

## A brief history of laparoscopy

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Laparoscopic Surgery gradually grew out of endoscopy and arrived at its present form a step at a time, through leaps of intuition for which it is difficult to attribute credit of discovery. Those who would like to know the History of Laparoscopic Surgery must look at the earliest stages of development of Endoscopy, and Endoscopy traces its origins to two of the easiest access points of the human body; the rectum and the vagina.

The oldest description of an endoscopic examination comes from the Kos School of Hippocrates (460 – 375 BC) which created and used a rectal speculum that was extraordinarily similar to those used today (1). An analogous instrument used for the rectum, vagina, nose and ear, was found in the ruins of Pompei (2). The Babylonian Talmund (500 BC) described a similar vaginal speculum: Abulcasis of Cordoba (980 – 1013, according to other authors 936 – 1013) (3) and later Giulio Cesare Aranzi (1530 – 1589) tried to illuminate the rectal and vaginal cavities with reflected natural light (4).

One has to look at the early 1800s in order to discover the next leap ahead. In 1805 a Frankfurt obstetrician, Phillipe Bozzini (Fig. 1) (5) devised an instrument for examining the bladder and rectum using a concave mirror which reflected the light of a candle. He demonstrated this to the Medical Faculty in Vienna, which not only rejected this sort of “magical lantern”, but also censured Bozzini for his “morbid curiosity” (3). However, the idea did not go unnoticed: during the same year R. Fisher in the United States and the following year M. Segales in France carried out vaginal examinations using reflected light applying Bozzini’s idea. In 1865 Antonin Desormeaux presented the first “modern” cystoscope to the Academy of Medicine in Paris (6): the examination carried out with this instrument is considered the first true endoscopy in history (3). In 1870 Adolph Kussmaul performed esophagoscopy using a rigid tube with mirrors: he had the idea while watching a sword swallowing show! In 1867 a dentist from Breslau, Karl Ludwig von Bruck created the first instrument with an internal light. Ten years later, in 1877, Max Nitze (7), an urologist from Berlin, designed a cystoscope that incorporated lenses and electric light. He copied Bruck’s idea, adding a cooling system using water. Three years later, in 1880, Thomas Alva Edison, in the United States invented the first light bulb. This invention became a turning-point in the History of Endoscopy: many practitioners attempted to insert a light bulb into the endoscopes, causing numerous burns. Johann von Mikulicz-Radecki (Fig. 2) was the first to use a miniature light bulb at the end of his gastroscope, which could be angled up to 30° at the third distal, thus anticipating the creation of the first semi-flexible gastroscope by more than 50 years (Wolf von Schindler, Berlin) (8). In 1887 using von Mikulicz’s instrument, Gustav Killian performed the first bronchoscopies, increasing the illumination by using a small head mirror.

On September 23, 1901, (according to some authors September 21) George Kelling (1866-1945) (Fig. 3), a surgeon from Dresden, examined the peritoneal cavity of a dog using Nitze’s cystoscope, insufflating it with oxygen filtered through sterile cotton wool, and coined the term “celioscopy”.



Fig. 1 - Philippe Bozzini (1805 - Obstetrician from Frankfurt) Instrument with reflected light to examine the urethra and bladder.



Fig. 2 - Johann von Mikulicz-Radecki. In 1881 was the first to use a miniature internal light bulb on his gastroscope.

Thus arrived laparoscopy, separating from endoscopy. In the same year Kelling presented the case to the Medical-Biological Society of Hamburg. He published it the following year (9). Kelling also used this technique to examine the abdomens of several patients, but he did not publish this experience immediately, limiting himself to describing it in letters to colleagues (3). In the same year, 1901, Dimitri Edler Von Ott from St. Petersburg examined the abdominal cavity of a pregnant woman using an illuminated head mirror. This was already not a celioscopy but a minilaparotomy (10).

