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Transfer of Knowledge in Urology: A Case Study of Jacob Eduard Polak (1818–1891) and the Introduction of Contemporary Techniques of Lithotomy and Lithotripsy from Vienna to Persia in the Mid-19th Century: A New Analysis of Scientific Papers from the 19th Century

Keywords

Networking urology · History of medicine · History of urology · Lithotomy · Lithotripsy

Abstract

The middle of the 19th century marks the beginning of a global process of science and knowledge transfer from Europe to the rest of the world. During the phase of globalization, Austrian physician and ethnographer Jacob E. Polak (1818–1891) played a key role in the transmission of practical and scientific reasoning, leading to the development of medical science and clinical care in Persia. In 1851, Polak was commissioned by the Persian court to work as an academic teacher at the first secular institution of higher learning in Teheran, the Dār al-Fonūn. After 4 years of teaching and working as a doctor and surgeon, Polak was appointed per-

sonal physician to the Qājār king, Nāṣer-ad-Dīn Shāh (r. 1848–1896). During Polak's 9 year stay in Persia, he performed numerous surgical operations with specific focus on lithotomies on men and women of all ages. He documented each operation and collected samples of bladder calculi for the purpose of chemical analysis. After his return to Austria, he published a detailed report on his practice of lithotomy in Persia. This extensive documentation is, we believe, the only known historical evidence that currently exists of the introduction of modern urology to Persia. This study will present Polak's role as a pioneer of modern medicine and lithotomy, and will examine how he introduced the latest achievements of Viennese medicine in the field of operative urology to Persia.

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Introduction

Austria and Iran enjoy a harmonious medical friendship and exchange for more than 100 years. In 2007, a multidisciplinary team of the Institute for Iranian Studies in the Austrian Academy of Sciences investigated the life and intercultural influence of the Austrian physician and ethnographer Jacob Eduard Polak (November 12, 1818 – October 8, 1891) hypothesizing a central role of this individual in the development of the productive exchange between these 2 nations [1]. Within Polak's extensive corpus of written works are a series of published letters describing his activities and experiences in Persia, entitled "Briefe aus Persien," and an article "Ueber 158 Stein-Operationen, ausgeführt in Persien im Zeitraum vom Nov. 1852 bis Juni 1860," rich sources of medical, specifically urological, information. They were initially published in the journal "Wiener Medizinische Wochenschrift" (Vienna Medical Weekly) in 1852–1857 [2] and in the prestigious "Zeitschrift der k. u. k. Gesellschaft der Aerzte in Wien" [3]. Several other publications and presentations of his texts followed [4–8]. All of Polak's letters, sent to his colleagues in Vienna and appearing in various Viennese medical journals, have recently been collected, analyzed, and published for the first time [9]¹.

Interestingly, there has been, until now, little historical focus on the correlation between the emergence of urology as a medical specialty, a field which was established in Vienna in the 1850s, and the introduction of the new technique of "blind lithotomy" to Persia, which was a developing country in medicine at that time.

Our analysis will outline the status of contemporary knowledge on lithotomy and lithotripsy in Vienna in the 1850s and show how the critical thinker and practitioner of medicine and ethnographer Jacob Eduard Polak introduced this emerging specialized medical subject to Persia.

Furthermore, with regard to the discussion of "open" and "blind" techniques in the treatment of bladder stones in the middle of the 19th century resulting from the work of Jean Civale (1792–1867) and Nicolas Heurteloup (1750–1812) in Paris, or Vincenz von Kern (1760–1829) and Victor von Ivánchich (1812–1892) in Vienna, our analysis will unravel an international multicontinental perspective expanding on the usual European or North American focus.

Jacob Eduard Polak (1818–1891): A Short Biography

Jacob Eduard Polak (his name appears in the literature spelled as Jakob Pollak or Pollack) was born in 1818² as the third son to Jewish parents (Elias and Sara Polak born Neumann [10]) in the town of Mořina (Velká Mořina), House No. 6 [11], Bohemia region (German: Groß Morschin/Groß Moržin), which was, at that time, part of the Austrian-Hungarian Empire and is now located in the Czech Republic. Facts about his life can be found in several biographies and encyclopedic articles [12–20], which in turn are often dependent on several contemporaneous obituaries [21, 22] and biographical accounts during his life time [23].

