

## The First Production of Artificial Limbs in The Ottoman State\*

### Osmanlı Devleti'nde İlk Yapay Uzuv Üretimi

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#### ABSTRACT

**Aim:** The main goal of this study is looking for an answer in the light of the documents of the Ottoman Archives of the Prime Minister's Office to the question that when the production of modern artificial limbs in the Ottoman Empire was started.

**Method:** A catalog review was made on the website of Ottoman Archives of the Prime Minister's Office between January 2019 and July 2019. In the catalog review, the keywords "suni aza (artificial limbs)", "suni el (artificial hand)", "suni kol (artificial arm)", "suni ayak (artificial foot)", "suni bacak (artificial leg)" were used and all determined 39 documents, that will enable us to illuminate the process of first-time production of modern artificial limbs in the Ottoman State were included in the study. The documents written in Ottoman Turkish were read by the author and evaluated scientifically.

**Results:** In some previous studies, it was reported that the local production of artificial limbs in Ottoman State started, since the renovation of Sadettin Pasha's prosthesis was too expensive. However, this study revealed, that the person needed a new prosthesis was Rauf Pasha, not Sadettin Pasha and that the State spared no expense to start the first artificial limbs practices.

**Conclusion:** This study revealed that the production of the first modern artificial limbs began during the reign of Abdülhamid II and continued after him.

**Keywords:** History of Medicine, Ottoman State, Artificial Limbs, Prosthesis, Orthosis

#### Öz

**Amaç:** Bu çalışmanın temel amacı, Osmanlı İmparatorluğu'nda modern protezlerin üretimine ne zaman başlandığı sorusuna, Başbakanlık Osmanlı Arşivi belgeleri ışığında yanıt aramaktır.

**Yöntem:** Başbakanlık Osmanlı Arşivi'nde Ocak 2019 ile Temmuz 2019 tarihleri arasında katalog taraması yapılmıştır. Anahtar kelime olarak "suni aza", "suni el", "suni kol", "suni ayak", "suni bacak" kullanılmış ve Osmanlı Devleti'nde ilk modern yapay uzuvların üretimine dair tespit edilen 39 belgenin tamamı çalışmaya dahil edilmiştir. Ardından belgeler yazar tarafından okunmuş ve bilimsel olarak değerlendirilmiştir.

**Bulgular:** Daha önceki bazı çalışmalarda, Osmanlı Devleti'nde yapay uzuv üretiminin Sadettin Paşa'nın protezinin yenilenmesinin çok maliyetli olması nedeniyle başladığı bildirilmiştir. Ancak bu çalışma, yeni bir proteze ihtiyaç duyanın Sadettin Paşa değil, Rauf Paşa olduğunu ve devletin ilk yapay uzuv uygulamalarını başlatmak için hiçbir masraftan kaçınmadığını ortaya koymuştur.

**Sonuç:** Bu çalışma, ilk modern yapay uzuv üretiminin II. Abdülhamid döneminde başladığını ve ardından devam ettiğini ortaya koymuştur.

**Anahtar kelimeler:** Tıp Tarihi, Osmanlı Devleti, Yapay Uzuvlar, Protez, Ortez

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## Introduction

One of the oldest surgical procedures in history is the amputation. The earliest description of amputation surgeries is found in Hippocrates' writings. However, amputating limbs to save lives did not become widespread until the sixteenth century. The reasons for this situation are that early amputation techniques could not control the blood loss and that the anesthetic and antiseptic techniques were not known.<sup>1,2</sup>

Advancements in amputation techniques have been made mostly due to the rise of gunpowder and the weapons of war associated with it. A major step in the development of the amputation technique was the performing of the ligature by Ambroise Pare (1510-1590), a French military surgeon, in 1529. This technique, which stops the flow of blood from a severed vein, reduced the patient's chances of bleeding to death. Further contribution to amputation is the introduction of antiseptic techniques by Lister in 1867. Other advances, which were achieved about at the same time, included the usage of chloroform and ether as anesthetics.<sup>3</sup>

