



# Some Interesting Points of Competition of X-Ray using during the Greco-Ottoman War in 1897 and Development of Neurosurgical Radiology: A Reminiscence

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## ABSTRACT

**AIM:** To investigate the competition of radiologic development between Turkey and Greece during the Greco-Ottoman War when the first application of X-Ray took place.

**MATERIAL and METHODS:** A literature review was conducted, and we searched the published papers about X-Ray using during the Greco-Turkish War in 1897.

**RESULTS:** The use of X-Rays in the military dates to the Greco-Ottoman War in 1897, which is an important issue because X-ray was first specifically used in this war. The radiographic images were used to show the evidence of pieces of bullets and shrapnel inside the bodies of soldiers.

**CONCLUSION:** The experience of the Ottoman Empire and Greece is important for the development of neurosurgical radiology. Both Greek and Turkish parts used the X-Ray technology before any of the risks and adverse effects were unknown. More studies are required.

**KEYWORDS:** X-Ray history, Greco-Turkish war, Neurosurgical radiology

## INTRODUCTION

Today is different from the past (12), in which the German physicist Wilhelm Conrad Rontgen had an impact on who discovered the rays (23). The discovery of X-Ray in 1895 brought about a shift of paradigm in the practice of neurosurgery. X-rays were first used at the beginning of 1896 at the British River Wars in the Nile, Egypt (25). Then, it was used on many injured soldiers in the Greco-Turkish War (April – May 1897). So X-rays were first used in the Ottoman Empire only 16 months after its discovery (23).

### The effect of X-Ray discovery on Turkish and Greek Parts

#### Turkish Part

The first user in the Ottoman Empire is known to be Mon-

seigneur Isoard (Isoire) who was a physics and mathematics teacher at Istanbul Galatasaray High School in 1896 (23). The Greco-Turkish War broke out in 1897. Germany and England (along with France and Russian) took sides (20). In 1897, wounded Turkish soldiers were being transported from Thessaly to Istanbul. These soldiers were managed in a temporary hospital that had been set up in the Yildiz Palace (11). On May 1, 1897, Ottoman Empire permitted Esad Feyzi and Rifat Osman to use the X-ray device in this hospital (25), and this new x-ray technology was used in the management of wounded Ottoman soldiers to detect and to localize the bullets or shrapnel. Gunshot injuries are a common cause of traumatic injury (18,19) during the war. The figure shows a wounded soldier with a shrapnel injury on his right wrist. The shrapnel was later removed surgically. During the Greco-Ottoman war

in 1897, it was reported that 244 wounded Ottoman soldiers were transferred to Istanbul (25). After ten days, Esad Feyzi and Rifat Osman started to take X-Ray, and a group of German Red Cross doctors and surgeons were sent to Istanbul with a prototype x-ray machine (11). The German Delegation consisted of eleven members, namely six doctors, two surgeons, three dressers (25). German doctors were surprised to see that X-Ray apparatus had already been being used by Esad Feyzi in the Yıldız Palace (11). The head of the German Redcross delegation was Hermann Küttner from Tübingen University who was one of the most respectable and well-known surgeons in Germany at the time (25). Dr. Hermann Küttner visited these two Turkish physicians in the hospital in which they worked.

### Greek Part

As noted above, the X-Rays were discovered by Wilhelm Conrad Roentgen in November 1895, and this device was first used by the British Army at the Royal Victoria Hospital in November 1896 (22). In Greece, the first X-Ray was taken by professor Timoleon Argiropoulos in March 1896, then was used by Dr. Francis C. Abbott during the 1897 Greco-Ottoman war (22). At that time, several British volunteers came to Greece and established modern military hospitals (20). A medical team constituted of British doctors, surgeons, and nurses arrived in Athens on May 4<sup>th</sup>, 1897 (25). The medical materials, operation tables, medicine, and the roentgen apparatus were brought to Greece. One of the roentgen apparatus was set up in the area of Phaleron, and was working with electricity supplied from the English Warship Rodney anchored at Piraeus Harbour (20). The other one was set up in the area of Chalkis. They were similar to those used in St. Thomas Hospital in London at the time (20). X-rays of 10 wounded Greek men were taken (20). The soldiers' behavior was based on fear because they considered the machine to be "the work of the devil" (3).

