is lexical in the TL since it is the exact translation of the English use**.** In addition, it is not a new calque but fixed in the Turkish language because the term is used universally, especially among medical professionals.

- "The visual signals, in turn, are superimposed onto this background ganglion cell firing." (Arthur Guyton p. 637).
- "Oluşan görsel sinyaller arka planda var olan bu spontan ganlion hücresi ateşlemesinin üzerine biner." (Ersin Koylu p. 637).
- "Nerve signals in the brain system activate the cerebral part of the brain in two ways: (1) by directly stimulating a background level of neuronal activity in wide areas of the brain…" (Arthur Guyton p.728)
- "Beyin sapındaki sinir sinyalleri beynin serebral kısımını iki şekilde uyarır: (1) beynin geniş alanlarında arka plandaki aktiviteyi doğrudan uyararak ve…" (Özlem A. Yılmaz p. 728)

"Background" means the ground situated in the rear. The word actually belongs to English language and therefore the translator applies calque translation method by translating it into Turkish language literally as "arka plan" (two words: arka+plan) in the process of translating. The calque applied to this sentence is fixed in the Turkish language due to its popularization and it is lexical as a type.

- "That is, *the shock itself causes still more shock*, and the condition becomes a vicious circle that eventually leads to deterioriation of the circulation and to death." (Arthur Guyton p.280)
- "Yani *şokun kendisi daha ağır bir şok tablosuna yol açar,* sonuçta dolaşımın iflasına yol açan ve ölüme götüren bir kısır döngüye girilir. " (Sema Yavuzer p.280)

- "The hydrogen ions do then diffuse into the stomach epithelium, creating additional havoc and leading to a vicious circle of progressive stomach mucosal damage and atrophy." (Arthur Guyton p.820)
- "Hidrojen iyonları mide epiteline difüze olur, daha fazla hasar yapacak şekilde kısır döngü oluşturarak ilerleyici biçimde mide mukoza hasarı ve atrofisine yol açar." (Ahmet Ergün p. 820)

"Vicious circle" describes difficult or problematic situations having the potential to create new problems which give rise to the occurence of the original problems or situations again. The term is derived from Latin "circulus vitiōsus". First of all, the English took the word from Latin and literally translated it into English by following calque translation method. In doing so, they however changed the stucture of the expression in a way conforming to the rules of their own language and therefore began using it as "vicious circle". Similarly, Turkish language borrowed the term from English. In parallel with this, it can be stated that the translator actually follows calque translation method by translating the term into the TL literally that is, as "kısır döngü" in the process of translating. The calque used in the Turkish language is lexical since it is the exact translation of "vicious circle" with no structural changes into Turkish language. Lastly, the term "kısır döngü" in Turkish is so widely used that it is a fixed calque now.

3. Literal Translation

Literal or word for word, translation is the direct transfer of a SL text into a grammatically and idiomatically appropriate TL text in which the translators' task is limited to observing the adherence to the linguistic servitudes of the TL (Vinay&Darbelnet, 1958/1995: 33-34). Literal translation is generally used between two languages of the same family or culture.

- "When a blood vessel is ruptured and a clot begins to form, multiple enzymes called *clotting factors* are activated within the clot itself." (Arthur Guyton p.8)
- "Bir kan damarı yırtıldığı ve bir pıhtı oluşmaya başladığı zaman, *pıhtılaşma faktörleri* adı verilen bir dizi enzim, pıhtının kendi içinde aktive edilir." (Zeynep Solakoğlu p. 8)

"Blood vessel" means any of the vessels that convey the blood such as vein, artery, or capillary. In addition, "clotting factors" as a term is defined by *Stedman's Electronic Medical Dictionary* "as any of the various plasma components which play a role in the clotting process". "Rupture" on the other hand implies a complete break in a structure. The translator transfers these terms into Turkish as "kan damarı", "pıhtılaşma faktörleri" and "yırtılma". In doing so, she actually applies literal translation during the translation process to achieve the same technicality of the source text in the TL by also taking into consideration other source language elements to produce a grammatically and idiomatically appropriate TL text.

- "Integral membrane proteins can also serve as *receptors* for water- soluble chemicals, such as peptide hormones that do not easily penetrate the cell membrane." (Arthur Guyton p.14)
- "İntegral zar proteinleri, hücre zarını kolaylıkla geçemeyen peptit hormonlar gibi suda eriyen kimyasallar için *reseptör* olarak da hizmet edebilir." (Günfer Turgut p.14)

"Integral membrane proteins" are proteins which cannot be easily separated from a biomembrane. "Peptide" is known as "any member of a class of compounds of low molecular weight which can be broken down to yield two or more amino acids" as pointed out by *Dorland's Medical Dictionary*. "Receptor" as a term in the source text is also associated with "integral membrane proteins". These terms are transferred by the translator into the TL as "integral zar proteinleri", "peptit" and "reseptör" respectively. Due to the presence of such terms in the TL and its similar technicality to the source text, the translator can be said to apply literal translation method in the process of translating. In doing so, the translator also attaches importance to creating a grammatically and idiomatically appropriate TL text as it is clear from the example.

- "The skeletal muscle fibers are innervated by large, myelinated nerve fibers that originate from large motoneurons in the anterior horns of the spinal cord." (Arthur Guyton p.85)
- "İskelet kası lifleri omuriliğin ön boynuzundaki büyük motor nöronlardan köken alan büyük miyelinli sinir lifleri tarafından inerve edilirler." (Osman Açıkgöz p. 85)

"Skeletal muscle" implies "any of the striated muscles that are attached to bones and typically cross at least one joint. They are under voluntary control and enable movements of the skeleton" accorrding to *Dorland's Medical Dictionary*. Also, "innervated" as a term implies "the supply of nerve fibers functionally connected with a part" according to *Stedman's Electronic Medical Dictionary*." In addition, the term "myelinated nerve fiber" means "an axon enveloped by a myelin sheath formed by oligodendroglia cells (in brain and spinal cord) or Schwann cells (in peripheral nerves)" as pointed out by *Stedman's Electronic Medical Dictionary*. "Motoneurons" implies an efferent neuron which is reponsible for conveying motor impulses from the center in order to cause body parts to move. "Anterior horn of the spinal cord " as described by *Dorland's Medical Dictionary* is also "the horn shaped configuration presented by the anterior column of the spinal cord in transverse section".

These terms are transferred by the translator into the TL as "iskelet kası","inerve edilirler", "miyelinli sinir lifleri", "motor nöron" and "omuriliğin ön boynuzu" respectively. Therefore, the translator actually refers to literal translation for the transfer of the SL text into the TL to achieve the same technicality of the source text in the translation and create a grammatically and idiomatically appropriate TL text as a result.

- "Depolarization of the atria begins in the sinus node and spreads in all directions over the atria." (Arthur Guyton p. 136)
- "Atriyumların depolarizasyonu sinus düğümünde başlar ve bütün yönlerde atriyumlara yayılır." (Bayram Yılmaz p. 136)

"Depolarization" in the SL means a change in direction of polarity. "Sinus node" is however known as sinoatrial or S-A node in which the normal rhythmical impulse is created. Acording to *Dorland's Medical Dictionary*, it is also defined as "a collection of atypical muscle fibers in the wall of the right atrium where the rhythm of cardiac contraction is usually established; thus the term is also referred to as the pacemaker of the heart". "Atria" is the plural form of atrium which is used to refer to "either of the 2 (right and left) upper chambers of the heart collecting blood from the body and lungs respectively" according to *Illustrated Medical Dictionary.* These terms in the source text are transferred by the translator into the TL as "depolarizasyon", "sinüs düğümü" and "atriyumlar" respectively as it is also clear from the example analyzed. Therefore, during the translation process, the translation method applied by the translator is literal translation to achieve the same technical atmosphere of the source text in the target text and create a grammatically and idiomatically appropriate TL text for target readers.

- "Stimulation of the autonomic nerves to the heart can affect coronary blood flow both directly and indirectly." (Arthur Guyton p.251)
- "Kalbe gelen otonom sinirlerin uyarılması koroner kan akımını hem doğrudan hem de dolaylı olarak etkileyebilir." (Hakkı Gökbel p. 251)

"The autonomic nerve" represents "a bundle of autonomic nerve fibers outside of the central nervous system belonging or relating to the autonomic (visceral motor) nervous system" as explained by *Stedman's Electronic Medical Dictionary*. "Coronary" on the

other hand implies "encircling in the manner of a crown, said of anatomical structures such as vessels, ligaments or nerves" according to *Dorland's Medical Dictionary*. These terms that take place in the source text are transferred by the translator as "otonom sinir" and " koroner" into the TL respectively. In addition, during the transfer of these terms into Turkish along with the whole original sentence, the translator actually applies literal translation by considering the preservation of the technicality of the source text in the TL as well as the rest of the source language elements in order to create a grammatically and idiomatically appropriate TL.

