The mechanical suture is a semi-automatic anastomosis of tissues by means of a stapler. The above-mentioned refers to the anastomosis of tissues using mechanical or absorbable clips. In recent years the structure of suturing equipment is constantly developing. Worldwide, one may observe the growing interest of the mechanical suturing technique.

The nineteenth century includes the development of science and chemical industry, which largely contributed to the modification of materials used in case of suturing. The first absorbable synthetic sutures were based on polyvinyl alcohol, and appeared in the early thirties of the past century, manufactured by B. Braun Melsungen in cooperation with Wacker Chemie. In 1946 and 1949 polyamide-coated (Supramid) sutures were introduced into clinical practice by BASF, while between 1950 and 1951 synthetic, collagen sutures (Collafil). Further experience in this direction showed that polyacids can be used to manufacture absorbable sutures with exceptionally favorable properties. In the seventies of the past century one observed the introduction of a glycol acid suture (Dexon) into hospitals throughout the world. The above-mentioned suture was modified in 1979 and named Dexon S. Currently, many medical sectors are engaged in manufacturing suturing material. They are considered as the basic material for closing surgical wounds, modified depending on their intended use, being subject to continuous development, according to the latest scientific knowledge (1).

The rapid development of surgery that took place over the centuries did not resolve issues concerning alimentary tract continuity disruption. Manual suturing methods thus far used, often did not prove successful, due to the development of complications, such as inflammation, irritation of the operated area, and leakage of the intestinal anastomosis. This was the reason why surgeons tried to construct a mechanical device that would replace the already existing manual mechanism. In 1826, the Belgian surgeon Henroz attempted the above-mentioned by severing the dogs bowels and joining them by means of special rings. More than 60 years later, in 1892, an American surgeon from Chicago, John B. Murphy constructed a device, which joined the lumen of the gall-bladder with the duodenum (2). The above-mentioned device was named “Murphy’s button”, consisting of two sleeves stapled together. They provided good adhesion of the anastomosed organ walls. Later on the device was applied in gastric and intestinal surgery. Davis & Geck in the eighties of the past century developed a Biofragmentable Anastomotic Ring-Valtrac® (1).
Evolution of the mechanical suture

The Hungarian surgeon, Humer Hultl was considered as the author of the stapler technique. In 1909, he presented the first device and its possibilities. However, the above-mentioned was not free of drawbacks. First of all it was large and heavy and thus, inconvenient to use. The device anastomosed tissues only by means of one row of staplers. It was later improved by Aladar von Petz, and the German surgeons Friedrich and Neuffer (1). The development of the stapler technique and its introduction into the operating rooms in the fifties of the past century was largely owed to Soviet surgeons. They possessed during that period staplers enabling side-to-side anastomoses with simultaneous severing of tissues and the possibility to exchange the stapler magazines (2).

The rapid development of this technology was contributed to the visit of an American physician, Mark Ravitch in Kiev. He observed the Russian surgeons using the mechanical suturing device. With its improvements and research during the seventies and eighties of the past century, staple devices have spread around the world. In 1976, a disposable epidermal stapler was introduced. The Americans took over the production and delivery of highly specialized and technologically advanced equipment, which dominated the market in the nineties of the past century (5). In Poland, Russian equipment (SPTU: size 25, 28, 31 mm staplers) was used. According to prof. Andrzej Kopacz, the most comfortable and reliable stapler for colorectal surgery was the Premium CEEA Plus stapler, while the most commonly used staplers are as follows:

- transverse staplers used in case of intestinal lumen closure,
- staplers used to restore epidermal continuity using singular staples- epidermal stapler,
- linear stapler enabling tissue suturing by means of double-row staples (depending on the thickness of the anastomosed tissues or regulation possibility of the closure of the staple),
- linear staplers additionally equipped with a harmonic knife enabling tissue severing between both staple rows,
- rotational linear staplers used for tissue anastomosis by means of interrupted sutures,
- circular staplers widely used in case of intestinal „end-to-end” or „side-to-end” anastomoses, both simple and curved variants are available,
- endostaplers with various embedded tips enabling laparoscopic trocars approach.

During one operation the surgeon can use one-, two-, or three staple techniques. Currently, mechanical suturing devices are characterized by an interesting technology and reliability. These are mostly disposable devices. The application of a mechanical suture should be subject to certain basic principles, the so-called „Halstead principles” (4). When suturing the severed organ the surgeon should aim for as little tissue damage, maintaining good blood supply. The suture should be tight without tension. The use of a mechanical suture seems to be most appropriate, because it satisfies most of the above-mentioned principles. Additionally, it enables to perform anastomosis where access is difficult, it has an adjustable or programmed clamp, the same along the suture line, which due to maintained vascularization leads towards a reduction in the number of anastomotic organ wall necrosis cases (5). One may observe minimal tissue trauma (6) and shorter duration of surgery. However, an undoubted disadvantage of the stapler technique is its cost, which is much higher, as compared to the manual suture, as well as the need to possess the full range of sizes and types, depending on the type of operation.

Just as after each operation one may observe the occurrence of numerous complications, such as bleeding, fistula development, and stricture. The tightness, durability, and functional efficiency of the anastomosis depends on the technical accuracy, as well as other factors. Thus, it is difficult to authoritatively determine the superiority of the mechanical suture over the manual suture, which may be indicated by the numerous publications and discussions concerning the issue. There are situations where mechanical sutures are better off than manual sutures, such as low colorectal anastomoses. Another type of mechanical sutures include anastomoses with the use of special rings made of polyglycolic acid with the addition of barium sulphate. These include anastomoses with the use of the so-called „Valtracs”, enabling “end-to-end”, and “side-to-side” anastomoses (25, 28, 31 and 34mm in diameter) (7).

Currently in Poland, one may observe the development of prototype, circular, exoluminal
surgical staplers used in case of intestinal resection anastomosis. This device is characterized by a kinematic operation mode, different from the widely used. The in vivo investigations performed on animals have shown that the specific combination of individual anastomotic elements, as well as devices during its practical activity might be fully used in clinical practice (8).

Recent years have seen many changes in the field of surgery all over the world. The mechanical suture is gaining more and more followers, despite the fact that it completely differs from the traditional manual suture. Clinical trials have shown that this type of mechanical anastomosis reduces the percentage of complications, such as anastomotic leakage. The mechanical suture is used in case of low colorectal resections, due to rectal carcinoma, while the manual suture in such a case is impossible. However, both the mechanical and manual sutures have their advantages and disadvantages. Therefore, one should not only follow progress in medicine, but most importantly with the well-being of the patient, and choose the treatment method which is most safe and beneficial for his health.

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