

Using of Cadaver in Anatomy Education from Past to Present: Review

Anatomi Öğretiminde Geçmişten Günümüze Kadavra Kullanımı

Nermin ÇELİK,^a
Safa ÇELİK,^b
Cem UYSAL^c

^aDepartment of Medical History and Ethics,
Kırıkkale University Faculty of Medicine,
Kırıkkale

^bDepartment of Forensic Medicine,
Dr. Sami Ulus Obstetrics and Gynecology,
Childrens Health and Disease
Training and Research Hospital,
Ankara

^cDepartment of Forensic Medicine,
Diyarbakır Group Administration,
Council of Forensic Medicine,
Diyarbakır

Geliş Tarihi/Received: 08.06.2011
Kabul Tarihi/Accepted: 10.02.2012

Yazışma Adresi/Correspondence:
Nermin ÇELİK

Kırıkkale Üniversitesi Faculty of Medicine,
Department of Medical History and Ethics,
Kırıkkale,
TÜRKİYE/TURKEY
drcelik.nermin@gmail.com

ABSTRACT In this study, we want to explain studies on the corpse, mainly examination of the anatomical dissection throughout history. We have tried to explain difficulties in order to provide cadavers for dissection, grave robberies, and community responses to these events. In addition to that, attitudes of the Christian, Jewish and Muslim clerics' feelings are mentioned against to these studies. In the literature, we have noticed that racial discrimination and differences between classes of society are important in the provision of cadavers throughout the history. In this study, we referred to history of dissection in Europe and United States. And we discussed the modern medical education history of the Ottoman Empire and beginning of the anatomy education. Also we want to exhibit conditions of first dissections and when the first time dissection is done. In addition to that, we have discussed difficulties of the providing cadavers and necessity of the use of corpses for medical education especially training of today's anatomy.

Key Words: Anatomy; history of medicine; cadaver

ÖZET Bu çalışmada tarih boyunca ceset üzerinde yapılan çalışmalar, ağırlıklı olarak da anatomik inceleme amacıyla yapılan disseksiyon konu edinilmiştir. Disseksiyon için kadavra sağlamak amacıyla yapılan mücadeleler, mezar soygunları ve toplumun bu olaylara verdiği tepkiler yer almaktadır. Ayrıca Hristiyan, Yahudi ve Müslüman din adamlarının ceset üzerinde çalışma yapılması karşısında takındıkları tavırlardan bahsedilmektedir. İncelediğimiz kaynaklarda tarih boyunca toplumda yapılan sınıfsal ve ırksal ayrımcılığı kadavra temininde tercih edilen kişiler üzerinden görmekteyiz. Avrupa ve Amerikada'ki disseksiyon tarihinin yanında Osmanlı Devleti'nde Modern Tıp eğitimi vermeye başlayan Tıbbiye'nin ilk kurulduğu yıllardaki anatomi eğitiminden ve disseksiyonun ilk kez ne zaman ve ne şartlarda yapıldığından bahsedilmektedir. Ek olarak günümüz anatomi çalışmalarıyla ilgili olarak kadavra temini ve tıp eğitiminde anatomi eğitimi için kadavra kullanılmasının gerekliliği tartışılmaktadır.

Anahtar Kelimeler: Anatomi; tıp tarihi; kadavra

Türkiye Klinikleri J Med Ethics 2012;20(3):179-85

Since ancient times, people are interested with the anatomy. Anatomy always is accepted as one of the most basic science in medical education. Aristotle (B.C. 384-322) never did any dissection in humans. Anatomical works and examinations on human body was a taboo and strictly forbidden at that time. Because of the prohibition of the research on the human body and existance of similarities between animal and human internal organs, systematic dissections were made in animals. While Aristotle was doing dissections many people paid attention to his studies and

the results were taken into consideration. After Aristotle dissections just were made by Herophilus on people in Alexandria, Egypt and up to 15. century any anatomical study was not performed on the human body. In the second century after Christ, Galen made dissections only on animals.¹

In Medieval and Renaissance Europe, there was a taboo about burying the dead. Dissection was perceived as both dangerous, contagious, polluting and considered as a violation by religious representatives. In this perspective, dissection was seen as a punishment of people. So that reason bodies of the convicted criminals used as cadavers. When people died away from his home during the Crusades in medieval times, traditionally fragmentation of body and separation of bones by boiling was common in Europe. Thus, the bones buried in the desired location. Pope Boniface VIII said for this procedure “disgusting not only for God, but also in the eyes of all people” and prohibite the making of this process by publishing an order. This statement issued by the pope did not directly target the anatomists but also indirectly effected them. Boniface prohibited dissection and evisceration on the corpses with the published laws.²⁻⁵ On the other hand in the 15th century Pope Sixtus IV permitted dissection of corpses in the Bologna and Padua.⁶