- "Soon after the onset of the infarction, small amounts of collateral blood begin to seep into the infarcted area, and this, combined with progressive dilation of local blood vessels, causes the blood area to become overfilled with stagnant blood." (Arthur Guyton p. 253)
- "İnfarktüsün başlangıcından hemen sonra küçük miktarda kollateral kan infarkt alanına sızmaya başlar ve bu, bölgesel kan damarlarının giderek genişlemesiyle birlikte bölgenin durağan kanla dolmasına yol açar." (Hakkı Gökbel p. 253)

"Infarction" occurs if arterial or venous blood supply becomes suddenly insufficient owing to emboli, thrombi or mechanical factors. "Collateral" as a term implies "secondary or accessory; not direct or immediate, a small side branch, as of a blood vessel or nerve" as pointed out by *Dorland's Medical Dictionary*. Also, "infarcted area" refers to the area of necrosis resulting from a sudden insufficiency of arterial or venous blood supply as pointed out by *Stedman's Electronic Medical Dictionary*. The translator feels obliged to transfer these terms into Turkish language as "infarktüs", "kollateral" and "infarkt alanı" respectively. This is actually caused by the technicality of the source text. So, the translator can be said to apply literal translation in the process of translating by also focusing on the other source language elements and producing a grammatically and idiomatically appropriate TL text in this way.

- "In mitral regurgitation, blood flows backward through the mitral valve into the left atrium *during systole*" (Arthur Guyton p. 272)
- "Mitral yetmezliğinde *sistol sırasında* kan mitral kapak yoluyla geriye sol atriyuma akar. (Sema Yavuzer p. 272)

"Mitral regurgitation" is related to the backflow of blood from the left ventricle into the left atrium owing to the inadequacy of the mitral valve. "Mitral valve" is associated with closing the orifice between the left atrium and the left ventricle of the heart. "Systole" is known as the contraction of the heart. On the other hand, "atrium" is known as a chamber or cavity that affords entrance, particularly one of the upper chambers on either side of the heart receiving blood from the body and transmitting it to the ventricles. These terms are transferred by the translator as "mitral yetmezlik", "mitral kapak", "sistol" and "atriyum" into Turkish. In addition, with the presence of such terms in the translation, the achievement of the technicality of the source text is also clear in the TL. The translator can therefore be said to apply literal translation for the transfer of the original sentence into the target setting. In doing so, the translator also focuses on producing a grammatically and idiomatically appropriate Turkish translation.

- "Some parts of the tubule, especially the proximal tubule, reabsorb large molecules such as proteins by *pinocytosis*." (Arthur Guyton p. 330)
- "Tübülün bazı kısımları, özellikle proksimal tübül, proteinler gibi büyük molekülleri *pinositoz* ile geri emer." (Gülsen Öner p.330)

"Proximal tubule" is referred to as the proximal tubules of the kidneys, in which sodium ions move from the lumen of the tubule to the interior of the tubular cell, when hydrogen ions are counter transported to the tubule lumen. "Pinocytosis", on the other hand is defined as "a mechanism by which cells ingest extracellular fluid and its contents" as pointed out by *Dorland's Medical Dictionary.* These terms are transferred by the translator into Turkish language as "proksimal tübül" and "pinositoz" respectively. The presence of such terms in the target text makes it technical in a way similar to the source text. Therefore, it can be said that the translator applies literal translation during the transfer of the original text by bearing in mind the other source

language elements to achieve a grammatically and idiomatically appropriate translation for medical students.

- "Water is also lost by evaporation from the lungs and the gastrointestinal tract and by evaporation and sweating from the skin." (Arthur Guyton p. 362)
- "Su buharlaşma yoluyla akciğerlerden, gastroinestinal kanaldan, terleme ve buharlaşma yoluyla deriden de kaybedilir." (Kubilay Uzuner p.362)

"Evaporation" means a change from liquid to vapor form. In addition, "gastrointestinal tract" brings into mind digestive tract, stomach, small intestine or large intestine. These terms are respectively transferred by the translator into the TL as "buharlaşma" and "gastrointestinal kanal". The existence of such terms in the TL makes it technical in a way similar to the source text. Because of this, the translator can be said to use literal translation in the process of translating by also considering the other source language elements to be able to produce a grammatically and idiomatically appropriate TL text.

- "The partial pressure of a gas in a solution is determined not only by its concentration but also by the *solubility coefficient* of the gas." (Arthur Guyton p. 492)
- "Bir eriyikteki gazın parsiyel basıncı, sadece onun konsantrasyonu ile değil, aynı zamanda o gazın *erime katsayısı* ile belirlenir. (Gülseren Şahin p. 492)

"Solubility" in the source text denotes the feature of being soluble and "coefficient" implies the amount or degree of the solubility. Depending on the presence of such a term in the source text ("solubility coefficient" in combination) and its technical atmosphere along with its other language elements, the translator also feels obliged to transfer "solubility coefficient" into the TL as "erime katsayısı" and besides keeps the same technicality in the target text. It can then be said that she actually applies literal translation as a translation method and creates a grammatically and idiomatically appropriate TL text in this way.

- "An important route of communication between the limbic system and the brain stem is the *medial forebrain bundle*, which extends from the septal and orbitofrontal regions of the cerebral cortext downward through the middle of the hypothalamus to the brain stem reticular formation." (Arthur Guyton p. 731-732)
- "Limbik sistem ile beyin sapı arasındaki iletişimin önemli bir yolu, serebral korteksin septal ve orbitofrontal bölgelerinden çıkıp hipotalamusun ortasından beyin sapı retiküler formasyonuna inen *medyal önbeyin demetidir*." (Özlem A.Yılmaz p. 731-732)

"Limbic system" is defined as "a heterogeneous array of brain structures at or near the edge (limbus) of the medial wall of the cerebral hemisphere, in particular the hippocampus, amygdala, and fornicate gyrus" as defined by *Stedman's Electronic Medical Dictionary*. "Cerebral cortext" is defined as the convoluted layer of gray matter covering each cerebral hemisphere. The thinking and reasoning of the human is controlled here. In addition to these, the term "orbitofrontal" is related to "the cerebral cortex covering the basal surface of the frontal lobes" as defined by *Stedman's Electronic Medical Dictionary*. "Septal" is similarly associated with one of the regions of cerebral cortext. Furthermore, "the brain stem" is known as "the entire unpaired subdivision of the brain, composed of (in anterior sequence) the rhombencephalon, mesencephalon, and diecephalon as distinguished from the brain's only paired subdivision, the telencephalon" according to *Stedman's Electronic Medical Dictionary*.

"Reticular formation" is"a network of nerve cells spread through the brainstem" as pointed out by *Illustrated Medical Dictionary.* "Hypothalamus" is also defined as "a part of the diencephalon lying beneath the thalamus at the base of the cerebrum" according to *Dorland's Medical Dictionary.* "Medial forebrain bundle" is defined as "a fiber system coursing longitudinally through the lateral zone (area) of the hypothalamus, connecting the latter reciprocally with the midbrain tegmentum and with various components of the limbic system" as clearly emphasized by *Stedman's Electronic Medical Dictionary.*

As it is clear, there are many specific terms and technicality in the original sentence. The translator therefore applies literal translation in the process of translating in order to

create a text that is the same as the source text and also grammatically and idiomatically appropriate for the target reader. In parallel with this, all of the terms in question are transferred into the target setting by the translator as "limbik sistem", "serebral korteks, septal ve orbitofrontal bölgeler, "hipotalamus","beyinsapı", "retiküler formasyon," and "medyal önbeyin demeti".

- "Two hormones, *epinephrine* and *glucagon*, can activate phosphorylase and thereby cause rapid glycogenolysis." (Arthur Guyton p. 832)
- "İki hormon, *epinefrin* ve *glukagon,* fosforilazı aktive eder ve böylece hızlı bir glikojenolize neden olurlar." (Kadir Kaymak p.832)

"Epinephrine and glucagon" as stated in the example analyzed are hormones. In addition, "phosphorylase" is a group of enzymes which is regarded as being important in the breakdown of glycosides. "Glycogenolysis" is however known as "the splitting up of glycogen in the liver, yielding glucose" according to *Dorland's Medical Dictionary*. As it is clear, there are specific terms in the source text and they seem technical. The translator hence applies literal translation in the translation process by transfering the terms in question into the TL as "epinefrin", "glukagon", "fosforilaz" and "glikojenoliz" respectively for the purpose of creating the same technicality and meaning of the source text in the target setting as well as a grammatically and idiomatically appropriate target text.

