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The Emergence and Effects of the First Anatomy Theatres in Western Europe

El Surgimiento y los Efectos de las Primeras Salas de Anatomía en Europa Occidental

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SUMMARY: The spread of the idea that the human body should be learned from cadavers, especially under the leadership of Vesalius, and the strong support of this idea among surgeons and medical students of that period, led to the emergence of anatomy theatres, particularly in the rich centres of Western Europe. Anatomy theatres have become prestigious places that make contributions to financial income for the cities they are located in. They have contributed to the importance of universities with the students they attract. Anatomy has become a more visual and international science because of the spread of anatomical drawings in scientific medical books, the newly invented printing press making it easier to print more books and the increasing interest of the people of the period. Learning medicine has become easier with the spread of visual anatomy books and cadaver studies. Cadaver studies and anatomy theatres, which started to become widespread under the leadership of brave science warriors such as Vesalius, who lived in the Renaissance period, became the subject of the paintings of painters of the period such as Rembrandt under the name anatomy activities. It is beneficial and necessary for society to keep in memory what this period brought to the world of anatomy and the present with its historical processes.

KEY WORDS: Anatomy theatres; Vesalius; Cadavers; Human dissection.

INTRODUCTION

The increase in doctors, painters, and medical students who want to learn the human body more scientifically through dissection has motivated the construction of anatomy theatres where dissections can be made. The interest in understanding human anatomy increased with the effect of the Renaissance, which was felt primarily in Italy between the 1450s and 1800s, on science and art. Therefore, the dissection of the human body in Padua, Bologna and Pavia attracted attention first to these cities, and thus anatomy theatres became widespread in Western Europe. It is understood that the anatomy theatres in this period took the theatre in Padua as an example (Ciliberti *et al*., 2020). Anatomy theatres were later established in London, Paris, Madrid, Barcelona, Saragossa, Leiden, Amsterdam, Delft, Utrecht, Den Haag, Dordrecht, Rotterdam, Middleburg, Enkhuizen, Basel, Uppsala (Sweden) etc. (Yunusoglu, 2008; Yılmaz &Yılmaz, 2015; Martínez-Vidal & Pardo-Tomás, 2005).

While dissections were performed primarily for public performances, they were later performed for educational purposes by surgeons in anatomy theatres, hospitals and universities, which were established by spending large sums of money. By the 15th century, the practice of dissection began to become a part of anatomy teaching (Ciliberti *et al*., 2020).

Anatomical displays. Before the establishment of the permanent anatomical theatres, anatomical studies were carried out in churches and chapels, especially when necessary, such as for diseases (Martínez-Vidal & Pardo-Tomás, 2005). But public dissections of human criminal bodies took place in public at winter times once a year at temporary anatomical theatres (Yılmaz &Yılmaz, 2015). The first permanent anatomy theatre was built in Padua in 1584. Other European centres in the competition have also tried to implement this tradition in their cities. Among these

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important centres, Salamanca and Leiden constitute priority after Padua (Martínez-Vidal & Pardo-Tomás, 2005). Public anatomy lessons became popular activities for citizens at the end of the 16th century. From the beginning of the 16th century, these lessons developed and spread throughout Europe. At the end of the century, the public took anatomy classes in many medical centres in Europe (Heckscher, 1958).

General anatomical demonstrations were organized annually by the guild and directed by a Praelector, which was chosen by the municipality from among the physicians in the city. Usually, each lesson lasted longer than one day, and the lessons were held in the winter season. Thus, the corpse would remain in relatively good condition due to the low temperatures. Even when no anatomy lessons were held, visitors could see inside the theatre with human and animal skeletons placed in the gallery. Public anatomy lessons were accessible not only to Guild members but also to local citizens, but visitors paid to attend the event. It is clear from the guild's anatomy book, which lists public anatomy lectures held between 1631 and 1731, that these were popular events in Amsterdam (Baljet, 2000).