In Europe, time of the first dissection is not known exactly. According to some medical historians the first dissection was performed in the 13th century but also according to some of them believe that it was applied in the 14th century in Europe. In the 13th century, the first dissections were performed to investigate the cause death on human bodies in the University of Bologna. The dissection was performed by an Italian, Hugh (1170-1240) and his student Theodoric Borgogni (1205-98) at the University of Bologna. William’s works followed these studies. He was from Saliceto, in Italy. We learn his works from his book name was “Surgery”. He wrote it in 1275. With this approach, we can say that dissection studies is started between 1266-1275 in Europe.^{2,7}

In Medieval and early modern Europe, executed criminals were the main source of anatomical material. Around the 1800 century, body of the

poor people was used for dissections. In England, the law of Anatomy was accepted to prevent grave robbery in 1832. With this law, anatomists obtain the unlimited rights to use the bodies of the poor people who lived in doss-house. Thus, the corpses of more upper class people would be preserved and remain intact. In America, not only the class difference but also racial differences are important contributing factors for the selection of the cadavers. Black’s was mostly used for dissection. Despite violent protests and civil war, anatomy law was published at the end of the 19th century in America.⁸

Jewish religious leaders began to express their opinions about autopsy and dissection in the 18 century. At the Responsa literature, Ezekiel Landau (1713-1793) allowed the autopsy and dissection if autopsy and dissection indicated benefit to living human being. Another Rabbi Jacob Emden from Altona who prohibited autopsy because of “no benefits of it to corpse”. Many rabbis accepted Rabbi Landau’s opinion at the 19. century. Rabbi Sofer Chata has allowed an autopsy in order to save someone’s life who suffered from the same illness. However performing of autopsy was allowed for not only potential benefit of future patients but also development of medical science. In Response, Rabbi Ettinger allowed performing autopsy on body of some people who gave permission performing autopsy before he died.⁹

Many dissection were made especially in Vienna in the 19th for century at Europe. However corpse of Jewish people was remained outside of the anatomical studies until 1903. This ongoing “anatomic inequality” was reported by new and elite chief pathologist of Rudolf Hospital. Between 1901-1906 years 7757 death cases occurred in Rudolf Hospital and anatomical dissection was performed on 22% of them. Anatomical dissection was not performed none of the 179 Protestant, 1 Greek, 218 Jewish people corpse who who died in this hospital at the same time.⁸

Andreas Vesalius was one of the most important Renaissance anatomist (Figure 1). He dissected dogs, mice and other animals. Vesalius had been making big efforts his education and the teaching



FIGURE 1: Andreas Vesalius author of the one of the most influential books on human anatomy, *De humani corporis fabrica*.

in Paris. He sometimes found the material taking risks and he had made many times theft of the dead. Outbreaking of war was forced to return him to Louvain. When Vesalius saw a corpse of murderous man hanged on the gallows outside of the city walls of Louvain he took corpse with the help of his friend and he had been benefit from this corpse to perform dissection.¹⁰ Vesalius, Da Vinci and Michelangelo have challenged the state and religion. They were courageous to learn about the human body and worked by candlelight. They stole corpse from the graves and church body.¹¹ At the time, the false information about human anatomy were dominant from Galen and Ibn Sina, and the works of scientists were extremely necessary.

One and a half centuries ago, the U.S. government did not permit the dissection of unclaimed corpses and no one's donated his/her body for dissection. Many Americans considered dissection that was humiliating to body and disrespectful to holy things. For these reasons, the need for cadavers were limited with convicted criminals. This solution remained ridiculously inadequate. There were two ways in front of anatomists; they gave up dissection or stole the bodies for dissection. Theft of the corpse was horrible and a great sin in the eyes of the Americans and this situation was caused to

the uprising of the people. How would anatomists found cadaver not taking attention of the community? The most secure way for taking minimum attention of the community was stealing of someone relatives' corpses who reacted very little response. For this reason, blacks and poor whites were a very good target. Whites disliked the dissection of the corpses, the blacks did not have the power to resist it. Because of the powerlessness and marginal social status of poor whites and blacks they were enough not protect their corpse. Whites living in doss-house were appealing to the managers of doss-house to prevent theft of corpses from doss-house cemetery.¹²

