Ancient Dissections in the Greco-Roman World and Its Influence on Modern Medical Studies

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Abstract

Human dissection is a foundational element to modern medicinal studies, yet in the ancient Greek and Roman world it was heavily restricted by cultural, religious, and moral beliefs. This paper explores how these prohibitions influenced the development of anatomical science and future medical practices. The Greco-Roman concepts of impurity, sacred symbolism of the skin, and overall widespread fear of corpses created strong resistance to dissecting the human body. Despite these constraints, physicians such as Herophilus and Erasistratus conducted methodological and controversial human dissections in Hellenistic Alexandria, making groundbreaking discoveries about the brain, nervous system, circulatory structures, and lower internal organs. After this brief period in the 3rd century BCE, anatomical study reverted to animal dissections, which were more accepted among society, most notably in the work of Galen. Although limited by many cultural boundaries, these methods introduced significant findings that informed medical professionals for centuries to come. This paper argues that ancient dissections, both human and animal, served as crucial antecedents to modern anatomy, establishing practices, and scientific techniques that continue to shape medical education and research today.

Introduction

Modern medical students often dissect human cadavers as part of their training; however, this practice would've been considered nearly impossible in the Greco-Roman world. Even though Greeks and Romans forbade human autopsies due to cultural reasons and morals, their interest in learning about the human body led them to find different methods to study anatomy. This paper will demonstrate the reasons why human dissections were prohibited, who did human and animal dissection, including their discoveries and justifications for their practices, and finally, how dissections influenced the progression of future medicine. The influence of Greek and Roman methods continues to be reflected in modern medicine, especially in the use of animal dissections and testing for anatomical research.

Moral Prohibitions and the Symbolism of the Skin

To the Greeks, corpses were viewed as a huge source of pollution, which was one of the main reasons humans prohibited human dissection. Sources state that bodies become contaminated the moment someone dies or a corpse is brought inside a house, tainting a whole space to

impurity.[1] This belief was also reinforced by other funerary rituals at this time. One of which stated that once postmortem, women were expected to prepare the corpse with crowns and change them into white robes to symbolically purify it. However, even after all these rituals, the corpse was still considered to be contaminated and infect everything around it. Furthermore, there were others who also expressed their opinions towards corpses. For example, Greek Philosopher Teles briefly mentions Greeks' attitude to corpses, stating that Greeks "shrink both from looking at and from touching corpses".[2] This conveys the Greeks' widespread fear of the dead and death itself. Aristotle states that corpses are human by definition only. He believed that once a person died, the body lost the qualities that made it human, which is why he felt no emotion towards corpses.[3] In Plato's time, it was believed that once a person dies, the soul of a deceased person is stuck inside the body. Because of all the cultural factors, the chances of a person to be willing to touch a body, let alone dissect it, were almost unimaginable. These views together contributed to a wall of cultural resistance that decreased the number of human dissections performed.

Additionally, the Greeks' beliefs that the symbolic purity of the skin contributed to their rejections of dissection, since breaking the skin was considered to disrupt the wholeness of a body. This was because the Greeks viewed skin as a symbol of wholeness and unity.[4] To them, skin was the backbone of a community, ensuring that all parts of a larger group were in their assigned places and doing their assigned tasks, just like how the parts of a body all work together underneath the skin. Ancient authors emphasized that disrupting the skin could threaten not only the physical integrity of a body but also the symbolic unity within the community. In addition to this, when sacrificing an animal, the skin is the only part that isn't burnt or eaten. The skin was so symbolic to the Greeks that prior to sacrificing an animal, the individual who was sacrificing had to recite an oath in order to cut the skin. Because the skin held this sacred and special meaning to the people, any act that involved cutting or harming the skin was viewed as a violation of social and religious order. However, one exception to this statement is Hippocrates' practice of bloodletting. Bloodletting was more peaceful than deep dissections and had more of a specific purpose to it. Hippocrates performed bloodletting to remove what he considered to be dangerous in the body. These dangers seemed to be an imbalance or impurity of humors which he believed could eventually cause illnesses. This powerful symbolism of the skin made the idea of human dissections especially concerning, since it implied the literal and metaphorical fragmentation of a corpse. At the same time, these beliefs created a strong resistance towards anatomical study, which also discouraged people

