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Jan (Johann, Johannes) Mikulicz-Radecki's cancer surgery in Krakow times

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Abstract: Jan (Johann) Mikulicz-Radecki (1850–1905) was one of the most illustrious surgeons in the history of medicine, and eponyms in modern medicine bearing his name are still numerous. In this paper we present only a small part of his achievements, focusing on oncological aspects and narrowing our investigation to the period of 1882–1887, when Mikulicz was a professor in the Medical Faculty of Jagiellonian University, in Krakow.

Key words: oncology, cancer surgery, tonsil cancer, lateral pharyngotomy, history of surgery.

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Introduction

Without doubt, Jan (Johann) Mikulicz-Radecki is one of the most eminent personalities in the history of surgery. It is enough to recall his achievements in the pioneering days of gastroscopy or the first chest operations conducted with Ferdinand Sauerbruch, then his assistant at Breslau University Clinic. Mikulicz's name is strongly connected with the history of modern aseptics and antiseptics with many crucial discoveries and practical solutions in that field [1, 2]. Mikulicz peritoneum forceps are still in use, and in medical eponyms we can easily find *Heineke-Mikulicz pyloroplasty*, *Mikulicz-Vladimir operation* or *Mikulicz's pad*. It is therefore not surprising that much

was written about Mikulicz's life and professional achievements, which made a significant contribution to the development of many surgical specialties, including abdominal surgery, thoracic surgery, otorhinolaryngology, urology, gynecology, neurosurgery, and dermatology [3–7].

Our paper focuses on a much narrower topic, namely Mikulicz's approach to oncological problems during his tenure as a professor at Jagiellonian University in Krakow, which lasted from 1882 to 1887.

Methods

Reconstructive historical analyses of original papers published by Mikulicz with comparative analyses of works of other authors exploring the same topics and problems. For the research purpose, Mikulicz's papers, which were published in Polish, were taken into consideration.

Discussion

In 1876, a young assistant to Professor Theodor Billroth, Jan (Johann) Mikulicz-Radecki published results of his scientific research on the subject of human rhinoscleroma discovering and making a proper description of characteristic cells, which are today referred to as *Mikulicz cells* [8, 9].

Ordered by Billroth to examine on a tissue removed from a patient operated on for rhinoscleroma, Mikulicz began his histopathological investigation. The work seemed to be routine and simple.

The disease was already known in the pre-Columbian Maya civilization in Central America (300 to 600 years AD), but more detailed studies on its etiology and pathogenesis were not conducted until the second half of the 19th century [10]. According to some evidence, Ludwik Bierkowski (1801–1860), a professor of surgery in Krakow, was previously acquainted with the condition. He had certain exponates with rhinoscleroma-specific alterations in his well-known collection of moulages and plaster casts [11]. In 1870, famous dermatologists, Ferdinand Hebra and Moritz Kaposi, coined the term "rhinoscleroma" from two Greek words: *sclero* which means "hard" and *rhino* which means "nose" [12]. Then followed by work of others, like Eduard Geber [13] and Vincenzo Tanturri [14], it was classified as neoplastic process, what became widely approved by scientific community. This was to be changed now. Mikulicz established the nature of this disease as a chronic inflammatory process, depicting large vacuolated histiocytes, which are present in the granulomatous stage of rhinoscleroma [8]. Those are still eponymously named *Mikulicz cells*. The pathogenic factor was found to be gram-negative, rod-like bacillus called *Klebsiella rhinoscleromatis* (subspecies of *Klebsiella pneumoniae*). It was first recognized and described in 1882 by Anton von Frisch and sometimes referred to as the *Frisch bacillus* after him. It is worth mentioning that Frisch gives credit for Mikulicz's work as curtail for the discussed subject [15].

Mikulicz's discovery was acknowledged as being of great importance, bringing the discoverer fame and opening his long-lasting concern in the realm of oncological problems. Billroth, who at the beginning was skeptical about Mikulicz's qualifications as a surgeon, now strongly supported his young assistant. No doubt his career gained momentum.

At the age of 32, Mikulicz received a professorship in the Faculty of Medicine at Jagiellonian University in Krakow, a city that was then a part of the Austro-Hungarian Empire. Appointed head of the Department and Clinic of Surgery in the summer of 1882, he remained in this position until the spring of 1887, when he left Krakow and went to take up a surgery clinic in Königsberg.

Fig. 1. Portrait of Jan Mikulicz-Radecki. 1st Department of Surgery, Jagiellonian University Medical College, Kraków, Poland. Photo by Michał Chlipała.

Fig. 2. IGCA commemorative medal.

