SPECIAL ARTICLE

Surgery in Austria

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In 1747, Gerhard van Swieten (1700-1772), personal physician to Empress Maria Theresia and reformer of medical education in Austria, founded a *bonne école de chirurgie* in Vienna. He invited the Florentine Natalis Giuseppe Pallucci (1719-1797), whom he had specially trained in Paris, France, to Vienna to assist him with the school. However, although van Swieten was highly successful as a reformer of the medical curriculum, his attempt to transform surgery from a craft into an academic discipline failed.[1] Emperor Joseph II, son of Empress Maria Theresia and successor to the throne, also attempted to raise the standing of surgery. In 1785, he founded a school for military surgeons later called Joseph's Academy. Joseph II's *protochirurgus*, Giovanni Alessandro Brambilla (1728-1800), became the first director of the school, which was modeled on the Academie Royale de Chirurgie in Paris. The Josephinum, a building in beautiful classical style, still exists today in Vienna.

In 1805, Vincenz Kern (1760-1805) began the development of civil surgical training, that is, the foundation of an efficient university school of surgery. It was Kern's life work to transform surgery from a craft to a science. In 1807, Kern founded the Imperial Royal Surgeons' Institute, which became the springboard for future Austrian surgeons. Kern's successor, Joseph Wattmann (1786-1866), developed plastic surgery and orthopedics. Two of his students, Johann Dumreicher (1815-1880) and Franz Schuh (1804-1865), were instrumental in furthering surgery in the following decades. In 1842, Schuh became the head of the newly founded Second University Clinic of Surgery in Vienna.[2,3]

ON THE HISTORY OF SURGERY IN AUSTRIA

The acceptance of physical diagnostics, Schuh's own pathophysiologic experiments, and a mind open to new surgical methods (neurectomy as therapy for the trigeminus, myotenotomy, plastic surgery) demonstrate Schuh's ardent desire to provide a thorough scientific grounding for surgery. By 1840, Schuh had already performed a successful pericardiac aspiration, and on January 27, 1847, he was the first to use ether as an anesthetic on a human in Austria.[2,4]

Franz von Pitha (1810-1875) was the chair of surgery at Joseph's Academy from 1857 until the academy's closure in 1874. Pitha came from Prague, Czechoslovakia, where he had been rector of Charles University. His experience in the war zones in Italy was summarized in *Verletzungen und Krankheiten der Extremitäten* (*Injuries and Diseases of the Extremities*).[5] Pitha's important influence on Austrian surgery led to an invitation to Theodor Billroth (1829-1894) to come to Vienna.[2,4,6-9] Billroth was a Prussian who had taught for 6 years in Zürich, Germany. Because of the defeat by Prussia at Königgrätz in the Czech Republic, Austrians did not take too kindly to Prussians. Despite this, Pitha was successful in acquiring a position for Billroth among the medical faculty.

The coexistence of 2 surgical clinics and a chair of surgery in Vienna was important to separate surgical procedures into different working areas. Surgical clinics also existed in Prague, Graz, Austria, and Innsbruck, Austria.

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Theodor Billroth performing an operation in the auditorium, 1890. Assistants: Leopold Dittel, Anton von Eiselsberg, and Friedrich Salzer. Painting by Aalbert Franz Seligmann, Vienna, Austria, 1890. Reprinted with permission from the NOCOD Esterreichische Gallerie, Vienna.

Theodor Billroth, the son of a pastor who was born in Bergen on the island of Rügen (Germany), had all the qualifications required by the medical faculty (**Figure**). In Vienna, he excelled and became the leading surgeon of his time.

Billroth learned the experimental, physiologic, and histologic direction of medicine from his teachers, Rudolf Wagner in Göttingen, Germany, and Johannes Müller in Berlin, Germany. When he became assistant to his surgical teacher Bernard von Langenbeck (1810-1887) in Berlin in 1853, he also learned experimental pathology. During his years as an assistant, Billroth produced a series of anatomic and pathohistologic works. Because of these works, he was nominated with Rudolf Virchow (1821-1902) for the chair of pathological anatomy in Berlin. His reputation as a clinician was further enhanced during the years he worked in Zürich (1860-1867) with the publication of his book *Die Allgemeine Chirurgische Pathologie und Therapie* (*General Surgical Pathology and Therapeutics*).[10] The combination of clinical symptomatology with the pathohistologic research of Billroth's years in Berlin emphasized once more the basic problems of surgery, such as wound healing, regeneration, hemorrhage, and inflammation.

