

## ORIGINAL ARTICLE


### The History of Surgery in World War I: A Correspondence between Fedor Krause (1857 – 1937) and Arthur Simons (1877 – 1942)

#### Abstract

This study focuses on a correspondence between the surgeon, Fedor Krause (1857 – 1937), and the neurologist, Arthur Simons (1877 – 1942), who specialized in muscle neurology. The correspondence shows many interesting aspects of surgery at the time of World War I. It is especially remarkable that the important surgeon, August Bier (1861 – 1949), is criticized in this correspondence. One major problem of German surgery at the beginning of the 20th century was the fact that patients often were not mobilized sufficiently and instead, unnecessarily were told to stay in bed (“*Betruhe*”) for many weeks, and in many cases, patients also were unnecessarily told to move as little as possible. Even giving massages was considered harmful. This is in contrast to today’s principle of early mobility (ERAS). The correspondence between these two scholars clearly indicates that these wrong principles were propagated by certain important surgeons in Germany (like August Bier) and that these principles were rather based on their personal opinions than on scientific evidence. More than 100 years ago, there were already some physicians, like Arthur Simons or Fedor Krause, who openly criticized these wrong approaches in German surgery.

**Key words:** Mobility, ERAS, Complex regional pain syndromes, 20th century history, World War I

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## Introduction

With a total of approximately 9,000,000 dead soldiers, with that said nearly as many dead civilians, World War I (1914 – 1918) can be regarded as the most critical period for the global healthcare system in the history of the 20th century (Winter, 1985, p. 75). The field hospitals quickly built up in Germany and Austria, after the war commenced, are often assumed to have a rather provisional character and some contemporary descriptions clearly address these insufficiencies (Enzensberger, 2021, p. 14; Biwald, 2000, pp. 54-128). If we look at the whole picture of the condition of field hospitals and patients, we may observe the following points: there were highly specialized expert physicians who were often responsible for these field hospitals, but they partly had to treat patients from a different specialty (Lessing, 1929, p. 4). Many severely wounded patients in the field hospitals sometimes were short of medical and surgical materials, such as medicine and bandages. (Rehor, 2011).

On the other hand, World War I led to many different medical and surgical advances. The French surgeon Alexis Carrel (1873 – 1944), for instance, introduced a new method of wound antiseptics (Carrel–Dakin method) for traumatic wounds. Carrel is also considered an important pioneer of vascular suturing techniques and organ transplantation. In 1906, Carrel joined the Rockefeller Institute of Medical Research in New York (Reggiani, 2007, pp. 21, 32, 50).

In addition, Harvey Cushing (1869 – 1939), the US surgeon, also participated in World War I as a member of the US Army Medical Corps in France. Cushing developed many basic surgical techniques for operating on the brain (Haas, 2002, p. 596).

Surgery and medicine in the Russian Empire during World War I were especially characterized by efforts to improve the overall low hygienic conditions with a focus on preventive medicine (Uzbekova, 2014, pp. 51-54).

The Ottoman Empire joined the Central Powers in World War I and therefore was supported by German and Austrian physicians. For example, the Austrian surgeon, Anton von Eiselsberg (1860 – 1939), had a journey to the Ottoman Empire in March/April 1918 and held several lectures about war surgery (Eiselsberg, 1937, pp. 331-333). Eiselsberg writes that he met with the Ottoman General Staff Physician, Suleiman Numan Pasha, who was a close confidant of Enver Pasha (1881 – 1922) and a very important person in the Ottoman Empire's health system during World War I (Eiselsberg, 1937, p. 332; Reichmann, 2009, pp. 115-116). Other Austrian and German physicians stayed in the Ottoman Empire for several months and even for some years (Reichmann, 2009, pp. 88, 115-116, 251-253). That certainly had an influence on the Ottoman Empire's health system and perhaps also indirectly on the health systems of other countries in the Middle East (Reichmann, 2009).

This article focuses on a correspondence between two physicians from Germany who participated in World War I and tends to present different interesting aspects of surgery during that time.