Polak completed 4 years of study in the disciplines of medicine and surgery at the Charles University in Prague [24] before moving to the Vienna School of Medicine in 1845. During this time period, the theory and science of medicine in the Habsburg Empire (as well as in other western European countries) was undergoing a fundamental transformation. Scientific medicine gradually prevailed as the previous medical system. Medicine based on natural philosophy was increasingly being replaced by detailed experimental investigations, such as chemical and physical analyses, that accompanied the development of the field of pathophysiology. In Vienna, Polak studied under prominent professors such as Carl von Rokitansky (1804–1878), Franz Schuh (1804–1865), and Joseph von Wattmann (1789–1866) [25]. On May 26, 1846, Polak graduated as doctor in medicine (Dr. med.) from the Vienna School of Medicine [26]; 1 year later he was awarded further degrees in surgery (mag. chir. 1847) [27] and obstetrics (1847) [28] from the same institution. Between 1848 and 1850, Polak worked as a physician in a sugar beet refinery in Klobauk (today: Klobouky u Berna in the Czech Republic, in the south of Brno) and in Vienna's General Hospital (AKH) [29, 30], where he continued his medical studies [31–33] (Fig. 1).

In July 1851 [34], upon the recommendation of 2 famous Viennese physicians, surgeon Johann von Dumreicher (1815–1880) [35, 36] and physician Joseph Dietl (1804–1878) [37–40], Polak was commissioned by the Persian state to work as a teacher at the first secular institution of higher learning in Teheran, the Dār al-Fonūn

¹ A greater publication will be published in 2018. Gächter, A. Der Leibarzt des Schah Jacob E. Polak 1818–1891. Eine west-östliche Lebensgeschichte New Academic Press, Vienna [in press].

² Within the literature the date of birth has several variations from 1818 to 1820 (it is unclear how these variant dates came into being; perhaps due to a mistake in one necrology which led to a false information in an encyclopedia).

Fig. 1. a Johann Heinrich Freiherr von Dumreicher-Österreicher (1815–1880) photography by Georg Wassmuth, Museum, Library and Archives, German Urological Association, repro Keyn, with permission. **b** Joseph Dietl (1804–1878) lithography by Joseph Kriehuber, about 1844.

(House of Science, School of Skills, or Polytechnics) [41]. Polak was hired as a professor of medicine and surgery, receiving an initial contract for 4 years. His commission was negotiated between Jān Dāūd Khan, an Armenian interpreter, who had married an Austrian lady [42], acting on behalf of the Persian court, and Heinrich Alfred Barb (1826–1883) [43], professor of Persian language at the Imperial and Royal Polytechnic Institute and representative for the Austrian Foreign Ministry. Barb later (1871–1883) became the director of the Oriental Academy (The Academy for Oriental Languages, whose name and location has changed several times over the years; it is today known as the Diplomatic Academy of Vienna) [44–46].

The employment of European physicians at that time had a wide political, social, and cultural dimension in Persia of the 19th century [47]. In Persia, Polak began to institutionalize medical teaching by establishing a modern medical vocabulary within the Persian language [48] and

writing a textbook of anatomy in 1854 [49]. He later authored a textbook of surgery with a treatise about ophthalmology in 1857 [50]. Through this prolific work, he initiated the integration of methodological approach to surgery based on pathological anatomy as an integral part of Persian medical training. In the same year, he announced the release of his surgery textbook in the well-known “Zeitschrift der k. u. k. Gesellschaft der Ärzte” in Wien (Journal of the Imperial and Royal Society of Physicians in Vienna) [51] and was elected a member of the Imperial and Royal Medical Society of Vienna [52]. He himself interpreted his Persian textbook as a representation of the Vienna School of Medicine [53].

Polak initially used French as his language of instruction, with the help of his translator Moḥammad Ḥosayn Khan Qājār (who may be identical with Adib-al-Dawla [1835–1897]). However, Polak claimed he was soon able to give his lectures in Persian. Although Polak did not have many students – he gives their num-

ber as 22 [54], they graduated successfully and 7 of them went on to continue their medical education in Paris [55, 56].

