

## What does surgery owe to anaesthesia?

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Motto: “And the Lord God caused a deep sleep to fall upon Adam, and he slept: and he took one of his ribs, and closed up the flesh instead thereof” Genesis 2:21

While preparing to write this article I tried to search for relevant publications on the Internet. Unfortunately, after entering the sentence “what does surgery owe to anaesthesia?”, both in Polish and English, I did not find a single publication. Therefore, everything I have written below comes from various books, studies, the experiences of other surgeons and my own thoughts resulting from more than 55 years of experience of working as a physician and surgeon. I have had the opportunity to cooperate with anaesthesiologists for over 55 years. I have included the good and bad sides of this cooperation below.

“Everything that happened in surgery before the discovery of general anaesthesia was a night of ignorance, suffering and a fruitless search in the dark” these are the words of Gosset, a well-known French surgeon [1]. Until 1846, it was impossible to “enter” the human body surgically due to the resulting agonising pain. The basic surgical procedures included amputations of limbs or parts thereof, hernia repairs, the removal of stones from the urinary tract and cataract surgery. The results of these procedures were poor and the perioperative mortality was very high. The most common postoperative complications included infections with high fever, bleedings and haemorrhages, and the death of patients. The procedures had to be short in duration. Only major and larger blood vessels were ligated. The surgeon had to be very agile and fast so that he could finish the surgery, often just before the patient died.

The history of surgery is the history of the last 170 years. It begins on October 16, 1846, when John Collins Warren, the chief surgeon at Massachusetts General Hospital in Boston, operated on a man named Gilbert Abbot because of a maxillary tumour infiltrating the tongue. General anaesthesia with ether was conducted by William Morton. The surgery went off painlessly. After the surgery, the reaction of the surgeon was almost hysterical. Warren cried and shouted, “Gentlemen, this is no humbug” (Fig. 1).

Another distinguished surgeon Robert Liston (1794–1847), having seen the effect of ether anaesthesia, said: “This Yankee dodge, gentlemen, beats mesmerism hollow”. Henry Hartmann, another excellent surgeon, observing the surgery in Boston on October 16, 1846, uttered the prophetic words, “I am convinced of the revolutionary influence of narcosis on the development of surgery.” Indeed, these were prophetic words.



**Figure 1.** The first use of general anaesthesia with ether, October 16, 1846 [2]

J. F. Dieffenbach, who allegedly was the first to use general anaesthesia in Europe, said the following sentence: “a beautiful dream has become a reality: surgeries can now be performed painlessly”.

Thanks to ether anaesthesia, the basic condition for the dynamic development of surgery had been met, one which began from the second half of the nineteenth century and continues to this day.

We must remember that general anaesthesia does not only mean eliminating pain but also providing the relaxation of the patient. Thanks to general anaesthesia, the surgeon can operate comfortably and precisely, provided that he or she is working with an experienced and competent anaesthesiologist monitoring the basic vital parameters of the patient.

Dr. Bigelow described general anaesthesia with ether on October 18, 1846 in the Boston scientific journal, the *Medical and Surgical Journal*.

The pioneering use of general anaesthesia on October 16, 1846 was not a scientific bombshell or sensation. In fact, that day was the culmination of almost 50 years of an intellectual process aimed at eliminating pain during surgical procedures.

Here are some moments of this process:

1. In 1800, Humphry Davy, an English chemist, inhaled nitric oxide which relieved his severe toothache. However, this experiment went largely unnoticed.
2. In 1823, Henry Hill Hickman, an English physician, conducting experiments on animals, anaesthetising them with carbon dioxide.
3. In 1842, Crawford W. Long administered ether to his patients in order to reduce pain.
4. In 1844, Dr. Smille gave patients a mixture of ether and morphine during the incision of abscesses, which enabled painless procedures.
5. October 16, 1846 is a memorable day regarding the first use of ether anaesthesia for a surgical procedure. Every year, this day is celebrated worldwide as Ether Day.
6. In 1847, chloroform was introduced into clinical practice.
7. In 1930, curare and its derivatives were introduced to general anaesthesia (H. R. Griffith)
8. Succinylcholine has been employed as an anaesthetic since 1942.

The next stages of the development of anaesthesiology include the introduction of intubation, selective intubation of the main bronchi, the development of regional anaesthesia, nerve block anaesthesia, spinal anaesthesia, and local anaesthesia (ethyl chloride, lidocaine, cocaine).