In 19 century, grave strippers even murdered someone to meet the need for cadaver. Public opinion was agitated by some news about anatomist (Robert Knox) who killed 16 people to perform dissection. And as a result, the killers punished.¹³ The only certain document about this manner was shown that a woman was killed and buy in order to perform dissection in the United States occurred in 1886. A Hotelier's daughter called Emily Brown finally was seen the coast of Maryland Baltimore under the influence of drugs and alcohol. Unfortunately, Brown was strangled by a porter and then Brown's body was transferred to the University of Maryland School of Medicine and sold for \$ 15. Fortunately murderer caught and hung.¹⁴ 19. century, medical students still were making grave robbery in Canada and the United States. When they made grave robbery, sometimes they used them for their education and sold some of the corpses to anatomy department.¹⁵ Corpse of a white were stolen from the cemetery of Trinity Church in New York in February, 1788. On this issue an anatomist of the Colombia College was accused. A gang pilaged the New York hospital and manhandled and seized four medical students. Until sheriff saved their life, medical students was in the hands of this gang. The gang returned to the city to search for doctors, medical students and cadavers after the next day. Three or four hundred men marched towards Broadway to catch medical students in the city prison. The governor and the dignitaries spoke to disperse the crowd. Although this restraining

speech, numbers of the crowd increased and reached 5 000 and then people inevitably began to walk toward prison. The governor, Clinton, urged the militia to prevent the growth of the events. The crowd responded with a hail of bricks and stone. The soldiers began to fire their guns, as a result, three demonstrators were killed and six of them were injured. The governor asked for the additional power from the surrounding cities to quell this civil commotion. After this civil commotion stealing corpses from the grave became illegal with a new enacting law in New York state.¹⁴

Since ancient times, there were some reports which were investigated cause of death only with physical examination in the Ottoman Empire. Here, there was no post-mortem approach for autopsy.¹⁶ Crime scene was investigated by kadi (Ottoman's judge) or an assistant of kadi. In some cases, for example in cases of homicide, corpses or bones of the victims were exhumed and subjected to the necessary discovery and inspection.¹⁷

Initially, in the Ottoman Empire performing dissection on corpses disliked as in other countries. When we search correspondences of Mekteb-i Tıbbiye-i Şahane we understand that corpses of forlorns or gying people were moving to school with private ways. Because directors of the school were afraid of reaction of the people. In addition to that, also bodies of homeless and criminal were using to perform dissection.¹⁸

In Islam, Actions or behaviors whether permissible or not are learned from two main sources: Quran and Sunnah of the Prophet. If there is no specific information about the subject, muslims are referred to ijihad. Ijihad means that removing provisions according to comparison, simulation, necessity or general rules. There is no specific provision about post-mortem examination in two main sources. Insulting and disrespectful behaviors or actions to corpse or grave are prohibited. Autopsy is not relevant with these behavior or acts. Autopsy become permissible if there are which special damages against the general interest of society, bearing a small loss to get rid of large damages. In some cases because of the some the necessities (compulsion) for public and private benefits autopsy must be per-

formed. In 1907, Egypt, after someone asked a question about performing autopsy to the famous scholar Rashid Riza who answered that post-mortem examination or performing autopsy was permissible. (*Fetâvâ, R. Rıza, Beyrut, 1970, c. II, s. 592.*)¹⁹

In Turkey, Anatomy education is divided in to 4 parts by Bedii Şehsuvaroğlu who has been teachers of the Istanbul Faculty of Medicine Medical History Department. The first part is called as the period of the madrasa which is started with the establishment of Kayseri Darüştifa in 1205 and continued until 1816. In this period anatomy education is not based on dissection of body. This period proceed about six hundred years and all the anatomy knowledge is roughly the same in all of the the medical book. Ibn-i Sina and Galen works are the main sources of anatomy. The second period is between 1816-1827. In this period an anatomy book that is called as *Mir'at'ül ebdan fi teşrih-i aza'ül insan* and written by Şanizade Ataulah Efendi (Figure 2, Figure 3). At that time, society was not yet ready to perform dissection. Şanizade wanted to embarrass some people who thought that "there was not any Turks physicians familiar with the new medicine".²⁰ So that reason he wanted to read western European medical books and translated many of them into the Turkish. The third period begins with the establishment of Tıbhane and Cerrahhane-i Amire in 1827 and lasts until 1839. During this period, many examinations could be done on the skeletons but have not been yet performed any dissection on cadaver. Medical education was being processed on the models which was brought from Europe.²¹ In 1839 a new era began in medical education with the moving of Tıphane-i Amire to Galatasaray and bringing of Dr. Bernard from Vienna. With the beginning of this new period, some of the new innovations were being constructed like giving lessons at the bed side of the patient and also performing dissection and autopsy. At the same time, Sultan Abdülmecit (1839-1861) signed an edict as a caliph in 1841 and after that time examinations and dissections began on the body of death. After getting the permission first dissection was performed on a Christian's body. Public reactions among the people were not