Billroth's important surgical period began when he performed 6 ovariotomies from 1865 to 1870; however, he performed new operations only in Vienna. He became a pioneer in 3 fields of major surgery: esophageal resection (1871), laryngectomy (1873), and gastrectomy (1881).

According to Billroth, "What has given me the most joy in my life is the establishment of a school that carries on my aspirations and aims, be it scientific or humanitarian thereby ensuring a legacy for the future."[11] Indeed, the school of Billroth was the most lasting and influential school in most of Europe. Its representatives headed surgical clinics in Lüttich, Belgium (Karl Gussenbauer, Alexander Winiwarter), Utrecht, the Netherlands (Friedrich Salzer, Albert Narath, Anton von Eiselsberg), Freiburg, Germany (Vincenz Czerny), Heidelberg, Germany (Czerny, Narath), Königsberg, Prussia (Eiselsberg), Krakau (Johann von Mikulicz [1850-1905], who developed esophagoscopy and gastroscopy), Prague (Gussenbauer, Anton Wölfler, Hermann Schloffer, Karl Maydl), Innsbruck (Viktor Hacker, Schloffer), and Graz (Wölfler, Hacker).

Practically all organs, including the kidney, spleen, liver, bladder, lungs, and brain, were treated surgically at Billroth's clinic. Important stimuli from this clinic spread to gynecology, urology, and plastic surgery. During Billroth's tenure (the last half of the 19th century), the Second University Clinic of Surgery was the dynamic international center for modern surgery. Billroth also founded a training school for nurses in Vienna (Rudolfinerhaus) and a new home for the Society of Physicians.

Karl Gussenbauer (1842-1903) became Billroth's successor in October 1884. Gussenbauer investigated the growth of tumors. He raised the question of whether these tumors could be of a parasitic nature and was one of the first surgeons to advocate the removal of regional lymph nodes.[2,4]

In 1881, Eduard Albert (1841-1900) was appointed Johann Dumreicher's successor as head of the First University Clinic of Surgery in Vienna. From 1877 to 1880, Albert published a 4-volume work: *Lehrbuch der Chirurgie und Operationslehre* (*Textbook of Surgery and Operations*).[12] Albert's favorite field of work was the surgery of extremities. In this field, he laid the groundwork for the great era of Viennese orthopedics that would follow under the tutelage of Adolf Lorenz (1854-1946). In treating congenital clubfoot and different forms of paralytic deformities, Lorenz showed that it was possible to overcome the resistance of even the most severe deformities. He termed these attempts at correction without violence *molding reduction* (*modellierendes Redressement*). According to Lorenz, his greatest success, healing congenital hip luxation, was also the result of this molding reduction. Lorenz's method for treating joint tuberculosis with plaster fixation was also a great success.[13]

Billroth's spiritual heritage and teaching tradition were taken over by Anton von Eiselsberg (1860-1939). Eiselsberg[2,4] was head of the First University Clinic of Surgery from 1901 to 1931. When he started to work for Billroth as a young assistant, an era of hormone research had just begun. Eiselsberg studied tetany following cerebral trauma, loss of hair after thyroidectomy, and transplantation of the thyroid gland. Eiselsberg devoted much energy to a new surgical specialty, neurosurgery, which was continued by his student, Egon Ranzi (1875-1939). However, in keeping with the

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tradition of the Billroth school, Eiselsberg's main focus remained gastrointestinal surgery. He recognized early the significance of orofacial and maxillofacial surgery and as a result established his own surgical department in his specialty in 1915, which was headed by Hans Pichler (1877-1949).