The first celioscopy performed on a human was carried out by Hans Christian Jacobaeus (1879-1937) in 1901 using Nitze's cystoscope and without pneumoperitoneum: it was Jacobaeus who introduced the term "Laparoscopy", deriving it from Greek. In 1911 he performed 115 laparoscopies on 69 patients with only one serious complication (bleeding) which required a laparotomy (11). One month after the Jacobaeus' publication, Kelling published an article on 45 laparoscopies, in which he described several types of tumour and peritoneal tuberculosis (6). Still in 1911 Hippolyte Bernkeim of the John Hopkins University used a 12mm proctoscope, inserted in the epigastrium in order to study a patient with a pancreatic tumour and appendicitis, and published the first American article on laparoscopy (3, 12). Reports of similar experiences arrived from Denmark, Finland, France, Italy, Hungary and Brazil, confirming the spread of the technique (4). The following year, 1912, Severine Nordentoft, a gynaecologist from Copenhagen, was the first to adopt the position of Trendelenburg for laparoscopy. He also designed and used the first trocar (13); in 1920 the American William R. Orndorff added the typical pyramidal points to this instrument, in order to facilitate the insertion (14). A year later, 1921, two German surgeons further improved laparoscopy: R. Korbsch described and adopted the needle to induce pneumoperitoneum and Otto Goetze invented the apparatus for insufflation (15, 16). Further progress achieved by German surgeons was accomplished by Heinz Kalk (1895 – 1973) who, in 1929, introduced a new system of lenses for lateral vision at 45°. In 1935 he also published in the most important German medical journal, the 'Deutscher Medizinischer Wochenschrift', issue 46, his "dual trocar technique" of initiating and executing endoabdominal procedures. From 1929 to 1959 he published 21 works on laparoscopy. His monograph of 1951 reports his experience with over 2000 patients. The results were exceptional (17). In 1933 Fevers (4) used Kalk's technique while performing the first surgery on adhesiolysis with haemostasis through cauterization and in a few biopsies: this could be considered the first "modern" surgery using Laparoscopic Surgery. Fevers realised the risks of using oxygen to induce pneumoperitoneum and recommended the use of carbon dioxide (18) as an alternative. In 1937 a diagnosis of an ectopic pregnancy treated with laparoscopy was reported for the first time by the American Hope: it was the first use of Laparoscopic Surgery in emergency (19). In a publication the following year Jano Veress, a Hungarian surgeon, reported that he had devised a needle to induce pneumoperitoneum, to drain the ascites and to drain air and liquid from the pleural cavities (20). Veress' needle which is still used today, has undergone few modifications in respect to the original.

In 1952 the British physicist Harold H. Hopkins published his invention of the system of illumination by cold light (21) and in the same year three Frenchmen, N. Fourestier, A. Gladu and J. Vulmiere were the first to adopt this new system of illumination for laparoscopy (cold light lapa-



Fig. 3 - George Kelling (1866-1945).



Fig. 4 - Kurt Semm, gynaecologist at the University of Kiel.

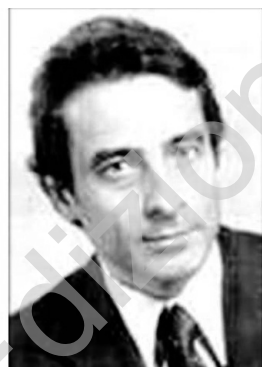


Fig. 5 - Erich Mühe (University of Boblingen). In 1985 he performed the first laparoscopic cholecystectomy in the world.

cholecystostomy with favourable results (26). July 15, 1882, in the small hospital Lazarus, in Berlin, Carl J. A. Langenbuch (1846 – 1901) performed the first cholecystectomy on a 42 year old patient, discharged from hospital without any complications (27, 28). One hundred and three years later, Erich Mühe (Fig. 5), a surgeon at the University of Boblingen in Germany, performed the first laparoscopic cholecystectomy on humans using a modified rectoscope as for access and with the insufflation with CO<sub>2</sub>. His pioneering contribution would be recognised belatedly. In 1986 he presented the case to the German Society of Surgeons Congress in Munich, but the surgical community was sceptical; in the same year he presented it to the Rhineland – Palatinate Surgical Society in Cologne, where he was again unsuccessful (29). He was practically unknown abroad: from 1965 to 1988 he published 342 articles, of which only 7% were in English (30). In 1986 video was adopted, after having been experimented since 1982; video laparoscopic surgery (VLS) had arrived. In 1987 Philippe Mouret (Fig. 6), a gynaecologist from Lyon, performed the first cholecystectomy with 4 trocars on a patient with a gynaecological disorder and gallstones. In the same period Mühe had

roscopy) (1). In 1967 the British gynaecologist Patrick Steptoe wrote the first Treatise of Laparoscopic Surgery. In 1970 the same author performed the first artificial insemination in vitro, extracting the oocytes laparoscopically (22). In the same year, 1970, the German surgeon H. Hasson presented his technique and the relative instrument to access the peritoneum. His first publication concerning this technique appeared eight years later (23).

During the same period, the German School was noted for its achievements, in particular that of Kiel under the guidance of Kurt Semm (Fig. 4), a graduate in Engineering and in Medicine, and specialised in Gynaecology. From the mid 60s to the mid 80s laparoscopic instrumentation grew enormously: Semm developed the automatic insufflator which monitored abdominal pressure, the hook scissors, the endloop applicator, the pre-tied loop (Roeder loop), the high volume irrigation/aspiration apparatus, the laparoscopic thermocoagulation, the instrument for macrobiopsies, and the pelvitrainer. He performed lysis of adhesions, intestinal sutures, biopsies and staging of tumours, more than 200 hepatic biopsies and, above all, gynaecological interventions. At that time gynaecological interventions were performed either by a median incision or by an incision of Pfannenstiel (Herman J. Pfannenstiel, Gynaecologist at Kiel from 1907 -1909). From 1970 to 1991 Semm performed more than 20.000 pelviscopes, replacing 70% of the laparotomies (24). In 1983 the first laparoscopic appendectomy was performed. In 1979 another German surgeon, Dominic Frimberger had performed the first laparoscopic cholecystectomy on a pig, but the work was published many years later (25); the era of experimental laparoscopic cholecystectomy had begun.

