

PROGRESS AND PERSPECTIVES IN SURGERY

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The word "surgery" comes from Greek and literally means "the art of the hand" and represents the part of the medical sciences that aims to cure some illnesses and traumas by performing operating techniques. Surgery is probably as ancient as the human race. The initial elementary and spontaneous maneuvers to immobilize a fractured limb or to wash a wound or to compress a bleeding vessel have led by generalization, continuous improvement and transmittance from generation to generation to present-day surgery, with its numerous branches that make the glory of contemporary medicine.

Historically speaking, starting with the second half of the nineteenth century, the discovery and utilization into clinical practice of three paramount acquisitions - anesthetics, asepsis and hemostasis - have revolutionized surgery and have allowed the future development of surgical activity and techniques. The limited knowledge of that time, especially in the field of physiology and pathophysiology did not allow the extension of surgical procedures to the thorax, the cardiovascular and central neurological systems.

In the first half of the twentieth century, the science of anesthesia has developed and made it possible to alleviate pain while protecting and supporting respiratory and circulatory functions. Other important developments were represented by the discovery of X-rays, the therapy of the shock by improving and scientific utilization of blood transfusion (blood groups were described by Landsteiner in 1900), infections were better controlled by large-scale use of antibiotics, better insight into metabolic disturbances and many others. All these have

constituted the scaffold on which surgery has made its remarkable progresses in the last decades, as well as enabled a change into its initial aims.

The trends for the future in surgical specialties are remarkable and some of them are truly amazing. That is why we will not make any attempt towards a comprehensive presentation, as it would be impossible but we will underline some aspect and the most important tendencies of development in modern surgery, in the context of bio-medical sciences and scientific advents. Some considerations will be presented on the personality of the surgeon.

The scientific progresses have burgeoned in the last three decades of the twentieth century. Science has developed both vertically and horizontally resulting in a doubling of the knowledge in less than 15-25 years. The number of scientists and researchers, the information boom of an enhanced quality all contributed to a significant impact on human society.

In such circumstances, a brief review on medical sciences and particularly on the surgical field can document achievements un-hoped for 40 or 50 years ago, that further enlarge the outstanding perspectives that are within reach for the current generation of surgeons.

Surgery differs fundamentally from others medical specialties, not only because its main therapeutic part relies on hand skills directed by the brain, but also because it has some unique particularities, listed below.

a. Manual labor itself: interventions, dressings, specific investigations that are time-consuming and also physically exhausting; however the surgeon must remain continuously informed on so many domains of knowledge. In fact, some surgeons are famous in

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both medical and non-medical world as front intellectuals, thinkers, and talented writers. Despite their limited time, along history, several surgeons (e.g., Lister, Dragsted, Moore, Toma Ionescu, Iacobovici and many others) have brought a fundamental to our knowledge in anatomy, physiology, biology, etc., and they have been recognized as such by the specialists of these fundamental fields of medicine.

b. Surgeons take personal responsibility for the surgical intervention, regardless of their status (residents and professors alike) as this is the fundamental gesture of its therapeutic activity and the reason of the surgeon's existence. Therefore, as he cannot close the wound and go to the library for a better documentation, the surgeon is expected to make fast decisions depending on the findings during surgery - a one-session therapy -, to choose the optimal therapeutic solution and to elegantly put it into practice.

c. Let's take a moment in order to analyze the work of the surgeon that can be without much exaggeration called "creation" or "artwork". It is an act of creation, as in an area of the human body the surgeon builds a situation that has not existed before. Even in a mutilating intervention performed as necessity, is an act of creation and can become through its beauty and elegance of execution, an "artwork", if the surgeon is talented and intelligent. Let's meditate over some "masterpieces" of the plastic surgery; even if these artworks created by the surgeon are subject to decay as they will disappear with the human that hosts them. Even so, such extraordinary mastership and wonderful accomplishment of the human mind and hand can a transplanted organ or plastic surgery contain, or even a well-performed derivation.