[1] Von Staden, "The discovery of the Body: Human Dissection and its Cultural Contexts in Ancient Greece", 226.
[2] Von Staden, "The discovery of the Body: Human Dissection and its Cultural Contexts in Ancient Greece", 226
[3] Von Staden, "The discovery of the Body: Human Dissection and its Cultural Contexts in Ancient Greece", 233.
[4] Von Staden, "The discovery of the Body: Human Dissection and its Cultural Contexts in Ancient Greece", 227-228.

from wanting to perform human dissections and reinforcing the alternative reliance of animal dissections for research instead.

Important People Who Performed Dissections

Greek and Roman physicians such as Herophilus and Galen, made significant discoveries about anatomy through human and animal dissection, even though it was disapproved by society at the time. Herophilus of Chalcedon was one of the most prominent physicians who performed dissections. Called the "Father of Anatomy", he practiced in the 3rd century BCE under the instruction of Praxagoras of Kos, performing some of the earliest known systematic dissections in Alexandria.[5] Herophilus' dissections were said to have been influenced by the earlier Egyptian religious embalming practices.[6] Over his lifetime, he wrote 11 treatises in Alexandria, none of which survived, and *Anatomika*, his main work that consisted of four books, however, it could be up to nine. Although dissections were disapproved by most people in his time, Herophilus was permitted to examine human cadavers because he lived among the Ptolemies, who did not feel bound to follow traditional Greek taboos. They also wanted Alexandria to be a center of literary and scientific learning.[7] These Ptolemaic rulers, especially Ptolemy I, were also the ones who allegedly sent over 600 criminals and prisoners for him to vivisect.[8] This allowed him to analyze the body with a precision no Greek physician was able to achieve before him. Herophilus relied on a method of carefully distinguishing organs, mapping individual structures, and comparing similarities between different cadavers. Through this approach, he was able to provide the first detailed description of the cranial nerves, identifying more than seven pairs and differentiating between sensory and motor functions. Along with this, he also studied and recognized the fourth ventricle in the brain, examined the salivary glands, and named the cornea, retina, and choroid coat in the eye. He confirmed that arteries in cadavers had thicker walls than veins and was the first to separate between blood vessels and tendons. Herophilus' anatomical investigations also extended to the lower internal organs as well. He wrote the first description of the liver, named the duodenum, investigated the pancreas, and provided an account of the male and female anatomy. He refuted his mentor Praxagoras' theory that the pulse wasn't connected with the heartbeat. Instead, he proposed the Pulse Theory, where he was the first to connect age with a person's pulse. In addition to this, his findings demonstrated that motor nerve damage could cause paralysis and challenged another earlier theory that the womb wandered throughout the body and caused hysteria.[9]

[5] Bay, "Greek Anatomist Herophilus: The Father of Anatomy", 1.
[6] Von Staden, "The discovery of the Body: Human Dissection and its Cultural Contexts in Ancient Greece", 234.
[7] Von Staden, "The discovery of the Body: Human Dissection and its Cultural Contexts in Ancient Greece", 231.
[8] Von Staden, "Herophilus | Research Starters | EBSCO Research".
[9] Von Staden, "The discovery of the Body: Human Dissection and its Cultural Contexts in Ancient Greece", 224.