Surgeons' guilds. Surgeons' guilds had a primary influence on the establishment of anatomy theatres in the Netherlands. The Surgeon's Guild was founded in Amsterdam in 1552 (Afek *et al*., 2009). On March 13, 1555, a petition was prepared to Philip II, King of Spain and the Netherlands, to allow the Guild of Surgeons to hold annual anatomical dissections open to the public in Amsterdam (Baljet, 2000). In this period, when the political and economic power of the surgical guilds was high, the church and administrators also supported the establishment of anatomy theatres. The fact that Amsterdam prelectors such as Sebastiaen Egbertsz de Vrij or Nicolaes Tulp, who were members of this guild, were promoted to mayor indicates their political acceptance (Baljet, 2000).

The benefits of theatres. The anatomy theatres of the Netherlands were primarily used to train surgeons and midwives (Baljet, 2000). One can assume that the anatomical knowledge and curiosity of painters, philosophers, etc., who watch the dissections made here, have gradually increased. Some of the wrong anatomical beliefs transmitted from authors such as Galen, who lived in the times when human dissections were forbidden (2nd century AD), were corrected with the widespread use of human dissection by anatomical researchers. Vesalius' investigations into the structure of the human body resulted in the discovery of inconsistencies in the teachings of Galen, who interpreted the internal organs without ever seeing them in human form since his dissections were limited to Barbary apes. An example of knowledge refreshed by dissection was the belief in the creation of Adam and Eve that the number of ribs on one side of men is less than that on the other side. As a result of the dissection and studies carried out by Vesalius, it was determined that men have an equal number of ribs on both sides (Perloff, 2013).

Dissection, anatomy theatres and anatomy as science rose together. The anatomical information used in the periods just before Vesalius' time was the information accepted in the time of Galen, a physician and surgeon for gladiators who lived in the Roman period. Galen dissected animals such as dogs and pigs because human dissection was prohibited at his time (Perloff, 2013). Moreover, the Catholic Church also censored some Galen texts during Vesalius' time as well (Giménez-Roldán, 2020). Pope Boniface VIII's papal proclamation was de facto law, threatening to excommunicate anyone who dared dissect (Olry & Haines, 2008). Anatomy studies were prohibited in the Netherlands until 1555, although autopsies have been performed since the 12th century, an acceptance that affected the whole of Europe. The first anatomy lesson in Amsterdam was held in 1550 at the Monastery of Saint Ursula, where the surgeons guild was allowed to conduct anatomy lessons when they were able to obtain a cadaver from the local authorities (Baljet, 2000). It has not been emphasized enough for years that human anatomy cannot be learned most accurately without human dissection in all educational settings. Anatomy theatres have contributed to eliminating this deficiency and have increased the education quality of European medical faculties by disseminating the knowledge of human anatomy in practice over time.

It seems that Italy paved the way for human dissection in Europe first. Especially in the sixteenth century, Italy was a pioneer in the advancement of both technical and diagnostic anatomical research and training future doctors (Turillazzi *et al*., 2012; Sblano *et al*., 2014). Since cadaver supply was more accessible in Italian cities such as Padua and Bologna, medical students from many parts of Europe preferred these cities for their education (Vázquez *et al*., 2015). The inclusion of dissection in anatomy education has also started in Italian cities. Anatomy education by dissection for doctors and surgeons is told to have emerged in Bologna in the early 14th century under the leadership of Mondino de Liuzzi (Vázquez *et al*., 2015).

Anatomy lessons provided prestige and power to the region or university where they were held and revived the city's economy. Some anatomy theatres are also depicted in paintings that have survived from that time. For example, an anatomical theatre in the Palazzo dell'Archiginnasio in Bologna is shown in a magnificent illustration (Yunusoglu, 2008).

ABOUT VESALIUS

One of the important historical figures in the spread of dissection at that time was Andreas Vesalius (1514-1564), a 16th-century physician of Flemish-German origin who came to Italy, was considered one of the most outstanding surgeons of his generation (Afek *et al*., 2009; Giménez-Roldán, 2020). Vesalius was born on December 31, 1514, in Brussels (Flanders, Belgium), in an influential family of doctors and pharmacists. His father, Andreas van Wesele (1479-1544), was a pharmacist and valet de chambre at the court of Holy Roman Emperor Charles V (King Charles I of Spain).