- "Niacin, also called *nicotinic acid*, functions in the body as coenzymes in the form of nicotinamide adenine dinucleotide (NAD) and nicotinamide adenine dinucleotide phosphate (NADP)." (Arthur Guyton p. 876)
- "*Nikotinik asit* de denilen niyasin, vücutta nikotinamid adenin dinükleotid (NAD) ve nikotinamid adenin dinükleotid fosfat (NADP) şeklinde koenzim olarak fonksiyon yapar." (Abdurrahman Şermet p. 876)

In the sentence, "nicotinic acid" called also "niacin", "is a part of the vitamin B complex; used in the prevention and treatment of pellagra, as a vasodilator, and in hyperlipidemia, where it lowers cholesterol and acts as an HDL-raising agent" as pointed out by *Stedman's Electronic Medical Dictionary*. In addition, "coenzymes"

implies a substance that is required for the action of enzymes. "Nicotinamide adenine dinucleotide", on the other hand is a coenzyme that is involved in many biochemical oxidation-reduction reactions. Furthermore, "nicotinamide adenine dinucleotide phosphate" is a similar coenzyme like NAD but it is involved in fewer reactions. Due to the technicality of the SL along with these terms, the translator feels obliged to transfer them into the TL as "nikotinik asit de denilen niyasin", "nikotinamid adenin dinükleotid", "nikotinamid adenin dinükleotid fosfat" and "koenzim" respectively and therefore applies literal translation method so as to create the same technicality of the source text in the translation as well as a grammatically and idiomatically appropriate target text.

- "A person with panhypopituitary dwarfism does not pass through puberty and never secretes sufficient quantities of gonadotropic hormones to develop adult sexual functions." (Arthur Guyton p.926)
- Panhipopitüiter cüceliği olan bir kişi, puberteye girmez ve erişkin cinsel işlevlerin gelişmesi için yeterli miktarda gonadotropik hormonları hiçbir zaman salgılamaz." (Bilge Pehlivanoğlu p. 926)

"Panhypopituitary dwarfism" is a kind of dwarfism composed of two types: Type I and Type II. Type I is an autosomal recessive disorder in which human growth hormone such as ACTH (Adrenocorticotropic hormone) and FSH (Follicle Stimulating Hormone) is deficient, sexual development is delayed or hypothyroidism and adrenal insufficiency occur. Type II is alike but it is known as an X-linked disorder. Besides, "puberty" is a period starting usually at the age of 10 and ending at the age of 15. "In this this period, secondary sexual characteristics tend to develop and the genital organs mature. "Gonadotropic hormone" on the other hand is the synonym of gonadotropin which implies a hormone having a stimulating effect on the gonads. Due to the technicality of the SL with the presence of such words, the translator feels obliged to transfer them into the target setting as "panhipopitüiter cücelik", "puberte" and "gonadotropik hormon" and hence applies literal translation to create the same technicality of the source text in the TL as well as a grammatically and idiomatically appropriate target text.

- "The outer surface of the tooth is covered by a layer of enamel that is formed before eruption of the tooth by special epithelial cells called *ameloblasts*" (Arthur Guyton p. 992)
- "Dişin dış yüzü, diş çıkmadan önce, *ameloblast* denilen özel epitel hücreleri tarafından oluşan bir mine tabakasıyla kaplıdır." (Sami Aydoğan p.992)

"A layer of enamel" is described by *Dorland's Medical Dictionary* as "the outermost layer of cells of the enamel organ". Furthermore, "ameloblast" is known as "one of the columnar epithelial cells of the inner layer of the enamel organ of a developing tooth, concerned with the formation of enamel matrix" as clearly defined by *Stedman's Electronic Medical Dictionary*. The terms in question are transferred by the translator as "mine tabakası" and "ameloblast" into Turkish. Due to the fact that there are such terms in the TL and the translation seems literal, it can be said that the translator actually applies literal translation method in the process of translating by also taking into consideration other source languuage elements for the purpose of producing a target text which is grammatically and idiomatically appropriate for target readers.

As a matter of fact, the grammatical structure of English and Turkish are different. In parallel with this, the word order of English is S+V+O whereas the word order of Turkish is S+O+V. Yet, sentences analyzed in this study are still good examples of literal translation even if there are such slight differences between these two languages. Only examples in which medical terminology is abundant are chosen for the analysis of literal translation. There are also many literal translations in the translated textbook because of the fact that it is a technical text focusing on converying the medical knowledge among medical students or professionals.

OBLIQUE TRANSLATION

4. Transposition

Transposition means replacement of a word class with another. The meaning of the message is however preserved. Similarly, it can be defined as the replacement of one class of words by another without changing the meaning of the message (Vinay&Darbelnet, 1958/1995: 94). It is the most common structural change undertaken by translators in the process of translating to be able to prevent the problem of untranslatability from occurring**.**

In addition, it is necessary to have a very good command of the TL in the application of transposition. Transposition can be divided into two types: obligatory transposition associated with the term "servitude" which means compulsory grammatical changes or variations causing from the unalterable facts of the language system and optional transposition related to the term "option" which means personal choices made optionally for stylistic, ideological or cultural resaons. Besides, there are many categories of transposition such as adverb→verb, verb→noun, noun→past participle, verb→preposition, adverb→noun, past participle→noun, adjective→noun, prepositional expression→adjective/adverb, adjective→verb, supplementation of demonstratives by transposition and "inverse transposition". ""Inverse transposition" is very common between English and French. It implies the translation of nouns (generally action nouns) via verbs. These nouns are connected with prepositions in patterns alien to French expression (Vinay&Darbelnet, 1958/1995: 105). In addition to being a translation method, transposition can be applied within a language as well.

There are two kinds of expression which are also associated with transposition: "base expression" refers to the unchanged form of the word class or the first expression whereas the transposed expression refers to the changed version or the second expression.

- "In summary, the membranous system of the endoplasmic reticulum and Golgi apparatus represents a highly metabolic organ capable of forming new intracellular structures as well as secretory substances to be extruded from the cell." (Arthur Guyton p. 22)
- "Özetle, endoplazmik retikulum ve Golgi aygıtının zar sistemleri, hücre dışına salgılanacak olan sekretuvar maddeleri ve yeni hücresel yapıları oluşturabilme kapasitesine sahip yüksek metabolik aktive gösteren organlardır." (Günfer Turgut p.22)

"Membranous" in the SL text is the adjective form of the term membrane which is "a thin sheet or layer of pliable tissue functioning as lining of a cavity, as a partition or septum" according to *Stedman's Electronic Medical Dictionary*. It is however changed into noun in the process of translating, in other words transposed into the TL by the translator. Therefore, "zar" is used in the translation instead of "zar yapısı gösteren or zarsı" which is actually the exact translation of the word. Therefore, the transposition applied is from adjective into noun and it is optional as it totally seems to depend on the translator's personal choice. (adjective→noun)

- "Blood normally flows continually from the great veins into the atria; about 80 percent of the blood flows directly through the atria into the ventricles even before the atria contract." (Arthur Guyton p.107)
- "Kanın büyük venlerden atriyumlara akışı normalde süreklidir; kanın yaklaşık %80'i atriyumlar kasılmadan önce atriyumların içinden geçip doğrudan ventriküllere akar." (Neslihan H.Dikmenoğlu p.107)

"Flow" as a verb in the source text implies the movement of blood and it is translated into Turkish by applying transposition translation method by the translator. Therefore, its noun form "akış" is chosen instead of its verb form "akmak" in the process of translating. The transposition applied is from verb into noun and it is optional due to the translator's personal choice or since the word in question may also be translated as a verb that is, as "akmak" which can be seen in the second part of the example selected. (verb→noun)

- "Urea, however, is not very permeant in this part of the nephron, resulting in increased urea concentration as water is reabsorbed." (Arthur Guyton p.356)
- "Ancak, nefronun bu parçasından üre geçirgenliği çok olmadığından suyun emilmesi, üre konsantrasyonunun artışı ile sonuçlanır. " (Kubilay Uzuner p.356)

The word "permeant" in the SL is an adjective implying permeating or pervading. However, it is translated into the TL by applying transposition translation method instead of keeping its adjective form that is "geçirgen" in the translation. So, it is used in the translated text as a noun that is, "geçirgenlik. Then, it is obvious that the word class is changed from adjective into noun in the example analyzed and the transposition applied is optional since it is based on the translator's personal choice and the term in question may also be transferred into the TL with its original form that is, as adjective. (adjective→noun)

- "The thymus also makes certain that any T lymphocytes leaving the thymus will not react against proteins or other antigens that are present in the body's own tissues; otherwise, the T lymphocytes would be lethal to the person's own body in only a few days." (Arthur Guyton p. 441)
- "Timus aynı zamanda timusu terk eden T lenfositlerin vücudun kendi dokularında bulunan protein ve diğer antijenlere karşı yanıt vermemesini de sağlar, yoksa bu T lenfositleri yalnızca birkaç günde organizmayı öldürebilir." (Güher Saruhan Direskenli p.441)