Herophilus' student and contemporary, Erasistratus of Ceos, was the only other person besides Herophilus who performed human dissections up until the 14th century CE.[10] Herophilus was considered the "Father of Anatomy" while Erasistratus was the "Father of Physiology".[11] Together, they achieved great scientific progress in anatomy and medical science during the Hellenistic period in Alexandria. However, aside from working with Herophilus, Erasistratus also made discoveries of his own. He was a surgeon who closely studied the heart and blood vessels, determining that the heart acted more as a distributor than a producer of blood. He gave an account of the "three-fold network", which is the binding of the veins, arteries, and nerves to connect the tissues. His work proved that air moved through the trachea and lungs, which led him to be the closest physician to understand the circulation of blood.[12] Like Herophilus' beliefs, Erasistratus justified his methods by arguing that anatomical accuracy would be most precise through hands-on examination, such as dissections or closely studied injured soldiers on battlefields. Injured soldiers and gladiators were both sources that physicians used to study anatomy. In fact, descriptions of war wounds were found in two of Homer's writings, the Iliad and Odyssey, proving that the Greeks had some knowledge of human anatomy.[13] Both Erasistratus and Herophilus' discoveries were so influential that their school, Alexandria's first medical school, became the first formally recognized institution for anatomical teaching.[14] Together, their work established the foundations for future anatomical studies, influencing the progression of medical science for centuries.

For the Greeks, there was only a brief 30-40 year period where dissections were permitted in Alexandria under Herophilus and Erasistratus. But after their deaths, there were numerous reasons dissections stopped. One of the most common ones is because people still needed to adapt to the new information that was just discovered by Herophilus and Erasistratus. Because they had so many discoveries during their lifetime, it was hard for people to wrap their heads around their complex discoveries. Another main reason was that people simply didn't agree with Herophilus and Erasistratus' beliefs which caused arguments to occur. Additionally, after their deaths, Ptolemy Kings were politically weaker and ended dissections to avoid extra disputes. The burning of Alexandria in 389 CE could have also been a factor in the conclusion of dissections as well. All these factors together contributed to the elimination of dissections in addition to the already existing religious, moral, and psychological issues that were present before Herophilus and Erasistratus' deaths.[15]

While Herophilus and Erasistratus may be the only two that did human dissections, that did not mean others were unable to advance anatomical knowledge using different methods.

[10] Ghosh, Bhattacharjee, "Public Human Dissection and Societal Connect of Anatomical Sciences: A Glorious Association in the Past but Ethically Forbidden Practice at Present", 1643.
[11] Jackson, Doctors & Diseases in the Roman Empire, 27.
[12] Jackson, Doctors & Diseases in the Roman Empire, 28.
[13] Wysiadecki, et al, "The Most Ancient Sources of Anatomic Knowledge", 3.
[14] Ghosh, Bhattacharjee, "Public Human Dissection and Societal Connect of Anatomical Sciences: A Glorious Association in the Past but Ethically Forbidden Practice at Present", 1643.
[15] Jackson, Doctors & Diseases in the Roman Empire, 28.

Aristotle, who practiced during the 4th century BCE, was one of the first scientists to conduct animal dissections. His animal dissections led to the development of biology and his practices were said to indirectly influence future human dissections.[16]

Centuries later, Galen, a physician for the Roman court and gladiators, was one of the most influential figures who performed animal dissections in the first century CE. In his lifetime, he was unable to perform human dissections due to the Romans' moral prohibitions.[17] As an alternative, he conducted public and private dissections on pigs, cattle, goats, elephants, and monkeys. However, he preferred to dissect monkeys and apes because of their similarity to humans. Galen regularly performed these dissections in public theaters filled with students, where physicians would compete to demonstrate their knowledge or impress their audiences. Additionally, he conducted vivisections, which were earlier and less public than dissections.[18] Vivisections began with Herophilus in the 3rd century BCE and helped to discover the importance of the spinal cord and movement of blood in the body.[19] One of Galen's vivisections demonstrated the importance of the laryngeal nerve in controlling voice production using a pig.[20] Through this work, Galen was able to identify many anatomical and physiological structures. He proved arteries are filled with blood; the brain, not the heart, controlled speech; urine is formed in the kidneys and liver creates blood; muscles and nerves mediate movement in respiration; and spinal cord injuries cause loss of sensation and mobility below the injured level to the point of paralysis.[21] All his findings were compiled in writing, including his anatomical and physiological work, *On the Use of Parts*, which was part of over five hundred writings in his lifetime.[22]

