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Theodor Kocher (1841-1917) and his outstanding contributions to surgery

Theodor Kocher (1841-1917) y sus contribuciones destacadas a la cirugía

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ABSTRACT

Theodor Kocher (1841-1917), an exceptional Swiss surgeon who described a technique for the safe removal of enlarged thyroid unraveled the true function of this endocrine gland but also made significant contributions to many other fields of surgery. Kocher was the first surgeon awarded the Nobel prize in Physiology and Medicine in 1909 for his work on the physiology, pathology, and surgery of the thyroid gland. He was professor and clinical director at Insel Hospital during 45 years. Kocher created the prominent Surgeon's School in Bern. He was the first president of the International Society of Surgery in 1903 and the founding president of the Swiss Society of Surgery in 1913.

Key words: Emil Theodor Kocher; Thyroidectomy/history; Nobel Prize; History, 19th Century; History, 20th Century; Switzerland. (Source: MeSH-BIREME)

RESUMEN

Theodor Kocher (1841-1917), excepcional cirujano suizo que describió una técnica para la extirpación segura del agrandamiento del tiroides y desentrañó la verdadera función de esta glándula endocrina, pero también hizo importantes aportaciones a muchos otros campos de la cirugía. Kocher fue el primer cirujano galardonado con el premio Nobel de Fisiología y Medicina en 1909 por sus trabajos sobre la fisiología, patología y cirugía de la glándula tiroides. Fue profesor y director clínico del Hospital Insel durante 45 años. Kocher creó la destacada Escuela de Cirujanos de Berna. Fue el primer presidente de la Sociedad Internacional de Cirugía en 1903 y el presidente fundador de la Sociedad Suiza de Cirugía en 1913.

Palabras clave: Emil Theodor Kocher; Tiroidectomía/historia; Suiza; Premio Nobel; Historia del Siglo XIX; Historia del Siglo XX; Suiza. (Fuente: DeCS-BIREME).

INTRODUCTION

The late nineteenth century marks the world, and especially Europe, for being revolutionary in social-political aspects, and the world of medicine and surgery witnessed the anesthesia's advance and the development of abdominal surgery with antiseptic measurements.

Surgeons founded that anesthesia's improve allowed them to perform more complex, invasive and precise maneuvers than they had dared to attempt before. For instance, the first successful hysterectomy, bilateral ovariotomy and many others complicated surgery.

During the period from late century XIX to century XX, scientific advances led to the regulation of the medical profession, the specialization of doctors, and the rise of auxiliary occupations. In the early Century XX reduced mortality from infectious diseases, mostly benefiting younger population groups, was concurrent with large-scale public health improvements, especially clean water ionized and sanitation [1].

Among many exceptional surgeons of the early century XX highlights Theodor Kocher (1841-1917), an exceptional Swiss surgeon described a technique for the safe removal of enlarged thyroid, and unraveled the true function of this endocrine gland but also made significant contributions to many other fields of surgery. Kocher was the first surgeon awarded the Nobel Prize in Physiology and Medicine in 1909 for his work on the physiology, pathology, and surgery of the thyroid gland. The aim of this paper is to provide a brief review about Kocher's outstanding contributions to surgery [2].