### **Fedor Krause (1857 – 1937)**

Fedor Krause was born on March 10, 1857, in the Prussian (Silesian) town of Friedland (now called Mieroszów in Poland, a border town to the Czech Republic) near the city of Breslau (today called Wrocław in Poland) (Stürzbecher, 1980, p. 700). He began to





study music in Berlin, but later he turned to medicine (Kuhlendahl, 1973, pp. 159-163). After his graduation, Krause became an assistant surgeon to Richard von Volkmann at Halle University) and completed his study, as a neurosurgeon in 1887, working on brain tumors. He published the article, "*Maligne Neurome und das Vorkommen von Nervenfasern in denselben*" in 1887. He continued his career as a scientist at the Senckenberg Institute in Frankfurt between 1890 and 1892. Then, he was appointed to senior physician and consecutively was promoted to the chief physician at Hamburg Altona Hospital between 1892 and 1900. Krause invented many new techniques in the field of neurosurgery (for example, the Hartley – Krause – operation for trigeminal neuralgia or new surgical access routes for brain surgery). He also contributed to other fields of surgery (for example, plastic and reconstructive face surgery) at Hamburg Altona Hospital (Röttgen, 1983, pp. 148-155). From 1900 until 1923, Krause became the chief physician at the Augusta Hospital in Berlin. He published several important books about neurosurgery (Röttgen, 1983, pp. 148-155). Fedor Krause retired in 1931, spent the rest of his life in Rome, and passed away in 1937 (Stürzbecher, 1980, p. 700).

#### **August Bier (1861 – 1949)**

August Bier was born on November 24, 1861, in Helsen (today part of the town of Bad Arolsen in Hesse). He studied medicine from 1881 until 1886 in Berlin, Leipzig and Kiel. In 1888, he became an assistant physician to Friedrich von Esmarch at Kiel University (Müller, 1955, pp. 230-231). It is important to mention that in Kiel, August Bier was deeply influenced by navy and military surgery (Kiel was a very important naval city in the German Empire after William II. became emperor in 1888). In the following years, August Bier was promoted to senior physician and associate professor in Kiel (Vogeler, 1941, p. 26). Together with his assistant, August Hildebrandt, he probably performed the first spinal anaesthesia (1898) and also used that method for his surgical operations at Kiel University (Bier, 1899, pp. 361-368). In 1899, Bier was promoted to full professor of surgery at Greifswald University and then invented new methods of therapeutic hyperaemia by using special cupping glasses (Bier, 1903, pp. 13-171). He accepted an offer as a full professor at Bonn University and began to work together with Victor Schmieden in 1903. Four years later in 1907, Bier finally was promoted to full professor for surgery at Berlin University (Müller, 1955, pp. 230-231; Vogeler, 1941, pp. 38-39). From that time on, August Bier was, so to say, the German Empire's most important surgeon and therefore was very influential in the whole German healthcare system. In fact, his personal surgical opinions became nearly indisputable. As a chief surgeon in Berlin, he also invented intravenous regional anaesthesia (Vogeler, 1941, pp. 40-41). In World War I, Bier became very famous as a military surgeon. For example, he invented the German steel helmet "M1916" to protect soldiers from head injuries (Vogeler, 1941). Later in the era of the German Republic (1918 – 1933), Bier was one of the first surgeons to teach sports medicine, but during World War I, Bier still preferred to recommend hyperaemia than early mobility or gymnastics in many cases (Vogeler, 1941, pp. 44, 134, 155-182). Bier mainly began to recommend hyperaemia for patients who suffered from tuberculosis (local application of cupping glasses on focal tuberculosis lesions), but later recommended hyperaemia for many other patients, as well (Bier, 1903, pp. 176-177). He retired in 1932. Although August Bier did not become a member of the Nazi party ("NSDAP"), he





later politically stood quite close to the Nazi movement and received a number of awards between 1933 and 1945. He passed away in 1949 (Müller, 1955, pp. 230-231).