"To make certain" means to ensure. It is composed of two words, a verb ("to make") and an adjective ("certain"). When the translator transfers it into the TL, the adjective becomes totally verb that is, "sağlar". The meaning between two languages is similar but the adjective "certain" is also converted into verb in Turkish throughout the translation process unlike the original use. Therefore, the translator applies in a way obligatory (servitude) transposition as the word is used in this manner in Turkish. On the other hand, "lethal" is associated with death which is the synonym of fatal. As is clear in the source text, "lethal" is an adjective. However, it is translated into the TL by the translator in its verb form that is, as "öldürebilir" by changing the word class from

adjective into verb or in other words applying transposition translation method. Besides, the transposition in question is optional due to fact that it is applied optionally by changing the original word class instead of translating the term as "öldürücü" into the TL. (adjective→verb/ adjective→verb)

- "The pulmonary capillaries are relatively leaky to protein molecules, so that colloid osmotic pressure of the pulmonary interstitial fluid is about 14mm Hg, in comparison with less than half this value in the peripheral tissues." (Arthur Guyton p. 488)
- "Pulmoner kapillerler protein moleküllerini göreceli olarak sızdırdıklarından, pulmoner insterstisyel sıvının kolloid ozmotik basıncı yaklaşık 14mm Hg olarak bulunur. Oysa perifer dokularda basınç bu değerin yarısından daha azdır." (Lütfi Çakar p. 488)

"Leaky" implies holes, cracks, or other faults allowing liquids and gases to pass through. Under normal conditions, it should be translated into the TL as "sızıntılı". However, the translator instead prefers to translate the word in question into the TL as "sızdırmak" that is, in its verb form. It is therefore certain that there is a transposition from adjective into verb in the translated sentence. The transposition applied is optional as it is performed optionally by the translator and the word in question may also be translated into Turkish as "sızıntılı" as mentioned above . (adjective→verb)

- "It can be seen from the oxygen-hemoglobin dissociation curve in figure 40-8 that when the alveolar P02 is decreased to as low as 60mm Hg, the arterial hemoglobin is stil 89 percent saturated with oxygen …" (Arthur Guyton p.507)
- "Şekil 40-8'deki oksijen-hemoglobin disosiyasyon eğrisinden de görülebileceği gibi, alveoler P02 60mm Hg düzeyine kadar düştüğünde, arteryel hemoglobin hala oksijenle %89 doygunluktadır.." (Gülseren Şahin p.507)

"Saturated" as a past partciple in the original sentence means "filling of all the available sites on an enzyme molecule by its substrate, or on a hemoglobin molecule by oxygen" as exactly pointed out by *Stedman's Electronic Medical Dictionary*. The term in question is translated by the translator into Turkish by applying transposition

translation method. So, it becomes "doygunluktadır" in the TL. Then, the transposition is from past participle into noun and it can be said that it is optional by considering that the exact translation of the term into Turkish is "doymuş" but the translator prefers to transpose the term into the TL as "doygunluktadır" as mentioned above. (past participle→noun)

- "In performing the FVC maneuver, the person first inspires maximally to the total lung capacity, then exhales into the spirometer with maximum expiratory effort as rapidly and as completely as possible." (Arthur Guyton p.526)
- "Zorlu ekspirasyon vital kapasitesini ölçerken, kişi ilk olarak toplam akciğer kapasitesine kadar maksimum bir inspirasyon yapar, sonra da spirometreye maksimum ekspirasyon çabası ile olabildiğince hızlı ve tüm havayı verecek bir ekspirasyon yapar." (Nermin Yermen p. 526)

"Inspire" as a medical term is the synonym of inhale meaning to draw in the breath. "Exhale" is the opposite since it implies to breathe out. Both of these terms are classified as verb. In addition, "expiratory" is counted as being the adjective form of "expire" or "expiration". These word classes in the source text are differently translated into the TL by the translator when compared to their original versions. So, "inspire" is translated as "inspirasyon", "exhale" is translated as "ekspirasyon" and "expiratory" is similarly translated as "ekspirasyon" as it is also clear in the example. In other words, these examples show that the translator actually applies transposition in the process of translation. In doing so, verbs are changed into nouns and similarly adjective into noun in the TL. The transpositions applied to this example are optional due to the translator's personal choice or since these terms in English can also be transferred into Turkish without having to change their word classes that is "soluk almak", "soluk vermek" and "ekspiratori" respectively. (verb→noun/ adjective→noun)

- "Therefore, it is likely that pain impulses entering the brain stem reticular formation, thalamus, and other lower brain centers cause conscious perception of pain." (Arthur Guyton p.601)

- "Buna göre, retiküler formasyon, talamus ve diğer alt beyin merkezlerine giren ağrı uyarıları bilinçli olarak algılanır." (Lamia Pınar p. 601)

"Perception" means "the interpretation of sensations in which the information is received through the five senses known as taste, smell, hearing, vision and touch and organized into a pattern by the brain" according to *Illustrated Medical Dictionary.* The word class of the term in question is noun as is obviously seen in the source text but it is translated into the target settting in its past participle form that is, as "algılanır". So, the translator seems to apply transposition from noun into past participle in this example. In addition,the transposition applied is optional since it is applied by the translator optionally and "perception" can also be translated into the TL by preserving its original word class that is, "algı or algılama". (noun→past participle)

- "Ischemia causes visceral pain in the same way that it does in other tissues, presumably because of the formation of acidic metabolic end products or tissue degenerative products such as bradykinin, proteolytic enzymes, or others that stimulate pain nerve endings." (Arthur Guyton p. 604)
- "İskemi, diğer dokulardakine benzer şekilde viseral ağrıya yol açar. Ağrı sonlanmalarını uyaran diğer maddeler gibi, asit nitelikteki metabolik son ürünler veya bradikinin, proteolitik enzimler gibi doku dejenerasyon ürünleri bu ağrıyı oluşturur." (Lamia Pınar p. 604)

"Degenerative" "which is related to degeneration implies deterioration or a worsening of mental, physical, or moral qualities" as mentioned by *Stedman's Electronic Medical Dictionary*. Instead of translating it by preserving its adjective form, the translator translates it into the TL as a noun by benefiting from transposition translation method. Then, the word class is changed from adjective into noun and "degenerative" becomes "dejenerasyon" in the Turkish translation. The transposition applied is optional due to the fact that the term in question may also be translated into the target setting by preserving its original word class and the translator's personal choice is in that direction. (adjective→noun)

- "The eyes can no longer accommodate for both near and far vision." (Arthur Guyton p. 618)
- "Bu göz bir daha yakın ve uzak görüş için akomodasyon yapamaz." (Ersin Koylu p. 618)

"To accommodate" as a verb in the source text means to adjust, especially to adjust the eye for seeing objects at various distances. The translator translates the term in question as "akomodasyon" by applying transposition translation method. Then, the word class is also changed from verb into noun in the process of translating. The transposition applied is optional due to the fact that changing the word class depends entirely on the translator's personal choice. (verb→noun)

- "Ulcerative colitis is a disease in which extensive areas of the walls of the large intestine become inflamed and ulcerated." (Arthur Guyton p. 823)
- "Ülseratif kolit, kalın barsak duvarlarının büyük bölümünde inflamasyon ve ülserin bulunduğu bir hastalıktır." (Ahmet Ergün p.823)

"Inflamed" implies the site or area that inflammation occurs or appears. It is generally translated into Turkish as "iltihaplanmış" or "iltihaplı" since it is the past participle form of inflammation. In addition, "ulcerated" means having undergone ulceration and is mostly translated into Turkish as "ülserleşmiş" or "ülserli". However, both of these terms seem to be translated into the TL as "inflamasyon" and "ülser" respectively as is clear from the example analyzed. In other words, there is a change from past participle into noun in the translation which demonstrates that the translator applies transposition translation method in the process of translating. The transpositions applied to this example are optional as the change of their word class is not compulsory but depends on the translator's own decision. (past participle → noun)

- "Because the steroids are higly lipid soluble, once they are synthesized, they simply diffuse across the cell membrane and enter the interstitial fluid and then the blood." (Arthur Guyton p. 908)

- "Streoidler lipitte çözünürlüklerinin oldukça yüksek olması nedeniyle, yapılır yapılmaz kolayca hücre zarından difüzyonla instertisyel sıvıya, oradan da kana geçerler." (Z.Dicle Balkancı p. 908)

"Diffuse" as a verb in the source language sentence means to disseminate or spread about. Instead of translating it into the target setting by preserving its original form, the translator applies transposition translation method and therefore changes the word class from verb into noun that is, translates the term in question as "difüzyon". The transposition can be said to be optional since it is based upon the translator's personal decision. (verb→noun)

- "Synthesis and secretion of calcitonin occur in the *parafollicular cell*s, or *C cells*, lying in the interstitial fluid between the follicles of the thyroid gland." (Arthur Guyton p. 988)
- "Hormon tiroid bezindeki folliküller arasında bulunan *parafolliküller hücreler* ya da *C hücreleri* adı verilen hücreler tarafından sentezlenir ve salgılanır." (Sami Aydoğan p.988)

