NATURAL ORIFICE TRANSLUMINAL ENDOSCOPIC SURGERY

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Twenty years have passed since the first laparoscopic cholecystectomy was conducted by P. Moruet in 1987. Since then, the success of laparoscopy has been undeniable. Almost all surgical procedures can be carried out using laparoscopic techniques. The majority of those procedures that can be performed laparoscopically do so regularly. Laparoscopic gallbladder and bile ducts surgery, exploratory laparoscopy, appendectomy, anti-reflux procedures, and adrenal surgery are examples of today’s standard laparoscopic procedures. The number of more advanced laparoscopic procedures is constantly increasing. Intestinal surgery, oesophagus resections, parenchymal organ surgery, inguinal hernias, and in particular, postoperative hernia repairs are carried out in most surgical departments; in many of those, they are carried out regularly. The philosophy of surgical management is changing along with the development of new technology. Surgeons constantly aspire to reduce the invasiveness of their procedures. One of the promising methods of achieving this goal seems to be “incisionless” natural orifice transluminal endoscopic surgery (NOTES). Although many terms, such as “incisionless”, “transluminal”, “natural orifice transluminal endoscopic surgery” or “NOTES”, describe this kind of procedure in the literature, there is not yet an official Polish terminology. This method may become a promising alternative to classic or laparoscopic surgeries, because achieving minor postoperative pain, shorter postoperative management, and perfect cosmetic effect is possible with its use (1).

The term most often used in literature, approved by NOSCAR (Natural Orifice Surgery Consortium for Assessment and Research), is “NOTES” (Natural Orifice Transluminal Endoscopic Surgery).

In 2005, SAGES (Society of American Gastrointestinal and Endoscopic Surgeons) stated that “we are convinced it is fair to our colleagues to say that an era of laparoscopic revolution has ended. The era of natural orifice transluminal endoscopic surgery has started” (2).

The basic premise of NOTES rests on inserting a flexible endoscope through natural orifices of the body, such as the mouth, anus, vagina, incising stomach wall, rectum, or vaginal fornix, and then guiding the endoscope to peritoneal cavity where the surgical procedure is conducted.

Many NOTES procedures, such as peritoneoscopy, appendectomy, cholecystectomy, splen resection, resection of the pancreatic tail, gastroenterostomy, bariatric gastric-by-pass and sleeve resection, cholecystogastrostomy, tubal ligation, salpingo-ovariectomy, debridement in hemorrhagic and necrotizing pancreatitis, and guided biopsy procedures, have been studied in animal models (1, 3, 4).

During the EAES congress in Berlin in 2006, Rao presented the first series of seven human cases of appendectomy conducted using NOTES.
The goal of this essay is to introduce the reader to both the idea of NOTES and its technical basics.

The are three ways of accessing the peritoneal cavity at this time:
- oral cavity,
- rectum,
- vagina.

NOTES procedures are carried out under general combined anesthesia.

Preoperative management includes mechanical and pharmacological (antibiotic) preparation of the proper section of the gastrointestinal tract, such as the esophagus, stomach, colon, or vagina. Most researchers agree that the risk of peritoneal infection in NOTES is small and similar to the risk of infection associated with classic procedures of gastrointestinal tract (5).

The procedure is conducted with a sterile, flexible endoscope. Model animal procedures are conducted using classical flexible endoscopes. Using double-channel endoscopes provides a significant improvement, because it allows for the insertion of two endoscopic instruments simultaneously. During the experimental procedures, endoscopes with special tips are used. These tips greatly enhance the technical possibilities during the procedure. The tips are shaped like a snake’s tongue and allow counter-movements of both instruments, which thus increases tractability. Hemostasis is obtained with both normal, mono- or bi-polar electrocoagulation and all other devices used in classical endoscopy (5).

After the endoscope is inserted into the gastrointestinal tract, an ordinary endoscopy procedure with a biopsy is carried out. Then, a point of the incision is chosen on the front stomach wall. The stomach incision is made with a sphincterotome. An 18 mm balloon dilatator is inserted into the incision, creating a canal in stomach wall. Through this canal, the endoscope is inserted into the peritoneal cavity. The pneumoperitoneum is then created. There is a problem, however, in achieving correct pneumoperitoneum pressure values with a flexible endoscope, because endoscopic insufflators are not capable of maintaining neither constant pressure nor pressure measurement. This technique requires monitoring of pneumoperitoneum pressure via either an additional Veress’s needle or periodic measurement with an endoscope work channel. This second pressure measurement method is disadvantageous because it necessitates interrupting the procedure and flushing the endoscope’s work channel before the measurement. This flushing is necessary because mucus, blood, or pieces of tissue inside the channel may produce false results. Another disadvantage arises because this method uses air in place of carbon dioxide. All of those disadvantages can be eliminated by using laparoscopic insufflators or obtaining pneumoperitoneum with an additional Veress needle and laparoscopic insufflator, as in classic laparoscopy (hybrid technique).

After pneumoperitoneum is created the inspection of the whole peritoneal cavity is conducted (peritoneoscopy). After peritoneoscopy is finished, the main procedure begins. Appendectomy begins with the dissection of appendix mesentery. Standard endoscopic forceps, electro-coagulation, and standard endoscopic scissors are used to cut off the mesentery section by section. Then, a loop of surgical suture is either applied to the base of appendix or simply clipped and cut off using a diatermal loop. The operative area is flushed with the endoscope, and the dissected appendix is removed through the stomach.

The stomach wall incision may be closed in several ways. Most often, it is closed with clips (Quick-Clip – OLYMPUS), which are prolene sutures. The technique employs the prototype LSI Solutions device, with a linear flexible-endoscopy stapler which simultaneously cuts the stomach wall and introduces a purse-string suture (6).

All NOTES procedures are conducted using similar schemes. Except for Rao’s series of cases, all procedures presently under study utilize animal models. This does not diminish the fact, however, that NOTES procedures provide an interesting path in the evolution of minimally-invasive surgery.
REFERENCES


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