Gallbladder interventions have their origins in distant past. In the early 1800s in Indianapolis, Indiana, J. S. Bobbs performed the first

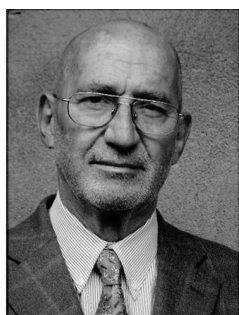


Fig. 6 - Philippe Mouret, gynaecologist from Lyon. In 1987 he performed the first VLS cholecystectomy with 4 trocars.

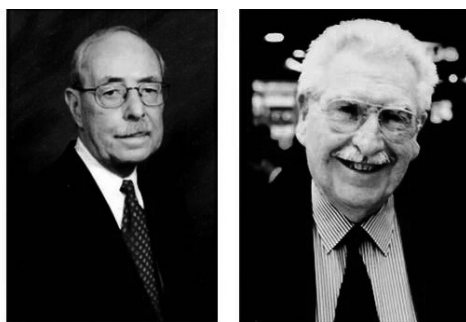


Fig. 7 - Donald P. Dubois e Jacques Perissat.

successfully performed 94 cholecystectomies, without the scientific world being aware. In 1988 Donald P. Dubois (Fig. 7) carried out the same intervention publishing his work the following year (31). During the same period in Bordeaux Jacques Perissat (Fig. 7), and in Dundee Alfred Cuschieri, performed the same operation. In Moscow in 1983, D. Lukikev performed the first laparoscopic cholecystectomy (not VLS), which was censured by the Medical Academy. Still in 1983 the British urologist J. E. A. Wickham coined the term “minimally invasive surgery” and in 1987 the first edition of the journal “Surgical Endoscopy” came out (32, 33). Barry J. McKernan, surgeon, and William B. Saye, gynaecologist, on June 22 1988 at Marietta in Georgia, performed the first VLS cholecystectomy in the USA. In the same year it was performed by Eddie J. Reddick and Douglas O. Olsen in Nashville (Tennessee) (they also organised the first courses in the world in Laparoscopic Surgery), and subsequently at Los Angeles by Berci (34). In 1990 Mühe sent an article to the American Journal of Surgery on laparoscopic cholecystectomy: the article was rejected. In the same year he met Dubois in Paris, and an argument almost erupted when the German surgeon claimed to have performed the first laparoscopic cholecystectomy. At the Second World Congress of the Society of American Gastrointestinal Endoscopic Surgery (SAGES) the question as to who was the first surgeon to perform a laparoscopic cholecystectomy was raised: the names Perissat, Reddick, Berci, Cuschieri, Dubois and Mouret were proposed: Mühe was not mentioned. The official recognition by SAGES and therefore the whole scientific world, finally occurred on March 26, 1999 in San Antonio, Texas, with the Annual Karl Storz Lecture in New Technology, it was awarded to Mühe. The title of the lecture was “The First Laparoscopic Cholecystectomy: Overcoming the Roadblocks on the Road to the Future”. Although Mühe was accepted as the inventor, it was the French School that contributed the most to making laparoscopic cholecystectomy use common. In fact, many surgeons consider Mouret, Dubois and Perissat the “Second French Revolution” (32).

Within a few years there were two important positive developments in General Surgery. On one hand, laparoscopic surgery began to be applied to nearly every organ in the body. For many types of interventions (cholecystectomy, hiatal hernia surgery, adrenalectomy,) its application surpassed the point of no return (35). On the other hand, the acceptance of the Laparoscopic Surgery among the general population has been overwhelmingly positive and has changed Surgery more dramatically and more rapidly than any other milestone, including the use of anaesthesia and later antibiotics. From the point of view of the doctor-patient relationship, a quote from Perissat (36) is significant: “The laparoscopic revolution is particularly important because for the first time, surgery no longer involves any physical contact between the surgeon’s hand and the patient. Let us hope that this will not lead to total absence of a human relationship in the surgical operation”. Nevertheless, not all the surgeons accepted this revolution, above all among those who were older, and a group formed whose motto was, “Why peek through a key hole when you can open the door?” To which the advocates of laparoscopy responded: “Why kick in the door, when you can look through the key hole?” (37).

In 2004 the first work on NOTES (Natural Orifice Transluminal Endoscopic Surgery) (38, 39) was published: the hepatic trans-gastric biopsy was among the first surgeries (40).

Laparoscopic surgery will definitely continue to develop on the technical level, and new surgeries will become possible. However, nothing will equal the impact of the first laparoscopic interventions on the course of Surgery and on the expectations of patients. After having defeated pain

and infection, the devastation of the body caused by large incisions has been defeated as well: an important step towards improving the quality of life.

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