In the first century CE, Roman author and physician Aulus Cornelius Celsus offered a revealing perspective on the idea of dissections in the ancient world. He observed different schools that held contradicting beliefs over the ethics of human and animal vivisections. One of the schools, the dogmatic school, saw the anatomical benefits of dissections and vivisections. They justified their belief with the outcome of accurate anatomical knowledge. On the other hand, the empiric school believed that vivisections were morally wrong and cadavers were sufficient substitutes for living bodies.[23] Celsus, along with Galen and Tertullian, also repeated accusations that Herophilus and Erasistratus performed vivisections on criminals over two hundred years after Herophilus' death, meaning that they weren't even alive to prove these claims.[24] Tertullian stated that Herophilus was a "butcher who cut up people for investigative

[16] Von Staden, "The discovery of the Body: Human Dissection and its Cultural Contexts in Ancient Greece", 232.
[17] Rothemich, Galen's Anatomical Anomalies & Discoveries.
[18] "Dissections & Vivisections - the Empire's Physician".
[19] Rothemich, Galen's Anatomical Anomalies & Discoveries.
[20] "Dissections & Vivisections - the Empire's Physician"
[21] Dziedzic, et al. "Exploring the Evolution of Anatomy: From Historical Foundations to Modern Insights", 2.
[22] "Dissections & Vivisections - the Empire's Physician"
[23] Jackson, Doctors & Diseases in the Roman Empire, 29.
[24] Bay, "Greek Anatomist Herophilus: The Father of Anatomy", 282.

nature".[25] This significantly reduces the amount of fame Herophilus and Erasistratus should have received for their achievements because physicians were not able to study the new information without having to question the validity of it. However, despite Celsus' original statements, his real argument was that dissecting cadavers was a necessary skill for students to learn in order to understand the positions of organs and how the body functions.[26] This proves that he ultimately did support this method of anatomical study rather than condemning it like the rest of the Roman population at that time. The contrast between Celsus' many viewpoints highlight the tension between ethical and cultural concerns in his environment and the scientific need for accurate anatomical knowledge. Together, these conflicting beliefs shaped how later physicians approached dissections and influenced the greater development of anatomical science.

Influence of Dissections on Modern Medicine

These methods of animal dissection and observations helped develop the foundational concepts that influenced the progression of future modern medical science. Even though Greek and Roman physicians were not always able to dissect human bodies, their reliance on animal dissection established practices that continue to influence modern medical techniques. Today, 75-80 percent of students in biology classrooms still use animals, such as frogs or pigs, to reflect the long lasting impact of ancient approaches to anatomical study.[27] Additionally, modern surgery evolved from the techniques of ancient dissections, which introduced ways of understanding the body through direct examination. Ancient anatomy is also reflected in the Greek and Roman vocabulary used in modern medicine, with many anatomical terms derived from the languages. One common example is the term anatomē, which means "to cut".[28] The long term demand for cadavers eventually led to certain absurd activities in the medieval period such as grave robbing, body snatching, and murder, demonstrating the continued value placed on anatomical study.[29] Eventually, these practices and influences demonstrate how ancient methods still shape the way anatomy is taught and learned around the world today.

Conclusion

Overall, the development of anatomy in the ancient world demonstrates how early methods became stepping stones towards the scientific standards seen today. Even though modern medicine does not follow the same beliefs of previous physicians, the influence of their

[25] Jackson, Doctors & Diseases in the Roman Empire, 29.
[26] Spivack, "A. C. Celsus: Roman Medicus."
[27] Rothemich, Galen's Anatomical Anomalies & Discoveries.
[28] Dziedzic, et al. "Exploring the Evolution of Anatomy: From Historical Foundations to Modern Insights", 1.
[29] Ghosh, "Human Cadaveric Dissection: A Historical Account from Ancient Greece to the Modern Era.", 154.

discoveries remains visible in society today with the continued use of dissection-based learning, anatomical terminology, and animal research and testing.

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