Anaesthesia, antisepsis and asepsis have created strong foundations for the development of surgery. The organs such as the liver, heart, lungs, thyroid, central nervous sys-

tem (brain and spinal cord), etc., which were not accessible until the mid-nineteenth century, were now wide open to surgeons. In this situation, great surgeons appeared as fighters for human life. The first procedures under ether anaesthesia were performed as follows:

- December 21, 1846 — Robert Liston performed a thigh amputation within 28 seconds, the first operation under ether anaesthesia in Europe.
- January 24, 1847 — surgery under anaesthesia was performed in Erlangen by the surgeon Johann Ferdinand Heyfelder.
- January 27, 1847 — the first surgical procedure was conducted in Vienna by the surgeon Franz Schuh).
- January 19, 1847 — the first surgery under anaesthesia took place in Edinburgh.
- February 6, 1847 — Dr. Ludwik Bierkowski, a Cracow surgeon, for the first time applied general anaesthesia in Poland — within four months after the first use of ether anaesthesia in the world. Admirable!

On November 4, 1847, James Young Simpson discovered the anaesthetic effect of chloroform. The anaesthetic effect of chloroform was subsequently used by John Snow during the delivery of two of Queen Victoria's children in the 1850s. In recognition of his achievements, Snow was knighted by the queen, and his coat of arms bore the inscription “Victo dolore” (Victory over pain).

With the increasingly common use of general anaesthesia, a galaxy of excellent surgeons appeared, including Billroth, Mikulicz-Radecki, Fenger, Senn, Oschner, McBurney, William and Charles Mayo, Morton, Murphy, as well as Rydygier. Today's anaesthesiologists owe very much to these giants of surgery. Although we do not know much about them, it was due to their efforts that surgeons could safely and effectively gain access to the human body.

In addition to many areas of surgery, the dynamic development of gastric surgery has been observed since 1880. The treatment of peptic ulcer, its complications and the management of stomach tumours became possible. During this period such prominent surgeons as Emil Pean (Paris), Teodor Billroth (Vienna), Ludwik Rydygier (Chełmno), Jan Mikulicz-Radecki (Wrocław) conducted gastric surgeries.

The night of September 7, 1896 deserves to be remembered. At a hospital in Frankfurt, Luis Rehn, for the first time in the history of surgery, sewed up a 1.5 cm stab wound of the heart in a man named Wilhelm Justus. The patient survived the operation. After this surgery, which shocked the world, the brilliant surgeon Billroth said: “In the past, a surgeon who had attempted to repair any heart defect could have been sure to lose the respect of colleagues forever.”

Briefly, some further achievements in surgery are as follows [3, 4]:

- Surgery of so-called blue babies: Blalock's operation in the 1940s and 1950s, although criticized today, prolonged children's lives by 10–15 years.
- April 4, 1943 — in Kampen (the Netherlands), Prof. Kolij connected Jenny Schrijver to an artificial kidney (dialysis),
- June 17, 1950 — Richard D. Lawler performed the first kidney transplant from a deceased donor on Ruth Tucker (Chicago, USA)
- 1960 — the introduction to clinical practice of arterio-venous fistula in chronically dialysed patients (Scribner's fistula).
- 1963 — progress in the closure of congenital heart defects, heart valve surgery thanks to open heart surgery (valve stenosis, valvular incompetence).
- March 1, 1963 — the first liver transplant; however, the child died on the operating table due to a massive haemorrhage (Starzl).
- April 21, 1966 — Professor De Bakey introduced the idea of an artificial heart, i.e. the first by-pass to support the work of the left ventricle.
- November 20, 1967 — information that the way to conduct a heart transplant was open and ready, appeared in the *Journal of the American Medical Association (JAMA)*. This news was confirmed by Prof. Norman Shumway from Stanford University.
- December 3, 1967 — *Newsweek* reported that Dr. Christian Barnard from Cape Town (South Africa) along with a 30-person surgical team performed the first human-to-human heart transplant. The recipient died after 18 days.
- October 1970 — Prof. Denton A. Cooley implanted an artificial heart. Unfortunately, the patient died. Although the patient's widow (Shirley Karp) had signed the consent form agreeing to experimental surgery, after a year she filed a lawsuit for \$4.5 million in damages for her husband's death. Is this the irresoluteness of human nature? Could one's mourning have turned into a desire for profit under the influence of lawyers? These are among the many faces of human nature which we have experienced up to today.

