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Theodor Billroth (1829-1894) and other protagonists of gastric surgery for cancer

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Summary

Theodor Billroth was one of the great surgical giants of all time. In Vienna he created one of the finest schools in the history of surgery where he carried out pioneering work in experimental studies, surgical pathology and operative surgery. He pioneered gastric surgery for cancer. In 1881 he carried out the first successful partial gastrectomy for cancer. The first pylorectomy was carried out in 1879 by Jules Péan of Paris but his patient died on the fifth postoperative day.

Key words: Theodore Billroth, gastrectomy for cancer, Jules Péan

Introduction

In the late 19th century, probably the most outstanding surgical innovator in Europe was Albert Christian Theodor Billroth (1829-1894). Born a German and educated in Berlin, he made his principal contributions in Zurich and, especially, in Vienna, where he was the first to successfully perform extensive operations on the pharynx, larynx, and stomach.

Billroth's life, career and scientific works

Billroth (Figure 1) was a native of Bergen, on the island of Rugen, on the Baltic coast; he liked music more than books. His father, a clergyman, died when he was 5, and his mother persuaded him to study medicine. Educated in Göttingen, Greifswald and Berlin, he received his medical degree in 1852 and chose Berlin to start private practice. It was a fiasco: not a single patient came in 2 months! He was saved by stumbling on a job at the Charité Hospital as assistant of Bernhard von Langenbeck (1810-1887), who is regarded as one of the founders of modern German surgery. Langenbeck was long known as the founder of *Archiv für Klinische Chirurgie* ("Langenbeck's Archive"). This enabled Billroth to begin scientific research, using a microscope like Lister. He raced through the clinic's large collection of operated tumours and, classifying them, he wrote a dissertation [1].

Billroth was made privatdocent (free professor) of surgery and histology in 1856. Four years later, in 1860, at the age of 31, his scientific and clinical skills were renowned throughout German-speaking lands,

Figure 1. Theodor Billroth.

and he became professor of clinical surgery at Zurich. Seven years later, in 1867, he succeeded Schuh as chief of the second surgical clinic at the University of Vienna. Here, he founded one of the greatest schools of surgery where he carried out pioneering work in experimental studies, surgical pathology and operative surgery. He pioneered surgery for gastrointestinal conditions and various cancers. He performed excision of tumours of the bladder and the bowel, and performed a hindquarter amputation [2].

He made advances in anaesthesiology, and gathered a circle of assistants who regarded him as a father. The students worked independently in the laboratory, and collaborated with teachers to apply new results in the operation room. Billroth performed the first laryngectomy for cancer in 1873, using experimental work by Czerny. Most importantly, Billroth's boldness and technique made him the great pioneer in abdominal surgery. He was the first to do well with gastric resections, to remove the whole oesophagus, and to create detours around acute or chronic intestinal obstructions by providing "anastomoses" between parts of the digestive tract [3].

Interested mainly in infection and healing of wounds, he was the first to use regular temperature measurement for postoperative control, and to show that a rise in temperature is often the initial sign of complications. Such measurement was a novelty, introduced in Leipzig by Carl August Wunderlich (1815-1877), who published *The Relation of Body Heat to Illness* in 1868 [4].

Billroth was restless at the beginning of his long carreer in Vienna. New methods and untrained personnel cost the lives of many patients. But he stuck to the task of refining his initiatives, and the mortality rate decreased with better postoperative care.

He founded the modern concept of reporting the total clinical experience of the department which included operative mortality, complications and 5-year follow-up. However, he sounded a warning note: "*Statistics are like women, mirrors of purest virtue and truth or like whores, to use as one pleases*!" [5].

