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K. F. Vegner — an outstanding scientist, founder of the national orthopedics and traumatology

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The main stages of the research achievements of the outstanding scientist orthopedic and traumatologist Professor Karl Fedorovych Wegner are characterized and presented. His significant contribution to the development of a functional method of treating bone fractures and his use of the skeletal traction method for treating a femoral fracture are outlined. Objective. To show the contribution of K. F. Wegner to the formation and development of domestic orthopedics and traumatology, in particular to the technology of treating bone fractures and bone tuberculosis, the organization of narrow-profile orthopedic and traumatological care for victims with industrial injuries, and the development of the concept of «emergency surgery». Methods. An information search was conducted in electronic databases, archives, and the library of the State Institution «Institute of Spine and Joint Pathology named after Prof. M. I. Sytenko of the National Academy of Medical Sciences of Ukraine». Results. Karl Fedorovych also revealed in detail the concept of what a bone fracture is, analyzed the mechanisms of its occurrence. The works of K. F. Wegner are analyzed, the professor's contribution to the formation of domestic orthopedics and traumatology is highlighted. The phenomenon of elitist thinking of Karl Fedorovych Wegner, which became the foundation of the collective medical experience of the Kharkiv School of Orthopedists and Traumatologists, of which he is the founder, is characterized in a multi-vector manner. Conclusion. It is proven that Professor Wegner is the founder of the modern system of providing medical care to patients with occupational injuries of the musculoskeletal system. Special attention is paid to the methods of treating bone tuberculosis introduced by him.

Схарактеризовано й подано основні етапи дослідницького доробку видатного вченого ортопеда-травматолога професора Карла Федоровича Вегнера. Окреслено його значний внесок у розвиток функціонального способу лікування переломів кісток і використання ним методу скелетного витягнення для лікування перелому стегнової кістки. Мета. Показати внесок К. Ф. Вегнера в становлення і розвиток вітчизняної ортопедії та травматології, зокрема в технології лікування переломів кісток і кісткового туберкульозу, організацію вузькопрофільної ортопедо-травматологічної допомоги постраждалим з виробничими травмами, розробку концепції «хірургії невідкладних станів». Методи. Проведено інформаційний пошук в електронних базах, архівах і бібліотеці ДУ «Інститут патології хребта та суглобів ім. проф. М. І. Ситенка НАМН України». Результати. Проаналізовано роботи К. Ф. Вегнера, висвітлено внесок професора в становлення вітчизняної ортопедії та травматології. Різновекторно схарактеризовано феномен елітарного мислення Карла Федоровича Вегнера, яке стало фундаментом колективного лікувального досвіду Харківської школи ортопедів-травматологів, засновником якої він є. Карл Федорович детально розкрив поняття, що таке перелом кісток, проаналізував механізми його виникнення. Висновок. Доведено, що професор К. Ф. Вагнер є засновником сучасної системи надання медичної допомоги хворим із виробничими травмами опорно-рухової системи. Особливу увагу звернено на запроваджені ним способи лікування кісткового туберкульозу. Ключові слова. Виробнича травма, переломи, лікування, кістковий туберкульоз, організація медичної допомоги.

Keywords. Industrial injury, fractures, hip, treatment, bone tuberculosis, organization of medical care

Introduction

In recent decades, there has been growing interest among researchers in studying the biographies of scientists who have made significant contributions to various fields of science. These individuals have not only identified promising research areas but also provided crucial impetus for the further advancement of science and offered examples of problem-solving for young scientists. Examining their life paths allows for the identification of the features and patterns in the development of science, shaped by the prevailing social conditions of their time.

The analysis of the scientific achievements of Professor K. F. Wegner contributes to a deeper understanding of the formation and development of orthopedics and traumatology in Ukraine, as well as to the improvement of the planning and organization of scientific research in these fields.

Purpose: to show the contribution of Professor K. F. Wegner to the formation and development of domestic orthopedics and traumatology, in particular in the technology of treating bone fractures and bone tuberculosis, the organization of orthopedic and traumatological care.

