

Sigmund Freud (1856-1939) e Karl Köller (1857-1944) e a Descoberta da Anestesia Local*

Sigmund Freud (1856-1939) and Karl Köller (1857-1944) and the Discovery of Local Anesthesia

Almiro dos Reis Jr, TSA¹

RESUMO

Reis Jr A — Sigmund Freud (1856-1939) e Karl Köller (1857-1944) e a Descoberta da Anestesia Local.

JUSTIFICATIVA E OBJETIVOS: O entendimento por vezes admitido de que Sigmund Freud teve a intuição de utilizar a cocaína como anestésico local para intervenções cirúrgicas, ou mesmo de que ele tenha tido algum papel na descoberta da anestesia local não é verdadeiro. Os objetivos das pesquisas de Freud eram outros e o verdadeiro realizador da descoberta foi Karl Köller, sobre o que há argumentos irrefutáveis. Diante desses fatos, tem importância histórica o conhecimento correto da questão.

CONTEÚDO: O texto refere-se às propriedades há muito conhecidas da cocaína. Recorda dados pessoais, atividades profissionais e científicas de Sigmund Freud e de Karl Köller. Apresenta as pesquisas de Freud sobre efeitos fisiopatológicos observados com a cocaína. Expõe as razões das duras críticas recebidas por Freud diante de conceitos por ele emitidos. Descreve a súbita, porém consciente e justificada idéia de Karl Köller de estudar cientificamente a cocaína como anestésico local em animais e seres humanos. Indica como foram realizadas as pesquisas pioneiras que culminaram com a descoberta da anestesia local por Köller e as duas exposições sobre esta, feitas em Viena. Relata a primeira intervenção cirúrgica oftalmológica sob anestesia local. Comprova a imediata difusão pelo mundo da descoberta que marcou o início da anestesia locorregional. Comenta numerosos documentos comprobatórios da prioridade de Köller na descoberta. Finalmente, menciona as numerosas homenagens recebidas por Köller em várias partes do mundo.

CONCLUSÕES: A anestesia locorregional foi iniciada por Karl Köller em 1884, quando ele provou a possibilidade de praticar intervenções cirúrgicas oftalmológicas sem dor utilizando a cocaína como anestésico local. Sigmund Freud realizou muitas pesquisas sobre a cocaína, mas não participou diretamente do importantíssimo feito.

Unitermos: ANESTESIA, Regional: local; ANESTESIOLOGIA: história.

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SUMMARY

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BACKGROUND AND OBJECTIVE: The understanding, occasionally recognized, that Sigmund Freud had the intuition to use cocaine as local anesthetic for surgical procedures, or even that he played any role in the discovery of local anesthesia is not true. The objective of Freud's studies were different, and based in irrefutable evidence, Karl Köller was the real inventor of local anesthesia. In face of those facts, proper knowledge of this historically important subject is due.

CONTENTS: This report refers to the long-known properties of cocaine. It also remembers personal data, and the professional and scientific activities of Sigmund Freud and Karl Köller. It presents Freud's researches on the pathophysiological effects of cocaine. It exposes the reasons for the harsh criticism of Freud's concepts. It describes the sudden, but conscious and justified, idea of Karl Köller to study scientifically the use of cocaine as a local anesthetic in animals and humans. It indicates how those pioneering studies, that culminated with the discovery of local anesthesia by Köller and two presentations in Vienna on the subject, were done. It also reports the first ophthalmologic surgery under local anesthesia. It shows the immediate dissemination throughout the world of the discovery that marked the beginning of regional blocks. It comments several documents corroborating the role of Köller in this discovery. And, finally, it mentions the numerous homages received by Köller in different areas of the world.

CONCLUSIONS: Regional block was introduced by Karl Köller in 1884, when he demonstrated the feasibility of performing painless ophthalmologic surgeries by using cocaine as a local anesthetic. Sigmund Freud studied cocaine extensively, but he did not have direct participation in this important discovery.

Key Words: ANESTHESIA, Regional: local; ANESTHESIOLOGY: history.

INTRODUÇÃO

A anestesia local surgiu há 124 anos e somente 62 anos após o início da anestesia geral, criada há 166 anos. Em algumas publicações, inapropriados pinçamentos de frases incluídas em escritos de Sigmund Freud dão a entender que ele teve a intuição de poder conseguir anestesia local com finalidade cirúrgica e/ou que teve relevante participação na descoberta desta, o que é totalmente inverídico^{3,12}. Este artigo visou a descrever como os fatos realmente ocorreram, desde seus preâmbulos até a conquista final da