"Synthesis" is "the creation of an integrated whole by the combining of simpler parts or entities" as pointed out by *Dorland's Medical Dictionary*. "Secretion" on the other hand means "the manufacture and release by a cell, gland, or organ of substances such as enzymes needed for metabolic processes elsewhere in the body" according to *Illustrated Medical Dictionary*. These two terms are categorized as noun as is also seen in the source text. However, the translator converts the word class from noun into past participle by benefiting from transposition in the process of translating and therefore "synthesis" is translated as "sentezlenir" while "secretion" is translated as "salgılanır" in the TL. The transpositions applied to this example are optional as it is related to the translator's own decision. (noun→past participle)

- "Progesteron promotes development of the lobules and alveoli of the breasts, causing the alveolar cells to proliferate, enlarge, and become secretory in nature." (Arthur Guyton p. 1018)
- "Progesteron alveol hücrelerinin proliferasyonuyla memelerdeki lobül ve alveollerin gelişimini hızlandırır. Böylece memeler büyüyerek salgılayıcı bir hal kazanırlar." (Günnur Yiğit p. 1018)

The verb "proliferate" in the source text means "to grow and increase in number by means of reproduction of similar forms" according to *Stedman's Electronic Medical Dictionary*. However, it is translated into Turkish in its noun form by the translator that is, as "proliferasyon". Then, the translator can be said to apply transposition from verb into noun in the translation. The transposition applied is optional since the reason why the translator changes the word class is not caused by compulsory grammatical differences between English and Turkish but by her personal choice. (verb→noun)

- "Experiments have demonstrated that the hypothalamus does not secrete GnRH continously but instead secretes it in pulses lasting 5 to 25 minutes that occur every 1 to 2 hours." (Arthur Guyton p. 1020)
- "Deneysel araştırmalara göre, hipotalamusun GnRH salgısı sürekli değildir. Salgı, her 1-2 saatte bir gerçekleşir ve 5-25 dakika süreyle devam eder." (Günnur Yiğit p.1020)

The verb "to demonstrate" which is used in the source language text means to make a fact clear to people. The Turkish counterpart of the word is "göstermek or kanıtlamak". It is however translated into the TL by the translator as a preposition that is, as "araştırmalara göre". Then, it seems that the translator applies transposition in the process of translating. The word class is thus changed from verb into preposition. Similarly, another verb in the original sentence "to secrete" meaning to synthesize and release a substance is transposed into the TL by the translator changing the word class from verb into noun and therefore it is translated as "salgı" instead of "salgılamak". Furthermore, the transpositions are optional because both of them are caused by the

translator's personal choice in the process of translating. (verb→preposition/ verb→noun)

5. Modulation

Modulation is defined as the change or reversal of the point of view. In other words, it is the change of the form of the message or semantic of the source text when it is translated into the target text. Using modulation, translators can translate the intended message of the source text in a different way.

Modulation is borrowed by Vinay&Darbelnet from Panneton and it is also divided into two types in a way similar to transposition that is, obligatory ("servitude") and optional modulations ("option"). Modulation is subdivided into: abstract for concrete (metonym), explicative modulation that is, cause for effect or the means for the result, the part for the whole (synecdoque), one part for another (metonym), reversal of terms, negation of the opposite (litotes), active into passive or passive into active, space for time (metalepsis), exchange of intervals for limits (in space and time), and change of symbol.

- "Now, to complete the picture, the myosin filament itself is twisted so that each successive pair of cross bridges is axially displaced from the previous pair by 120 degrees." (Aarthur Guyton p.76)
- "Ayrıca, miyozin filamenti kendi etrafında döner ve her çapraz köprü seti ve önceki setten 120 derece aksiyal olarak yer değiştirir." (Berkant Muammer Kayatekin p.76)

"Twist" refers to make a spiral shape by turning the two ends of it in opposite directions. The verb is used in passive voice as is simply understood from the original sentence. "To displace" on the other hand implies removal from the normal location or position. It is also used as passive voice in the source text. Instead of following the same way as it is in the source text, the translator attempts to modulate these words into Turkish by changing the structure from passive into active and therefore translates them as "döner" and "yer değiştirir" respectively. The subjects of the source text are "mysoin filament" and "each successive pair of cross bridges". During the transfer, "miyozin filament" becomes the subject of the target text as it is in the source text. However, the second subject of the source text is again changed to "miyozin filament" by the

translator in the translation process. In addition, the action that is summarized in this sentence is normally initiated by the body itself and although it is not directly used in the source text, verbs are used in their passive form. The translator instead prefers active form of the source language elements in the Turkish translation. Actually he has an alternative to use their passive form that is, "miyozin filamenti kendi etrafında döndürülür" or "aksiyal olarak yeri değiştirilir" in the TL although this use is literal. The modulations applied are therefore optional. (passive into active on a syntactic plane)

- "Three particularly well known drugs, *neostigmine, physostigmine*, and *diisopropyl fluorophosphate*, inactivate the acetylcholinesterase in synapses so that it no longer hydrolyzes acetylcholine." (Arthur Guyton p. 89)
- "Özellikle iyi bilinen üç ilaç-*neostigmin*, *fizostigmin* ve *diizopropil florofosfat*-sinapslardaki asetilkolinesterazı inaktive eder. Bunun sonucunda asetilkolin artık hidrolize edilemez." (Osman Açıkgöz p. 89)

In the example analyzed, "to hydrolyze" means to subject to the hydrolysis and it is defined by *Dorland's Medical Dictionary* as "the cleavage of a compound by the addition of water, the hydroxyl group being incorporated in one fragment and the hydrogen atom in the other". In addition, the verb is used in active voice and furthermore, the subject pronoun "it" refers to "acetylcholinesterase" in the source text but in the translation the subject pronoun "it" is omitted and the translator tends to change the structure of the verb in question from active into passive by making "asetilkolin" subject of the translated sentence and thereby applying modulation translation method. Therefore, the verb is alternatively translated into the TL as "hidrolize edilemez" instead of "hidrolize etmez or edemez". Then, the modulation applied to this sentence is optional. (active into passive on a syntactic plane)

- "The atria are separated from the ventricles by fibrous tissue that surrounds the atrioventricular (A-V) valvular openings between the atria and ventricles." (Arthur Guyton p. 104)

- "Atriyumlar ve ventriküller arasındaki atriyoventriküller (A-V) kapak açıklıklarını çevreleyen fibröz doku atriyumları ventriküllerden ayırır." (Neslihan H.Dikmenoğlu p. 104)

"To separate" implies the division between two things. It is clearly used as passive voice in the original sentence. The translator however transfers the verb by changing its structure from passive into active voice and thus translates it as "ayırır" by benefiting from modulation translation method in the process of translating and as a result "fibröz doku" becomes the subject of the translated sentence unlike its previous position in the source text. The modulation applied to this example is totally based on the translator's own decision in the process of translating which makes it optional. (passive into active on a syntactic plane)

- "The constricted kidney secretes renin and also retains salt and water because of decreased renal arterial pressure in this kidney." (Arthur Guyton p. 227)
- "Arteri daralan böbrekte hem renin salgılanır hem de renal arter basıncı düştüğünden su ve tuz tutulur." (Ayhan Bozkurt p. 227)

"To secrete" means to synthesize or release subject and it is easily understood from the example analyzed that it is used in active voice in the original sentence. "To retain" other hand means to continue to have something or to keep something and not lose it, give it away. It is also used in active voice in the English sentence. In addition to these, the term "kidney" functions as the subject of the source text. However, this is not the case in the Turkish translation since the translator prefers to translate these verbs by changing their active structure into passive and applying modulation translation method in this way. Then, these verbs are respectively translated into the TL as "salgılanır" and "tutulur" instead of "salgılar and tutar". Furthermore, "böbrek" is no longer the subject of the translated sentence while "renin" and "su ve tuz" which are used as objects in the source text are converted into subjects in the translation. The modulations applied are optional since the terms in question may also be translated in their active form as mentioned above. (active into passive on a syntactic plane)

- "It must also be remembered that many factors can affect the pressure-regulating level of the renal-body fluid mechanism." (Arthur Guyton p. 231)
- "Böbrek-vücut sıvısı mekanizmasının basınç düzenleme işlevini etkileyen birçok faktör olduğunu unutmamak gerekir." (Ayhan Bozkurt p. 231)

"To remember" means to recall or in other words to keep in mind. It can be translated into TL as "hatırlamak, "akılda tutmak" or even "göz önünde tutmak". However in the analyzed example, the translator prefers to use "unutmamak" which implies the same meaning instead of using one of these counterparts in Turkish. This is called negation of opposite that is a type of modulation and it is optionally used by the translator in the direction of his personal decisions during the process of translating. (negation of opposite on a syntactic plane)

- "A frequent cause of death in heart failure is *acute pulmonary edema* occurring in patients who have already had chronic heart failure for a long time." (Arthur Guyton p.264)
- "Kalp yetmezliğinde sık karşılaşılan bir ölüm nedeni, uzun süreden beri kronik kalp yetmezliği olan hastalarda oluşan *akut akciğer ödemidir*." (Sema Yavuzer p. 264)
- "For years, it has been taught that the prefrontal cortex is the locus of "higher intellect" in the human being, principally because the main difference between the brains of monkeys and of human beings is the great prominence of the human prefrontal areas." (Arthur Guyton p.719)
- "Yıllardan beri, prefrontal korteks, insandaki "gelişmiş zekanın" yeri olarak düşünülmüştü. Bunun temel nedeni, insan prefrontal alanlarının, maymunlardakine göre çok daha belirgin olması ve bu özelliğin, bu iki türün beyinleri arasındaki en önemli farkı oluşturmasıdır." (Gönül Ö.Peker p. 719)

In the translations of the original texts, there is exchange of intervals for limits (in time). According to this type of modulation, the limit becomes a fixed point in time and the interval a duration. In the source texts, time is not certain and the direct translation of "for a long time" and "for years" into Turkish would be "uzun zamandır" and "yıllardır".