Published in June 1543, Vesalius' book De Humani Corporis Fabrica was the result of five years of hard work on human dissection. Vesalius's book, which brought him worldwide fame, was a landmark in the history of science. It was also a unique aesthetic achievement. Advanced printing and typography techniques made it possible to display the anatomy perfectly. For the first time, an understanding of medicine was based on an accurate representation of the human body (Perloff, 2013). De humani corporis fabrica ("on the fabric of the human body") spread rapidly in Europe, thanks to the printing press invented nearly a century ago. De Fabrica is organized into seven "books" or chapters that address different parts of the body (skeleton, musculature, abdomen, etc.).

In the atlas book 'De humani corporis fabrica libri septem', the illustrations were mostly illustrated by Johann Steven Van Calcar (Giménez-Roldán *et al*., 2020). The first illustrations made by Vesalius are also found in the book called 'Tabulae anatomicae sex' (1538). The portrait of Vesalius and the dissected right-upper limb muscles of a standing cadaver are also shown in this book (Yunusoglu, 2008).

To test the anatomical knowledge produced in the time of Galen of Pergamum in the second century AD, whose anatomical studies were based on animals, Vesalius performed a human dissection, recorded more than two hundred errors, and published it in his book. But even in Vesalius' time, some continued to believe the information from Galen's time that Vesalius tried to change. (Giménez-Roldán, 2020; Ciliberti *et al*., 2020). Noting the need for fresh supplies, Vesalius persuaded judges and influential figures to schedule executions at the most convenient times for him (Giménez-Roldán, 2020). Vesalius has been practising medicine since he studied under Giovanni Battista Monte (1498-1551) in Padua (Guijarro-Castro *et al*., 2018). Vesalius' career as an anatomist ended in Madrid in 1544 when Charles V requested him as a personal physician. He joined many Flemish stationed at the emperor's court and followed him in his constant travels and military expeditions.

Even before Vesalius, the ideas of anatomical theatres existed, although they were few. The construction of permanent anatomy theatres for the sharing and demonstrating anatomical studies is based on temporary anatomy theatres.

The dissection method of the period just before Vesalius. Vesalius made his dissections in public all by himself, which was a new method for his time. Just before Vesalius' time, there was a method of Mondini de Luzzi being used. Mondino Luzzi, a teacher in Bologna, introduced the dissection of human organs into the medical studies program, conducted the public dissection of the human body in 1306, and, in 1316, wrote the anatomy encyclopedia Anathomia corporis humani for his students. There was no illustration in this book, but a later edition was published with illustrations in 1493 (Brockbank, 1968; Wilson, 1987).

Mondino's method of dissection was in a hierarchical order. The anatomy professor would sit in an oversized ornate chair on a high platform and carry out the dissection, narrating from Avicenna, Galen, or his anatomy texts. The dissection was done by a 'sector' roughly. A person called Ostensor would show the organs described by the professor with a stick (Vázquez *et al*., 2015; Yılmaz &Yılmaz, 2015; Ciliberti *et al*., 2020; Giménez-Roldán, 2020). A drawing in accordance with Mondino's method is available in Johannes de Ketham's Fasciculus medicinae (Wilson, 1987; Klestinec, 2004).

The first anatomy theatres. Obviously, the construction of permanent anatomical theatres in 16th-century Europe responded to the need for suitable places to perform anatomical dissections for a growing audience. There were several reasons for the increased participation in the demonstrations. Still, the most important ones were probably the spread of dissection into medical teaching at the time and the growing number of medical students. Anatomy theatres were explicitly designed for these purposes (Park, 1994; Martínez-Vidal & Pardo-Tomás, 2005). To understand why the anatomical theatre was built in Spain as an example, two issues were highlighted: The first is the so-called "Vesalian reform" movement in Spain and a particular "cultural policy" regarding teaching and education, and the second is the practice of medicine initiated by the government of Charles V (1516-1556) and continued by his son Philip the second. As for the first, it should be remembered that anatomy teaching in Salamanca began with the dissections initiated by Cosme de Medina (d. 1591) in September 1551. Following the assumptions of Vesalius, Medina initiated a

form of teaching in Salamanca that provided an effective anatomical education with practice (Martínez-Vidal & Pardo-Tomás, 2005).