#### **Victor Schmieden (1874 – 1945)**

Victor Schmieden was born in Berlin on January 19, 1874. He graduated from Bonn and also achieved his doctorate degree and his postdoctoral lecture qualification at Bonn University. Together with his chief physician August Bier, he took up a position at the Charité (Berlin University Hospital) in the year 1907 (Lotz, 1978). In the following year, in 1908, Schmieden was assigned to associate professor in Berlin, and in the year 1913, Schmieden went to Halle and was promoted to full professor for surgery. In World War I, Schmieden became a military surgeon and after the war, he wrote an extensive large book about war surgery (*Lehrbuch der Kriegschirurgie*). In 1919, Victor Schmieden became a full professor at Frankfurt University Hospital (Sachs, and Ecke, 1997, pp. 597-609). Although he was a very important surgeon at that time, Victor Schmieden later became deeply involved in the Nazi movement (Klee, 2005, p. 547). Victor Schmieden died on October 11, 1945 (Lotz, 1978).

#### **Arthur Simons (1877 – 1942)**

Arthur Simons was born in Düsseldorf on October 11, 1877. Simons mainly was a neurological practitioner in Berlin (Holdorff, 2012, pp. 514-519). He was assigned to associate professor at Berlin University in 1923. Arthur Simons specialized in muscle neurology and more specifically in different aspects of hemiplegia (Holdorff, 2012, pp. 514-519; Holdorff, 2015, pp. 63-71). In World War I, he worked on diagnostics for “war neurosis” and factitious disorders, especially in connection with the differentiation between genuine paralysis of muscles on the one hand and “war neurosis”/ factitious disorders, leading to “psychological paralysis” on the other hand (a very common phenomenon in World War I) (Simons, 1917, pp. 36 -63). Arthur Simons was murdered by the Nazis in autumn 1942 (Holdorff, 2015, pp. 63-71).

#### **Materials and Methods**

The main material of this study is a correspondence between the neurologist, Arthur Simons (1877 – 1942), and the surgeon, Fedor Krause (1857 – 1937), between “May 1, 1918” and “May 23, 1918” (Figure 1-4). It was part of a small bundle of different historical materials (letters and correspondences), I obtained on 13 June 2022. First, it was completely unclear who could have written the letter (“Krause” is a very common surname in Germany). But with enormous efforts made, I could clearly identify Arthur Simons and Fedor Krause as the two physicians who wrote the letters. I compared Fedor Krause’s handwriting with a number of other manuscripts written by him. Krause’s handwriting is very unique and therefore the comparison of his handwriting very clearly indicated the genuineness of the material. Furthermore, the genuineness of the letter written by Arthur Simons can be proven by the existence of the following reference (Simons, 1917, pp. 36-63).

The document analysis method in qualitative research was used in this study. A German transcript of the correspondence was prepared by identifying each word and character of the handwritten text. Although some words were not easy to identify, I was able to work





out a transcript. Then, I carefully translated the transcript into English. The contents of the correspondence were analyzed by comparing it with different references, especially with the following two important references (Bier, 1917, pp. 925-928 ; Simons, 1917, pp. 36-63). Step by step, the historical context of the correspondence was highlighted and discussed, resulting in an overview of the presented topic.