FIGURE 2: Drawing of the vascular system from Şânîzâde Mehmed Atâullah Efendi's work *Hamse-i Şanîzade*.



FIGURE 3: Şanîzade Mehmed Atâullah Efendi author of the first printed modern illustrative anatomy book in Ottoman Empire and is the first book of "*Hamse-i Şanîzade*" a combined printing of five books, which are "*Miratü'l Ebdan fi Teşrih-i Aza-ü'l İnsan*", "*Usûlü't Tabia*", "*Miyarü'l-Etibba*", "*Kanunü'l Cerrahin*", "*Mizarü'l Edviye*". The first three books were printed as a single volume in İstanbul in 1820.³⁵

effective with the support of the Sultan and statesmen. The physician was searched for courses of anatomy by placing ads in Europe. Dr. Spitzer won the exam and brought from the Europe.^{18,22-26} In Turkey, the first courses about forensic medicine were given by Dr. Bernard in the new medical school at the 5th and 6 classes.²⁷

Emir Murat Celebi who was hekimbasi of the Sultan Murad IV. and completed his book name as "*Enmuzec-üt Tıb*" in 1624. Anatomical information was mentioned about the teeth, bones, muscles, blood vessels and internal organs. Because of the dissection of the Muslims meeting as unpleasant situation to experience for anatomy, for this reason in this book has recommended that dissection could be done to dead bodies on the battlefield²⁸ or to the human-like animals as pigs and monkeys.²⁹⁻³¹

Anatomy lesson generally is one of the most basic lesson in medical education. Learning anatomy with cadaver is considered to be the most important element for the anatomy education in the entire world. There are very few different opinion on this subject. In the UK, Peninsula College of Medicine which has contrary opinions about human based anatomy education and is accepted its first students in 2002. When the costs, risks, practicality and rules of this school was considered together related with anatomy education, this medical school was decided that cadavers has not been used for anatomy educations. While medical school was taking this decision not only benefits of using cadavers in anatomy education but also some ethical, moral and practical issues were considered.³²

Recently, some medical schools choose using imaging technology rather than dissection of the human cadavers in medical education. The dissection has very cost price as well as being dirty and smelly, tedious and time-consuming, physically and psychologically difficult process. Medical schools have begun to reevaluate to reduce or eliminate this tax and the cost of their own anatomy curriculum. Computer software about anatomy program is very a significant expense for the medical education but it is done only once. This program allows students to run images of the body in every angle and every plane. In addition to that the

muscle can be attached by clicking a different button and arm movements can be seen. And also muscle can be removed and underlying bone can be seen. Invisible things on the cadaver for example, blood pumping between the chambers of the heart can be indicated at the computer software anatomy program. Grayish-green color of the nerves and the veins are difficult to distinguish from the other tissues of formaldehyde embalmed cadavers. But these structures can be more easily seen by changing the colors in the computer environment. All of these operations can be done anywhere or any screen.¹¹ In addition, exactly the same as the original colored models are not hard at all to do with today's technology.

In Turkey, Ümit S. Şehirli and his colleagues prepared a study to investigate the attitudes of anatomists about cadaver donation for the anatomy education, they found that only 15.7% of anatomists could donate their bodies, 63.9% could not think donation and 20.5% stated that they had no ideas in this regard. Anatomists described that why they did not donate their bodies; 43.4 % percent not being ready psychologically, 26.5% unaccepted by their families, 26.5% disrespectful movements against the cadavers, 15.7% dissection by their colleagues.³³ Yes, as we have seen here people do not wish using of their own or relatives' bodies for anatomical dissection. Here, extremely striking event is that even the anatomists do not think to donate their bodies.