Together with Julius von Hochenegg (1859-1940), Eiselsberg was able to establish emergency wards in the clinics in 1909. This was historically important because these wards were the first in the world in which trauma services were institutionalized.[3]

In the period that followed, many leading Austrian surgeons, whose influence lasted long after World War II, emerged from the First University Clinic of Surgery: Burghard Breitner (1884-1956), Paul Clairmont (1875-1942), Rudolf Demel (1891-1952), Wolfgang Denk (1882-1970), Ernest Gold (1891-1967), Hans von Haberer (1875-1958), Robert Oppolzer (1899-1972), Leopold Schönbauer (1888-1963), Peter Walzel (1882-1937), and Adolf Winkelbauer (1890-1965).[4]

Working as Eduard Albert's assistant, Julius von Hochenegg continued the tradition of Eduard Albert's school in the 20th century. In 1887, Hochenegg introduced the transsacral method devised by Kraske in 1885 for the incision of colon tumors. He improved this method and made the fight against cancer the central theme of his clinical work. With his excellent technical and anatomic training, Hochenegg dared to perform difficult operations, such as the partial liver resection, which he accomplished successfully for the first time in 1890.[4]

In 1911, Hochenegg asked a young graduate student named Lorenz Böhler to become an assistant at his clinic (Second University Clinic of Surgery) after completion of his surgical examination. Lorenz Böhler, the son of a carpenter, eventually became the *praeceptor traumatologiae totus mundi* ("teacher of traumatology in the whole world"). In 1929, he published his principles of treatment in his main work *Technik der Knochenbruchbehandlung* (*The Treatment of Fractures*).[14] This work was printed at Böhler's own expense. Thirteen editions appeared until 1963, and the text was translated into almost every language. Böhler, the father of traumatology, also founded Austria's first emergency hospital in Vienna (1929). This hospital became a role-model for numerous emergency hospitals not only in Austria but all over the world.

The most popular representative of Austrian surgery after World War II was Leopold Schönbauer (1888-1963). Schönbauer was probably the last general surgeon in Austria whose skills encompassed the whole field of surgery, since the field eventually split into surgical specialties.[15]

SURGICAL SERVICE IN AUSTRIA AT THE PRESENT

Surgical service is a part of the medical and social care system for approximately 8 million inhabitants of the Republic of Austria. The social and political system is organized so that statutory social security provides all medical supplies to the entire population. Additionally, private medical insurance is available, which grants, in addition to a high level of medical quality, more comfort and the freedom to choose physicians and hospitals. In the last 4 decades, the life expectancy of women increased from 71.9 to 80.9 years; for men, from 65.4 to 74.7 years. The public health expenditures also increased, from Euro $0.4 billion in 1960 to Euro $11 billion in 1997. Health expenditures measured as the gross domestic product (Euro $12.4 billion in 1960, and Euro $181.7 billion) doubled in the last 40 years from 4.3% (1960) to 8.3% (2000). The average annual increase is 6.9%, where the percentile distribution of public and private costs (6%) moved to private costs (26%). The total morbidity of the population did not change significantly. However, the incidence of cancer increased to 32 000 new cases per year.

Table 1. Number of Health Care Practitioners in Austria

	1952	1975	1999
Total No.	11 368	15 305	33 854
Interns	3132	2913	5711
General practitioners	4843	5429	10 886
Residents	2374	5439	13 638
Staff	1019	1524	3619

The number of physicians in Austria has tripled during the last 40 years, whereas the population has grown only about 10%. A total of 33 854 health care practitioners covered the medical care demand in 1999 (**Table 1**).

General medicine physicians work mostly privately; 28% of all specialists are exclusively employed, and 72% of all specialists have a private office. Surgical service is provided in 138 surgical departments and clinics. Based on cultural, economic, and juridical conditions, surgical services, including general surgery and trauma services, are provided predominantly in inpatient departments or clinics. Such departments are occupied on average by 5 staff surgeons and 2 to 5 residents. The surgical service system in Austria also has 3 university clinics (Vienna, Innsbruck, and Graz) that provide advanced clinical service, graduate education, and research. In 1998, there were 2 135 350 inpatients registered, and half of them (1 037 131) underwent surgery (**Table 2**). Within the European Union, Austria is the leading country in transplantation and organ harvesting (28 organs harvested per million inhabitants a year).