Billroth embodied the tremendous achievements of German surgery and became that country's most celebrated surgeon. As an outstanding surgical technician, he was able to apply his experimental successes to the practical side of clinical medicine. Billroth's views on surgical training were unique for the time in which he lived. Billroth thought that the student would be ready to start surgical training only after he had completed his medical studies and had preliminary experience working in a hospital. Performing operations on cadavers and experimental animals, 2 or 3 years of assistantship in a surgical department, studies of the surgical literature, writing patient histories, and acquiring advanced practical experience in a hospital were necessary to prepare the surgeon for independent work. Billroth firmly believed that anything that concerned a patient, including nursing duties, had to be experienced by the surgeon in training. His viewpoints on doctors were the following: "*A person may have learned a good deal and still be a bad doctor who earns no trust from patients. The way to deal with patients is to win their confidence, listen to them (patients are more eager to talk than to listen) and help them, console them, get them to understand serious matters: none of this can be read in books. A student can learn it only through intimate contact with his teacher, whom he will unconsciously imitate…The patient longs for the doctor's visit; his thoughts and feelings circle around that event. The doctor may do whatever is necessary with speed and precision – but he should never give the impression of being in a hurry, or of having other things on his mind…*" These viewpoints were promulgated to an attentive surgical world via graduates of his own training program [6].

In general, Billroth had a fascinating personality. All writings about him are complimentary. John Berg, the Swedish surgeon, was equally impressed by a visit to the clinic in 1879: "*His entire attitude, like his speech, bore witness to a scientific genius and to one of Europe's admittedly best and most trusted surgeons… While it may be said that he was aware of his superior gift, I saw no sign of haughtiness, and often admired his tolerance towards the younger trainees…*" [7].

Another facet of Billroth, which is perhaps less well known, was his life-long association with music. As a student, his only talent was for music, which he wished to pursue professionally. However, his mother, widow of a Lutheran pastor, insisted that he study medicine, although he did continue to play the piano and to compose. In Zurich, Billroth first met Johannes Brahms and their acquaintance continued when both moved to live in Vienna. Nearly all Brahm's compositions were first tried out at the home of Billroth. Who knew what he might have achieved if his mother had not made him study medicine! Billroth is buried in the Central Cemetery in Vienna, not far from the graves of Beethoven and Schubert and the monument to Mozart [8].

Billroth authored a number of prominent texts, including a study of the history of military and naval hygiene (1859), his great *Die Allgemeine Chirurgische Pathologie Und Therapie* (*General Surgical Pathology and Therapeutics*) (1863) [9], his *History of the German Universities* [10] and a trea-

tise on breast surgery, *Die Knankheiten Der Brustdrusen*(1880) [11].

His teaching abilities, prominence as a writer on surgery, and personal influence were such that his students filled many of the prestigious chairs of surgery in Europe.

Billroth and the Viennese surgical school

In understanding Billroth's success, it is essential to appreciate the evolution of the Viennese surgical school and its relationship with the Allgemeine Krankenhaus, or General Hospital, of that city. The hospital was founded in 1784 with Ferdinand von Leber (1729-1808) as its first head of surgery. He in turn was succeeded by Vinzent von Kern (1760-1829) and, later, by Joseph von Wattman (1779-1866). During Wattman's professorship (1830-1847) the surgical service was split into first and second surgical divisions (1842). Johann Dumreicher (1815-1880) became head of the first division, to be succeeded by Edouard Albert (1841-1900). The latter was professor of surgery from 1881 to 1900, and his overlapping service with Billroth caused a great rivalry. Franz Schuh (1804-1865) became head of the second division in 1842 and was succeeded by Billroth, who remained in the position until his death in 1894. Anton von Eiselsberg (1860-1939), one of Billroth's most brilliant protégés, succeeded Edouard Albert. Eiselsberg was professor of surgery of the first division from 1901 to 1938. Billroth was succeeded by Carl Gussenbauer (1842-1903), who served as professor of surgery of the second division from 1894 to 1903. When Gussenbauer died prematurely in 1903, he was succeeded by Julius von Hochenegg (1859-1940), one of Albert's most famous pupils. Hochenegg served as head of the second division from 1904 to 1930. By such curious crossings of paths, justice was done to both Billroth and Albert and to the rival branches of the Vienna surgical school.