Some physicians such as Alessandro Benedetti (1450-1512) from the pre-Vesalian generation and later Guido Guidi (Vidius Vidius) (1509-1569), who was a surgeon and anatomist, and anatomist Charles Estienne (1504-1564), also expressed their opinions about temporary anatomy theatres. They stated that the temporary anatomy theatres should be large and well-ventilated, surrounded by audience seats, the seating will be distributed according to the positions, the cadaver will be placed on a high table in a well-lit place, and there should be guards to line up the people who want to enter (Brockbank, 1968; Ferrari *et al*., 1987; Corbin *et al*., 2008).

The first of the permanent anatomy theatres, which were established for education and demonstration purposes after the temporary theatres used for a long time, was built in Padua between 1584-1592 under the patronage of Hieronymus Fabricius ab Aquapendente (1537-1619) (Brockbank, 1968; Corbin *et al*., 2008; Porzionato, 2012). This theatre was a structure with six concentric galleries that could accommodate 300 people, and all locations were no more than 10 meters from the dissection table. This building, which has cramped rows for those standing, is illuminated by candle-lit chandeliers held by students. The first row was reserved for anatomy professors, rectors, city councillors, members of the medical school, and representatives of the Venetian nobility, the second and third rows for students, and the fourth, fifth and sixth rows for other audiences (Brockbank, 1968).

The permanent anatomical theatre of the University of Salamanca is the oldest in Spain (Santander, 1983). One of the first permanent anatomy theatres was built in 1597 in Leiden, the Netherlands (Ciliberti *et al*., 2020). Educated in Padova, Professor Pieter Pauw established the chair of anatomy in Leiden in 1589. This theatre is broader and flatter, brighter than the one in Padova. In public dissections, there are flute players to distract the public. In the light of the information obtained from the painting, the engravings drawn by Jan Cornelis Woudanus in 1609-1610 and made by Bartholemus Delendo and Willem Swanenburg are the witnesses of the theatre used until 1822 (Brockbank, 1968).

In places such as Spain, where church teachings were strong against dissection, the existence and continuation of the anatomy theatre activity was supported by the leadership of local governments (Yunusoglu, 2008). The time of the execution was usually announced to the public, followed by an anatomy lesson. A "praelector anatomiae", always a medical doctor, was commissioned to teach anatomy (Baljet, 2000).

The need for cadavers to be used for dissection in anatomy theatres was obtained by newly executed prisoners with the permission of local governments. Dissection was carried out immediately after the execution of these prisoners, especially in winter (Baljet, 2000). For example, Leiden University, which suffered from cadavers, was authorized to take the bodies of all executed criminals in Dutch cities on December 18 1593, in the provinces of Holland and West Friesland (Huisman, 2008). Some of the prisoners who were not executed and the patients who died in the hospital were also used as cadavers with their families' permission, with their families promised a free burial.

To increase the supply of cadavers, on December 18 1593, the University of Leiden was granted the authority to take the bodies of executed criminals throughout the Netherlands (Hansen, 1996).

After the anatomy lesson was over, either the skin or the skeleton of the cadaver was displayed in the anatomy theatre. Thus, the theatre collected visitors like a museum even when there were no anatomy lessons, thus making money. The wastes of these anatomy lessons were a moral warning deterring crime for the people who visited there. The criminal who was executed and then cut into the smallest pieces was exhibited like this, and in fact, he was executed once again in public. According to church thought, the transience of life is also emphasized by dissection and skeletal figures. From another point of view, although these people who were executed took part in that theatre as punishment for their crimes, they also had a certain dignity and justification as they were now a tool to prove the greatness of the god. "The criminal who has done so much harm to society now becomes useful to society after his death" (Park, 1994; Baljet, 2000).