Then in 1890 Mikulicz moved to Breslau (today Wrocław), his fourth and last post. Professor Mikulicz passed away on 14th June 1905.

When in Krakow, Mikulicz already presented a wide attitude to the methods of diagnosis and therapy that were then of interest to surgeons. His works on gastrointestinal surgery, with special attention paid to gastroscopy, orthopedics, gynecology, urology, and antiseptics, especially the use of iodoform, of which he was strong proponent [2], are the leading ones here. We, however, would like to focus on this part of Mikulicz's work which relate to cancerous processes. We consider this to be an example illustrating the state of contemporary general surgery, in the scope of which oncological problems had to be faced.

In March 1883, Mikulicz's paper *Resection of the pylorus because of the cancer* [Resekcja odźwiernika z powodu raka] was available for readers of "Medical Review" [Przegląd Lekarski] [16]. In the initial part of the text, Mikulicz points out, citing Ludwik Rydygier's report, that out of 23 cases of pyloric resection, only 5 resulted in complete recovery. It should be remembered that pyloric resection was then a relatively new operation. First performed by French surgeon Jules Pean in 1879, then in 1880 by Polish surgeon Ludwik Rydygier. Although from a technical point of view Rydygier's method (named modo Rydygier) was well-developed and effective, the first patient died twelve hours after the operation, probably of postoperative shock. Pean's surgery was also unsuccessful. In 1881, Theodor Billroth performed pyloric resection, with the distal stomach anastomosed directly to the duodenum, in fact repeating Rydygier's operation but this time with a positive outcome. This is known today as Billroth I; however, it should be, and indeed sometimes is, known as modo Rydygier.

Mikulicz then reports on the course of the operation performed in a Krakow clinic. The patient was admitted with a diagnosis of pyloric carcinoma. The surgery lasted 2 and a half hours.

A "goose egg-sized tumor" (Mikulicz's own description) was revealed in the pyloric part of the stomach. The tumor was removed with the pylorus and then the duodenum was anastomosed to the stomach. During the whole procedure, temporary gauze dressings impregnated with iodoform were used as a crucial antiseptic remedy. The patient's health condition on the first day after surgery was good and remained so until the end of hospitalization.

Mikulicz particularly emphasized that a positive outcome of such operations depends on the correct determination of the patient's general condition, and final qualification should be made upon careful diagnosis of the expansion of cancer itself. This can be done with the help of gastroscopy, which, although still imperfect, will, according to Mikulicz, be crucial in such situations in the future. It should be noted that gastroscopy was again a "fresh" method applied to practical surgery. The first effective gastroscope, heralding the new era of endoscopy, was developed by Mikulicz in cooperation with Leiter during his stay in Vienna in 1881 [17, 18]. Now, two years later in Krakow, this tool was fully in use, and Mikulicz was exploring its advantages and disadvantages during surgery.

In December 1883, Mikulicz published a paper entitled *A Contribution to the Surgical Technique and Subsequent Treatment of Tonsil Cancer* [Przyczynek do techniki operacyjnej i następowego leczenia raka migdałków]. He points out that the tonsil is, as far as clinical observations are concerned, a very rare place for primary cancer. Even if he admits: "primary tonsil cancer very often spreads to adjacent parts; therefore, in cases of surgery for this type of cancer, it is very rarely about removing the tonsils themselves but about removing a more or less extensive part of the esophageal wall". Then concludes, "Surgery to remove tonsil cancer will most often be a partial esophagectomy using one of the pharyngotomy methods" [19].

Pharyngotomy, as Mikulicz emphasizes, has become a relatively safe procedure thanks to technical solutions introduced by, among others, Bernhard Langenbeck, Theodor Kocher, Theodor Billroth, and Carl Gussenbauer, as well as the use of iodoform, which was of key importance in postoperative treatment. However, only the surgical approach for tonsillar cancer via lateral pharyngotomy was considered by Mikulicz as the best way to achieve success. This method was introduced by Langenbeck in two modifications and then in the next modification by Gussenbauer. Giving a short but instructive description of all the above-mentioned approaches, Mikulicz speaks for the first of Langenbeck's methods. This procedure in his own words goes like that: "Cut from the angle of the mouth across the jaw downwards to the level of the thyroid cartilage. After cutting the soft parts in layers, the lower jaw is sawn between the attachment points of the masseter muscle; now by tilting both halves of the jaws with two strong hooks, you can comfortably remove sickle parts on the root of the tongue and tonsils" [19].