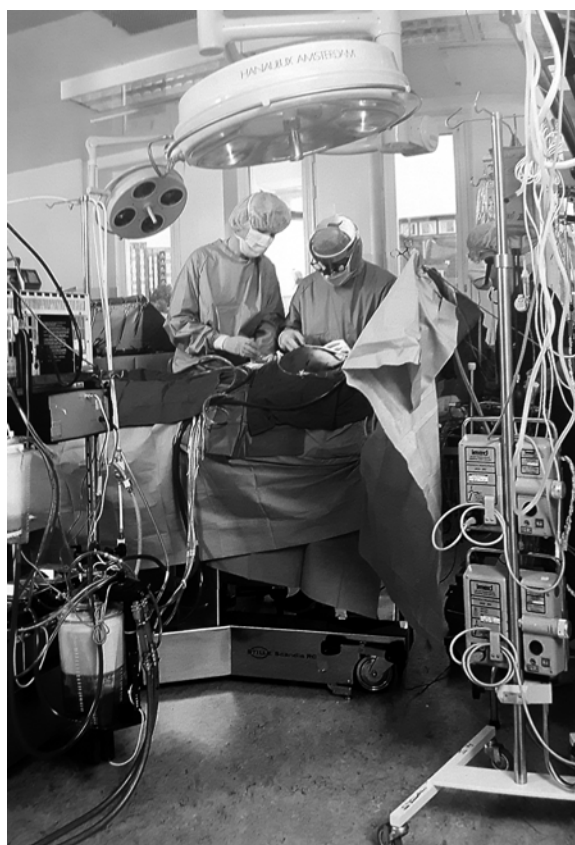
Another example of the development of surgery concerns the outcomes of rectal cancer treatment. Thanks to modern anaesthesiology and progress in surgical techniques, such as classic, laparoscopic, robotic and hybrid methods, general mortality in rectal cancer today is 4%, 5-year survival 65% while local cancer recurrences occur in only 4% of patients.

Thanks to advances in intensive care, the lives of patients can be saved and supported in clinical situations that once ended in death, e.g. multiple injuries, extensive myocardial infarcts with arrhythmias, sepsis, thoracic or abdominal aor-

tic rupture, diffuse peritonitis, etc. The ICU patient requires an average of 178 individual activities and interventions during a 24-hour stay [5] (Fig. 2).

While preparing for this article, I asked various surgeons the following question: "What does surgery owe to anaesthesia?" Here are some replies:

1. Dr. MP, head of a district hospital, already retired, but in excellent mental and physical condition, told me how he had begun to anaesthetise patients having completed a course on anaesthesiology. As the head of surgery, he introduced anaesthesiology to the hospital.
2. Another colleague, a surgeon, said that after a 3-month course in anaesthesiology, he started anaesthetising patients for surgery. Subsequently, other colleagues blocked his access to surgical procedures by asking him not to operate but to anaesthetise the patients for surgery.
3. A professor of surgery from Rzeszów told me that once anaesthesiology was introduced in the hospital, the surgeon did not have to worry about the patient anymore and focus on the procedure.
4. Surgeons agreed that they could safely perform increasingly difficult, long-lasting procedures if the patient was anaesthetised by a competent anaesthesiologist.



**Figure 2.** The so-called spaghetti syndrome [2]

5. Modern anaesthesiology has eliminated explosive gas mixtures, such as ether, from operating theatres. Thus, surgical procedures have become safer.
6. My friend from Rzeszów, Dr R. Z. confessed that he once gave a doctor, who was an anaesthesiologist, a bouquet of beautiful flowers for preventing surgery under general anaesthesia in a patient in whom he wanted to excise a suspicious breast lump. The reason was a serious heart disease which my colleague had did not recognised. If the anaesthesiologist had folded under pressure of the surgeon and had anaesthetised the patient, the patient's life could have been in danger. In my opinion, the anaesthesiologist was simply a good doctor.

Indeed, Professor E. M-Z, a recognised authority in Polish Anaesthesiology, once said, "a surgeon and an anaesthesiologist are like a couple of dancers on ice. The fall of one of them causes the inevitable fall of the other." This is undeniably true.

Many surgeons, for various reasons, also became excellent anaesthesiologists (Prof. Jurczyk, M. Matulewicz MD). In 1938, the first PhD dissertation on anaesthesiology was written and defended by Dr. Stefan Wesołowski, later an outstanding urologist and professor of medicine.