However, the translators translate them as "uzun süreden beri" and "yıllardan beri", thereby making them fixed points in time. The modulations applied by the translators are optional as is clear from the examples analyzed. (exchange of intervals for limits in time on a syntactic plane)

- "PAH is secreted so rapidly that the average person can clear about 90 percent of the PAH from the plasma flowing through the kidneys and excrete it in the urine." (Arthur Guyton p. 334)
- "PAH o denli çabuk salgılanır ki normal bir şahısta böbreğe gelen plazmadaki PAH'ın %90'ı böbreklerden idrar aracılığı ile itrah edilir." (Gülsen Öner p. 334)

"To excrete" means to throw off or eliminate, as waste matter, by a normal discharge, called also void. In the source language text, it is used in active voice and "the average person" is also the subject. The translator nevertheless prefers to apply modulation translation method by changing the structure of the verb from active into passive and thereby translating it as "itrah edilir" instead of "itrah eder" in the translation process. As a result, the subject is also replaced by "PAH'ın %90'ı". Due to this alternative offered by the translator, the type of the modulation is optional. (active into passive on a syntactic plane)

- "In the absence of ADH, this segment is almost impermeable to water and fails to reabsorb water but continues to reabsorb solutes and further dilutes the urine." (Arthur Guyton p. 353)
- "ADH yokluğunda, bu segment suya hemen hemen hiç geçirgen değildir ve suyu reabsorbe edemez fakat erimiş madde reabsorpsiyonu sürer ve idrar daha ileri derecede sulandırılır." (Kubilay Uzuner p. 353)

"To dilute" as a verb means "to reduce a solution or mixture in concentration, strength, quality or purity" as pointed out by *Stedman's Electronic Medical Dictionary*. In addition, it is explained by *Dorland's Medical Dictionary* as "to make something less concentrated, such as by adding fluid to a mixture or solution". It is obvious that the verb is used in active voice in the source text and "this segment" is the subject of the SL. However, the translator tends to modulate the verb by changing the structure from

active into passive in the translated version of the sentence. That's, the verb is alternatively translated as "sulandırılır" instead of "sulandırmak". The modulation applied is therefore optional. As it is also clear, "idrar" becomes the new subject in the translation instead of "new segment". (active into passive on a syntactic plane)

- "In times of serious tissue infection, the total life span is shortened to only a few hours because the granulocytes proceed even more rapidly to the infected area, perform their functions, and, in the process, are themselves destroyed." (Arthur Guyton p. 431)
- "Ciddi doku enfeksiyonlarında, bu toplam yaşam süresi genellikle birkaç saate kadar düşer çünkü granülositler daha hızlı enfekte bölgeye gider, işlevlerini yerine getirir ve süreç içinde kendi kendilerini haraplarlar." (Gülseli Yıldırım p.431)

"To shorten" means to become shorter or make something shorter. In addition, "to destroy" means to damage something very badly, so that it cannot be repaired. Both of these verbs are used in passive form in the source text. However, they are modulated in their active form by the translator in the process of translating. Therefore, they are respectively translated as "düşer" and "haraplarlar into the TL. The subjects of the original sentence do not change in the TL as it is clear from the example analyzed. In addition to these, modulations applied to this sentence are optional since the translator translates "shortened" as "düşer" into Turkish while she may alternatively translate it as "ciddi doku enfenksiyonları tarafından bu toplam yaşam süresi genellikle birkaç saate kadar düşürülür "into the TL although such a use would be too literal. "Destoyed" may also be translated into Turkish as "haraplanırlar" instead of "haraplarlar". (passive into active on a syntactic plane)

- "It is easy to understand why large quantities of heparin might be needed in these areas…" (Arthur Guyton p.464)
- "Bu alanlarda neden çok miktarda heparine gereksinim olduğunu anlamak zor değildir." (Kasım Özlük p.464)

The adjective "easy" in the source language text is clearly modulated by the translator into the TL with its opposite or in other words negative connotation "zor", which

however implies the same meaning since it is combined with "değildir". Therefore, the modulation applied to the TL is negation of opposite and it is optional since it is done by the translator in the direction of his personal decision during the translation process and most importantly the sentence may also be translated as "bu alanlarda neden çok miktarda heparine gereksinim olduğunu anlamak kolaydır." (negation of opposite on a syntactic plane)

- "These lenses are held in place by a thin layer of tear fluid that fills the space between the contact lens and the anterior eye surface." (Arthur Guyton p.620)
- "Kontakt lens ile gözün ön yüzeyi arasındaki boşluğu dolduran ince bir gözyaşı tabakası kontakt lensi yerinde tutar." (Ersin Koylu p. 620)

"To hold in place" means to keep something in the same position. It is used in passive form in the source text by the author. However, the translator offers an alternative by changing its point of view and thereby applying modulation from passive into active in the process of translating. As a result, it is translated as "yerinde tutar" into the TL. This change also affects the position of the subject (that is, "these lenses" in the source text) since "kontakt lens ile gözün ön yüzeyi arasındaki boşluğu dolduran ince bir bir gözyaşı tabakası" becomes the new subject in the translation. The modulation applied to the example is optional as it is caused by the translator's personal decision. (passive into active on a syntactic plane)

- "Large quantities of fat are stored in two major tissues of the body, the *adipose tissue* and *the liver."* (Arthur Guyton p.842)
- "Çok miktarda yağ vücutta başlıca iki dokuda, *yağ dokusu* ve *karaciğerde* birikir."(Kadir Kaymak p. 842)

"To store" means to accumulate as is commonly known. It is used in passive voice in the original sentence. The translator nevertheless attemtps to modulate it in active voice into the target setting by translating it as "birikir". Therefore, passive into active modulation is applied to the example analyzed. In addition, the position of the subject in the SL does not change during the transfer into the TL. Then, "çok miktarda yağ" is still the subject of the translation. The modulation applied is also optional since it is caused

by the translator's personal choice and the verb in question may also be translated into the TL as "çok miktarda yağ biriktirilir or depolanır." (passive into active on a syntactic plane)

- "Stimulation of adenylyl cyclase, a membrane-bound enzyme, by the Gs protein then catalyzes the conversion of a small amount of cytoplasmic *adenosine triphosphate* (ATP) into cAMP inside the cell." (Arthur Guyton p.913)
- "*Gs proteini* ile zara bağlı bir enzim olan adenil siklaz uyarıldığında, küçük bir miktar sitoplazmik *adenozin trifosfat* (ATP)'ın cAMP'ye dönüşümü katalizlenir." (Z.Dizle Balkancı p. 913)

"To catalyze" means "to cause or produce catalysis which means an increase in the velocity of a chemical reaction or process produced by the presence of a substance that is not consumed in the net chemical reaction or process" as explained by *Dorland's Medical Dictionary*. The verb is used in active voice in the original sentence. The translator however modulates it into the TL by changing its active structure into passive and therefore translates the verb in question as "katalizlenir" into Turkish. As a result while the subject of the original document is "stimulation of adenylyl cyclase, a membrane-bound enzyme, by the Gs protein", it is changed in the TL into "küçük bir miktar sitoplazmik adenozin trifosfat (ATP)'ın cAMP'ye dönüşümü". The modulation applied can also be said to be optional since it is caused by the translator's personal choice and besides the verb in question may also be translated into Turkish in active voice that it, as "katalizler". (active into passive on a syntactic plane)

- "In the absence of insulin, all the effects of insulin noted earlier that cause storage of fat are reversed." (Arthur Guyton p. 966)
- "İnsülin yokluğunda, insülinin yukarıda anlatılan yağların depolanmasına olan etkilerinin tümü tersine döner." (Ayşe Doğan p. 966)

"To reverse" implies a turning or change in the opposite direction. In the original sentence, it is used in passive voice. However, the translator changes its structure from passive into active by applying modulation translation method in the process of translating. Under this circumstance, the verb is modulated as "tersine döner" into

Turkish. This change however does not seem to affect the position of the subject during the transfer into the TL. Therefore, "insülinin yukarıda anlatılan yağların depolanmasına olan etkilerinin tümü" is similarly the subject of the translation. The modulation applied to the translation is optional. The reason is that the action is actually performed by the body itself and the source text is written in passive voice to imply this. Hence, the translator may also translate the verb into the TL as "tersine döndürülür" although it is word for word. (passive into active on a syntactic plane)

Modulations in the examples are generally active into passive or passive into active. There are also other types of modulation in the examples. However, they are not as outstanding as active into passive or passive into active. Therefore, it can clearly be said that active into passive or passive into active is the most common modulation type for the textbook in question.