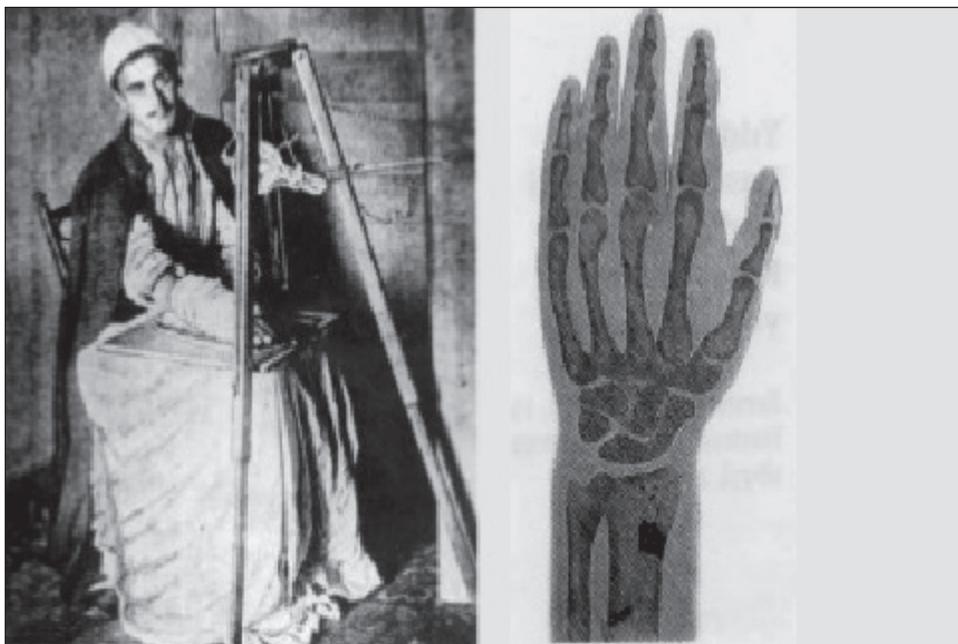
Despite the significant difficulties, like the lack of electricity in Greece at that time, the X-Ray apparatus worked continuously for 6 weeks, allowing Dr. F. Abbott to collect valuable materials (21). Later, he exhibited these materials during the first official meeting of the Roentgen Society in London in November 1897. Two years later, a report based on Dr. F. Abbott's x-Rays experience during the Greco-Turkish war was published in 1897 (1).

### The Role of Hermann Küttner and the Contribution of German Surgeons

Hermann Küttner (1870- 1932) was one of the great German researchers and a famous surgeon in the 19<sup>th</sup> century. He investigated the surgical disease of the cerebral and facial skull. He was a brilliant surgeon, and became a Professor of Surgery at the University of Tübingen in 1900. As a consultant of the German Red Cross when he introduced X-ray diagnostics into war surgery during the Greece-Ottoman War, he was also interested in the problem of neurological surgery, and published some works of early neurosurgery (16). In 1917, during the first world war, when he worked as a general practitioner of the German navy and a consultant surgeon in the field, he performed a resection of a tumor of the cerebellar bridge angle in a naval hospital (14). He begun to promote young surgeons, and helped Ottfried Foerster with the foundation of German neurosurgery (5). Fedor Krause introduced X-ray diagnostics in the special field of neurosurgery (2).