d. Some indispensable qualities are needed to be a surgeon (to practice surgery), no matter the surgical specialty. That does not necessarily mean exceptional qualities particular to some, very few, persons that made the glory of surgery, but those routine, everyday qualities mandatory for our specialty to be practiced in acceptable conditions. Some are inborn, other are acquired. Famous physicians and surgeons as well as writers, of whom I will mention a few, have formulated in their writings, under the influence of historical, social and scientific conditions of their times, the qualities needed by physicians and especially by the surgeons. I further mention some of them: in Roman antiquity: Aulus Cornelius Celsus; Avicenna, in the 10th Century; Guy de Chauliac, in the 14th Century; Paul Valery, in the 20th Century has pictured one of the most suitable portrait of the surgeon: "his work, of all possible, is the one that embraces the greatest number of independent conditions and it requires such a large

collection of abilities, a fast and good memory, such a definite science, such a sustained temperament, a vivid spirit, a great physical endurance, a sensorial acuteness, a precision in uncommonly-used gestures, that the coincidence of so many distinct abilities in one individual makes the surgeon a particular case".

In the surgeon's decalogue, written by Ludovic Palumbo in the 20th century, the eight order states: "remind that if the physician* is not a surgeon, the surgeon must possess all the knowledge of the surgeon". To paraphrase Ludovic Palumbo, we could ask more: a surgeon must be a very good internist who also knows how to perform surgery. (**physician* = *internal medicine specialist*).

The great progresses recorded in contemporary surgery have enormously increased the prestige of the surgeons and surgery for the general public. The patients look up with great confidence to the surgeon and the surgical act.

Often worshiped, the surgeon tends to unwillingly become the central figure of medical characters: in life, in literature, in cinematography. Here is what Arkadie Percek has to say concerning this aspect: "a surgeon that successfully combines the technical and the ethical issues of his profession has a great chance to be deified by his patients". Victor Sahleanu, on the same topic, says: "surgery is of great matter to the patient who imagines that the scalpel is both a magic wand and a sculptor's chisel; it is also of great importance to the healthy individual who perceives himself as a potential patient; nor to the philosopher who sees this medical branch the embodiment of fight of the people with death, with the unforeseen and with pain."

I will make some observations regarding the scientific advances and the contribution of fundamental sciences and other fields of research to the progress of surgery.

As it happened to any other medical specialty, the revolution of science strongly influenced the development of surgery. As Saegeser put it, "along with the progress of other sciences, the surgery changed more profoundly and more rapidly in the last thirty years than it did in the preceding thousands of years".

We even believe that few are the medical fields that obtained such important successes as surgery did, the quality jump being invaluable. According to De Bakey, "surgery is currently on of the domains with the fastest progress, apart from fundamental medical sciences". One can say that the most daring surgery forecasts have been not only achieved but lately also surpassed.

When we talk about the "quality jump" that took place in surgery, we do not only refer to the spectacular decrease of intra-operative mortality, post-operative morbidity and to some very good long-term results, obtained in most commonly encountered diseases, some with a recognized severity, but also to the extension of surgical procedures, to some conditions that until some time ago belonged exclusively to internal medicine, as well as to some top performance achievements that make the glory of contemporary surgery.

Currently, no organ however minute, of the human body, has been omitted by the surgical treatment. To give an example, I will talk about one of the most important accomplishment of the surgery, i.e. organ transplantation. A large global experience has been built for organ grafting: heart, kidney, liver, gut, extremities, fingers, etc. Grafting surgery is now performed in large specialized centers throughout the world, and Romania and Timisoara makes no exception.

The most impressive are heart transplants, the first one being successfully performed by Christian Barnard in 1967. Heart transplant dominates the transplant surgery by its importance and spectacular. Regarding tissue and limb grafting, the contemporary surgery has achieved significant progresses and the future promises are extremely optimistic and comforting.

Limb and even finger re-implants have been important achievements in the past 40 years. Microsurgery techniques currently allow re-implantation of the fingers, nose, ears, even that of the penis, with remarkable success. Hopfner, in 1903, and Carrel and Guthrie in 1906, were the pioneers in this field.

The use of reinsertion methods have extended in the last four decades of the 20th century. Statistics speak for themselves. Chen Yu and his team reinserted limbs and fingers in 438 patients between 1973 and 1986. The rate of survival and partial functionality was 83.3% for the limbs and 57.5% for the fingers. Since 1986, when Chen started to use microsurgery techniques, survival rate for the reinserted fingers is 92.3%.