estatutárias. Em 1922, a Sociedade Americana de Oftalmologia criou e ofereceu a Köller uma medalha de ouro. Em 1927, a Sociedade Internacional de Pesquisa em Anestesia presenteou-o com um pergaminho comemorativo dos seus 70 anos. Em 1928, a Universidade de Heidelberg ofereceu-lhe a medalha Kussmaul em comemoração à descoberta que foi anunciada pela primeira vez naquela cidade. Em 1930, a Academia de Medicina de New York comemorou o cinquentenário da descoberta da anestesia local, oferecendo-lhe a primeira medalha de honra em ouro da Instituição. Em 1934, por ocasião do quinquagésimo aniversário da descoberta de Köller, a Academia Americana de Oftalmologia e Otorrinolaringologia presenteou-o com outra medalha de honra em ouro. No mesmo ano, a Sociedade Alemã de Oftalmologia relembrou seu feito e consagrou-o como o descobridor da anestesia local. Ainda em 1934, foi publicado um longo artigo, reedição de um ensaio do Prof. J. Meller, em homenagem a Köller pela descoberta da anestesia local. Karl Köller foi eleito membro honorário de várias sociedades médicas: da Sociedade Médica de Viena, da Sociedade Americana de Fisiologia e Farmacologia, da Real Academia Médica de Roma e da Sociedade dos Médicos de Budapeste.

Sigmund Freud (1856-1939) and Karl Köller (1857-1944) and the Discovery of Local Anesthesia

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INTRODUCTION

Local anesthesia was introduced 124 years ago, only 62 years after general anesthesia, which was introduced 166 years ago. In some publications, the inappropriate selection of sentences from the works of Sigmund Freud leads one to believe that he had the intuition that he could induce local anesthesia for surgeries and/or that his participation in its discovery was paramount, which is not true^{3,12}.

The objective of this report was to describe how the facts really happened, since its preambles until the final victory of local anesthesia, demonstrate the secondary role played by Sigmund Freud, and reveal that Karl Köller was responsible for one of the greatest discoveries in the history of medicine, which is recognized all over the world. The discovery of local anesthesia represents a decisive victory in the fight against pain, and an extremely important step in the history of anesthesia. With the passing of time, the work of Köller was forgotten and his name was frequently omitted in publications on the discovery of local anesthesia, which marked the beginning of regional blocks².

SIGMUND FREUD AND COCAINE

Sigmund Freud was born in Morava on March 6, 1856, and died in London, on September 23, 1939². He studied jurisprudence for one year in 1875, and in 1876 he changed his focus to medicine, graduating in March 1881 at the University of Vienna. He studied several medical subspecialties, such as Physiology, Internal Medicine, Dermatology, and Neurology². He decided to dedicate himself to Psychiatry, writing several works on the subject, including the famous "The Interpretation of Dreams" in 1900, becoming one of the pioneers of psychoanalysis and, from 1920 on, neuropathology professor at the same University^{2,4}.

Detailed experimental studies on the pathophysiological effects of cocaine by Neumann in 1860 using the alkaloid erythroxyline isolated by Gaedicke in 1855 disseminated especially by the pharmacologists Schroff and von Anrep, between 1862 and 1880, demonstrated that the oral or local administration of the drug caused mydriasis, vasoconstriction of peripheral arteries, and numbness of the tongue; von Anrep even admitted that the anesthetic actions of cocaine might eventually be of medical importance^{2,5}.

Inspired by the studies of Schroff and von Anrep, a young Freud decided to study cocaine and wrote: "A secondary interest but, however, very real, made me order, in 1884, cocaine, that little-known alkaloid, to study its physiological effects"^{1,2}. However, feelings of thickening and numbness of lips and tongue, and some of the systemic effects of cocaine had already been known to the natives of the Andean region of South America for several centuries.

Initially, Freud searched the literature for everything that had been published on cocaine and once he obtained the drug he dedicated himself to its study^{1,2}. He ingested it on several occasions and he felt that cocaine when taken by mouth "exerted a curious unsensitizing effect on the nerves of the tongue"^{1,2,6}; he used it as an antidepressant drug, including in the treatment of his own depression, and considered it to be a "magical drug"^{2,3}. He indicated it to his good friend, Karl Köller, and other physicians, asking them to report its stimulating effects². He even sent some cocaine to his fiancée to "strengthen her and give a pink hue to her face"², his sisters, and other friends and colleagues.