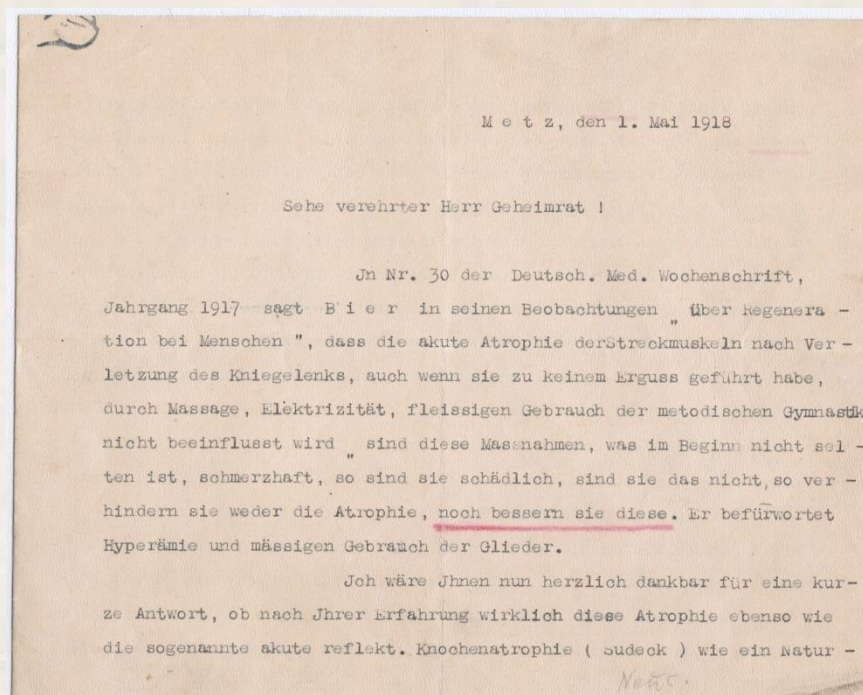


Figure 1. First page of the correspondence between Simons and Krause. Private source (contact author); in preparation for archiving.

## Results

Correspondence between the neurologist Arthur Simons (1877 – 1942) and the surgeon Fedor Krause (1857 – 1937) with the date “1 May 1918”:

[Translation]

Dear Mr. Privy Councillor! (“*Sehr verehrter Herr Geheimrat!*”)

In No. 30 of the journal “*Deutsch. Med. Wochenschrift, Jahrgang, 1917*”, Bier writes in his observations “About Regeneration in Humans” that the acute atrophy of the extension muscles after injuries of the knee articulation can not be improved by massages, electricity, and gymnastics, even when they did not lead to an articular effusion. “While these methods are painful, which is quite common in the beginning, they are harmful. If they are not painful, these methods neither prevent atrophy nor do they lead to an improvement of the atrophy.” Instead, he recommends hyperaemia and only moderate use of the arms and legs.

If you could tell me about your personal experiences with these atrophies, and with the so-called, Sudeck’s atrophy (“*akute reflekt. Knochenatrophie (Sudeck)*”), and about the question if such atrophies occur like a law of nature, although measures have been taken,





and if they can not be healed after they begin, I would be very thankful if you give me a short answer. I already asked a number of excellent surgeons about that question and many of them told me that frequent and active exercise can avoid these atrophies, in spite of the pain. For example, S c h m i e d e n [Victor Schmieden (1874 – 1945)] writes:

“..... it is for sure that the atrophy can be avoided completely (the word “completely (*“vollkommen”*) was obviously crossed out by Fedor Krause) by early active and passive (massages) mobility.” [Fedor Krause wrote: “That is principally correct” (*“Ist im allgemeinen richtig!”*)] Does your opinion comply with that, Mr. Privy Councillor? The opinion of such an experienced and excellent surgeon would be extraordinarily valuable. I am only a layperson in that question, but I have to write a comment about that issue in the last paragraphs of my work “Bones and Nerve” (Previously, I sent you the first part of that work). I tried to see as many patients as possible with injuries of the knees and their consecutive problems and my impression is that Bier’s general and definite specification is not indisputably correct. [Fedor Krause wrote: “I can not take responsibility for Bier’s specifications” (*“Ich kann Biers Angaben nicht unterschreiben.”*)] I really would not disturb you with this question, but I know that you could answer it with a few sentences. If your answer arrives in time, I would include it in “Journal for Neurology” (*“Zeitschrift für Neurologie”*) [Arthur Simons obviously refers to *“Zeitschrift für die gesamte Neurologie und Psychiatrie”*].

[handwritten addition by Arthur Simons:]

Yours sincerely, Simons.