For thousands of years, medicine was facing the troubling question: what would constitute the ideal treatment for a patient suffering with an incurable chronic disease that would be ultimately fatal? The answer is simple: to replace the diseased organs with healthy ones. Although this possibility was foreseen

for a long time, it was only at the beginning of the 20th century that the era of scientific organ transplantation has been officially inaugurated by Alexis Carrel and Guthrie. Such "spare parts" can be obtained. Today the criteria for declaring death following disease or some severe trauma are well established. The decisive element is the death of the brain. According to Küse, it is only in these circumstances that a person can be declared dead as any chance of recovery is lost. If blood circulation is artificially preserved, the other organs and tissues can be irrigated and thus kept alive for longer, as the science progresses. So, there will be subjects that can be considered true "organ banks" and the needed organ will be harvested from them. Moral, psychological and legal barriers will surely find an answer, and progress can be already noted in this regard. Once the possibility of obtaining the "spare parts", the transplant surgery will be more often performed and will know further development. The deceased will become useful for the living.

This dream of the humankind briefly summarized by Woodruff: "Nemo sibi nascitur" (nobody is born for himself) will become reality on a larger scale (it already is but in a small proportion) and will be extensively used in the years to come.

The remarkable progresses of surgery are based mainly on the achievements of basic disciplines. In this regard, substantial contributions have been brought by physiology, pathophysiology, biology, bacteriology, biophysics, experimental medicine and lately electronics, mechanics and even mathematics. A spectacular opening has been recorded in the last four decades for genetics and immunology.

A milestone for modern progress of surgery was the moment when the above-mentioned sciences were granted full rights and sometimes priority in diagnosis and therapy and offered a greater safety for surgical interventions.

The surgeon of our times and even more in the future should be aware and accustomed in all these fields. His knowledge, perspective, way of thinking are fundamentally changed compared to the surgeon from the beginning of the last century.

Continuous achievements of the fundamental sciences as well as the practical verification make it mandatory for the surgeon to permanently revise the diagnostic and therapeutic surgical procedures that become safer and more effective.

The consequences on surgery development and

improvement of the surgical techniques brought by the fundamental sciences are listed below:

1. Increased knowledge on surgical diseases. Many discoveries and achievements in transplant surgery are directly derived from the work of geneticists, biochemists and biologists.

2. Surgery supraspecialisation. The creation and development of surgical specialties on limited, well-defined domains has been a beneficial event that allows a better diagnostic precision, which improves substantially the effectiveness and the quality of the surgical act. Thus we saw the advent of digestive, urologic, orthopedic and bone traumatology surgery, oral surgery, gynecology, pulmonary surgery, heart surgery and last but not least plastic reparatory and esthetic surgery, thus fully reflecting the functional and reconstructive vocation of surgery.

The narrowing of the research and activity on surgical specialties allowed an increase in information, improved diagnosis and led to the greater number of techniques and instruments used and their adaptation to the anatomical area treated and thus to exceptionally good results.

Naturally, this process of continuous splitting of knowledge is threatened by the risk to lose the general perspective on the diseased human. To excessively narrow the field of knowledge means to make the mistake that Bernard Shaw has ironically depicted as: "a specialist is an individual that knows more and more on less and less. Therefore he will end up knowing everything about nothing". That is why the idea to create new specialties is not always justified; dividing does not always serve the surgical practice and teaching. It is an important task of surgical societies and schools to refrain such tendencies.

3. High precision techniques for pre- and post-operative assessment. It is noteworthy to mention the contribution of ultrasound, computed tomography, magnetic resonance imaging, etc.

4. Experimental surgery has enjoyed great progresses especially in the last half of the 20th century and its aims are to build experimental models for some diseases and to verify the surgical technique prior to using them on humans.

5. Modern anesthetics with tracheal intubation are based on discoveries in the field of biochemistry and pharmacology.

6. Modern intensive care is based on scientific criteria, including the improvement of safe methods for blood transfusions. In Stuart Welch's opinion, the discovery of blood typing by Landsteiner in 1900, an achievement that was awarded with the Nobel Prize, was one of the most important, maybe the most

significant, contribution for surgery in the 20th century.