In his extensive review article (*Über Coca*), finished in May and published in July of 1884 when he was still a resident at the General Hospital of Vienna, Freud described the historical use of cocaine in its countries of origin and the regions where it was cultivated; the botanical characteristics of the bush *Erythroxylon coca*, its reproduction, harvest calendar, and processing of the leaves; the pathophysiological effects of the drug in animals and healthy humans; and its therapeutic actions, such as anti-melancholy, antiemetic, and sedative, and he mentioned the results obtained in the treatment of heart disease, stress, diabetes mellitus, cachexia, morphine and alcohol addiction, asthma, and other diseases². At the end of this work, Freud stated: "The pro-

perty of cocaine and its salt, i.e., numbness of skin and mucous membranes that have contact with concentrated solutions of the drug, should lead to other uses, especially in disorders of the mucous membranes, allowing us to think that it will be possible to use it in the future, especially in cases of local infections... Due to its anesthetic property, the use of cocaine will be, in the near future, widespread", and "...other uses originating from the anesthetic effects of cocaine may as well be developed"^{2,3,5,7-9}. This publication was both well-received and had in a short period of time an unexpected collateral and long-reaching effect, although independently from Freud, the introduction of local anesthesia, in which he did not participate directly.

Freud and other investigators had observed that cocaine had a unique property, to cause paralysis of the peripheral nervous system, eliminate the transmission capacity of specific nerves, and blocks, temporarily, the sensitivity in specific areas¹. But it is clear, from Freud's publications, that it never occurred to him to use the drug as a local anesthetic in surgeries; the attention of the future creator of scientific psychoanalysis was focused on other interests^{2,3,8,9}. Freud did not favor the subcutaneous administration of cocaine, but in February 1885 he stated: "It is never too much to emphasize that, even subcutaneous injections – such as the ones I have been using successfully in cases of prolonged sciatic pain – are completely harmless. The toxic dose in humans is too high and it does not seem to have a lethal dose"².

Until mid 1884, cocaine seemed to be promising and harmless, a powerful tonic, and a morphine antidote with several possible uses, which should not be restricted². Around 1863, the French chemist Angelo Mariani prepared a medication with the infusion of coca leaves in wine, whose use was supported by well-known physicians of that time, in the form of elixir, lozenges, and tea for the treatment or prophylaxis of several disorders².

In March 1885, at a conference of the Psychiatric Society on the treatment of morphine addiction with cocaine, Freud stated: "I would, without hesitancy, recommend that one should not avoid dose accumulation"². In 1887, Freud wrote: "Cocaine is most promising in the treatment of morphine, and perhaps alcohol, addiction" and "cocaine is not habit-forming, one can stop using it very easily, and, after prolonged use, it can cause aversion and not desire"². Freud would eventually regret those statements. His good friend, the young and talented pathologist Ernest Fleischl-Marxow had a thumb infection that developed neuromas in the amputation stump; due to the unbearable pain, he became addicted to morphine. Sigmund Freud and Joseph Breuer, Fleischl's physician, tried to treat his morphine addiction substituting it by cocaine, and stimulated him to take high doses of this drug (approximately 100 times the dose Freud used occasionally); therefore, Fleischl became one of the first cocaine and morphine addicts similar to another physician and famous writer Sir Arthur Conan Doyle (the creator of Sherlock Holmes), which, at the time, was known as the "double

addiction"^{1,2}; Fleischl died in 1891. In regards to this episode, Freud wrote: "The mistaken use of cocaine anticipated the death of a great friend of mine"². At that time, the addicting potential of cocaine was not known^{2,10}, but "with the privileged point of view of our current knowledge, Freud was quickly becoming a public danger!"²

There is a generalized concept that the studies of Freud on cocaine were interrupted in June 1887 when he wrote, after the discovery of local anesthesia: "The general usefulness of cocaine is limited by the lack of reliability. Except for its anesthetic properties, which is not variable, reaction to cocaine varies according to individual excitability and the specific state of vasomotor nerves, which are affected by this drug"². In fact, Freud used cocaine until 1895, but he did not publish anything else on the drug and what he considered to be its wonderful attributes, dedicating his time to other endeavors².

The experience of Freud with cocaine was tough and his desire for fame was crushed by the criticisms regarding its use. The neuropsychiatrist F. A. A. Erlenmeyer was strongly opposed to the use of cocaine to treat morphine addiction, which he considered would become "the third scourge of humankind, after opium and alcohol"². Similarly, the journal Medical Record stated: "At the present time, we know little or nothing at all about its possible poisonous effects in large doses. We hope that it will not be demonstrated by a risky experiment"².

During the summer of 1884, Freud travelled to Wandersbeck, close to Hamburg, where his fiancée Martha Bernays had moved to, marrying her in 1886^{2,5}. He stayed there for one month and left the ophthalmologist Leopold Königstein in charge of testing the effects of cocaine and its properties in "eye infirmities" like the relief of the pain caused by trachoma, reduction of the secretion caused by ocular diseases, and vasoconstriction; in fact, we do not know which "eye infirmities" Freud had in mind^{2,3,5,7}.

History shows that Freud regretted not studying this matter any further. In his autobiography, Freud stated: "My studies with cocaine ended prematurely and I was content in predicting, in my book on the subject, the novel uses of this drug that would soon be discovered"². In an auto-criticism, Freud stated that "if, instead of counseling Königstein on eye experiments, I had had a firm belief and pursued them, I would not have left the fundamental fact to escape. But, with all the disbelief that surrounded me, I lost my direction"².