6. Equivalence

Equivalence means that the same situation is translated by different stylistic or structural methods. According to Vinay&Darbelnet, most equivalences are fixed, and belonging to a phraseological reportoire of idioms, clichés, proverbs. Besides, proverbs are generally perfect examples of equivalences (1958/1995: 38). It must also be emphasized that the use of equivalence as a translation method developed by Vinay&Darbelnet is different from its common theoretical use.

The classical example of equivalence given by Vinay&Darbelnet in their book is the reaction of an amateur who accidentally hits his finger with a hammer: If he were French his cry of pain would be transcribed as, "Aïe!", but if he were English this would be interpreted as "Ouch!" (1958/1995: 38).

Equivalence is also generally used in the translation of idioms. "To talk through one's hat" is one of the examples given by Vinay&Darbelnet to prove it (1958). It would not be correct to transfer this idiom into the TL via calque translation method. Instead, it is advised by Vinay&Darbelnet to use traditional forms of expression which can help translators to avoid accusations by their cultures. As a consequence, "to talk through one's hat" is not transferred into the Turkish language via calque but equivalence and it has a counterpart of "abuk sabuk konuşmak or işkembeden atmak" in the target culture .

Considering that the equivalence as a translation method generally seems to be limited to idioms, proverbs or cliches, there are no such examples in the textbook analyzed. In addition, it has a specific use which must not be confused by its common theoretical use as also mentioned above. So, it can be said that the equivalence as a translation method may usually be encountered in the translation of medical texts which are published in newspapers, journals and articles for laymen including patients or their families. However, this is not the case for the textbook analyzed at it is primarily translated for medical students or medical professionals.

7. Adaptation

Adaptation is accepted by Vinay&Darbelnet as the most extreme limit of translation. It is used in cases where the type of situation being referred to by the SL message is unknown in the TL culture (1958/1995:39).

In adaptation, translators are in charge of creating a new and analogous situation that is the counterpart or equivalent of the source culture. Besides, the content and the form of the source text are changed to conform to the rules of the TL and culture of the target setting for the purpose of increasing the readability and comprehensibility of the translated document.Adaptations are commonly used in literary works or in the translation of books and film titles or children's literature.

Adaptation can affect the syntactic structure as well as the development of ideas and the way their represention in the target culture, which often deters translators from using it. However, it should also be noted that there are cases in which adaptation is needed and has to be used.

- "If one knows that a person being viewed is 6 feet tall, one can determine how far away the person is simply by the size of the person's image on the retina." (Arthur Guyton p.622)
- "Eğer kişi, bir başka kişinin 1,83 metre olduğunu biliyorsa, bu kişinin ne kadar uzaklıkta olduğunu basitçe retina üzerindeki görüntüsünden saptayabilir." (Ersin Koylu p. 622)

"Feet" is the plural form of foot which is defined as the unit of measurement for length, height or depth, and is equal to 12 inches or 30.48 centimeters. "6 feet" in the SL text is used to give information about the height of a person and this is frequently represented with "metre" in Turkish. The translator therefore converts "6 feet" into "1,83 metre" in the TL by applying adaptation translation method that is, adapting "feet" into "metre" in the target settting to make it acceptable and understandable for target readers.

- "All the jaw muscles working together can close the teeth with a force as great as 55 pounds on the incisors and 200 pounds on the molars." (Arthur Guyton p.781)
- "Tüm çene kasları birlikte kasıldıkları anda, alt ve üst çenedeki kesicilerin 25 kg'lık**,** molarların ise 90 kg'lık bir kuvvetle birbiri üzerinde kapanmalarını sağlayabilirler." (Sena Erdal p. 781)

"Pound" as is used in the source text means a unit of weight which is regarded as being equal to 0.454 kilograms and used generally in Britain, America and other countries in which the system of unit and measurement belonging to Britain is applied. This is not the case in Turkey (especially due to the cultural differences). "55" pounds" and "200 pounds" are therefore not transferred into the TL in the same way as in the original. Instead, "pound" is converted into "kilogram" in Turkish by the translator and "55 pounds" and "200 pounds" become respectively "25 kg" and "90 kg" in the translation. In other words, the translator actually adapts "pound" into "kg" in the translated textbook and hence applies adaptation translation method during the transfer.

- "Without appropriate prenatal control of diet, the mother's weight gain can be as great as 75 pounds instead of the usual 24 pounds." (Arthur Guyton p.1034)
- "Gebe kadınlarda dikkat edilmemesi halinde, normal 11 kg yerine 38 kg'a varan kilo artışları olabilir." (Refik Yiğit p.1034)

"75 pounds" and "24 pounds" in the SL as units of weight are converted respectively into Turkish as "11 kg" and "38 kg" by the translator in the process of translating to make them acceptable and understandable for the target reader. The reason is that "kg" is used instead of "pound" as a unit of weight in Turkish due to the cultural differences as explained before and in parallel with this, translation method applied by the translator in the process of translating is adaptation.

- "Then, during the last trimester of pregnancy, the fetus gains tremendously, so that 2 months before birth, the weight averages 3 pounds, 1 month before birth 4.5 pounds, and at birth 7 pounds-the final birth weight varying from as low as 4.5 pounds to as high as 11 pounds in normal infants with normal gestational periods." (Arthur Guyton p. 1042)

- "Gebeliğin son üç ayında fetus birden ağırlaşır, doğumdan iki ay önce yaklaşık 1,5 kg, doğumdan bir ay önce 2,2 kg, doğumda 3,5 kg olur. Normal yeni doğanın ağırlığı 2,2 kg ile 5,5 kg arasında değişir." (Refik Yiğit p.1042)

The translator attempts to translate "pound" into the TL in a way conforming to the system of weight and measurement used in Turkey as in the previous examples. Therefore, "3 pounds", "4.5 pounds", "7 pounds" and "11 pounds" in the source text are respectively converted into "1,5 kg", "2,2 kg", "3,5 kg" and "5,5 kg" in the translated textbook. Then, it can be asserted that the translator actually applies adaptation translation method by creating an analogous situation (that is, the conversion or adaptation of "pound " into "kg") in the target culture, especially for medical students or field experts to understand it.

It should be noted that systems of weight and measure are also regarded as cultural references and may differ from society to society, which is also confirmed by Resurrecció and Davies (2007). Hence, they must be adapted in some cases. This is proven by the examples under the heading of adaptation although they are uniform. As explained before, "pound" (as a unit of weight) is compensated by translators of the examples as "kg" in Turkish. Similarly, "feet" (as the unit for measuring the height in the example discussed above) is compensated by the translator as "metre" in the TL.

CONCLUSION

This thesis has dealt with the topic of medical translation including its history, characteristics, language and also possible problems encountered in the translation process along with solutions to them. Each of these titles are explained in detail in different chapters of the thesis. In addition, the study has also offered an analysis to detect translation methods applied by the tranlators for the translation of *Textbook of Medical Physiology* from the point of the translation theory put forward by Vinay& Darbelnet.

The thesis has initially presented the historical development of medicine throughout the ages and therefore provided information about the historical roots of that special field and its translation. Medicine has a very rich history. Before the invention of printing, diseases were believed to be derived from evil spirits, magic or supernatural events. Later, people needed more scientific explanations as medicine is directly related to human life. Therefore, many famous physicians, translators and figures dealing with medical science were trained such as Hippocrates and Galen of Pergamum during the Greek time, Aulus Cornelius Celsus and Pliny the Elder during the Roman Empire, Hunain, Rhazes, Avicenna (Ibn Sina), and Al Zahrawi in the world of Islam, Thomas Linacre, Christian Gerard of Cremona and the Jew Faraj Ben Salim during the Medieval Period.

For the medical training in the past, translations were very important, especially translations of the works of Hippocrates and Galen of Pergamum since the modern medicine started in Greece. In connection with this, translations were done from Greek into Latin and into Arabic and Hebrew at the beginning. Furthermore, many famous schools were established such as the School of Toledo in Spain and School of Salerno in Italy, which accelerated the dissemination of medical knowledge and enhanced the European intellect especially via translations. With the contributions of such schools and the invention of the printing press in the 15th century, more reliable translations became available, further helping the dissemination of Hippocratic and Galenic writings and as a result medical science and its translation gained a status of being more universal over time.