7. Antibiotics, with an endless range of representatives, however not lacking some disadvantages and risks. The advent of antibiotherapy at the end of the 2nd World War and in the decades that followed and their large-scale use, with a wide range of drugs for local and general use, consolidated the success of surgery especially in the fields where an infection would be fatal (neurosurgery, heart surgery, pulmonary surgery, etc).

8. Development and practical application of laparoscopic techniques and their progressive expansion.

9. The development of microsurgery, that represented a progress and an important support for performing organ grafting, especially for some anatomic segments with delicate blood vessels, such as: the fingers, the nose, the ears, palatine velum, penis, etc.

10. Telesurgery: the possibility to give directions through visual and audio contact to a surgical team located at tens or hundreds kilometers away that request an advice or even need indications for performing the entire intervention.

Today, the definition of "telemedicine" as formulated by NASA, is: the performance from the distance of a medical or surgical act by means of informatics and communication technology.

In the past ten years, telemedicine and particularly telesurgery have known an unprecedented development.

The first put into practice was the so-called "robotic surgery", i.e. the involvement of complex mechanical devices that connect the surgeon's hand to the intervention site, best portrayed by laparoscopic surgery. Thereafter remote surgery has developed, that is surgery performed by a surgeon located elsewhere and not in the operating room. Thus, the first demonstration of robotic surgery performed from the long distance was the Lindbergh surgery, in 2000. The surgeon, located in New York, performed laparoscopic colecystectomy on a woman located in Strasbourg.

11. Cybernetics, a top invention of the human genius, serves not only to high precision monitoring of the surgical patient, but also to creation of artificial organs. Of great interest is the monitoring of the surgical patient using electronic devices. Surveillance of the patient during surgery and the automatic regulation using an "electronic brain" of the anesthetic drip, analeptics, transfused blood, etc., is not anymore an example of sci-fi literature, but a reality.

12. Finally, the organizing factor, represented by a complex team, consisting in: the nurse, the electronics

engineer, with the surgeon in the position of an "orchestra conductor", as very plastically was characterized by André Sicard: "the conductor cannot replace any of the members of the orchestra; however, the orchestra cannot play without a conductor".

Theodor Burghel said that "team work is achieved when the head of the team knows how to develop and grow the cooperation skills and also knows how to fight isolation that is the tendency of some specialists and ultraspecialists".

The trend to perform activity within a "complex team", as the American surgeon states, is "not in conflict with a thorough and competitive technical training, nor incompatible with maintaining the humane qualities that are kept with such religiosity by the worth-trusting members of a great profession" (quoted from De Bakey, 1963).

The order of presentation of this review of the modern achievements of surgery is not necessarily according to their importance or chronological. These premises are intertwined and interact with each other.

"To the presence of the triumphant procession of the technique, chemistry, electronics, etc. in medicine with the aim to obtain more and more detailed objective data is rightly attributed the tendency to dehumanize it since thus the interaction physician-patient is on the verge of disappearance" said René Leriche.

That is why we need to rethink and rebalance this relationship so that the human contact will not be underestimated in the future, in the advantage of the technique.

It is an aim that is especially required in surgery. As Pius Branzeu said, "In its interaction with the patient, the surgeon should act in such a manner that the patients' trust is gained. He must lead the patient lovingly and skillfully on the sometimes long and difficult road to healing."

All the diagnosis and therapeutic procedures must be rationally used in the best interest of the patient, under the control of the medical thinking, keeping permanently in mind the Hippocratic principle "primum non nocere, deinde salutare."

What can we say in conclusion?

Few are the medical disciplines which contain in their name one of the essential part of their activity, as surgery does. The name "hirurgia" (a creation of the hand) expresses the main feature of the specialty. But today purely manual procedures are not enough, as the great majority of the surgical interventions are

performed using more and more advanced surgical tools, and also with the valuable support of other complex devices and instruments: artificial oxygenators, pumps for replacing the heart, electronic apparatus for monitoring, stimulators, etc. And if it is still true that some manual skills are absolutely necessary for surgery, they are completely insufficient and almost of secondary importance if left alone.

Thinking based on thorough theoretic knowledge and clinical logic is indispensable for surgery. The hand that holds the scalpel must be directed by a mind sharp as a ... scalpel.

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