CONCLUSION

In this study we have noticed that dissection was performed despite society's reaction throughout

the history. Initially, some clergy didn't allow to dissection because of disrespect to sacred thing. But in time the effect of the scientific community dissection was permitted in all three Abrahamic religions representatives. During the selection of the cadavers emerged discrimination in the community. Throughout history cadavers for dissection has been chosen from some people who do not have enough force to protect themselves. Especially the bodies of blacks were used as cadavers also in other countries, and the Ottoman Empire corpses of criminals and the homeless used as cadavers. Today, the situation is not different. Because of lack of the relatives when homeless people are chosen to use as a cadaver no body show reaction against this situation. We have seen here people including anatomists do not wish using their own or relatives' bodies for anatomical dissection. Today, there are alternative forms of anatomy education with today's technology.³⁴ The dissection has very cost price as well as being dirty and smelly, tedious and time-consuming, physically and psychologically difficult process. Because of different branches of the medical students, a detailed anatomy knowledge are not required for most of them. In addition, the anatomy training are the first two years in medical schools syllabus. Naturally, this information is forgotten until medical students begin to work. Therefore, performing dissection is not very necessary for all medical students. Indeed, some medical schools has been thought the pros and cons of using cadavers in anatomy education and decided not to use cadavers for their anatomy education. As a result, the use of cadavers is not an essential method for anatomy education of medical students in medical schools.

REFERENCES

1. Karasu A, Aygen G, Sabancı PA, Sağlam G, Civelek E, Eskandar EN. Nörobilim Öyküleri: Aristo (M.Ö. 384-322) [Tales of Neurosurgery: Aristo (384-322 B.C.)]. *Sinir Sistemi Cerrahisi Derg* 2008;1(4):264-7.
2. Singer C. A Short history of Anatomy from the Greeks to Harwey. Newyork 1957.
3. Cleveland DE. On the Passing of the Anatomy Act. *The Canadian Medical Association Journal* 1925;15(5):543-4.
4. Walsh JJ. The Popes and Science. The Supposed Papal Prohibition of Dissection New York: 1908. p.32-3.
5. Park K. The Criminal and Saintly Body: Autopsy and Dissection in Renaissance İtaly. *Renaissance Quarterly* 1994;47(1):1-33.
6. Davis GJ, Peterson BR. Dilemmas and Solutions for the Pathologist and Clinician Encountering Religious Views of the Autopsy. *Southern Medical Journal* 1996;89 (11): 1041-4.
7. Kahya E. Bizde disseksiyon ne zaman ve nasıl başladı? *Belleten* 1979;43(172):739-59.
8. Buklijas T. Cultures of Death and Politics of Corpse Supply: Anatomy in Vienna, 1848-1914. *Bull Hist Med* 2008;82(3):570-607.
9. Notzer N, Zisenwine D, Oz L, Rak Y. Overcoming the Tension Between Scientific and Religious Views in Teaching Anatomical Dissection, The Israeli Experience. *Clinical Anatomy* 2006;19:442-7.