Some time later, he published further works about his time in Persia reflecting on medical and ethnological subject matters. In the field of medicine, it is worth commemorating Polak's epistolary texts on lithotomy ("Briefe aus Persien") written in 1852–1857, as well as his detailed presentation on the state of medicine in Persia published in 1860 [57, 58]. His "Letters from Persia," appearing serially in the Vienna Medical Weekly (Wiener Medizinische Wochenschrift), should be considered an independent source, where various aspects of medicine and culture were presented in the form of a "medical topography," a type of scientific presentation that was common in medical literature at that time [59, 60]. Quotations from the letters can be found in medical literature up to the 1960s [61].

In the year 1855, Polak became a medical attendant (Leibarzt, Hakim Bashi) to the Persian emperor Nāṣir-ad-Dīn Shāh (or Nasir al-Din Shah Qajar, 1831–1896, reign 1848–1896) [62, 63], succeeding Louis-André-Ernest Cloquet (1818–1855). Cloquet was also an instructor at the newly founded Dār al-Fonūn [64] and served as the French minister to the court from 1846 to 1855. Cloquet did himself 13 lithotomies, as reported by Polak [65–67]. This appointment led to an increased social status and influence of Polak in Persia while he continuously gained the confidence of the Persian emperor.

After Polak's return to Austria in 1860, he published an ethnographical and cultural account of his experiences in Persia, especially about medicine/public health [68–70], history of medicine with special impact on Persia [71], ethnography, and culture [72–79]. He then became a teacher of the Persian language at the University of Vienna [80–81]. He was soon recognized as an expert on Persia not only due to his publications, but also because the Persian government frequently turned to him as a mediator and spokesman in various affairs. The Austrian Foreign Ministry, indeed, recruited his services on various occasions [82, 83].

In the year 1882, Polak again travelled to Persia to explore the botany of the Alvand range with the help of botanist Thomas Pichler (1828–1903) [84] and geologist Franz Wähner (1856–1932) [85, 86]. During the short trip, he stayed in Teheran with his successor, Joseph Désiré Tholozan (1820–1897) [87], as royal physician. The emperor of Persia was very happy to receive him on this occasion [88]. Eventually, he died in Vienna at the age of

Fig. 2. Jacob Eduard Polak, Pf 28.165: C (1), Picture Archives and Graphics Department, Austrian National Library. <http://www.bildarchiv.austria.at/Preview/20223492.jpg>.

73 in 1891 secondary to a dry gangrene ("Altersbrand") and was buried at the Vienna Central Cemetery in the Jewish section [89–91] (Fig. 2).

Lithotomy and Lithotripsy in Vienna about 1850: The State of the Art

The Austrian general surgeon Vincenz von Kern (1760–1829) [92–94] was regarded by his contemporaries as an experienced master of lateral lithotomy. In 1803, after a visit to the famous Francesco Pajola (1741–1816) [95] in Venice, he taught himself the new technique of lateral lithotomy. In 1805, Vincenz von Kern was appointed to the Chair of Surgery of Vienna University, and in 1807, he

succeeded in laying the foundation of a surgical operating institute at Vienna's General Hospital. He dedicated a major part of his oeuvre to the perfection of this method of lithotomy, but it was not until 1828 that Vincenz von Kern published his main work, "The calculous diseases of the bladder, related ills and the excision of stones in both sexes," in which he claimed to have carried out lateral lithotomies 334 times with a mortality of 31 cases. The book also included 9 copper engravings depicting and describing the surgical table, instruments, techniques, and stones [96, 97]. But by the time his book was printed, the glorious era of perineal lithotomy had ended. The famous Jean Civiale (1792–1867) had introduced the new technique of lithotripsy in Paris 5 years earlier [98–103], initiating the first minimally invasive procedure to conquer the world. This led to the well-known dispute between Kern and Civale throughout the literature [104].