### X-ray and Neurosurgery

The first experiences with the X-ray diagnostics of Hermann Küttner during the Greco-Turkish War formed the basis for the introduction of X-rays as an imaging diagnostic procedure in neurosurgery. Currently, many technologic advancements



**Figure 1:** Soldier Boyabatli Mehmet Efendi and shrapnel on his right wrist taken by Esad Feyzi through X-Ray. The shrapnel was later removed surgically. The figure was taken from the book of Besim and Basekim (4).

have been noted in neurosurgical practice (8), but after the revolutionary discovery of x-rays by Rontgen, many famous neurosurgeons seemed to prefer to use X-rays in traumatic cases with fractures (6). Less than a century ago, two important neurosurgeons named Harvey Cushing and Walter E. Dandy had a major effect on the development of neurosurgery. Cushing started to work at Johns Hopkins Hospital in the fall of 1896 under the pioneering general surgeon William Stewart Halsted. Later, Dandy joined Cushing in this hospital as Cushing's assistant. Williams and Codman were the first physicians who first used x-rays in North America in 1896 soon after its discovery by Wilhelm Conrad Rontgen (6). Cushing foresaw the potential of this discovery almost immediately (10). There is no doubt that Harvey Cushing played an important role in the development of neuro-radiology (10). In February 1896, he wrote to his mother, "Everyone is very excited over the new photographic discovery" (10). In November 1896, Cushing first used recorded the new x-ray in a specific neurologic case (10). He published on the use of x-ray applications in 2 spine cases in 1898 (6). Until 1908, it was observed that Cushing had been pessimistic about the use of x-ray (6). However, 1908 was a good year for neurosurgery because 2 major monographs on neurosurgery by Cushing and Edward Archibald, as well as a textbook by Krause that heralded modern surgical technique on neurological structures incorporating x-rays appeared. (6). In *An American Text-Book of Surgery*, using x-rays to localization of foreign bodies and fractures in difficult cases was mentioned (6). The first neurosurgical textbook named *Chirurgie des Gehirns und Rückenmarks* was published and translated into English as *Surgery of the Brain and Spinal Cord* in 1908 (6). Cushing published a series of manuscripts in these years.

#### Early Adverse Effects

In April 1896, an X-ray image was taken for a case with an injured foot (24). Her X-ray showed a displaced cuboid bone in her left foot (24), and these images were later assumed to court in an early malpractice suit (24). Another story is about a student at Columbia University. His name is Herbert D Hawks. This student took on a side job of showcasing the novelty of X-rays by placing his head next to the tube to show the transparency of his skull (24). After the continuous exposure to these X-rays, the sunburn effect on his skin was described by this student (24). Many similar adverse effects of x-Ray were noted by other people (24). The burns began to cause this student to feel pain, and the skin began to peel (24). Also, his hair was falling out, his fingernails stopped growing, and his vision was impaired (24). He described these symptoms in the *Electrical Engineer Meeting* in July 1896 (24). In later years, other ill effects of X-rays were documented, such as radiation sickness, infertility, and malignancies (24).

Other early adverse effects were observed in Rontgen's family. His wife, Bertha, died in 1919, after the years of chronic pain and daily narcotics (24), but Rontgen's death soon occurred. The cause of death was said as an intestinal carcinoma, but this diagnosis was not assumed to be radiation-induced (24). We have a suspicion about the relationship between Rontgen's death and the adverse effect of radiation.