Billroth's protégés were: 1) Vinzenz von Czerny (1842-1916), who became professor of surgery at Heidelberg, performed the first total hysterectomy by the vaginal route in 1879 and developed a technique of intestinal anastomosis. 2) Carl Gussenbauer (1842-1903) helped with the canine experiments concerning gastric resection and succeeded Billroth to his chair in Vienna. 3) Johann von Mikulicz-Radecki (1850-1905) became professor of surgery in Breslau. He developed techniques of pyloroplasty, colectomy as a two-stage procedure and thyroidectomy. He was first to use the electric oesophagoscope in 1881 and devised a technique for reconstruction of the oesophagus after resecting its cervical portion for cancer. 4) Anton Wölfler (1850-1917), Billroth's first assistant at the time of the early gastrectomies, became professor of surgery in Prague and pioneered the operation of gastroenterostomy. 5) Anton von Eiselberg (1860-1939), Billroth's last great pupil, became professor of surgery in Vienna in 1901. He himself was a great teacher and produced no less than 19 chiefs of surgical departments. 6) Robert Gersuny (1844-1924). 7) Alexander von Winiwarter (1848-1917). 8) Victor von Hacker (1852-1933). 9) Albert Frankel (1857-1929). 10) Albert Narath (1864-1924).

Gastric surgery for carcinoma

Today, cancer of the stomach is common, about 5th in the list of killing malignancies in the Western world, but in the 19th century it led the field.

Billroth in 1872 reported the first resection of the oesophagus; the initial resection of the pylorus for cancer was completed a decade later. The first attempt to resect a tumour at the pylorus was carried out in 1879 by Jules Péan* of Paris. His patient died on the 5th postoperative day. In 1880 in Chelmno, Poland, Ludwig Rydigier** (1850-1920) (Figure 2) performed the second gastrectomy in history, but his patient died only 12 hours postoperatively.

Meanwhile, in Vienna at the Surgical University Clinic of the Allgemeines Krankenhaus, Billroth had his assistants work out the technical details of the procedure of gastric resection in the animal laboratory. They were able to demonstrate that survival was undoubtedly possible and eliminated the question of wheth-

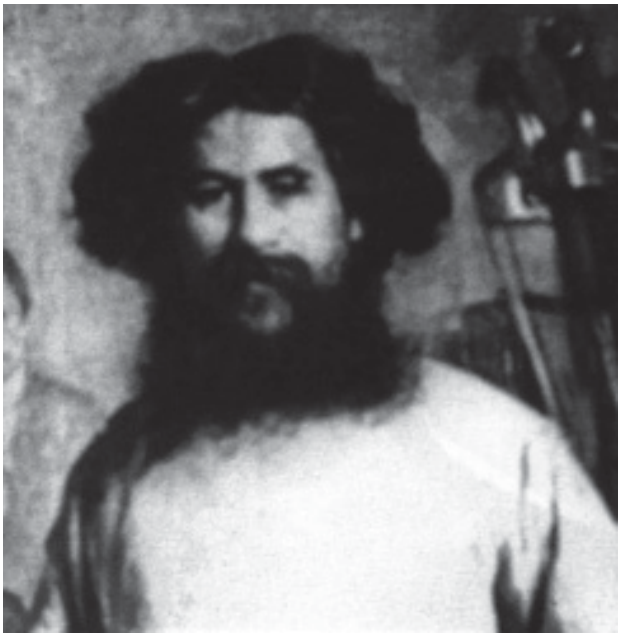

Figure 2. Portrait of Ludwig Rydigier (1850-1920).

er or not the gastric juice would dissolve the sutures or the healing tissues at the anastomosis between the gastric stump and the duodenum. Billroth wrote: "*No insurmountable obstacles to partial excision of the stomach exist on anatomical, physiological or operative grounds. It must succeed*".