Amputation surgeries had a high mortality rate before these developments. Therefore, a good prosthesis supply until the end of the 19th century was secondary. However, there is evidence of the usage of prostheses from the times of the ancient Egypt. One of the earliest humans remains with signs of amputation stems from ancient Egypt in the reign of Amenhotep II in the 15th century B.C. This mummy has an amputated great toe, which was replaced with prosthesis from wood and leather.<sup>3</sup>

Until the middle Ages, mostly wooden legs and hook arms were used as an artificial limb. In parallel with the increase in successful results of amputation operations since the Renaissance, the progress of prosthetics was initiated, and surgeons began to design true walking prostheses. In the 16th century, French surgeon Pare designed the first known above-knee prosthesis with articulated joints and hand prosthesis made of small bows. In 1800, in London, James Potts designed a leg prosthesis that was controlled by long tendons from knee to ankle. In 1898, Vanghetti introduced upper limbs that directed by muscle contraction.<sup>3,4</sup>

Amputation surgeries and prostheses made great progress until today. Nowadays, highly functional prostheses developed with quantum leaps in technology. Undoubtedly, the wars played an important role in the development of prostheses as well as in amputation surgery in the world. However, we have insufficient knowledge about the start of production of prostheses in Ottoman State. The main goal of this study is seeking an answer to the question that when the production of modern prostheses in the Ottoman State was started in the process of evolving from primitive prostheses to modern prostheses in the light of the documents of the Ottoman Archives of the Prime Minister's Office.

## Methods

In the scope of the study, catalog review was made on the website of Ottoman Archives of the Prime Minister's Office ([katalog.devletarsivleri.org](http://katalog.devletarsivleri.org)) between January 2019 and July 2019. In the catalog review, the keywords "*sunî aza (artificial limbs)*", "*sunî el (artificial hand)*", "*sunî kol (artificial arm)*", "*sunî ayak (artificial foot)*", "*sunî bacak (artificial leg)*" were used and all determined 39 documents, that will enable us to illuminate the process of first-time production of modern artificial limbs in the Ottoman State, were included in the study. The documents written in Ottoman Turkish were read by the authors and evaluated scientifically. Then, the findings of the studies were compared with the current information and a conclusion was drawn. The discussion and the conclusion were written in the same section.

## Results

According to documents in the Ottoman Archive, the first attempts of the production of artificial limbs in the Ottoman State took place during the reign of Abdülhamid II (1842-1918). Rauf Pasha (1832-1909), Marshal of Abdülhamid's 1<sup>st</sup> Army Commander, underwent leg amputation and needed a prosthesis. His first prosthesis was bought from Monsieur Mathieu who produced artificial limbs and surgical instruments in Paris. Pasha needed later a more useful prosthesis and the new one was ordered on June 8, 1892 again from Monsieur Mathieu.<sup>5</sup>

However, the Sultan wanted, that Mathieu would attach the prosthetic leg himself and describe its usage. He invited Mathieu to Istanbul, and sent a message, which said that for this visiting his expenses and other demands, if any, would be met. This message was conveyed to Mathieu through the Paris Embassy of Ottoman State. Mathieu sent his response in two days and accepted this invitation. He said that he had to come to Istanbul twice, first to take measurements and then to deliver the prosthetic leg. He requested for coming 2000 francs as the travel expense, 1000 francs as the cost of the prosthetic leg, 200 francs as the fee for accommodation in Istanbul, and 5000 francs in addition. He added that the usage of his prosthetic leg would not be different from the normal foot, and that he could set off on Sunday if desired. The response, which was including that the fee which he requested will be paid and it was appropriate to set off on Sunday, was sent to Mathieu through the Paris Embassy on June 12<sup>th</sup>.<sup>6</sup>