Freud was a pioneer in the study of some aspects of cocaine, and he could have discovered local anesthesia, as well as others before him but who also missed the opportunity. It seems that Freud had good understanding of the analgesic possibilities of cocaine and was virtually on the verge, but did not have the means of consummating the project, simply because he never thought on its surgical applications. Königstein who, like Köller, was an ophthalmologist and had the support of Freud, could have studied topical ocular anesthesia for surgical procedures, but that was not his primary interest.

KARL KÖLLER AND THE DISCOVERY OF LOCAL ANESTHESIA

Karl Köller, a young physician with only 27 years, the only son of Leopold Köller, a merchant, was born in Schüttenhofen, which at that time belonged to Austria, and practiced medicine at the same hospital as Freud, the Royal General Hospital, an annex of the University of Vienna where he trained during his residency, living with a small stipend^{2,5,11}. Köller was a difficult and troubled young man who could never be forced to be diplomatic, not even for his own good, who was always speculating about unknown and unresolved problems; he was honest, and had a stimulating, loyal, trustworthy, and fearless personality².

Until 1884, cold, by means of the local application of snow and ice or a mixture of ice and salt, was the method used more often to desensitize peripheral areas of the body^{1,2}. In 1867, Sir B. W. Richardson performed several painless surgical procedures by projecting volatile liquids especially ether on the skin^{1,2}; using ethyl chloride, introduced shortly after, this method persisted precariously until the beginning of the third quarter of the 20th Century, being used by surgeons and it is most likely known by anesthesiologists who stated in the specialty before that period.

Hortense Köller Becker, daughter of Karl Köller, tells that the ophthalmology professor at the university, Arlt, "explained to my father the inconveniences of narcotics, in general, and even the great danger of using them in ophthalmologic surgeries, which called his attention for the need of a local anesthetic for those surgeries"². The idea stimulated Köller, who decided to specialize in this medical field, and awakened in him the deep interest in finding it²; for such, he studied several drugs, like morphine and chloral hydrate, but he was not successful².

In August 1884, Köller discovered references on local analgesia caused by cocaine; he studied carefully the reports of von Anrep on the numbness of mouth and lips and the description that the injection of cocaine under the skin and embrocation of mucous membranes caused loss of tactile sensitivity and pain². He studied attentively the famous Freud publication (*Über Coca*); he also reviewed the pharmacology compendium he studied at the University where he read "Cocaine has not had any medical use so far" and that "15 minutes after its application to one side of the tongue, it was impossible to distinguish sugar and salt, and that even pin prick could not be felt, but it was felt on the other side; this lasted between 25 and 100 minutes"². After those readings, Köller reached immediate and logical conclusions; since he practiced internal medicine and ophthalmologic surgery, instead of internal medicine and psychiatry, his evaluation of the properties of cocaine differ from Freud's. Thus, he was steered to examine the effects of this drug on the conjunctiva and cornea of animal eyes^{1-3,5,7}.

Köller tried to contact Freud, but he was unable². Köller's daughter transcribed the text of his father explaining what

happened²: "On certain occasion", said my father, "another colleague, Dr. Engel, shared some (cocaine) with me, on the tip of his pocket-knife, and observed: It really numbs the tongue! To which I replied: yes, this has been noticed by everyone who has eaten it. At that moment I realized that I was carrying in my pocket the local anesthetic I had been searching a few years ago".

He headed immediately to the Anatomy Institute of Prof. Solomon Stricker taking a small container with a white powder and said to the young assistant, Gärtner^{1-3,7}: "I expect, actually, I do believe this powder will make the eye insensitive." "We are going to find out right now", he answered. As the sole eyewitness of the birth of local anesthesia in 1919, Gärtner, worried about the erroneous reports that would eventually be associated with the history of the event, recalled their first experiment and how cocaine was introduced as a local anesthetic in ophthalmology, leading to the creation of local anesthesia^{1-3,5,7,13}. "A few particles of the substance were dissolved in a small amount of distilled water, a frog was taken from the vivarium, wrapped in a cloth, and immobilized. We placed a drop of the solution on one of the eyes and the corneal reflexes were tested every few seconds. For one minute, nothing unusual happened. And then came the great historical moment: the frog allowed its cornea to be touched and did not demonstrate reflexive or defensive reaction to a small wound on the cornea. When the eye treated with cocaine was scratched or pricked, the frog calmly looked at us in a state of complete indifference, but reacted with the usual agitation to the slightest touch on the other eye. Identical tests were done on a rabbit and a dog. The results were equally favorable. Then, another step had to be taken: repeat the tests in humans, and it was done. We placed a drop of the solution under the eye lids of each other. We stood in front of a mirror and tried to touch our corneas with the head of a pin. Almost simultaneously we were saying: I don't feel anything! The experiments took no more than one hour. I am happy for being the first one to congratulate Dr. Köller as a benefactor of the humankind". This fantastic feat was not the result of chance; cocaine ended up on the hands of someone interested in local anesthesia, who wanted to produce it to be used in surgeries.