Despite the approval of Langenbeck's solution, Mikulicz decided to modify it with more radical two-stage operation. Opening the way to the lateral wall of the esophagus also by sawing through the lower jaw, he abandoned the temporary resection in favor of total excision of the ramus of the lower jaw. This was considered a preliminary operation. The external incision ran along the structure of the sternocleidomastoid muscle. Then in the second stage, after the opening of the lateral pharyngeal wall was conducted, the tissues affected by the cancer were removed.

Mandibulotomy performed by Mikulicz gives wide access to the tonsillar and tongue base tumors, leaving the oral cavity free from contact with the wound. But, as he explains, the same could be achieved using Langenbeck's technique. The modification proposed by Mikulicz was introduced for other reasons. As he explains that after deep resection, including in most cases also the soft palate and the root of the tongue, the subsequent shrinkage of the scar is most likely to happen and may impair the mobility of the completely preserved maxilla. This would not be the

case when the ramus of the lower jaw is resected. The healing of sawn jaw bones does not always proceed properly, which may result in subsequent deformation of the bite, which in such cases is an additional, sometimes serious, difficulty in the patient's daily life.

Mikulicz concludes, "It is possible to perform the operation in this way with the greatest peace under deep anesthesia, to stop the bleeding most thoroughly, to mark quite precisely the boundaries of the diseased part, and to avoid easily straining the larger vessels and nerves. Because almost no blood gets into the swallow, a preventive tracheotomy together with packing (tamponade) of the larynx seems unnecessary, and this is certainly not the least advantage of this method" [19].

Almost 3 years later, Mikulicz was giving a second report on the same subject. A short communication entitled *A few observations on the tonsillar and lateral pharyngeal wall cancer* [Kilka uwag nad rakiem migdałka bocznej ściany gardła] was published again in "Przegląd Lekarski" [20]. Mikulicz shortly presented 8 clinical cases of tonsillar and lateral pharyngeal wall cancer that underwent surgical treatment in his clinic, making references to his experiences and the literature dedicated to that subject. This time he is also focused on early diagnostics of cancerous process, describing the sings of pathological process and comparing some statistics present in the works of Billroth, Ernst Küster and Morell Mackenzie. It should be considered as an informative review. In the same year, that is, 1886, the communication concerning his tonsillar cancer and its surgical treatment, repeating overall what was given in Polish, was published by Mikulicz in Deutsche Medizinische Wochenschrift [21].

In Mikulicz's time, the surgical technique called lateral pharyngotomy was being developed not only in Europe but also in the United States. The first description of this technique in the literature was presented by a professor of Clinical Surgery at Harvard University and a surgeon at the Boston City Hospital, David W. Cheever, in 1878, who used it to remove a malignant tonsil tumor. The author mentioned that he performed the operation in 1869, and another one, which was the basis for the article, 9 years later. He also added that, to his knowledge, which was also confirmed by other authors, this was an original method [22]. During the first operation, performed because of an encephaloid tumor of the tonsil, Cheever opened the pharynx in a manner similar to Mikulicz's operation, with the exception that the ramus of the jaw was not resected. Additionally, a broader retraction of the flaps was obtained by adding a horizontal incision that extended forward along the body of the inferior maxilla, alongside the longitudinal cutaneous incision. In the second case, Cheever made the incision in a straight line across the ramus of the jaw, beginning at the mouth angle and moving backward to the anterior edge of the sternocleidomastoid muscle. The fragments were then separated after the ramus was cut through. The entire length of the cutaneous incision was then carried backward through the mucosal membrane [23].

In 1887, Mikulicz published a short text entitled *On the surgical technique of the lateral pharyngotomy* [W sprawie techniki operacyjnej przy bocznej faryngotomii], which was a part of a discussion with another Krakow's surgeon, Professor Alfred Obaliński, who came with his own modification, which was utilizing methods of Mikulicz and Kocher. As Mikulicz claimed, "The fundamental difference between the incision first performed [by Mikulicz] four years ago and the operation described by Obaliński is that he did not enucleate the lower maxillary ramus sawn through at the angle of the jaw, but, after the completed pharyngotomy, connected it to the body of the lower jaw by means of a bone suture" [24].

Mikulicz was then already in Konigsberg but reacted to the Obaliński's paper entitled *On the surgical technique of the lateral pharyngotomy for the extraction of tonsil tumors* [W sprawie techniki operacyjnej przy bocznej faryngotomii celem wydobycia nowotworów migdałka] [25].