Material and methods

An information search was conducted in electronic databases, utilizing data on the life of K. F. Wegner, as well as memoirs from his students. The professor's own works, housed in the library of the State Institution "Professor M. I. Sytenko Institute of Spine and Joint Pathology of the National Academy of Medical Sciences of Ukraine", were also analyzed. The figure of Karl Fedorovych captures the attention of both orthopedic traumatologists and historians of medicine, as well as local historians. His biographical information is presented in the work of O. Kuptsov (History of the City of Yenakiyevo) [1]. Memories of Karl Fedorovych and accounts of his collaboration with others can be found in the publications of his students, including the renowned orthopedic traumatologist Professor V. D. Chaklin [2] and V. Ya. Tarkovskaya [3]. In their work on the history of orthopedic development in Kharkiv, employees of Professor M. I. Sytenko Institute presented a socio-psychological portrait of Karl Fedorovych, highlighting his family ties [4]. K. K. Silvay and T. P. Galitsa, in their article [5], focused more on his professional activities.

Fig. 1. Photo of K. F. Wegner 1886 (a), 1914 (b)

Results

Karl Fedorovich (Teodorovich) Wegner was born on 12 December 1864 in Kamianets-Podilskyi. After graduating from high school in 1885, he studied at the Mathematics Faculty of St. Petersburg University, but in 1887 he transferred to the Medical Faculty of Yuriev (Derpt) University (Estonia). In 1892–1893, while still a student, Karl Fedorovich worked as an assistant in a clinic in Dorpt. In 1893, after graduating, he was accepted as a resident physician at the Yuzivka Factory Hospital (now Donetsk), where Karl Fedorovich thoroughly studied the characteristics of injuries in workers in the mining and mining industry and established himself as a talented doctor who had his own progressive views on the organization of medical care for patients. He developed a plan for the creation of a new institution, according to which in 1896 the Petrovsk Factory Hospital was built, where he later worked as a senior doctor [1].

The rise in industrial injuries and worker disabilities in the mining sector during this period prompted the decision to establish a specialized orthopedic hospital for the treatment of musculoskeletal injuries. In May 1907, the Council of Miners of the South of Russia sent Karl Fedorovich to Germany to study the organization of medical care for accident patients and methods for assessing the loss of working capacity among injured workers. He was entrusted with this responsibility due to his expertise in the field and his reputation as a creative organizer capable of leading this important initiative. Following his trip, Wegner authored an article titled "On Workers' Insurance in Germany", which was published in several issues of the magazine Mining Leaflet [1].

Using the experience he gained, Karl Fedorovich developed a project for a scientific and medical institution specializing in orthopedics and traumatology. Based on this project, the Medical and Mechanical Institute was established and opened in Kharkiv on 08 June 1907, with Wegner appointed as its head. The institute was tasked with treating workers injured in the mining and industrial sectors, addressing functional disorders resulting from musculoskeletal injuries, and evaluating the degree of working capacity loss among the injured [6].

K. F. Wegner, as a traumatologist, was a strong advocate of the functional method for treating bone fractures. From the very beginning of the institute's work, under his leadership, this approach became a priority in patient care. To support this, specialized technical equipment was acquired for the institute.

In 1909, based on the results of his research, K. F. Wegner published an article titled “On the Recognition of Femoral Neck Fractures” [7], in which he analyzed the diagnostic errors made by doctors when identifying femoral neck fractures in injured workers. He stressed that diagnosing a femoral neck fracture is a challenging task for doctors without the use of an X-ray machine. Even then, Karl Fedorovich advocated for recognizing “accident medicine” as an independent branch of scientific and practical medicine, calling for the specialization of doctors in “accident surgery” and the establishment of hospitals equipped specifically for the diagnosis and treatment of accident-related injuries [7].

In 1910, Karl Fedorovich performed the first operation in the country at the Medical-Mechanical Institute using the “skeletal extension” technique for the treatment of a femoral fracture [6] (Fig. 2).

Thanks to his scientific work, the functional method of treating bone fractures, which was progressive for its time, was introduced across the country. Under the leadership of K. F. Wegner, his team contributed many innovative approaches to the treatment of such fractures. One notable advancement was the combined method of extraction, which involved simultaneous application of nail traction on one segment and adhesive plaster traction on the other [5].

Several of his scientific works from this period highlight K. F. Wegner's active efforts in addressing the challenges of fracture treatment, including "On Indirect Fractures of the Spine" (1910), "On the Question of the Occurrence of False Joints", "Zur Behandlung veralter Oberschenkelbrueche" (1911), and "On the Steinmann Method in the Treatment of Hip Fractures" (1912). In 1914, Wegner presented his experience in fracture treatment at the 13th Congress of Surgeons in a report titled “Modern Principles of Fracture Treatment” [6]. That same year, he successfully defended his doctoral dissertation on “Closed Fractures of the Femur Diaphysis” [8].