[handwritten answer on the same page by Fedor Krause:]

Dear colleague!      23 May 1918

My position is 15 kilometers in front of La Barée and I am extraordinarily busy. Therefore, please excuse my short answer that will be sufficient for you. It is outstanding (*“großartig”*) here. Today I visited the shell – torn grounds (*“Trichterfeld”*) until 3 kilometers before Catancort [Chattancourt].

Sincerely, F Krause.

### Discussion

Arthur Simons refers to one specific article of a large series of articles published by August Bier in the “German Weekly Medical Journal” (*“Deutsche Medizinische Wochenschrift”*) with the main title “Observations about Regeneration in Humans” (*“Beobachtung über Regeneration beim Menschen”*). In the fourth sub – part of the second part of this series (issue No. 30 on July 26, 1917, pp. 925-928), August Bier wrote his specifications about atrophies as described by Arthur Simons in this correspondence (Bier, 1917, pp. 925-928). Arthur Simons also refers to one of his publications “Bones and Nerve” (*“Knochen und Nerv”*) in 1917 (Simons, 1917, pp. 36-63). Conceptually, that article was planned as a series of articles, but in fact, only one article was published in the journal in 1917 (I did not find a sequel in the journal *“Zeitschrift für die gesamte Neurologie und Psychiatrie”*). It is very remarkable that Arthur Simons’ considerations about atrophies obviously were not published, although he had asked a number of “excellent surgeons” (*“ausgezeichneter Chirurgen”*) about that issue. One reason could be the end of World War I in November 1918. “Bones and Nerve” might have been a series of articles about neurology and war medicine and therefore could have been cancelled after it became





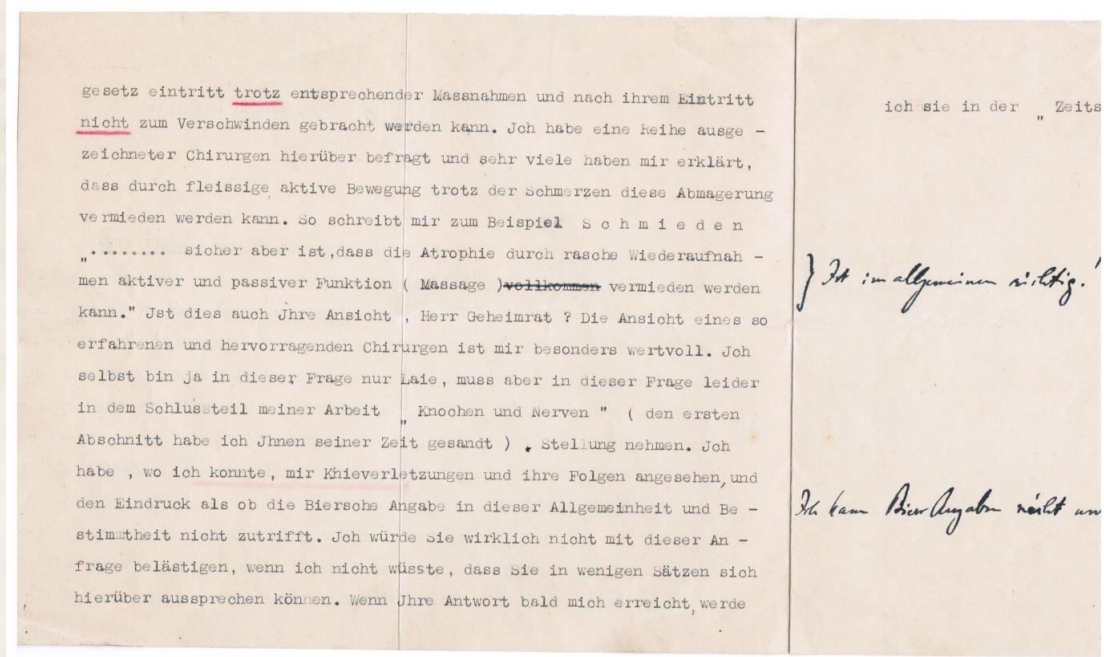


Figure 2. Second and third (excerpt) page of the correspondence between Simons and Krause. Private source (contact author); in preparation for archiving.