Köller preliminary observations, hastily written on both sides of one single page, were presented in the Ophthalmology Congress of the German Society held in Heidelberg, on September 15, 1884, but not by Köller, since he could not afford the trip, but by the Triestin ophthalmologist Josef Brettauer who had stopped in Vienna on his way to the Congress^{1-3,5,7}. In this first presentation, translated and republished in 1934 by an ophthalmology journal, Köller had written that "cocaine was competently brought to the attention of Viennese physicians by the careful compilation and interesting therapeutic assay of my colleague, Dr. Sigmund Freud"^{2,3,5,7,14,15}.

Dr. Henry Drury Nouys, who attended the Congress and was present during the presentation of Köller's work, sent immediately to the journal *Medical Record*, of the USA, a report of

what he had witnessed, which was published on November 11 of that same year in which he said that "it was discovered by a very young physician, and the future that this discovery opens up for ophthalmologic surgery and medication is obvious"². Since cocaine muriate was easily found in New York, several studies with the local anesthetic were undertaken, and important facts were discovered before other European publications by Köller were known².

On October 17, the work was presented once again at the Vienna Medical Society by Köller, who had already read the article on ocular surgeries he published^{2,3,7}. At that time, Jallinek, who had used cocaine in ENT by suggestion of Köller himself, also reported the results he obtained^{1,2}. Köller's conduct was severely criticized because, maybe by mistake, he mentioned Freud's monograph as if it were from August, and not July, giving the impression that they were simultaneous; later, he stated that this monograph was published one year after his work².

Köller's experience was extremely simple, and it seems odd that, in face of countless observations of numbness of the tongue and lips, and even with experiments on the eyes, this was not discovered by any of the brilliant scientists who had been studying cocaine for 25 years². Schroff, von Anrep, Montegazza, Moreno y Maiz, and De Marles, besides English, Russian, French, and German investigators did not realize that cocaine blocked the sensitivity of the conjunctiva or, if they did, they did not notice its meaning^{2,3,10,16}. In fact, anyone with a medical background who had studied the alkaloid had enough information to infer the discovery of local anesthesia of the eyes². Even Köller, who was dedicated at assisting Freud on his studies on the general effects of cocaine, only had the exact notion of its anesthetic possibilities after acquiring the drug and witnessing its effects.

In a short time, Köller's work caused admiration not only in Austria, but all over the world, and he received countless letters from different places sent by physicians, sick people, and surprisingly by an infantry officer who begged for the preservation of the eyesight of his favorite animal². From October 1884 on, an avalanche of studies on Köller's discovery were published, and several articles were published by the best journals of the time, such as *The Lancet*, *Medical Record*, *Semaine Medicale*, and *Progrès Medicale*, stating this was a decisive step on the struggle of humankind against the horrors of surgical interventions². "All medical journals are echoing... and it is imagined that cocaine should be the tool that will ban chloroform from ophthalmologic surgeries"². In a few months, several cases of the successful use of the new discovery were reported in many countries². The price of cocaine increased immediately².

It has been said that "The eyewitnesses of the first painless surgeries thought they were witnessing a miracle when they saw a man sleeping who did not feel the incisions of the scalpel; those who witnessed the first surgical interventions with local anesthesia contemplated a second miracle, maybe even more extraordinary than the first: the individual

remained aware of him/herself and the environment"¹. We should not forget other aspect of this discovery: a young physician who suddenly became famous and handed his discovery to the world, similar to the attitude of Crawford Williamson Long, who discovered general anesthesia in 1842, but not like later participants of this medical act, namely Wells, Morton, and Jackson whom, from 1846 on thought of obtaining patents, awards, and financial advantages with the discovery of inhalational general anesthesia, including hiding the identification of the anesthetic used¹⁷.

Upon returning from his trip, Freud found out that Königstein did not completed the decisive experiences he had requested and that cocaine was the main topic of medical debates, and felt he that the drug he was excited about was more popular². However, by that time the news had already been disseminated all over continental Europe, England, and had crossed the Atlantic, corroborating that Köller had indeed discovered local anesthesia for use in surgical procedures^{2,3,5}. Freud vented his disappointment: "Cocaine brought me prestige, but the greatest share went somewhere else"².