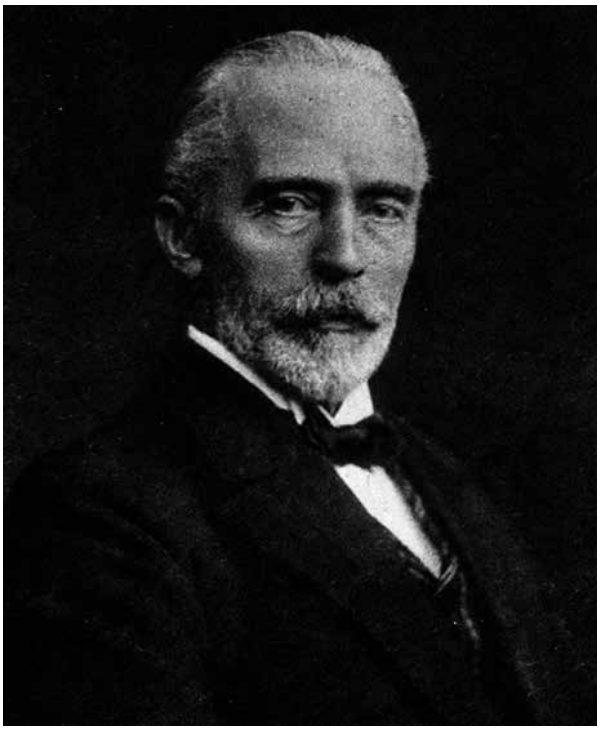

Figure 1. Theodor Kocher (1841-1917)

MEDICAL STUDIES

Emil Theodor Kocher was born into a wealthy family from the area of Seeland outside Bern, Switzerland on 25 August 1841. His father Jakob Alexander Kocher was chief engineer in the office responsible with maintaining roads and waterways in the Canton of Bern and he was also a state expert for railway projects. His mother was Maria Wermuth**,** a religious woman who left a deep imprint on him and she was part of the Moravian Church together with Jakob Alexander Kocher. They raised a family of five sons and one daughter.

Emil Theodor Kocher was the second son **(**better known by his second name). After completion of his high-school studies as the first in his class, he completed medical school at the University of Bern from 1860 to 1865. Theodor Kocher was promoted to Doctor of Medicine in 1866 with his dissertation on *Behandlung der croupösen Pneumonie mit Veratrum-Präparaten* (The treatment of croup pneumonia with Veratrum preparations) under Professor Biermer [3].

MEDICAL CAREER

As soon as Theodor Kocher concluded his medical studies, he visited leading surgical clinics in Berlin, London and Paris (1865-1866) to deepen his surgical education, learning from pioneers such as Paget, Lister, Billroth, von Langenbeck and Virchow. Theodor Billroth and Joseph Lister were particularly influential in shaping Kocher's career [4].

During his studies in England, Theodor Kocher learnt from Joseph Lister, who introduced the concept of asepsis to the surgical world and became aware of new antiseptic surgical techniques. Besides in London, he observed Spencer Wells paved the way for surgical intervention in the abdominal cavity, previously avoided for fear of lethal infections.

Kocher returned to Switzerland and worked as assistant to Georg Lücke, a professor of surgery at the University of Bern. In 1872 Lücke left his position, the board of regents appointed Theodor Kocher as chairman of the University Clinic of Surgery at the age of 31 years. Kocher held the position full professor of surgery until his professorship' retirement in 1911, but he continued to operate until the day before his death.

Kocher's surgery was initially based on morbid anatomy, and aimed to remove diseased tissue. He began resecting tuberculous foci in bones and joints, a procedure challenged from the 1890s. Early in his career he also began systematizing the technique of thyroid tissue's extirpation. Kocher as many surgeons of that time (late XIX and early XX centuries) performed orthopedic surgery, general surgery, neurosurgery and endocrine surgery.

Under Kocher's tenure, the surgical clinic in Bern became an internationally known center that attracted numerous leading surgeons of his time, for example William Halsted,

Harvey Cushing and Charles Mayo. Theodor Kocher developed a new style of surgery focusing on meticulous dissection of tissues, careful hemostasis, and strict adherence to antiseptic techniques. He carefully documented the clinical presentations, procedures and outcomes [5]. Kocher also introduced statistical evaluation in order to analyze mortality rates, complications and outcomes. Moreover, he performed epidemiological studies, e.g. on the incidence of goiter in the canton of Bern. Theodor Kocher published more than 140 publications, among them the outstanding textbook of surgery, *Chirurgische Operationslehre* (Surgical operation theory) which was printed in five editions and translated into many languages. Kocher's most important area of research, including 23 publications, focused on the surgery and pathophysiology of the thyroid. On the other hand, as a result of painstaking clinical-pathological observations he contributed to clinic-diagnostic neurophysiology by publishing the first complete chart of human dermatomes in 1896.This was important before the development of neuroradiology [6].