10. Uzluk FN. Genel Tıp Tarihi I.[History of medicine]. Anatomiye Ait Hakikat: Andreas Vesalius. Ankara 1958. p.110.
11. Montross C. Dead Body of Knowledge. The New York Times. March 27, 2009 Friday.
12. Humphrey DC. Dissection and Discrimination: The Social Origins of Cadavers in America, 1760-1915. 1973;49(9):819-27.
13. Öncel Ö, Namal A. Evrimsel Bakışla Tıp Etiği Açısından Ceset. Yearbook of Medical Ethics XI. 2002;(9): 85-106.
14. Halperin EC. The Poor, the Black and the Marginalized as the Source of Cadaver in United States Anatomical Education. Clinical Anatomy 2007;20:489-95.
15. Francis D. Bodysnatching in Canada. JAMC. 20 FEVR 2001;164 (4):530.
16. Kazancıgil A. XIX. Yüzyılda Osmanlı İmparatorluğunda Anatomi. [Anatomy in Ottoman Empire During Nineteenth Century]. Osmanlı Hekimliğinde Anatomi. İstanbul: Özel Yayınlar; 1991. p.1-3.
17. Tok Ö. Kayseri Kadı Sicillerindeki Yaralanma ve Ölüm Vakalarıyla İlgili Keşif Raporları (1650-1660). Sosyal Bilimler Enstitüsü Dergisi. 2007;22: 327-347 Bu konuyla ilgili olarak, Diyarbakır beylerbeyine gönderilen hüküm için bkz: 6 Numaralı Mühime Defteri (972/1564-1565), C.II, Tıpkıbasım, Ankara 1995.
18. Akıncı S. Osmanlı İmparatorluğu Tıbbında Disseksiyon ve Otopsi. İstanbul Üniversitesi Tıp Fakültesi Mecmuası (ayrı basım) 1962; 25: 97-115.
19. Karaman H. Günlük Hayatımızda Helaller ve Haramlar. İslam'da Otopsi Meselesi. İstanbul 2011. p.232-6.
20. Şehsuvaroğlu BN. Hekim Şanizade Ataullah Efendi Biyografisi ve Eserleri. İstanbul Üniversitesi Tıp Fakültesi Mecmuası (ayrı basım). 1951;14: 482-95.
21. Erdemir A.D. 19. yy. da Osmanlılarda Patoloji ne Anatomi Eğitiminin İlginç Yönleri ve Bununla İlgili Bazı Orijinal Belgeler. IX. Türk Tarih Kongresi'nden ayrıbasım. Ankara: Türk Tarih Kurumu Basımevi; 1989. p.1297-301.
22. Ataç A. Gülhane Askeri Tıp Akademisi'nin Kuruluşu. Galatasaray Tıp Okulu. Atatürk Kültür Merkezi Yayını Sayı:87 Ankara 1996. p.9.
23. Şehsuvaroğlu BN. Bizde Anatomi Öğretimine Dair. İstanbul Üniversitesi Tıp Fakültesi Mecmuası (ayrı basım). 1952; 15: 365-412.
24. Öztürel A. Adli Tıp Otopsileri Çağdaş Problemleri Memleketimizdeki Adli Otopsilerin Durumları. Ankara Üniversitesi Hukuk Fakültesi Dergisi 1978;35: 1-4.
25. Acıduman A, Er U, Şimşek S. Şanizade Ataullah Mehmed Efendi and Chapters Related to Anatomy of the Central Nervous System in His Work Miratu'l Ebdan Fi Teşrih-i A'zai'l-İnsan (Mirror of the Bodies in the Dissection Of the Members of the Human Body). Türkiye Klinikleri J Med Ethics 2009;17(2):71-86.
26. Ortug G. Yucef F. Ay H. The Role of Austrian Physicians and Prof. Joseph Hyrtl (1810-1894) On Modernization of Ottoman Turkish Medicine. Ann Anat 2003;185:593-6.
27. Bilgin NG, Ögenler O, Akça T. History of Forensic Autopsy in Turkey. Lokman Hekim Journal 2011; 1 (1): 8-12.
28. Acıduman A. Chief Physician Emir Celebi and Chapters Related to the Anatomy of Nerve System in his Famous Work Enmüze'ü-Tıbb (Sample of Medicine) Türk Nöroşirürji Dergisi, 2008;18(2):96-103.
29. Akdoğan İ. [Anatomy in Europe and Ottoman Empire During Seventeenth Century]. Türkiye Klinikleri J Med Ethics 2008;16(3): 166-70.
30. Acıduman A, Arda B. Emir Çelebi ve ünlü eseri Enmüze'ü't-Tıbb'da Tıbbî Deontoloji ile ilgili bir bölüm: Vesâyâ-yı Hükemâ-yı Selef ve Halef. [Emir Celebi and a section regarding medical deontology in his famous work Enmüze'ü't-Tıbb (A Sample of Medicine): Testaments of Philosophers' Predecessor and Successor] Çocuk Sağlığı ve Hastalıkları Dergisi 2008;51:68-72.
31. Şehsuvaroğlu BN, Erdemir AD, Gürsever GC. Hekimbaşı Emir Çelebi- Seyid Emir Mehmed Çelebi [Chief Physician Emir Celebi]. Türk Tıp Tarihi. Bursa 1984, 93-4.
32. Mclachlan JC, Bligh J, Bradley P, Searle J. Teaching Anatomy Without Cadaver. Medical Education 2004;38(4):418-24.
33. Sehirli US, Saka E, Sarıkaya O. Attitudes of Turkish Anatomist Toward Cadaver Donation. Clin Anat 2004;17(8):677-81.
34. Uluçam E, Gökçe N, Çıkmaz S, Yılmaz A. A Comparison of the Urinary System in the First Printed Modern Turkish Anatomy Book and Contemporary Anatomy Books. Trakya Univ. Tıp Fak. Derg 2009;26(3):256-60.