All the aforementioned achievements in surgery were assisted by anaesthesiologists and without their involvement surgical achievements would not have been possible. Due to progress in anaesthesia and intensive care, surgery opened another door in the process of saving human lives. Surgical procedures, such as face transplants, regeneration of the spinal cord by implanting stem cells or further successes of transplantology, have become possible due to anaesthesia.

Surgery forces continuous advances in anaesthesia and intensive care. Close cooperation between surgeons and anaesthesiologists is essential. The success of modern surgery has become possible thanks to modern anaesthesia and intensive care. Patients with serious risks and diseases can be prepared for surgical procedures. Long-lasting procedures, often including changing the patient's position on the operating table, can now be performed. Perioperative medicine has become crucial. Although surgeries can be performed, the most important element is the postoperative recovery. Indeed, prevention and treatment of perioperative complications is as important as the surgery itself.

In the operating theatre, team-oriented work is crucial. The operating theatre is not a place for solo performances. Each member of the team knows his/her place and their role in this game called surgery. However, the most difficult problem remains good cooperation between anaesthesiologists and surgeons. Who is more important in the operating theatre? The surgeon? The anaesthetist? We seem to forget that the most important and courageous person in the

operational theatre is the patient on the operating table as they have entrusted us — anaesthesiologists and surgeons — with their life and health.

The surgeon should be competent and responsible for planning and carrying out the procedure while the anaesthesiologist is responsible for planning and carrying out anaesthesia, as well as monitoring and maintaining the basic vital functions of the patient undergoing surgery [6]. Representatives of both specialties should trust one another that their partner will fulfil the tasks with due competence, conscientiousness and responsibility, unless a lack of qualifications becomes evident.

The cooperation of surgeons with anaesthesiologists is determined by the condition of the patient requiring treatment. There are three groups of patients:

- 1) patients in life-threatening conditions,
- 2) patients qualified for elective surgical treatment,
- 3) patients in severe conditions associated with surgical procedures or injuries treated in the intensive care unit.

In the 1990s, there were many meetings and discussions on the principles of cooperation between surgeons and anaesthesiologists [7]. The consensus statement of the Association of Polish Surgical Societies on the principles of cooperation was based on the following materials:

1. Opinions of Presidents of the Society of Polish Surgeons and the Polish Society of Anaesthesia published in the *Polish Journal of Surgery* (1991; 63(5): 396–398).
2. Discussions of these opinions, published in *ditto*.
3. M. Sych "Comments on cooperation of surgeons and anaesthesiologists" *Polish Journal of Surgery*, (1993; 65(5): 413–416).
4. W. Rowiński, B. Kamiński "Cooperation of the surgeon and anaesthesiologist: partnership relation or conflicts of ambition and interest?" *Polish Journal of Surgery* (1991; 63(5): 395).

These long-lasting discussions have led to the revealing, original and concise conclusion that the anaesthesiologist should competently anaesthetise and the surgeon should competently operate.

I would now like to answer the opening question, namely: "What does surgery owe to anaesthesia?" My answer to this question is short: "It owes a lot, and maybe everything."

On behalf of many, wise, experienced surgeon friends, I would like to apologise for the many undervalued years of anaesthesia in the development of surgery. As part of my apology, I would like to thank all the wise and competent anaesthesiologists for being present and enabling surgeons to carry out surgical procedures. After all, these wise and competent anaesthesiologists know perfectly well that patients come to hospitals in order to be operated on and not to receive general anaesthesia. You can get some sleep at home!

My dear anaesthesiologist friends, I would also like to say that “Some people make this world special just because they are”. Moreover, to my surgeon friends, I would like to address the words of Henry S. Hartmann: “One should learn to be more humble facing the greatness of medical knowledge”.

And here is my message to all physicians treating their patients requiring help: “The responsibility for the patient is borne by this doctor who comes first to the patient (John Murphy, Medical Society, Chicago)”.

Since I am a devotee of the Polish priest and poet, Jan Twardowski, whose favourite saying was that “Only love and laughter can save us,” I would like to cite a few jokes and sayings to be thought over, namely:

“There are three known natural types of anaesthetic agents: sleep, fainting and death” (Oliver Wendell Holmes)

“The invention of anaesthesia made it possible for every donkey to be a surgeon” (William Halsted, 1852–1922).

“Anaesthesia is like a plane journey: crashes happen most often during take-off and landing” (Max Simon).

“What is blue-white anaesthesia? The patient is blue and the anaesthesiologist is white”.

“Sir, since the patient can stand without sleeping, you can surely too” (W. Trotter, 1872–1939).

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