All started when, in January the very same year, Mikulicz, during a regular meeting of The Cracow Doctors' Association, presented a patient who suffered from neuralgia of the lower jaw, tongue, and temple. Surgery then performed was planned to remove a piece of the mandibular nerve. However, since the pain continued, Mikulicz decided to make an excision of the entire third branch of the trigeminal nerve. Patient, apart from some residual insensitivity of the right half of the tongue and indifference, was feeling well, and the outcome of operation should be considered as positive [26].

Obaliński, who was present at that meeting, published, as was mentioned earlier, in June 1887, his modification of lateral pharyngotomy, changing an exact place of Kocher's incision and then following the Mikulicz's pass when sawing the jaw. Obaliński argued that this, we can say, rather small change in surgical procedure, had this advantage that tracheotomy and tracheal tamponade could be avoided. The most important change was the abandonment by Obaliński the enucleation of the lower jaw branch and suturing of sawn bones together by means of two silver wires instead [25]. Mikulicz, as mentioned above, replied, accusing that Obaliński's proposal is in fact his own, that is, Mikulicz's modification, which he performed earlier. In return, Obaliński published his answer to Mikulicz, explaining that he never claimed that what he presented was a fully original treatment solution. He was also pointing out that in January meeting of The Cracow Doctors' Association, Mikulicz was presenting his surgical treatment in the case of neuralgia, with removal of the mandibular nerve, and there was not one word given for its application for cancerous tonsil operations. Above all, Obaliński was still convinced that in the case of tonsil tumors with significantly expanded arches, enucleation of the articular process of the lower jaw, a procedure proposed by Mikulicz, was unnecessary, and should be replaced by silver wire anastomosis [27].

We could not find a continuation of the above dispute. Probably everything that needed to be said at that time was said.

Results

Mikulicz's cancer surgery is well documented in the number of publications and abstracts from his oral presentations. However, not the main topic of his research and surgical practice when holding the professorship in Kraków, it shows his interest in that field. The most important was lateral pharyngotomy technique and tonsil cancer surgery, which remained on focus at that time. Being a discipleof Billroth, who in turn was a student of Langenbeck himself, Mikulicz was well prepared and introduced to the above-mentioned problems, bringing some important and then recognized achievements. He also had an important part in the very beginning of gastroscopy, which showed its value in cancer diagnostics, as was clearly shown in pyloric cancer surgery. Those works were, among others, the first pyloroplasty or the first vaginal resection of the uterus, which were performed in Krakow times.

Conclusion

When in Krakow, Mikulicz-Radecki has shown his mastery in surgical knowledge and skills. It was also a time when he was working on the best way to treat tonsil cancer, focusing both on diagnostics and operative techniques. It can be confirmed that it was between 1883 and 1886 when Mikulicz worked on the protocol of lateral pharyngotomy; however, it seems that he always looked on it as a general set of rules that should always be adapted to each individual case. It is also worth

remembering his undoubted contribution to the development of gastric surgery as well as to the development of antiseptics and aseptics which were also partly present in the Krakow times.

Mikulicz's Legacy

There is no doubt that Jan Mikulicz-Radecki, a surgeon of Polish origin born in Bukowno, then belonging to the Habsburg crown, will forever remain in the first row of pioneers of European surgery, which received worldwide recognition (Fig. 1). His legacy has its place and importance in the modern history of surgery. Numerous papers and books on Mikulicz's life and achievements are available to the readers.

It is also worth mentioning two international congresses, where the memory of Jan Mikulicz-Radecki was clearly present. In 1989 in Krakow, where Mikulicz received his first professorship of surgery, was the place of the jubilee congress on the hundredth anniversary of the Society of Polish Surgeons, which coincided with the bicentenary of university surgery and the founding of the first surgical clinic in Krakow. It was organized by Prof. Tadeusz Popiela, one of the leading surgeons in Poland, who continued traditions of Krakow's school of surgery. As an Honorary member of the International Gastric Cancer Association (IGCA), Professor Popiela was also the organizer of the IGCA World Congress in 2009. Both scientific events included sessions referring to the achievements of Jan Mikulicz-Radecki. It is worth noting that the IGCA commemorative medal features portraits of world pioneers of stomach cancer surgery: Theodor Billroth, Ludwik Rydygier, Jules Pean, and Jan Mikulicz-Radecki (Fig. 2).

Just two years ago, the Society of Polish Surgeons and the Polish Society of Oncological Surgery declared the year 2023 as dedicated to the legacy of Jan Mikulicz-Radecki. Two congresses organized by both Societies were held in Wrocław, where Mikulicz worked for the last 15 years of his life. In both meetings, historical sessions in memory of this outstanding figure were included. University Clinical Hospital in Wrocław is named after Jan Mikulicz-Radecki.

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