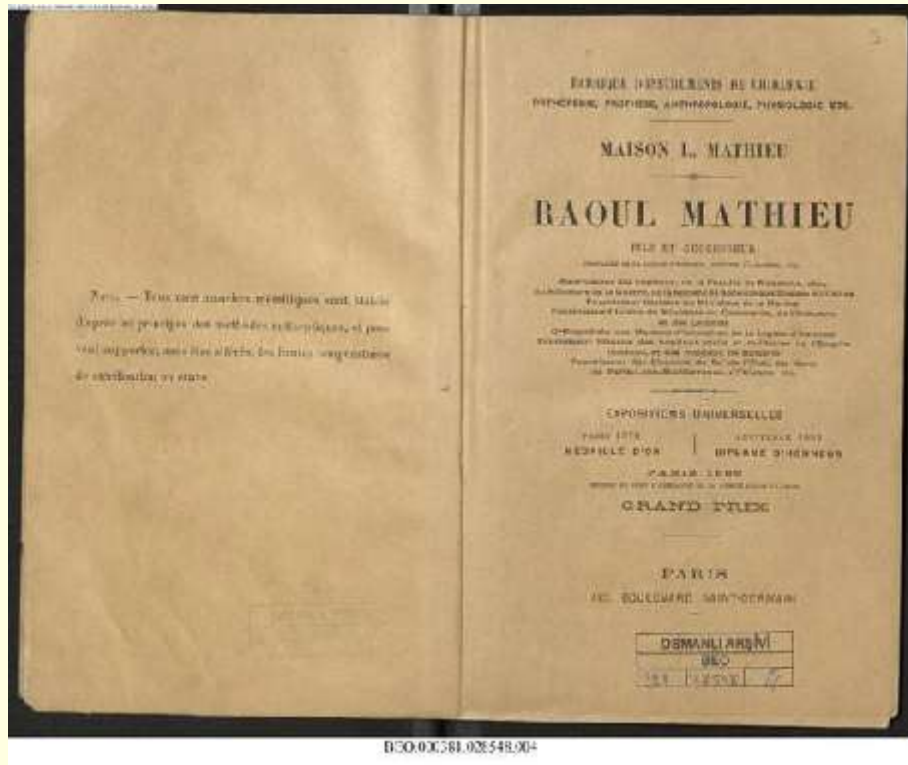
But Mathieu could not set off due to his incomplete preparations. He was able to come to Istanbul at the end of June, after 6000 francs of the desired 8200 francs was paid cash by Bank-ı Osmani through the Paris branch office.<sup>7</sup> He could not apply for a visa because his trip was planned suddenly. For this reason, it was ensured that he encountered no difficulties while crossing the border.<sup>6</sup> And Monsieur Mathieu was highly satisfied with his visit to Istanbul, because the Sultan paid close attention to him, honored him with the title "palace furnisher" and paid high costs for his services.<sup>8</sup>

When Mathieu returned to Paris, he expanded his factory and renewed his machines by favor of Sultan Abdülhamid's financial support.<sup>8</sup> Following his acquaintance and close relationship with Mathieu, the Sultan offered to send students to provide training in artificial limbs production. Mathieu gladly accepted it. So, two students from Imperial Arsenal (Tersane-i Amire) and two students from Imperial Armory (Tophane-i Amire) were sent to Mathieu's workshop.<sup>9</sup> And in January 1893, Mathieu sent a letter and said that the students made great progress within a short period of time. He also sent the first self-produced artificial limbs of students to Sultan. Mathieu also reminded that all needs of the military hospitals can order from his own factory and he can supply these at an affordable price as a duty of the title of the palace furnisher.<sup>8</sup>

Meanwhile, Monsieur Tush, who previously worked in the workshop of Mathieu and was in the service of the Ottoman State due to his skills in artificial limb production, said that he could teach this art in Medical School by applying to Sultan Abdülhamid II. Thus, he indicated that the students no longer need to be sent abroad for studying artificial organ production. However, no data available about how Monsieur Tush's application was responded.<sup>10</sup>

A year later, in March 1894, Sultan Abdülhamid II ordered the construction of a workshop for artificial limbs and surgical instruments, which was similar to that of Mathieu's, in Istanbul as well.<sup>11</sup> Upon request of the Sultan, Mathieu accepted preparing a workshop design which was the example of his own workshop.<sup>12</sup> In August, he presented the project, which was prepared considering every possibility. If the production was desired to be increased, this would be possible only by increasing the number of workers without the need to purchase new tools and machinery.<sup>13</sup>