In *Magenresektion* (Resection of the stomach) he described a new procedure: pylorectomy with subsequent gastroduodenostomy. In *Excisio recti* (Excision of the rectum) preparatory excision of the coccyx was introduced, which had been initiated by Paul Kraske, and Theodor Kocher took this step further and also removed a piece of the sacrum (1874). Among Kocher's other more important works those on the theory of strangulated hernia (an experimental and clinical study in 1877) and acute osteomyelitis (1878). He published his method for the radical operation for hernia, and also a larger work on hernia in infancy in Gerhardt's Handbook (1880). Apart from hernias, Kocher busied himself very much with the surgery of the abdominal organs.

He also conducted research on the prevention of gastric aspiration, and the use of salt solutions to treat shock. Other works were on the radical cure of cancer, the surgical treatment of gastric complaints (1909). In *Choledocho-Duodenostomia interna* (Internal choledocho-duodenostomy) he established the procedure for excision of gall stones from the lowest part of the bile duct. In *Mobilisierung des Duodenum* (Mobilization of the duodenum) he greatly advanced all the operations affecting the duodenum. With Dr. Matti he wrote *Hundert Operationen a den Gallenwegen* (A hundred operations on the bile ducts): this improved earlier surgical treatment of gall stones and simplified them in the form of ideal cholecystectomy. Other larger works dealt with ileus and with diseases of the male sexual organs, injuries of the vertebral column and fractures. Then followed *Zur Kenntnis der traumatischen Epilepsie* (On our knowledge of traumatic epilepsies) and *Über einige Bedingungen zur Operativen Heilung der Epilepsie* (On some conditions for the operative cure of epilepsy), and papers on injuries and concussion of the brain and trepanning. Kocher also devised a new treatment for «pes varus» and published a well-illustrated work on phosphorus necrosis and another on coxa vara [7].

ROLE IN THYROID'S SURGERY

Theodor Kocher (figure 1) introduced a new operative manner or style, profoundly different from the traditional one: This was a meticulously specific technique to dissect tissues with minimal blood loss. It was an out-of-time procedure, and it was rather slow but safe [8]. Kocher's anatomically precise dissecting technique greatly contributed to avoid infection of haematomas and of necrotic tissues. As for the thyroid, Kocher's technique amounted to a precise dissection directly on the capsule of the thyroid gland. This technique allows for the total and selective removal of all diseased thyroid tissue, if necessary of the entire gland. In Kocher's hands, even large goiters were removed without damage to the laryngeal nerves and the parathyroid glands, even though the anatomy (1880) and function (1891) of the latter were described only later.

One of his most important contributions was to reveal the function of the thyroid gland, through the observation and study of thyroidectomyzed patients, for which he was recognized by the academic and scientific community during the early twentieth century. Emil Theodor Kocher was the first surgeon awarded with the Nobel Prize in the field of physiology and medicine. in 1909 due to his work in physiology, pathology, and thyroid gland surgery, which allowed him the discovery of its function throughout the excision or removal of this gland. This made surgery indivisible from medicine and turned it into an essential element in the treatment of certain diseases, which until that very moment could only be medically treated or by means of radical changes in lifestyle. In Kocher's surgical procedure in the thyroid gland, the mortality decreased progressively from 14% in 1884 to 0.18% in 1898. In fact, remarkable, when the era in which he was undertaking the operation is considered. Kocher donated his Nobel Prize money for a research institute, which bears his name in Bern Switzerland[2,9].

Other contributions

In addition to his work on the thyroid, Kocher made significant contributions to many fields of surgery. This included, among others, a new method to reduce dislocations of the shoulder, innovative approaches to hernia repair, orthopedics, urology, shock, spinal cord and brain lesions, gun wounds, osteomyelitis, hemostasis, asepsis and gastrointestinal surgery. He also described the 'Kocher's maneuver' mainly to explain how the head of the pancreas may be mobilized and assessed during an operation. This facilitates operations on periampullary forms of cancer, chronic pancreatitis, duodenal ulcer, and pancreas and duodenal trauma.