Separate locations were also chosen when dissections were made for anatomical research rather than public activity. For example, dissections in Amsterdam were performed not only in anatomy theatres but also in the dissection room of Saint Pieter's or Inner Hospital ("Binnengasthuis") (Baljet, 2000). An example of the anatomy theatre of Leiden University, one of the anatomy theatres used as a museum in the 17th century, has been reconstructed today under the name of Boerhaave Museum. There are human body specimens, some surgical instruments, and various animal and plant specimens in the collection of this museum.

Some anatomical pictures. In the 16th century, it became customary to put pictures of anatomy lessons on the title pages of medical books. This tradition began in 1543 with the illustration of an anatomy lesson on the title page of Andreas Vesalius' "De humani corporis Fabrica" (Baljet,

2000). The fact that Andreas Vesalius did not prefer the traditional method for his students and did the dissection by himself, and reproduced the anatomical pictures he had drawn by himself or others with the book he created, revolutionized anatomy education according to the period. Some important painters such as Leonardo da Vinci, Albrecht Dürer and Michelangelo Buonarroti also made anatomical drawings (Yunusoglu, 2008; Vázquez *et al*., 2015). Andreas Vesalius, one of the greatest figures in the history of anatomy, was undoubtedly influenced by Leonardo, who was 60 years older than him (Perloff, 2013). It is interesting that Vesalius' book De Humani Corporis Fabrica and Copernicus' treatise on the solar systemwere published in the same year (Perloff , 2013). It was a period in that the level of economic welfare raised, painters were supported, and printing facilities increased; thus, anatomical pictures and engravings took place more frequently in medical books over time.

The earliest anatomy lecture painted in Amsterdam dates from 1603 (Baljet, 2000). In Dutch-origin paintings depicting the anatomy lesson, we generally see that a person presides (praelector) the dissection activity and a book is used as a guide. The presence of people holding paper and pencils in these pictures suggests that this environment is a lecture. The incense, which is scattered in many places around the anatomy table, is a precaution for possible bad odours. Anatomy theatres were also event venues used as museums for the public when dissection was not performed.

CONCLUSION

The anatomy theatres became widespread in Europe in a period when the need for dissection increased. Access to illustrated anatomy books became easier thanks to the scientists of this period, when printing facilities were newly widespread, thus making it easier to learn anatomy in medicine. The increase in these products and the European cities that are in competition with each other have spread the science of anatomy to the public on a common ground through the universities they have developed. This period, in which very crucial breakthroughs took place in the science of anatomy, should be constantly remembered with its historical figures.

BAYLAN, H. & DEMIRCI, G. N. El surgimiento y los efectos de las primeras salas de anatomía en Europa Occidental. *Int. J. Morphol., 41(3)*:819-824, 2023.

RESUMEN: La difusión de la idea de que el cuerpo humano se debe aprender a partir de cadáveres, especialmente bajo el liderazgo de Vesalius, y el fuerte apoyo de esta idea entre los cirujanos y estudiantes de medicina de ese período, condujo al surgimiento de las salas de anatomía, particularmente en los ricos centros de Europa Occidental. Las salas de anatomía se han convertido en lugares de prestigio que contribuyen a los ingresos económicos de las ciudades en las que están ubicados y han contribuido a la importancia de las universidades con los estudiantes que atraen. La anatomía se ha convertido en una ciencia más visual e internacional debido a la difusión de los dibujos anatómicos en los libros médicos científicos, la imprenta recién inventada que facilita la impresión de libros y el creciente interés de la gente de la época. Aprender medicina se ha vuelto más fácil con la difusión de libros de anatomía visual y estudios de cadáveres. Los estudios de cadáveres y las salas de anatomía, que comenzaron a generalizarse bajo el liderazgo de valientes guerreros de la ciencia como Vesalius, que vivió en el Renacimiento, se convirtieron en el tema de las pinturas de artistas de la época como Rembrandt bajo el nombre de actividades de anatomía. Es beneficioso y necesario que la sociedad guarde en la memoria lo que este período trajo al mundo de la anatomía y el presente con sus procesos históricos.

PALABRAS CLAVE: Salas de anatomía; Vesalio; Cadáveres; Disección humana.

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