Freud showed some regret for having left on a trip, leaving his studies with cocaine: "In my assay, I indicated that the alkaloid could be used as an anesthetic, but I was not meticulous enough to develop this matter even further"; he blamed his laziness and lack of will power and meticulousity for the omission². In his autobiography Freud stated: "I did not hold a grudge against my fiancée for interrupting my work"^{1,2}. On his biography of Freud published in 1924 Wittels admitted that Freud was annoyed for a long time². "Any way," says Freud in one of his reports, "it is good for cocaine, and my work has the reputation of having successfully recommended the drug to the Viennese people"².

Apparently, Freud was disappointed and irritated, at least at himself, but he did not manifest envy and remained a great friend to Köller; however, it took some time to assimilate that the recent use of cocaine as a local anesthetic would be virtually its only usefulness, making all the rest just dust and ashes². A classical quote is well-placed here: It is useless to seek scholarly knowledge everywhere, since men only learns what he is capable of.

Shortly after the discovery of Köller, Königstein, with the help of Freud, performed the enucleation of one of the eyes of a dog using cocaine as local anesthetic, and reported his experiments; however, he failed to mention the studies of Köller². In April 1885, Köller, who had diagnose glaucoma in one of the eyes of Freud's father, anesthetized him with cocaine, in the presence of Freud, and Königstein operated him^{3,5,7}. On this occasion, Köller observed: "the three individuals responsible for the introduction of cocaine are together"².

In a short time, the use of cocaine as a local anesthetic had increased and it was also used for local infiltration initially tested by the German chemist, Wölfler, assistant of the famous surgeon and professor of the University of Vienna, Billoth, and only after that it was adopted and developed by

K. L. Schleich^{1,2}. The use of peripheral nerve blocks started in 1892, mainly by the celebrated W. S. Halsted, Surgery Professor of the Johns Hopkins University and creator of the system of residency in Surgery, who was addicted to cocaine for some time because he injected the drug in himself several times during his investigations in New York^{5,6,14,18}. Cocaine was also studied by several other important investigators, who participated actively in the beginning of locoregional anesthesia, and, some years later, used this drug in nerve plexus and spinal blocks^{1,8,13,18}.

In 1887, Köller suffered with the severe anti-Semitism of that time. The problem reached a point that, at the end of 1884, he ignored Zimmer's order, Bilroth's assistant, and removed the tourniquet that was too tight from the finger of a patient who already risked losing it; he was rudely attacked, both verbal and physically; he responded the attack by punching one of Zimmer's ears. As a result, he was challenged for a fencing duel, on January 6, 1885, at the Infantry Fort in Josefstadt²; Zimmer sustained injuries on the head and right arm, and was sent to the General Hospital of Vienna. A police inquiry was instituted, but Zimmer told the district attorney he was compelled to challenge his colleague since otherwise he would lose his post as an officer in the Army reserves; Köller had the same post and was really affected by the episode, and only recovered after he was pardoned for participating in the fight². Freud supported Köller and gave him a present as a lasting remembrance of his victory². Their friendship lasted many years, but weakened in 1895 for unknown reasons².

In 1887, Köller moved from Vienna, having lived in Holland, France, Germany, and England². To that effect, Freud wrote Köller a letter (July 1885): "Your decision to return home does not make any sense... Stay away for as long as you can, and when you are ready, go to the United States. You will appreciate this advice"². Respecting the opinion of Sigmund Freud, and persuaded by his English friend, Arthur Ewing, Köller left Europe and went to the United States in May 1888 on the S. S. Saale a ship that still had sails. He lived in New York and worked at the Mount Sinai Hospital until his death in 1944, at the age of 84 years^{2,3,5,7,14}.

THE PRIORITIES OF KARL KÖLLER

It is true that "a new knowledge, a great discovery only happens when an investigator collects in his thoughts several isolated phenomena"¹. And that is what Karl Köller did. Several proofs indicate he was the real discoverer of local anesthesia. Besides the report by Gärtner, several other documents confirmed his discovery, such as letters from physicians congratulating Köller or asking for more information on his discovery, important testimonials, and several publications that his daughter found among his personal belongings. And finally, there are letters and reports written by Köller himself and several written by Freud.

On a letter from November 11, 1884, and subsequently published by the New York Medical Journal, in response to a request to an account of the discovery of local anesthesia, Köller wrote: "To convince myself of the wonderful effects of the drug on the body, I placed some alkaloid on my tongue and noticed the numbing effect of cocaine (which I knew from books). I imagined, then, that the influence of cocaine on the nerve endings of the conjunctiva and cornea should be similar to that of the tongue and, in this case, it would be extremely important... since we did not have a substance that produced anesthesia without concomitantly cauterizing the tissue". The journal added: "Therefore, Dr. Köller has the honor of the discovery, and his merit is even greater, since it was done by reasoning and not by chance..."².