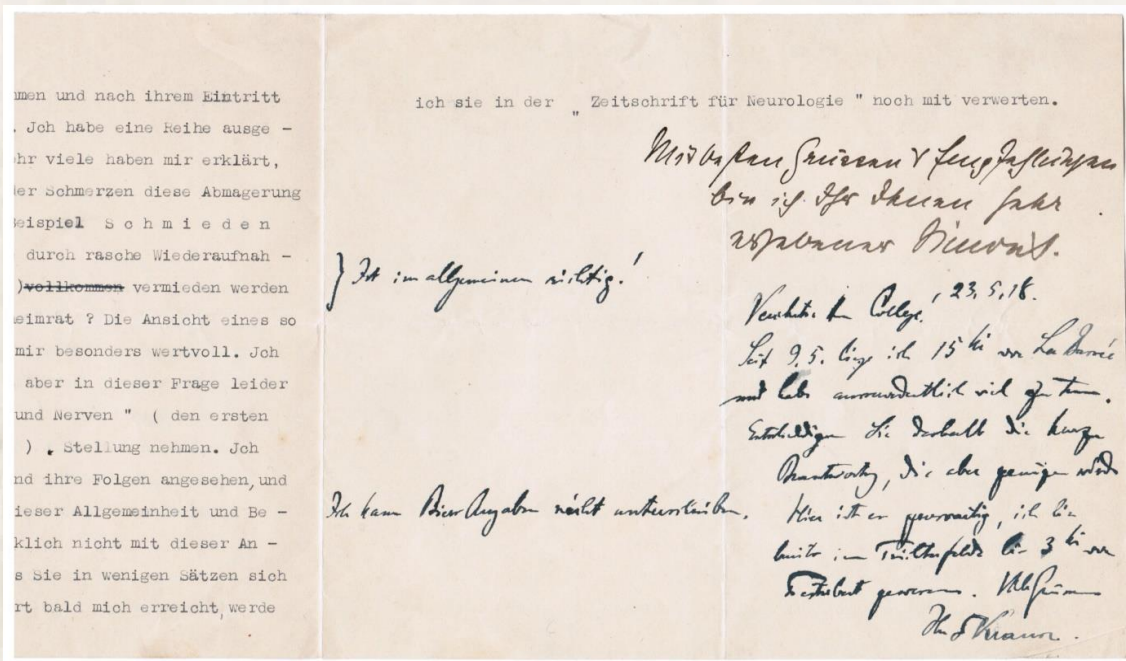


Figure 3. Third and second (excerpt) page of the correspondence between Simons and Krause. Private source (contact author); in preparation for archiving.