Bearing in mind such developments and further discoveries in medicine and also the acceleration of medical translation, it can be said that medical science is a dynamic field. From the past, it has developed consistently. Furthermore, new discoveries or medications are created each year in medicine to be able prevent diseases effectively and maintain health.

The thesis has also presented characteristics of medical translation. In the light of collected data, it can first be said that medicine is one of the well respected fields in the world as it primarily focuses on healing patients who suffer from many diseases such as flu, cancer, AIDS, Parkinson's Disease and so on. From this perspective, the same is also true of medical translation since medical translation is done for protecting human body, its organs or living organisms just like medical science.

Medical translation is also a risk opportunity since even a single mistake that is, the wrong translation of information about the dosage of medication or a simple word can cause the termination of the patient's life as well as other unexpected situations such as the bankruptcy of the firm responsible for the mistake or cancel of orders. Therefore, it should not be forgotten that medical science has a very rich library. In the case of a mistake, all available resources must be used to create a more reliable translation, most importantly free of mistakes.

Furthermore, the translation of medical documents has to be done meticulously. Most of the time, medical translation requires translators to do several things at the same time. They may have to read numerous books or articles for the familiarity with the terminology specific to medical science and for the enhancement of their medical knowledge in this way or may have to discuss with other translators and field experts about possible translation problems so as to find solutions to them.

As for the translation process, medical translators must also have a good command of target language's medical stylistics and must be able to determine the appropriate target reader for the selection of the language that is, a simple or complex language. This can also be determined according to the features of the medical texts or in other words medical genres such as patient information leaflets, patient education brochures, clinical trial protocols and so on.

The thesis also conducts a detailed research into the history of the language of medicine and characterizes that special language. The language of medicine has passed through many stages from the onset of the modern medicine occurring in Greek Civilization. So, it would not be wrong to say that the first language of medicine was Greek. With the popularization of translations from Greek into Latin and also into Arabic and Hebrew, these languages were also used as the language of medicine. However, Arabic language lost its importance over time since it was not scientific and ignored medical knowledge about images of the human body or dissected anatomy. In addition, it was only regarded by Europe as the pathway to Greek scientific system until more reliable translations were created.

Especially in 15th century when the printing press was invented, the demand for accurate translations increased extremely. In parallel with this, Latin became the lingua franca in the Renaissance, thereby having the upper hand in being the language of medicine. However, both Latin and Greek started losing their importance over time in the sense of being medical languages in spite of the fact that their prefixes, suffixes and roots still become the basis of the medical terminologies.

Latin and Greek languages were actually overshadowed by English because it has become the new lingua franca and also affected medical science and its translation as the language of medicine strongly, which makes it the primary language used in medical communication over time. USA has a share for the supremacy of English due to the fact that it is the most developed country in medical technologies and also computer sciences. However, it should also be noted that other languages such as French, German, Spanish, Chinese and Danish are accepted to be international languages of medicine as shareholders though English has still the leader position.

In addition to these, the thesis has discussed difficulties encountered in the translation of medical texts and solutions to them elaborately. Mistakes in other types of translation can cause some damages as well. However, the effect that they will create upon medical translation may not be compensated and may also cause fatal consequences as explained before. Furthermore, it should not be forgotten that most of the mistakes in medical translation are based upon the lack of knowledge of the specialized terminology or inability to understand the subject matter. Shortage of time, use of old dictionaries,

ambigious and inconsistent terms, complex grammatical variations between two languages can also contribute to the problems in question.

To be able to cope with such challenges effectively and successfully, some steps put forward by translation scholars and medical translators are given in the Solutions to Translation Problems Section. However, the first rule which medical translators must obey in the face of challenges is simple. That is to say, they must be keen on collaborating with other translators or medical experts, especially in the revision phase. This contributes to them for the complete understanding of the source material. In collaboration with the field experts or experienced translators, the risk of grammatical mistakes arising from the differences between the source and target texts or wrong meaning usually based on a complex medical terminology can be minimized or even eradicated in the translation process.

The thesis has also analyzed the translation of *Textbook of Medical Physiology* in terms of the translation methods applied by first explaning the translation shift approach based on Vinay&Darbelnet's model. For the analysis of the translation methods, sixty nine sentences are selected throughout the study. In addition, the analysis is carried out to find out which of the translation methods can be applied and to what extent to the translation. Due to the scope of the thesis, the number of examples is mostly limited to fifteen.

Since the list of the translation methods Vinay&Darbelnet's model is based on follows a hierarchical order, direct translation methods that is, borrowing, calque and literal translation are initially analyzed in the study. For the analysis of borrowing and literal translation, fifteen examples are separately selected. Examples of calques throughout the analysis are only five. This scarcity shows that calque is actually a special kind of borrowing that gains a new mode of expression or a structural calque into the language into which the translation is made. In connection with this, its application to the translation is limited when compared to borrowing and literal translation. In addition, examples of calque detected in the study are already fixed in the Turkish language and they are lexical.

As it is clear from the analysis, borrowing translation method is applied by the translators to be able to achieve the local flavour among medical students or field experts in Turkey. All borrowings in the examples are various and they are based on the lexicon or lexical plane of expression. Besides, they have actually counterparts in the ordinary language in Turkey but Turkish medical community is not alien to borrowed words as they are common among them. Therefore, their applications to the translation of the textbook by the translators seem appropriate. In addition, all of the examples of borrowings in the study reflect the technical and scientific aspect of medical science.

As for the literal translation, the objective of translators in the translation process can be said to be the same because they make an effort to create a text which is idiomatically and grammatically appropriate for medical students and other medical professionals by considering the preservation of the technical atmosphere of the source text in the translation. Besides, examples of literal translation are ample in the study and mostly based on the syntactic plane of expression.

Oblique translation methods are also applied to the translation of *Textbook of Medical Physiology*. During the analysis, fifteen examples are separately selected for transposition and modulation translation methods whereas the number is four for adaptation.

Examples of transposition can be said to be various in the study especially when compared to modulation and adaptation. In addition, the related examples show that transposition categories vary from "adjective to verb", "past participle to noun", "verb to noun", "adjective to noun", "noun to past participle" and "verb to preposition" in the translation process. Furthermore, all examples of transposition in the study are mostly related to the lexicon or lexical plane of expression.

However, in modulation, eleven examples out of fifteen are from active into passive or passive into active. The rest equally belongs to the negation of opposite and exchange of intervals for limits (in time), all of which function on the syntactic plane of expression. Based upon the excessive use of active into passive or passive into active modulations as it is also clear from the related examples, it can be asserted that modulation is not as various as transposition and is mostly uniform in the study. Owing to the limited use of

modulation in the translation, especially in the sense of its types, modulation can be said to be applied more to the figures of speech such as litotes, metonyms, metalepsis and synecdoque as also claimed by Vinay&Darbelnet.

There are no examples of equivalence in the translation. As can be recalled, equivalence as a translation method differs from its common theoretical use. According to Vinay&Darbelnet, it is mostly applied to proverbs, idioms and cliches. As the source textbook is technical and produced so as to train medical students about certain concepts of physiology, there are not proverbs, idioms or cliches in it and its translation. Therefore, it would not be wrong to claim that equivalence translation method can usually be found in the translation of medical texts which are published in journals, magazines or articles for the general public or in the translation of literary texts whose primary aim is to entertain.

In addition to these, examples of adaptation in the study are limited to the system of weight and measurement used in Turkey. Therefore, examples of "pound" and "feet" are analyzed under the heading of adaptation translation method and in parallel with this, translators tend to convert them into their Turkish counterparts in the target language so as to create a translation which is appropriate and understandable for Turkish readers. As a result, "pound" is adapted into "kg" and "feet" is adapted into "metre" in the Turkish translation. This limited use of adaptation in the study also makes the related examples uniform and therefore it would be correct to say that adaptation translation method is actually more common in the translation of book and film titles or children's literature, in other words literary texts.

In the light of this collected data from the study, it can be concluded about the presence of oblique translation methods in the translated textbook that they are not as outstanding as direct translation methods and besides they are uniform. Most importantly, there are no examples of equivalence in the study as emphasized before. However, this is not the case for direct translation because three types of direct translation are used in the target text. In addition, examples of calque though not as many as borrowing and literal translation are still less uniform than adaptation since the latter is only limited to the examples related to the conversion of "pound" and "feet" into "kg" and "metre" in the Turkish translation. Furthermore, in the study, examples of transposition are only

limited to six categories and examples of modulation have three types unlike borrowing and literal translation which are more various.

Due to these reasons, it is apparent that the translation of the textbook analyzed seems close to direct translation. Also, the target text is primarily produced for informing medical students at different faculties of medicine about physiological topics and hence it is informative, technical and scientific, all of which actually maximize the influence of direct translation in the process of translating. From this perspective, it would finally be correct to say that the seven translation methods applied to the translated textbook can also be used in the translation of other medical textbooks in a similar way.

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