But Joseph von Wattmann (1789–1866), former assistant and, successor of von Kern (First Surgical Department), performed the first lithotripsy in May 1828 and published a detailed account of early lithotripsy procedures in Vienna [105]. Some years later, Victor von Ivánchich de Margita (1812–1891), a native of Budapest, who was one of the first to hold a habilitation thesis for the diseases of the urinary tract in 1851 [106], reported on his successful series of operations which started in 1842; he subsequently also published his experiences of introducing general anesthesia [107–109]. This was the time the new specialty of urology was established in Vienna [110]. Wattmann's assistant, Franz Schuh (1804–1865) (later II. Surgical Department), was another promotor of the burgeoning field of urology as a specialty of its own. Johann von Dumreicher, Wattmann's successor, had also great interest in lithotripsy. Leopold von Dittel (1815–1898) was a disciple of the Dumreicher department. The Vienna medical historian Erna Lesky (1911–1986) was of the opinion that it was Leopold von Dittel who made Vienna a "Mekka of Urology" besides Berlin. According to Erna Lesky, the III. Surgical Department was surgical by name and urological by its therapeutic spectrum, equivalent to the Hopital Necker in Paris [111, 112].

Moreover, Dumreicher's assistant Leopold von Dittel performed many lithotripsies, starting in the 1850s.

Thus both methods, and especially the new blind method, were established with high rank in Vienna. It was relatively easy to learn these methods and to gain experience during the treatment of patients. The Viennese debate on the preferred method was settled after Leopold von Dittel [113] (III. Dept. of Surgery) published his article on lithotripsy and litholapaxy in 1880 [114, 115] (Fig. 3–5).

Fig. 3. Vincenz Sebastian Ritter von Kern (1760–1829), lithography by Joseph Lanzedelli the Elder, ca. 1820. Museum, Library and Archives, German Urological Association, repro Keyn, with permission.

The Urologic Oeuvre of Jacob Eduard Polak

Among the physicians of the French and English embassies in Persia, Polak held much respect. In the mid-19th century, there were other European doctors present in Persia who performed bladder stone operations [116], but the difference between Polak's influence and that of his European colleagues is that he introduced the discipline of surgery, and therefore urology, as an integral part of Persian medical education. Polak dedicated an entire chapter of his textbook on surgery, written in Farsi (the Persian language), to the most up-to-date methods of lithotomy and lithotripsy [117].

Fig. 4. Victor von Ivanchich (1812–1891), lithography, Museum, Library and Archives, German Urological Association, repro Keyn, with permission.

This is of significance because at that time, Persian physicians (*Hakims*) did not perform any type of surgical operation [118, 119]. Polak performed a total of 158 bladder stone operations with the aid of anesthesia. He believed himself to have been the first in Persia to “operate painlessly with anesthesia, to the astonishment of everyone” [120]. The use of chloroform and ether was still a new practice in Europe at that time. The first attempts to use ether at the Vienna School of Medicine had been carried out by the surgeons Franz Schuh [121] and Joseph Freiherr von Wattmann [122] in January 1847 [123] only 4 years before Polak went to Persia, and was soon adopted by Victor von Ivanchich for lithotripsy. Between 1852 and 1860, Polak carried out numerous lithotomies on men, women and children, the first being on a 10-year-old boy in November 1852 [124], and the last being on an adult lady in June 1860 [125]. He also performed blind lithotripsies in several settings [126]. He was able to easily obtain chloroform for anesthesia from an apothecary in Tiflis, Georgia, previously part of the Persian Empire, with the help of the Russian embassy in Teheran [127].

Fig. 5. Leopold von Dittel (18115–1898) lithography by Adolf Dauthage, Museum, Library and Archives, German Urological Association, repro Keyn, with permission.

He used as a diagnostic tool the sounding, which was in the time before X ray examination the only method of diagnosing bladder stones [128, 129].

Polak performed 121 lateral lithotomies [130, 131] (only 7 patients died), and interestingly 2 rectal approaches (proctocystotomies) for lithotomies. He reported on minimally invasive lithotripsies in only 2 patients [132]. He utilized ether anesthesia in only 6 cases with the other operations being done under chloroform. He performed 26 open urethrotomies on children and adolescents, when the stones were within the urethra [133]. In women, Polak performed a forerunner of the urethrotomia interna by leading a bistoury via a grooved sound.

He reported all of these cases in a detailed article published in 1860 together with the chemical analyses of various concrements [134].

In agreement with the common miasmatic theory of his time, he also reported a detailed description of the weather, wind, and place where he operated [135].