POSTGRADUATE EDUCATION

After finishing the required medical courses (1100 students annually), students must achieve the grade *ius practicandi* (approbation to work at own responsibility) to be authorized to work as a medical care practitioner. For a general practitioner, this grade can be achieved after a 3-year internship.

The postgraduate education for a specialist (43 special subjects or general practitioner) can start immediately after graduation from medical school or after completion of the general practitioner postgraduate education. Postgraduate medical education is regulated by Austrian medical law and the medical postgraduate education rules. It is regulated by a logbook, lasts at least 6 years, and is completed by a legally bound specialist examination.

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Table 2. Surgical Operations Performed in Austria in 1998

Operation	No. of Patients
Goiter	8895
Parathyreoidectomy, adrenalectomy	728
Breast surgery	14 247
Esophagectomy	253
Lung resection	5191
Fundoplication	521
Distal gastrectomy	1036
Total gastrectomy	414
Cholecystectomy (open)	5402
Laparoscopic cholecystectomy	15 191
Liver resection (limited)	424
Hemihepatectomy	136
Whipple procedure	241
Appendectomy, open	19 405
Appendectomy, laparoscopically	1295
Colon resection	6170
Rectum resection	1610
Miles procedure	381
Inguinal hernias	26 328
Inguinal hernias, laparoscopic	3707
Proctologic surgery (hemorrhoids, fissure, fistula)	9484
Abdominal aorta	1605
Thrombectomy, embolectomy, peripheral bypass	9024
Varicose surgery	18 006
Total	**149 694**

From 138 surgical departments and clinics in 105 hospitals, there are 109 that are authorized to provide postgraduate education in surgery. Of the 390 jobs for postgraduate education in general surgery, pediatric surgery, plastic surgery, and traumatology, there are 130 in 3 university hospitals and 260 in other general hospitals.

Currently under consideration is a course in visceral surgery. On completion of this course, the surgeon would be allowed to acquire other selected licenses (diplomas of the scientific society) to practice such as coloproctology, endocrine surgery, surgical oncology, and transplant surgery. Courses on the common trunk, pediatric surgery, and plastic surgery are also planned. A fusion of traumatology and orthopedics is under discussion.

The 6 years of postgraduate education consist of 4 years of studies in the main subject (surgery), 21 months of compulsory side subjects (6 months of traumatology; 6 months of internal medicine; 6 months of anatomy, pathology, and forensic medicine; and 3 months of anesthesia and intensive care medicine), and 3 months of general, free-selected subjects. The physicians must also perform 400 supervised operations in the fields of head and neck (20), thoracic (50), abdominal (200), muscle and skeleton (100), and vessels and peripheral nerves (30), as well as 150 flexible endoscopic investigations (100 gastroscopies, 50 colonoscopies) and 100 ultrasound investigations.

The Austrian Society of Surgery (Österreichische Gesellschaft für Chirurgie) aims to support science in the field of surgery and to keep and coordinate interaction among different surgical fields and specializations. The Austrian Society of Surgery organizes an annual scientific congress and awards annually the Billroth Award for the best research project. The Austrian Society of Surgery administers a repetitive series of postgraduate education events, covering all fields of surgery in 6-year cycles. Additionally, the Austrian Society of Surgery is authorized by the Austrian Medical Chamber to administer the specialists' examination.

The Austrian Society of Surgery is a member of the Union Européenne des Médicins Spécialistes, which was founded in 1958. Within the Union Européenne des Médicins Spécialistes, there are sections responsible for the professional defense of their specialty and coordination of the profession in Europe. Within those sections, there are boards that, assisted by experts from the scientific world, concentrate on the patient's interests and quality control in continuing medical education. Within the surgery section of the Union Européenne des Médicins Spécialistes, there is the European Board of Surgery and the European Board of Surgical Qualification. In both of these sections, the Austrian Society of Surgery is an active member represented by one of the authors (W.F.).

Finally, the surgical service in Austria is still developing and cooperating with other disciplines of research and service. Recently, the Austrian surgical service introduced a genetic research and tissue engineering program. In the future, the Austrian surgical service needs to focus on reforming medical schools by reducing the amount of theoretical courses and increasing the practical aspects of the curriculum. In addition, unlimited access to medical schools has to be prevented to avoid producing more unemployed physicians.

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