In January 1881, Billroth's assistant Anton Wölfler (1850-1917) (Figure 3), a Czechoslovakian who was later to become professor of surgery at the University of Prague, asked his chief to see a 43-year-old patient, Therese Heller, who had all the features of a malignant obstruction of the gastric outlet. She was bedridden, wasted and continuously vomiting, with a thin rapid pulse and an obvious palpable tumour in the upper abdomen. The patient knew only too well that, untreated, her end could not long be delayed, and she readily agreed to what was, in fact, an experiment. Billroth knew of Péan's unsuccessful attempt at gastrectomy but, at this stage, had not heard of Rydigier's failure. The operation was planned in great detail. The stomach was carefully lavaged and nutrient peptone enemas were given. The operation was carried out on January 29th under chloroform anaesthesia and strict antiseptic technique. Wölfler was the assistant. The abdomen was opened through a transverse incision and a large infiltrating carcinoma was revealed which involved more than one third of the distal portion of the stomach. The blood vessels along the greater and lesser borders of the stomach were ligated (Figure 4). There was some uncertainty as to whether or not the stump of the stomach would pull over sufficiently to reach the duodenum, but once the healthy tissues were divided about one inch

Figure 3. Anton Wölfler (1850-1917).

Figure 4. The gastrectomy on Frau Heller.

along the stomach side of the growth, the cut ends could indeed be brought together. The oblique wound in the stomach was sutured from distal upwards until the opening was just big enough to fit the duodenum and altogether some 50 sutures of silk were employed. The operation lasted 90 minutes and the examination of the excised specimen revealed that the pylorus was so narrowed by the growth that it could just admit the shaft of a feather (Figure 5). Much to everyone's delight, there was no weakness or vomiting and very little pain after the operation. The wound healed well and Billroth wrote in his report on February 4th : " *The course so far is already sufficient proof that the operation is possible. Our next worry, and the subject of our next studies, must be to determine the indications, and to develop the technique to suit all kinds of cases. I hope we have taken another good step for-*

Figure 5. The resected specimen of stomach. Note that only a fine probe can be passed through the obstructing tumour.

ward towards curing unfortunate people hitherto regarded as incurable or, if these should be recurrences of cancer, at least alleviating their sufferings for a time."

The brave lady died of diffuse metastases in the liver and omentum only 4 months later, but the news that a successful partial gastrectomy had been performed served as an immense stimulus to the surgery of the alimentary tract, which blossomed rapidly from that date. By 1890, Billroth and his team had performed 41 gastric resections for cancer with 19 successes.

On 15 January 1885, Billroth eliminated another cancer with "Billroth II": closing the proximal end of the duodenum and connecting the resected stomach with the jejunum. Billroth's methods would prove to be the most popular resections for stomach cancer – as well as for ulcers of the stomach and duodenum.

In 1897, Carl Schlatter (1864-1934) of Zurich even introduced a total gastrectomy, or removal of the stomach, for cancer. The case was reported the following year in *The Lancet*. The duodenum was closed and a loop of small intestine brought up and anastomosed to the oesophagus. The patient died of metastases in the lymph nodes and pleura a year later [12].

Figure 6. Jules Péan operating, by Henri de Toulouse-Lautrec.