#### Curiosity 1: Suspected Deaths of Turkish Physicians Who Started to Use X-Ray in the Country

The use of X-Rays in the military dates to the Greco-Turkish War in 1897 by its implementation on the bodies of the casualties of war, first in Istanbul, and then in Athens utilizing the X-Rays showing evidence of pieces of bullet and shrapnel inside the bodies of soldiers (25). Archival records and sources show that the first radiographic images of the wounded soldiers were taken by the Turkish team led by Dr. Salih Bey (25). Rontgen did not suffer much from x-ray exposure. Probably because his experiment was over a few years, his x-ray tubes were shielded with metal boxes. He was well aware of harmful biological effects, experienced by other early workers. Harmful biological effects of X-Ray devices were conveyed to British scientists after a meeting with Rontgen in 1898 (17). It was too late for the Turkish and Greek parts because Turkish and Greek physicians used the X-rays likely without knowing its hazardous effect in the 1987 Greco-Ottoman war. After using the X-ray, suspected deaths occurred. One of them is the death of Dr. Esad Fevzi. He died in 1901 (4). The cause of his death was reported to be sepsis due to erysipelas. We have a suspicion about the cause of Dr. Esad Fevzi's death because the harmful effects and protection methods from the harmful effect of X-rays were unknown in those early years (22). The medical history will always remember him with his very short span of life (22). He wrote a book named "Roentgen Rays, its Medical and Surgical Application" in 1898 (22). This is the first book ever written on X-rays in Turkey and the world (22). Later, succeeding Sufyan Bey, Dr. Ibrahim Vasif, who worked as an assistant of Esad Fevzi at the same laboratory, died of cancer. His death was probably due to the adverse effect of X-rays. His friend, Dr. Sevki Bey, from the same department (22) also died with the same suspicion. Another Ottoman Physician Dr. Rasih Emin also died of cancer. The cause was reported as radiodermatitis (22). Currently, neurosurgery has gone through moments of great renewal (9), but until the late 19th century, only external direct observation of the cranium or other part central nervous system could only be made. At that time, neurosurgeons had limited diagnostic tools (7). It is not possible to find a definitive death cause of Turkish physicians who were a beginner of the X-Ray using in the Ottoman Empire. Autopsy procedure is important in such suspicion deaths as the real cause cannot be determined without an autopsy report (13). Otherwise, the speculations will continue.

#### Curiosity 2: Why were the Ottoman Empire and Greece Chosen as the First Countries to Use X-Ray Device?

A question may arise about why German and British physicians did not use this new radiology technique into practice in their country, while Turkish and Greek physicians used the X-rays likely without knowing its hazardous effects in the 1987 Greco-Ottoman war. As a result, many suspected deaths of Turkish physicians who started to use X-Ray in the Ottoman Empire were reported. There is no doubt that the Turkish-Greece war of 1897 led to changes in radiological examination and clinical use of X-Ray (22).

Later, some manuscripts were published by German and English physicians after the Turkish Greece war (1,15). One of

them was published by German Hermann Küttner on using x rays during the Greco-Turkish War. His observations focused especially on the nervous system and appeared in the German journal *Beitraege zur klinischen Chirurgie* in 1898 (15). A second manuscript on the Greco-Ottoman War experience was published by English Physician Francis Charles Abbott in the *Lancet* of 1899 (1). English doctors started to take radiological images in Greece later on, in the middle of June 1897 (25).

## CONCLUSION

Greco-Ottoman War (1897) is an important war for radiology because those radiographic imaging techniques were first used extensively on wounded soldiers soon after the discovery of X-rays in 1896. There was a competitive effort between Turkish and Greek Parts. It is well known that the Roentgen technique had entered clinical practice well before the Greco-Turkish War, but the military experience during the Greco-Ottoman war in 1897 had likely an impact on the development of civil neuroradiology and neurosurgery. It is well known that the Roentgen technique had entered clinical practice well before the Greco-Turkish war. For instance, Fedor Krause in Altona had used a Roentgen device since the spring of 1896, and others like Hermann Kuettnner in Tuebingen, Harvey Cushing in Baltimore, Victoria Hospital near Southampton, and Francis Abbott in London installed their devices in the same year. This does not preclude the widespread skepticism prevailing for many years in civil as well as military medicine.

In the history of diagnostic neuroradiology, the invention of X-ray is an important event in the very early 20<sup>th</sup> century. The first point of this paper is related to the pioneering use of X-ray imaging by both sides during the Greco-Ottoman war of 1897 only 16 months after Wilhelm Conrad Roentgen had presented his discovery to the public. The experience of the Ottoman Empire and Greece is important for this issue as they were using the technology before any of the risks were understood. The fact that physicians of the Ottoman Empire belong to the true pioneers of X-Rays may be readily overlooked in Western countries, so we underlined the significance of this event. More studies are needed.

## AUTHORSHIP CONTRIBUTION

**Study conception and design:** AK

**Data collection:** ERG

**Analysis and interpretation of results:** ED

**Draft manuscript preparation:** ET

**Critical revision of the article:** AK

**Other (study supervision, fundings, materials, etc...):** AK

All authors (AK, ET, ERG, ED) reviewed the results and approved the final version of the manuscript.

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