Fig. 6. Dumreicher Cystotome from C. and J. Heitzmann, 1874. *Compendium der Chirurgischen Instrumenten-Verband- und Operationslehre*. Vol II., W. Baumüller, Wien, p 54, repro Keyn, with permission.

By this, Polak presented a detailed overview of the geographical and topographical spread of urolithiasis in 19th-century Persia. Further he investigated the etiology and history of lithotomy in Persia, with his report including investigations on the effects of nutrition on urolithiasis, as well as the effects of anesthesia during the treatment [136].

Polak collaborated with chemist Vinzenz Kletzinsky (1826–1882) [137, 138] to analyze calculi specimens according to shape, weight, consistency, and chemical composition. At the end of his long and detailed paper, he presented in a remarkable table the “Findings of the

Fig. 7. Jacob Eduard Polak with the Star of the Lion and the Sun, photograph by Viennese photographer Julie Haftner (active 1857–1867), Vienna, between 1860 and 1867. Pf28.165 B (1), Picture Archives and Graphics Department, Austrian National Library. <http://www.bildarchivaustria.at/Preview/9333858.jpg>.

chemical analyses of 67 Vesical Calculi from Persia,” listing with acribic precision the name of the patient, date of the operation, age, place of birth, gender, operation method, weight and characteristics of the calculi, with specific comments on the course of the operation [139].

Before departing for Persia, Polak wrote a list of medical textbooks, specimens, and instruments he would take with him. We, thus, learn that for lithotomies, he had the following instruments available to him: 2 conductors for different age groups, a number of anatomical scalpels, a “Dumreicher cystotome,” 2 straight and one curved for-

Fig. 8. Polak's remarkable paper published in the refined publication in the famous "Zeitschrift der k. u. k. Gesellschaft der Aerzte zu Wien (Journal of the Imperial and Royal Society of Physicians in Vienna).

ceps, and a calculus spoon [140]. All of these instruments were typically in use at that time [141].

He also provided his readers with information about the number of stones removed. On 147 occasions, only one stone was removed, on one occasion he found 6 stones, on 2 occasions 4, and on 8 occasions 2 stones [142]. As for the shape of the stones, he reports they were usually in the form of a pipe bowl or an hourglass [143] (Fig. 6).

By recording his surgical methods on male and female patients, he shared gender-specific aspects of urological procedures. When operating on male patients, he fixed the stone "with his thumb and index finger, then inserted a pointed bistoury, extended the incision and removed the stone using tweezers or by a lever movement with an ear scoop" [144]. On females, Polak conducted the operation in 2 or 3 stages. "A hollow probe was inserted and a bistoury fixed with a button pushed forward, and the entire urethra together with bladder neck divided upwards and leftwards [...] thus providing sufficient space to insert the index finger. This was used to examine the size of the stone, and if the incision was not sufficient, the bistoury was once again inserted on the finger and extended in the said direction. A stone or polyp forceps was then inserted and extraction carried out" [145] (Fig. 7–9).

Conclusions

In 1850, Viennese pathologist Carl von Rokitansky (1804–1878) became the president of the "k. u. k. Gesellschaft der Ärzte" (Imperial Society of Physicians) in Vi-

Fig. 9. Two-layer lithotomy set about 1860, upper layer not on display, Baker London, Moll private collection, repro Keyn, with permission.

enna. This represented a turning point in the history of medicine and urology, evidence of the shift from philosophical perspectives of science of the Romantic period to an era determined by the real natural sciences. Research became based on the connection between clinical manifestation, pathological basis, and experiment. As a representative of the respected Vienna School of Medicine [146], Jacob Eduard Polak fostered the acceptance and integration of modern scientific medicine and surgery into Persian systems of knowledge and culture by establishing a new scientific terminology in the Persian language to describe anatomical structures and physiological processes. This then made it possible for Polak to

transfer the intellectual foundation of a new medical system to Persian culture. This happened at a time before advances from the Vienna School had gained worldwide prevalence. Another noteworthy dimension within this transfer of knowledge and culture are the several documented instances of Polak performing blind lithotripsy surgery in Persia.

Ethics Statement

The authors have no ethical conflicts to disclose.

Disclosure Statement

The authors have no conflicts of interest to declare.

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