Moreover, he designed new techniques and instruments to approach other organs as the gallbladder. Kocher empowered the existing techniques for inguinal hernia radical surgery throughout invagination and introduced improvements in the intervention of organs as stomach, lung, and tongue. Theodor Kocher performed successful surgeries due to his deep knowledge in anatomy and physiology and precision in surgical techniques. In this

way Kocher contributed in shifting the point of view about the surgeon's job at the early century XX [10].

In the anesthesia's field, the problem of narcosis also took up a considerable part of Kocher's research efforts. His contribution was primarily the sequential chloroform-ether narcosis and the design of better masks for narcosis. He also introduced the preoperative preparation of patients who were to be subjected to narcosis, in particular to avoid life-threatening aspiration of the gastric content. His intravenous use of salt solution for acute preoperative shock was also trailblazing.

Kocher's contributions were collected by the anatomical eponymy of the time and these terms have largely been replaced on the Terminology Anatomical of our days. Others Kocher's medical and surgical eponyms still remain as: Spoon-shaped probe for goiter operations. Kocher's reflex: Contraction of the abdominal muscles following moderate compression of the testicle. Kocher's sign: Eyelid phenomenon in hyperthyroidism and Basedow's disease. Kocher's arced incision Oblique incision for opening the knee joint. Kocher's incision I: Oblique abdominal incision over the thyroid gland paralleling the thoracic cage on the right side of the abdomen for cholecystectomy. Kocher's incision II: Transverse incision over the thyroid gland in the neck for thyroidectomies. Kocher's method I: A method for fixation of the uterus. Kocher's method II: Invagination method for radical operation for inguinal hernia. Kocher's method III: Method for reducing dislocations of the shoulder. Kocher's syndrome: Splenomegaly with or without lymphocytosis and lymphadenopathy in thyrotoxicosis. Kocher's tweezers, forceps and others. The useful arterial clamp developed by Theodor Kocher in 1882 bears his name to this day [1,2].

Kocher's growing fame as an instructor, researcher and author brought him offers of full professorship and department chair from Europe's top universities. But he remained true to his home university, and during his 45 years' service here as professor and clinical director at Insel Hospital, he also created the prominent Surgeon's School in Bern.

Kocher's reputation was spread by his pupils and patients. Theodor Kocher was the first president of the International Society of Surgery in 1903 and the founding president of the Swiss Society of Surgery in 1913 [11].

PERSONAL SIDE

Theodor Kocher married Maria Witchi-Cournant in 1869 and had three sons, one succeeding him at the Bern surgical clinic. Albert Kocher (1872-1941) became Assistant Professor of Surgery and gave his father considerable help in his work. Theodor Kocher did not have many interests outside of surgery but play tennis with his sons. Kocher was a humble man of strong religious convictions, was highly focused on his professional life. He was appreciated by his patients, his trainees and peers. After retiring his professorship in 1911, he continued to operate until his death from renal failure at the age of 75 years. Theodor Kocher died at Berne on July 27, 1917 [3,12].

DISCUSSION

Theodor Kocher (1841-1917), was an exceptional surgeon who made significant contributions to many fields of surgery. He described a technique for the safe removal of enlarged thyroid, and unraveled the true function of this endocrine gland. Kocher was a professor and clinical director at Insel Hospital during 45 years. He also created the prominent Surgeon's School in Bern. Kocher contributed in shifting the point of view about the surgeon's job at the early century XX. As part of his contributions to Medicine, Kocher's medical and surgical eponyms still remain. He developed his helpful clamp in 1882, even in use to this day. He was the first president of the International Society of Surgery in 1903. Theodor Kocher was the first surgeon awarded the Nobel Prize in Physiology and Medicine in 1909 for his work on the physiology, pathology, and surgery of the thyroid gland. He received honorary memberships of numerous universities and professional societies. Theodor Kocher was the founding president of the Swiss Society of Surgery in 1913.

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