Fig. 2. Patient who was first treated with permanent skeletal traction in domestic practice

As senior physician and later director of the Medical-Mechanical Institute, K. F. Wegner prepared annual reports for the Council of the Congress of Miners. In these reports, he provided detailed histories of diseases, treatment methods, and outcomes for patients with orthopedic injuries. His reports offered valuable practical insights into fracture treatment, the management of their consequences, and the restoration of function in damaged support and movement organs [6].

From the outset of his career in traumatology, Karl Fedorovich was deeply engaged with the issues surrounding the organization of medical care for workers injured in industrial accidents. He dedicated several of his works to this problem, in which he emphasized the specific challenges involved in organizing medical care for injured workers. K. F. Wegner frequently delivered reports at meetings of the Society of Mining Doctors, the Pirogov Congresses of Doctors, and various international medical congresses.

Karl Fedorovich was elected a member of the permanent presidium of the International Congress on Combating Accidents [1]. Through his business trips, K. F. Wegner reported to the Council of the Congress of Mining Workers, detailing the results of fracture treatments presented at the congresses. He also addressed the issue of organizing the cooperation between doctors of insurance companies and health insurance funds (hospitals) [9].

During the First World War (1914–1918), in accordance with the Council's decision, K. F. Wegner organized wards for soldiers with severe gunshot fractures at the Institute. He also oversaw the operation of a 225-bed infirmary opened in Kharkiv for the treatment of soldiers with gunshot fractures of the limbs, where he applied the functional treatment methods he had already tested.

In 1916, K. F. Wegner published the scientific work “Principles of Functional Treatment in Case of Injuries and Diseases of the Limbs”. Drawing from his experience at the Medical-Mechanical Institute, he concluded that active movements in injured limbs are a crucial therapeutic tool, particularly in preventing future joint contractures. He demonstrated that systematic use of active movements promotes normal blood circulation in the tissues, aiding in the “resorption and physiological neutralization of painful infiltrates and pathological elements”, while also improving functional state of the limbs. Wegner believed that active movements, combined with stretching and

positioning the limb in a half-bent state, were particularly effective in treating joint contractures [10].

During the war, the Institute, under Wegner's leadership, was the first in the country to organize training courses for paramedical personnel, where 28 “sisters of mercy” were trained. After graduation, 20 of them took positions in the local hospital, while 8 were sent to military medical units on the front lines [6].

Between 1918 and 1925, the patient demographic expanded to include children with various orthopedic conditions. Karl Fedorovich remained deeply involved in medical work, personally performing closed reduction of congenital hip dislocations in young children using the Lorenz method, and employing skeletal traction with the Steinmann nail [3].

A notable achievement of Professor K. F. Wegner was his work on treating bone and joint tuberculosis, a widespread disease in the 1920s. In 1922, 16 % of the patients at the Medical and Mechanical Institute were diagnosed with this condition. Wegner applied functional treatment methods for managing bone and joint tuberculosis, including creating a solarium on the roof of the Institute for patients. To prevent joint contractures and alleviate pain, joints were unloaded through stretching, and a specialized diet was also introduced for patients [2]. Several of his works are dedicated to this issue, such as “The Current State of the Treatment of Tuberculosis of Bones and Joints” (1922), “On the Treatment of Tuberculosis of Bones and Joints” (1922), and “On the Fight Against Bone and Joint Tuberculosis” (1925) [5].

Karl Fedorovych was deeply committed to studying the experiences of European clinics, regularly delivering lectures on advanced methods for treating orthopedic and traumatological patients based on these studies, which generated significant interest [3].

He was particularly devoted to the training of young orthopedic traumatologists. Under his mentorship, several notable scientists took their first steps at the institute, including M. P. Novachenko, V. D. Chaklin, M. I. Sitenko, V. O. Marx, and A. P. Prykhodko. It was Karl Fedorovych who laid the foundation for the development of the Kharkiv school of orthopedic traumatologists, and his student, V. D. Chaklin, later founded the Sverdlovsk school [6].