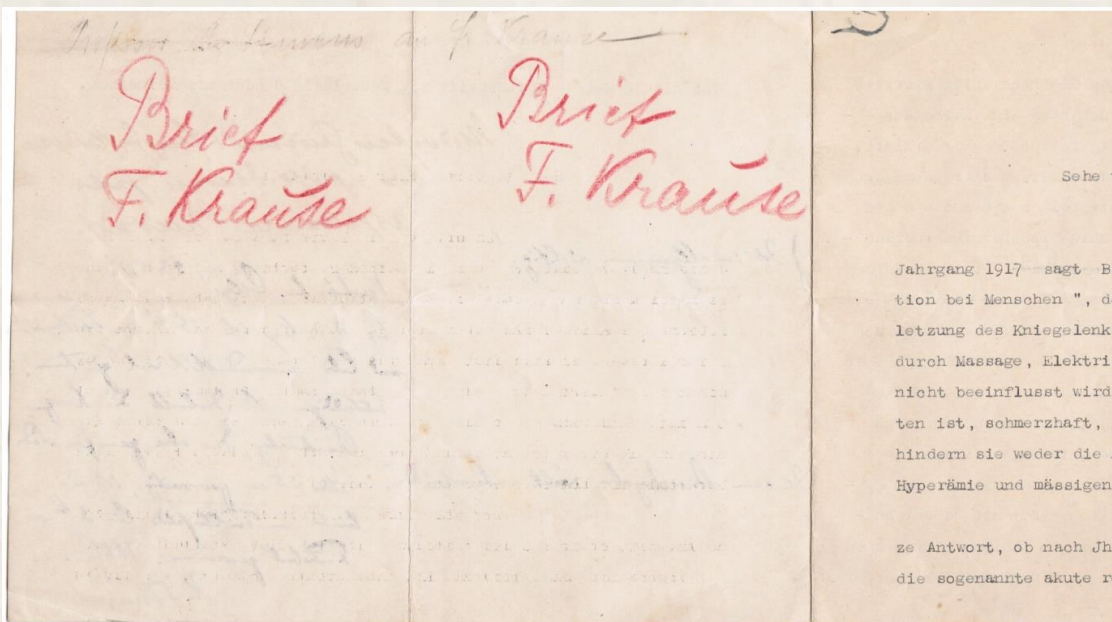


Figure 4. Fourth page and first (excerpt) page of the correspondence between Simons and Krause. Private source (contact author); in preparation for archiving.

clear that the end of World War I was near. But considering the high number of wounded soldiers who still had to be treated after the war, another possibility should also be considered. It is likely that Arthur Simons’ article was not published mainly because it heavily criticized the approach taken by August Bier, who, at that time, was the most important surgeon of the German Empire (full professor and head surgeon at Charité University Hospital in Germany’s capital Berlin).

Furthermore, Fedor Krause’s description of the “shell – torn grounds” (“*Trichterfeld*”) near Chattancourt is really impressive and shows that physicians and surgeons in World War I not only treated their patients behind the front lines, but also sometimes visited the front line to get an overview of the military situation (The Battle of Verdun (1914 -1918), 1919). Additionally, Fedor Krause’s answer also shows that the surgeons were very busy and had very little time for other activities during the time of World War I.

**Atrophies of the Quadriceps Femoris and Complex Regional Pain Syndrome (CRPS)**

Today, we know that there are different reasons behind atrophies of the quadriceps femoris muscle, as well as other atrophies of extension muscles after injuries (as described by August Bier) and therefore it is very important to identify and treat the underlying cause(s) (Bier, 1917, pp. 925-928; Harden, et al., 2010, pp. 268-274; Callaghan, and Oldham, 2004, pp. 295-299). One very important cause of these atrophies is CRPS (complex regional pain syndrome), but there are also many other possible causes (Callaghan, and Oldham, 2004, pp. 295-299). August Bier’s recommendations (late mobility; avoidance of movement, gymnastics, and physical therapy; instead hyperaemia) could have been helpful for a few cases, but for most cases, these recommendations were in fact rather harmful (Harden, et al., 2006, pp. 420-424). For example, today it is widely held that patients with CRPS, in general, do profit from movement, mobility, gymnastics, and





physical therapy (Harden, et al., 2006, pp. 420-424). On the other hand, it is still recommended today that patients with severe CRPS should not be mobilized in a painful way. So, regarding the latter case, August Bier was right and Victor Schmieden was wrong (Harden, et al., 2006, pp. 420-424; Harden, et al., 2010, pp. 268-274). Treatment should be dependent on the patient's specific problem and the true cause of the atrophy. Today, we can say that CRPS (CRPS Type I was formally called "Sudeck's atrophy") is based on local inflammation and dysregulations of vasoconstriction, sympathetic activity, and neurotransmitters after injuries and surgical operations (Harden, et al., 2006, pp. 420-424; Harden, et al., 2010, pp. 268-274). These processes are also believed to affect parts of the brain. The observation that smoking could adversely affect CRPS and the point that a preventive diet, with the addition of ascorbic acid (Vitamin C as an anti-inflammatory agent) or the supplementation of ascorbic acid, can prevent CRPS in most cases clearly support these theories (Hsu, Harden, and Houle, 2002, pp. 33-38; Shibuya, et al., 2013, pp. 62-66). In the years 1917 and 1918, malnutrition was a very common phenomenon; there were numerous patients with wounds and injuries of the arms and legs and considering the point that a lot of soldiers were frequently smoking, it becomes clear that a lot of patients could have suffered from more or less severe forms of CRPS in the last years of World War I (Winter, 1985, pp. 213-245; Biwald, 2000, pp. 327-688; Enzensberger, 2021, pp. 75-85).