Notes

***** Jules-Émile Péan (1830-1898) was one of the most important French surgeons of his time. He was a native of Chateaudun and studied at Paris (1860). After holding various hospital appointments, Péan organized the *Hôpital International*. Quite skilled as a surgical technician, in 1879 – two years before Billroth - he performed the first known pylorectomy for carcinoma, albeit unsuccessfully. In 1886 Péan described a method for removing a tumor of the uterus by nipping or crushing off little bits at a time, known as *morcellement* (Figure 6) He performed a total prosthetic replacement of the shoulder in 1894 and in the following year became the first surgeon to operate on diverticula of the bladder. His name is associated with a clamp for hemostasis (Figure 7). A chief surgeon at the Royal Seraphim Lazarette in Stockholm, John Berg (1851-1931), gave the following account in his *Autobiographical Notes*: "*Calm and cold as marble, the surgeon stands in his dinner-jacket, decorated with the Red Button, beside the table where his curt orders clash with the groans of a badly chloroformed patient and other victims. The previous patient is bandaged, and the next is gassed, while the present operation is going on – all in one room to save time. During the operation, Péan pauses briefly to inform the audience in a loud voice of everything he sees and does, keeping a sharp eye and hand on his assistants so that they do not obscure the view. He operates so wonderfully blood-free that hardly a spot reaches his white cuffs. This is explained by his fluent use of the clamp which is named after him; applying it is possible even before he cuts.. After the operation, which takes only a few minutes, he makes much of what he has achieved and, unpertubed, receives the usual storm of applause from his packed auditorium.*" The Red Button was that of the Legion of Honour. It should be

Figure 7. Before the operation where Jules Péan, chief at l'*Hôpital Saint-Louis*, discovered the clamping of blood vessels (1887). Painting by Henri Gervex.

Figure 8. Billroth operating in the auditorium of the Allgemeine Krankenhaus, Vienna (1889)***.

added that, apart from foreign doctors and students, the audience consisted mainly of the best Paris society, who took enormous pleasure in watching operations!

Péan, surgeon at the St Louis Hospital in Paris, was a versatile surgeon who had already published the first successful elective removal of the spleen. This was carried out in 1867 during an exploratory operation on a girl of 20, whose suspected ovarian tumour proved to be an enormous splenic cyst. Péan devised forceps for the compression of arteries which incorporated in the handles a ratchet to hook them in position. These were later modified by Spencer Wells, but in France these instruments are still termed "les pinces de Péan". Péan died suddenly of pneumonia while still busily engaged in his enormous private practice.

** Ludwig Rydigier went on to become professor of surgery at Cracow and is regarded as the father figure of modern Polish surgery, founding its Association of Surgeons. As early as 21 November 1881, Rydigier became the first to do an operation like "Billroth I" for gastric ulcers. "And hopefully the last," commented a leading surgeon who edited his article about it in 1882! Luckily, fate decreed otherwise. The patient, a woman of 30, had suffered bleeding for 3 years. She soon went home cured and, after bearing 5 children, was still healthy a quarter of a century later.

*** This painting shows Billroth, pale of complexion and with a white beard, at the peak of fame at 60 years of age (Figure 8). Adelbert Seligmann painted this scene 5 years before Billroth's death. In 1890, the painting was exhibited at the Society of Artists in Vienna. At the World's Fair in Chicago and Madrid it received a bronze medal and in Berlin and London a gold medal. In 1904 it was purchased by the Ministry of Education and presented to Hochenegg, chief of the Billroth clinic. Unfortunately the painting was lost until K. Absolon was able to locate it during a visit to Vienna. Yet much still seems highly traditional, not least the total absence of anything resembling the modern operating theatre, and the dependence on daylight. The doctors are wearing white coats over their suits. Moreover, nobody is wearing gloves or masks. However, it appears that although Billroth operated with sterilized instruments, he may have allowed the public to come extremely close to the operating field, contrary to aseptic operating conditions. Dr Böcher hands Billroth the scalpel. Dr Josef Winter holds the anesthetized patient's head. The patient is an old man, suffering from trigeminal neuralgia, who has a neurotomy performed. To Dr Winter's left is Dr Anton Eiselberg, the anesthetist. Dr Leo Dittel is next to him and finally Dr Salzer. The assistant with the scissors is Dr Heidenthaller. Sitting is Dr Beck. Left in the lowest row is Karl Theodor, the Duke of Bavaria, who commonly attended Billroth's lectures. The painter, Seligman, is in the first row on the right. The medical student standing in the first row is Alphons Rosthorn, the gynecologist.

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