In May 1927, in the United States, Köller talked about his reminiscences during the VI Annual Congress of Anesthesiologists, with participation of the International Anesthesia Research Society, which, after being revised in 1928, were published by the journal *Anesthesia and Analgesia Current Researches*, where one can read: "In the summer of 1884, Freud asked me to make a series of experiments (with cocaine) with him. Thus, Freud and I used to take the alkaloid by mouth... and... did experiments on our strength and muscular fatigue, measured by a dynamometer, and the speed of the effects of cocaine, and we tried to determine on what the individual differences of cocaine depended, and our conclusions were not definitive"^{2,19}. This statement confirmed the real intentions of Freud, which were not related with obtaining anesthesia for surgical interventions.

Freud wrote several texts on the discovery of local anesthesia, but only a few will be mentioned here. They make it clear that, as far as he was concerned, Köller was the one really responsible for the discovery of local anesthesia.

Shortly after returning to Vienna, Freud wrote: "When I returned from my trip, my friend, Karl Köller, to whom I spoke about cocaine, had undertaken decisive experiments on animal eyes, and communicated them to the Ophthalmologic Congress in Heidelberg. Therefore, he is justly considered the invention of local anesthesia, which has served minor surgeries well"^{1,2}. On a letter to Köller dated January 1885, Freud wrote: "I hope you will always be the same you have been this past days and weeks, a benefactor of humankind and the pride of your friends"².

Freud signed one of his articles with this witty dedication to Köller: "To my dear friend Coca Köller from Sigmund Freud"^{2,6}. In this article one can read: "While Dr. Königstein followed my suggestion and tested the numbing effect and reduction of secretions caused by cocaine on a sick eye, Dr. Köller, my colleague at the hospital, independently from my suggestion, conceived the idea to use cocaine to produce complete anesthesia and analgesia of the cornea and conjunctiva... and later he demonstrated the practical importance of this local anesthetic by experimenting in animals and in surgeries in humans. As a consequence of Dr. Köller's communication, cocaine was adopted everywhere as a local anesthetic"². In

1885, in the re-publication of his original work (*Über Coca*), one can read: "This use of cocaine has received universal approval through the application of cocaine on the cornea by Köller... and guaranteed a lasting place in medicine"².

In January 1886, Freud wrote Köller a letter stating: "It has been approximately one year since I noticed, for the first time, you were a valuable individual. Great discoveries are always made by great men". In 1935, Freud wrote in his autobiography: "Köller is certainly seen as the person who discovered, through cocaine, local anesthesia, which has become extremely important in small surgeries"².

Other testimonials from other great scientists, namely Herman Knapp, a German who had been living in the United States for many years, one of the greatest ophthalmologists of New York, thought the time had come to organize and summarize the sequence of events on cocaine. He said: "No modern medication was received with such general enthusiasm, no other fact was popularized as fast, and it is hard to find any other that demonstrated such a wide useful application as cocaine, the local anesthetic recently introduced by Dr. Köller, from Vienna"². He finishes by saying that "we have a debt of gratitude with Köller"². August Karl Gustav Bier, one of the greatest surgeons of Germany at the time, who introduced the intravenous regional anesthesia and spinal block, was not intimidated by the Nazi anti-Semitic philosophy and dared to speak openly about the scientific contributions of Jewish physicians and wrote, in his book *The History of Medicine* (1938): "Nobody but Dr. Köller is responsible for the tremendous contribution of local anesthesia. Local anesthesia was unknown until 1884 (Köller, Heidelberg, 1884). After that, only modifications were seen."² In the same publication, Bier wrote a sentence that is still currently true: "What has the contemporary history of Medicine or even the general opinion been doing with those obvious facts? Show me only one book on the history of medicine in which the service of Dr. Köller to medicine is properly demonstrated according to its relevance"².

Despite having said all this about Köller, curiously, in his autobiography (1942), he wrote about his opinion for Anesthesiology: "There are professional anesthesiologists in the United States. Even in Germany such institution is frequently praised. I cannot imagine anything more boring"⁶. Bier was, obviously, completely mistaken; far from being boring this specialty has become very interesting, complex, stressful, and extremely useful to Medicine besides rewarding, due to what it can do for patients.

Despite the large body of evidence documenting the priority of Karl Köller regarding the discovery of local anesthesia, two attempts were made by L. Königstein and M. J. Rossbach claiming the authorship of the discovery².

On October 19, 1934, on the occasion of the 50th anniversary of the discovery of local anesthesia, Köller wrote a paper correcting several mistakes made by newspapers on the subject. He stated: "Dr. Königstein regretted deeply letting escape through his fingers such an important event and,

when I read my essay on cocaine on October 17, 1884, he also read his essay, in which he stated that cocaine seemed to be an anesthetic, but he did not mention that I had undertaken the experiment before him. To avoid an inconvenient altercation on the priority, Drs. S. Freud and J. Wagner made Dr. Königstein publish a letter stating he recognize as mine the priority of using the anesthetic properties of cocaine with practical purposes. Dr. Freud himself never made any claims regarding this matter."² At that time, Freud sent a letter to Köller stating he was surprised that Königstein had not mentioned Köller in his essay².