**German surgery in World War I was characterized by a long stay in the hospital, late mobility, only little gymnastics, and bed rest ("*Bettruhe*")**

Today ERAS (Enhanced Recovery After Surgery) has become a very important principle in surgery with the aim of early recovery of patients who undergo a surgical operation (Kehlet, and Mogensen, 1999, pp. 227-230). Furthermore, physical therapy and early mobility are also considered important principles in most patients who undergo surgery today (Kehlet, and Mogensen, 1999, pp. 227-230). But at the time of World War I, the physicians recommended quite the opposite.

One example of the partly harmful recommendations of the former surgeons and physicians is August Bier's article mentioned by Arthur Simons in his correspondence with Fedor Krause. In this article, Bier's recommendation is obviously more based on his personal opinion than on scientific evidence (Bier, 1917, pp. 925-928). He recommends hyperaemia rather than mobility, massages, or gymnastics.

The incidence of "war neurosis" and factitious disorders in German and Austrian soldiers was common in the last months of World War I (Simons, 1917, pp. 36-63). That could have been one reason why field hospitals were very strict and the patients often had to keep bed rest ("*Bettruhe*"), although it was not often necessary from a medical point of view.

For further considerations, it is very important to know that wounded soldiers in the German army, in general, were first either classified as "lightly wounded" or "severely wounded" on the battlefield or near the battlefield. Then, "lightly wounded" soldiers were transported to field hospitals near the front line and had to recover as fast as possible in order to return to the front. But in contrast, "severely wounded" soldiers were transported to hospitals far away from the front, usually near the soldier's home region, and they were given much more time to recover from their wounds (Enzensberger, 2021, p. 12). Further-





more, the surgeons sometimes wanted to protect these patients from dangerous military duties by keeping them in the hospitals as long as possible. The fact that a very high number of patients had to be treated in the field hospitals, led to the situation that gymnastics or physical therapy was seldom available to the extent needed. It is also important to mention that patients frequently suffered from complications like infections and that would lead to a long stay in the hospital, too (Biwald, 2000, pp. 327-688; Enzensberger, 2021, pp. 17-18, 176). But perhaps the most important reason for late mobility, only little gymnastics and bed rest in World War I patients was the fact that many leading surgeons of that time simply did not recommend early mobility or early mobilization for their patients (Bier, 1917, pp. 925-928). August Bier especially did not recommend early mobility and instead often recommended hyperaemia (obviously partly because he published a number of scientific works about “hyperaemia”) (Bier, 1903, pp. 13-171). All in all, patients in World War I field hospitals often were hospitalized for a very long time. It is very difficult to guess how many complications (for example thrombosis) could have been avoided when early mobility of the patients would have been facilitated (Biwald, 2000, pp. 327-688; Enzensberger, 2021, pp. 176, 185).

### Conclusion

One important new hypothesis of this study is that CRPS could have been a big problem in the last months of World War I. At that time, malnutrition was a very common phenomenon. Furthermore, there were many war patients with wounds and injuries of the arms and legs and as a lot of soldiers used to smoke frequently, so, it was likely that a high number of them could have suffered from more or less severe forms of CRPS.

Surgery in Germany and Austria was very deeply influenced by the experiences in both World Wars and that could have been one reason why physicians were often very cautious with early mobility and physical therapy, even many years after the end of World War II. More than 100 years ago, there were already some physicians, like Arthur Simons or Fedor Krause, who openly criticized these wrong ideas in German surgery.

### Conflict of Interest

None.

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