However, Mathieu had not been informed if an old building would be converted to workshop or a new workshop would be built from scratch. For this reason, he demanded that the pictures of this building had to be sent to him if an existing building would be transformed into a workshop. He would then be able to give information about which materials should be placed where and how. After the construction of the workshop was completed, Mathieu wanted to come to Istanbul. Thus, the interior and exterior design of the building could be carried out in the most appropriate way.<sup>13</sup> He also added the catalog of materials which were produced in his own workshop<sup>12</sup> (**Figure 1**) and reminded that all the materials needed for the establishment of artificial limbs manufacturing factory could be supplied from his products cheap and quickly. In the meantime, Mathieu did not neglect to news from students who were trained in his own workshop. He recommended that the Ottoman students should continue training for a year or more to learn about this craft, even though they learned to produce all artificial limbs.<sup>13</sup>



**Figure 1.** Catalog of Maison L. Mathieu in Ottoman Archives of the Prime Minister's Office

Sultan Abdülhamid II found the price given by Mathieu very expensive. Mathieu set the need list on the assumption that a workshop would be built from scratch. The Sultan gave instructions to transform a suitable place in Imperial Armory (Tophane-i Amire) or Imperial Shipyard (Tersane-i Amire) into a workshop instead of building a new place from scratch.<sup>13</sup> After the investigation, it was decided that the armory was suitable.<sup>14</sup> Then it was requested that the existing materials in hand to be identified by Imperial Armory Marshall and wanted from Mathieu to present a new price by removing the existing items from the list of necessities.<sup>15,16</sup>

We do not have data on the completion date of the prosthetic workshop in the Imperial Armory and the returning date of the Ottoman students from Paris to Istanbul. However, in September 1896 honoring Mr. Lajes with the Medjidie Nishan of fifth class order, who supervised the Ottoman students during their training in Mathieu's Workshop, was an indication of the completion of the training.<sup>18,19</sup> And the prosthesis orders from Tophane increased since 1898. For example, in October 1898, an artificial leg for coal porter Ali

was ordered from Tophane.<sup>24</sup> And in May 1899, immigrant Mehmet Necib paid 920 qurush and ordered an artificial leg for himself.<sup>25</sup>

On the other hand, the order of prosthesis of Fatma Şahin for her daughter's amputated leg in April 1896 from Imperial Shipyard indicated that artificial limbs were manufactured also in Imperial Armory.<sup>26</sup> Especially, Senior Lieutenant Hüseyin Rıza from Üsküdar, who had a silver merit medal and one of the shipyard officers who had trained by Mathieu, stood out in producing artificial limbs. Due to his skills, he was assigned in Hamidiye Children Hospital as a prosthetist in 1901.<sup>27-30</sup> After him, Senior Lieutenant Osman Efendi played an active role in the production of prostheses in the shipyard.<sup>31</sup>

In the meantime, it seems that some craftsmen and the other officers also tried to produce artificial limbs. For instance, in January 1895, the rank of Senior Lieutenant Abdülkerim from the Imperial Armory was elevated a degree due to the skill of producing artificial limbs.<sup>20-23</sup> In March 1896, the artificial limbs for five soldiers treated in Yıldız Hospital were ordered to Monsieur Hovalis, who was a tool maker there, for 155 liras.<sup>17</sup> And Hralambo, craftsman from Gemlik was awarded with the silver industry medal in 1896 for his talent in artificial foot production.<sup>32</sup>

However, orders for prostheses were sent to Monsieur Matheiu from time to time. For instance, in August 1897, Greek Yorgi lost his foot in a work accident. His prosthesis was ordered from Matheiu. 500 francs fee for the prosthesis were paid by Ministry of Forest and Agriculture, where he was trained.<sup>33</sup> In parallel with all these developments, Sultan Abdülhamid II also tried to provide support to the poor in need of prosthesis for the cost of this expensive treatment from the state budget.<sup>34</sup>

During Abdülhamid II's reign, steps were taken to train orthopedic surgeons alongside prosthetic technicians also. Dr Orhan Abdi (Kurtaran) (1877–1948) was sent to Bonn University, Germany in 1900. He worked with Prof. Dr. Max Schede (1844–1902) for two years on orthopedics, prostheses, and orthoses.<sup>34</sup>