V. D. Chaklin, in his memoirs, highlights Karl Fedorovych’s extraordinary diligence, accuracy, and punctuality. He worked tirelessly, often 12-hour days, and was demanding both of himself and his students. Wegner was meticulous in observing patients postoperatively and during the treatment of bone fractures using the functional method, which was grounded in a thorough understanding of muscle physiology and pathophysiology in the context of bone fractures, as well as joint biomechanics. Wegner was a well-rounded physician, fluent in four foreign languages, and actively participated in European orthopedic and traumatology congresses, staying abreast of new advancements in research [2].

In addition to his leadership role at the institute, Karl Fedorovych was a professor at Kharkiv Medical Institute. At his initiative, the Ministry of Health of Ukraine granted permission to establish a department of orthopedics at the university [2]. In 1921, he became the head of the department of orthopedic surgery and a professor of operative surgery with topographic anatomy at the institute [11].

From 1926 onward, Professor K. F. Wegner headed the orthopedic department at the State Institute of Phthisiology and Orthopedics in Moscow. He played an active role in organizing and hosting the First All-Russian Conference on Industrial Traumatology in December 1926.

In the same year, Wegner’s seminal work “Fractures and Their Treatment” was published, and by decision of the Scientific Council of the People’s Commissariat of Health, it was adopted as a textbook for students [12]. This monograph compiled data on 3,892 cases of fractures treated at Kharkiv Medical and Mechanical Institute. Wegner thoroughly explored the concept of bone fractures and analyzed the mechanisms behind their occurrence. He emphasized the importance of fully understanding the presentation before starting treatment, including hemorrhages, ruptures of muscles, fascia, tendons, ligaments, the nature of bone destruction, and damage to vessels and nerves. In the section “Diagnosis of Fractures”, Wegner provided a detailed description of fracture symptoms, which was particularly important in cases where radiography was not possible. He also listed the classification of fractures, explained the displacement of bone fragments, the process of fracture healing, and laid out the foundational principles for their treatment [13].

Wegner served as a consultant in orthopedics at the polyclinic of the People’s Commissariat of Health of the USSR and was actively involved in the publication of the Journal of Modern Surgery [1].

In 1929, Karl Fedorovych moved to Switzerland, settling in Bern, where he worked in the clinic of the renowned Dr. Steinmann. Unfortunately, little is known about his time in Switzerland, and further research is needed to better understand this period

of his life. Karl Fedorovych Wegner passed away in December 1940 [1].

Conclusions

Professor Karl Fedorovich Wegner was a remarkable scientist in the field of orthopedics and traumatology during the 19th and 20th centuries. He made a profound contribution to the development of both the theory and practice of bone fracture treatment. Wegner is particularly recognized as the founder of the skeletal extension method for treating fractures, a technique that dominated the field at the time.

Additionally, K. F. Wegner pioneered the use of metal structures in the treatment of bone fractures, an innovation that paved the way for the development of key areas in modern orthopedic surgery, such as intramedullary fixation and bone osteosynthesis. His work laid the foundation for significant advancements in fracture treatment techniques, influencing the field for generations to come.

Professor K. F. Wegner made a profound contribution not only to the treatment of bone tuberculosis but also to the organization of medical care for patients with bone fractures, particularly in the context of combat trauma. He developed plans for establishing the Petrovskaya Factory Hospital and the Medical-Mechanical Institute, laying down the foundational principles for organizing specialized orthopedic and traumatological institutions to provide care for injured individuals.

Wegner is credited with founding the first domestic school of orthopedics and traumatology, where he mentored a distinguished group of scientists, including M. I. Sytenko, M. P. Novachenko, V. D. Chaklin, and many others. His influence extended far beyond his own time, and the legacy of his work continues to shape modern orthopedic practice.

The scientific achievements of Professor K. F. Wegner remain a valuable resource not only for the history of medicine but also for contemporary practices. Some of his treatment methodologies for musculoskeletal system pathologies still retain their relevance and importance today.

Conflict of interest. The authors declare no conflict of interest.

Prospects for further research. Future research could continue exploring Wegner's contributions to the organization of traumatology medical institutions, as well as investigating his life and activities during his time in Switzerland.

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K. F. VEGNER — AN OUTSTANDING SCIENTIST, FOUNDER OF THE NATIONAL ORTHOPEDICS AND TRAUMATOLOGY

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