M. J. Rossbach, director of the Pharmacology Institute of Würzburg, where von Anrep conducted his investigations with cocaine, also claimed that the work of this investigator was ignored by Köller and wrote the "Protest of Priority"². Köller presented his response, summarized here²: 1) He gave the proper credit to the contribution of von Anrep when he wrote: "In 1880, Dr. von Anrep wrote a comprehensive experimental study on cocaine, whose conclusion emphasized that its local anesthetic properties could become very important" and added: "Therefore, I regret that Professor Rossbach have not bothered to even look at my paper"; 2) "There can be no doubts on the priority of von Anrep regarding the analgesic effects of cocaine on mucous membranes, since it was already known to the first man in Europe to investigate cocaine, Professor Schroff, as well as all those that followed"; 3) "I never claimed the merit of discovering this useful physiological characteristic of cocaine, although its effects on the cornea had never been tested before. I just took the proper steps to make it adequate for use in the practice of medicine, especially in Ophthalmology, the known or easily deductive effects of cocaine".

TRIBUTES TO KARL KÖLLER

Köller received several tributes for his important discovery^{2,5,7,14}. From 1921 on, Köller received several indications for the Nobel Prize in Medicine, but he was never awarded the prize, supposedly for statutory reasons. In 1922, the American Ophthalmological Society created and awarded Köller a gold medal. In 1927, on his 70th birthday, the International Anesthesia Research Society awarded him a commemorative scroll. In 1928, the University of Heidelberg awarded him the Kussmaul medal to celebrate the discovery that was announced, for the first time, in that city. In 1930, the Academy of Medicine of New York celebrated the 50th anniversary of the discovery of local anesthesia by awarding him the first medal of honor of the institution. In 1934, on the occasion of the 50th anniversary of Köller's discovery, the American Academy of Ophthalmology and Otorhinolaryngology awarded him another gold medal. That same year, the German Society of Ophthalmology remembered his greatest accomplishment and acclaimed him as the inventor of local anesthesia. Still in 1934, a long paper, the reprint of an essay of Professor J. Meller celebrating Köller for the discovery of lo-

cal anesthesia was published. Karl Köller was elected honorary member of several medical societies: the Medical Society of Vienna, American Society of Physiology and Pharmacology, Royal Medical Academy of Rome, and Medical Society of Budapest.

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RESUMEN

Reis Jr A — Sigmund Freud (1856-1939) y Karl Köller (1857-1944) y el Descubrimiento de la Anestesia Local.

JUSTIFICATIVA Y OBJETIVOS: *Los que a veces se cree de que Sigmund Freud tuvo la intuición de utilizar la cocaína como anestésico local para las intervenciones quirúrgicas o incluso de que él haya tenido algún rol en el descubrimiento de la anestesia local, no es verídico. Los objetivos de las investigaciones de Freud eran otros y el verdadero realizador del descubrimiento fue Karl Köller, sobre lo que ofrece argumentos irrefutables. Frente a esos hechos, el correcto conocimiento de esa cuestión, tiene una importancia histórica.*

CONTENIDO: *El texto se refiere a propiedades que hace mucho tiempo se conocían sobre la cocaína. Nos habla sobre datos personales, actividades profesionales y científicas de Sigmund Freud y de Karl Köller. Presenta las investigaciones de Freud sobre los efectos fisiopatológicos observados con la cocaína. Expone las razones de las duras críticas recibidas por Freud sobre conceptos que él había explicado. Describe la súbita, pero conciente y justificada idea de Karl Köller de estudiar científicamente la cocaína como un anestésico local en animales y seres humanos. Indica cómo fueron realizadas las investigaciones pioneras que redundaron con el descubrimiento de la anestesia local por Köller y las de los exposiciones sobre esta, hechas en Viena. Relata la primera intervención quirúrgica oftalmológica bajo anestesia local. Comprueba la inmediata difusión por el mundo del descubrimiento que marcó el inicio de la anestesia locorregional. Comenta innumerables documentos que comprueban la prioridad de Köller en ese descubrimiento. Y finalmente, menciona los numerosos homenajes recibidos por Köller en varias partes del mundo.*

CONCLUSIONES: *La anestesia locorregional fue iniciada por Karl Köller en 1884, cuando él probó la posibilidad de practicar intervenciones quirúrgicas oftalmológicas sin dolor utilizando la cocaína como anestésico local. Sigmund Freud realizó muchas investigaciones sobre la cocaína, pero no participó directamente en el importantísimo hito.*