At the beginning of First World War (WW1), the workshops in the Imperial Armory and Imperial Shipyard were moved to Gülhane Clinical Teaching Hospital (**Figure 2**) and in 1915, the Ottoman State again sent students abroad to training in prosthesis production. Since the loss of limbs would occur as an inevitable consequence of the war, the Austrian Red Cross Society opened a prosthesis course in Vienna. Six students from the Ottoman State were invited to this course by Vienna embassy. The training was free; however, the students would need 250-300 franc per month to cover living expenses.<sup>35,36</sup>



**Figure 2.** A prosthetic leg sample from the Museum of Gülhane Military Medical Academy



Upon this invitation, the Ottoman State decided to send two people from the Health Department of the Ministry of Interior, two people from the Ministry of War and two people from the Red Crescent. However, Health Department dispensed with its quota, saying that no medical training is required to make prostheses, on the contrary, it requires manual skills and craftsmanship. Upon Health Department's recommendation, the quota was assigned to Industry Directorate of the Ministry of Commerce which employed artificers such as blacksmiths, metalworkers, and saddlers. The Ministry of Commerce also chose two people to send to Vienna. The first one was Selahaddin Effendi, who graduated from an industrial school. He was working in Zeytinburnu Factory as a modeler and painter. The other one was Yunus Effendi, who was also graduate from industrial school. His profession was metalworking and he was working as a precaution officer.<sup>37</sup> However, the Ministry of Interior covered their living expenses, as the Ministry of Commerce did not have enough budget.<sup>38</sup>

Upon the assignment of one person by the Red Crescent, the remaining three people were chosen by the Ministry of War. Red Crescent assigned Kazım Effendi.<sup>38,40</sup> Ministry of War assigned two land officers. One of them was Mehmet from Nazilli, who was working in cantonment's auto park. The other one was Ahmet Fazlı from İstanbul, who was a driver in pharmaceutical warehouse. The naval officer assigned by Ministry of War was Murad, son of İbrahim, from Giresun, who was a medical sergeant in the Naval Hospital.<sup>40</sup> These six people were chosen to go to Vienna in April 1915.<sup>41</sup>

Another development took place in 1915. Ministry of War demanded the prostheses, which were previously manufactured for Rauf Pasha and were kept in a chest in the treasury after his death. However, we have no data about the reason for this request.<sup>42</sup>

And the officers trained in Vienna began to produce prostheses after returning to homeland. They performed great service during the First World War, produced prostheses even for war prisoners.<sup>43,44</sup> After First World War, Mehmet Kazım (Elgün), sent by the Red Crescent to Vienna to be trained, opened a prosthetic shop in Çemberlitaş and continued to produce artificial limbs freelance. Furthermore, he produced prostheses for Kızılay cheaply. Similarly, Hüseyin Rıza Effendi preferred to work freelance as a prosthesis manufacturer at his home.<sup>46</sup> About the other prosthetists we cannot gain clear information from the sources.

## **Conclusion**

In some previous studies, it was reported that a prosthesis limb purchased from Paris for Sadettin Pasha, Minister of Finance, had to be renewed three times and instruction for local production was given by Abdülhamid II because it was expensive to bring the prostheses from abroad.<sup>34,45,46</sup> However, our study revealed, that the person needed a new prosthesis was Rauf Pasha, not Sadettin Pasha. In the Ottoman archive documents, there is no record about the order of a prosthesis for Sadettin Pasha. Furthermore, there is no data that Sultan Abdülhamid II was annoyed because of the high cost of the third prosthesis and ordered the prosthesis to be manufactured inside the country. On the contrary, according to the archive documents Sultan Abdülhamid II spared no expense to start the first artificial limbs practices in the Ottoman State.

Sultan Abdülhamid II, who was known for following the latest scientific and technological developments in the world closely, followed the developments in prosthesis field also.<sup>34</sup> He took the necessary steps to produce artificial limbs and pioneered the first local production in the Ottoman State. After him, production of artificial limbs continued and during the WW1, six more students were sent to Vienna to train in prosthesis production.

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