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GUEST EDITORIAL

Surgery without scars: The new frontier of minimally invasive surgery? Controversies, concerns and expectations in advanced operative endoscopy

MARCO MARIA LIRICI[1] & ALBERTO AREZZO, MD[2]

[1]*Department of General and Thoracic Surgery, BMM Hospital, Reggio Calabria, Italy, and* [2]*Department of Surgery, Ospedale Evangelico Internazionale, Genova, Italy*

Today, an increasing number of pathological conditions may be treated by operative flexible endoscopy. Some of these procedures are well established, some others, more advanced, are considered as treatment options and are gaining widespread interest and recognition because of their minimal invasiveness.

Endoscopic stenting is increasingly used to manage strictures in the upper and lower gastrointestinal tract and in the biliary tree: It is often the treatment of choice for palliation, it changes the management protocol in certain conditions such as colonic obstruction to avoid emergency surgery, stoma creation and allows a delayed laparoscopic bowel resection. The development of SEMS (self-expandable metallic stents) and the use of super-elastic materials have increased the success rate of such treatments.

The endolumenal management and/or control of gastrointestinal lesions or conditions such as polyps or variceal bleeding by flexible endoscopy is a gold standard and even diseases like hiatal hernia and gastro-esophageal reflux disease are starting to be approached with endolumenal techniques. Some of the articles published in this issue focus on these procedures and their actual results.

Endolumenal removal of large rectal adenomas and even malignant tumors of the rectum by a rigid operative scope (TEM – trans-anal endoscopic microsurgery, developed by Gerhard Buess) introduced the concept of surgery performed through natural orifices with no resulting scars already in 1983 (1). In recent years this concept has been transferred to flexible endoscopy with the aim to approach the abdominal organs through natural orifices and to accomplish surgical procedures by this route.

NOTES (natural orifice translumenal endoscopic surgery) may represent a disrupting novel surgical approach and at the same time the border between and the merging of different disciplines such as digestive surgery and gastroenterology. Several operations could be performed through such an approach. Some of them, like trans-gastric cholecystectomy, appendectomy, gastro-jejunostomy, fallopian tube ligation, diagnostic peritoneoscopy and liver biopsy have been successfully attempted on animals. Some have already been attempted on humans: Seifert performed and reported a series of trans-gastric retroperitoneal pancreatic necrosectomies in 2000 (2) and Rao reported the first small series of seven trans-gastric appendectomies in 2005 (3).

Much has been said about the pros and cons of the possibility to treat abdominal diseases making one hole on a viscus in order to access the peritoneal cavity; the risk of contamination and the lack of capability to manage intra-operative complications have to be weighed against the benefits of unaltered cosmetics and the dramatic decrease of postoperative pain. Most criticism against trans-gastric surgery (this is the access of choice to the peritoneal cavity but even the trans-colonic and trans-vaginal routes have been proposed) echoes what was said against those who were pioneering laparoscopic surgery in the late 1980s. Laparoscopic surgery has now become a gold standard in the treatment of many abdominal diseases and even selected cancers and is increasingly performed in surgical theatres worldwide. We should have learned the lesson and look at new coming techniques with a good attitude!

Yet, a word of caution is needed when introducing the NOTES concept and techniques into clinical practice.

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NOTES is at an investigational and developmental stage. There are a number of limitations that have to be overcome before starting clinical trials. First of all, the present technology is not suited for accomplishing trans-gastric surgical procedures with acceptable safety. Flexibility of scope, which is a great advantage in passing gut flexures during standard endoscopic procedures, causes control problems during trans-gastric operations. Other constraints are caused by inadequacy of traction and counter-traction manoeuvres, poor angulation of the surgical instruments introduced through the working channels, lack of scope fixation and impossibility of endoscope stiffening once the working position within the operative field has been reached. Furthermore, spatial orientation could be impaired due to the possibility of performing tasks off the angle of the scope axis.

The limits of the present technology do not attain only to present operative endoscopes but also to most devices required to accomplish many surgical steps of trans-gastric procedures. More effective suturing and clipping devices need to be designed and developed as well as safe anastomotic devices.

The ability to make reliable sutures is of utmost relevance. Closure of the gastric opening at the end of the translumenal procedure has to be accomplished to minimize the risk of postoperative leaks and infections. Advanced suturing is not yet possible and this will restrict the range of translumenal procedures that may be performed at such an early stage to those that will not require high skill-demanding suturing and the performance of anastomoses.

The last point leads us to introduce one of the most controversial issues, that is who is going to perform NOTES: Gastroenterologists who are acquainted with flexible endoscopes and present interventional procedures or surgeons acquainted with rigid scope work and advanced laparoscopic procedures? Not to mention training programs for learning procedures where the boundaries between laparoscopic surgery and therapeutic GI endoscopy are totally unclear, making a multi-disciplinary approach mandatory at the present time and in the near future.

One may also argue that the very principle of trans-lumenal surgery is wrong: Why should we make holes on internal viscera to gain access to the peritoneal cavity when laparoscopy already provides that, through a minimal access with maximum control over the abdominal environment? Why not develop trans-abdominal single access interventional techniques instead of translumenal procedures? Does a single scar on the abdominal wall really make a difference? What about specimen removal through the opening created on a viscus? How much are we allowed to enlarge the visceral opening in case of removal of bulky organs, even gallbladder or appendix? Do we need a trans-abdominal accessory port in such cases?

Certainly the birth of NOTES is pushing researchers, surgeons, endoscopists and last but surely not least industries to design a new generation of instruments and equipment. Hybrid instruments and HD chip-on-tip scopes that combine patterns typical of rigid and flexible endoscopy will be the next generation technology to be used in our future surgical suites.

Also, the nature of NOTES puts researchers, gastroenterologists and surgeons in a critical position due to several ethical issues: There is only one series of trans-gastric operations for removal of intraperitoneal organs on humans that has been reported, the already mentioned small series of trans-gastric appendectomies. Rao reported interesting results but also intra- and post-operative complications. Any new surgical approach for the treatment of diseases that can be cured by well established techniques in a very safe way needs at least to mirror the existing results. Thus, how should we start clinical trials? Should we first need to wait for more effective and dedicated technology? Should we first wait for extensive animal studies? In the United States SAGES and ASGE joined to create a working group on the development and assessment of NOTES. A step ahead has been the launch by the same group of surgeons and endoscopists, with the financial support of industries, of a consortium for the assessment and research on natural orifices surgery, the NOSCAR. In Europe, research in this field is still left to the initiative of single centres: More efforts are requested and the involvement of international scientific associations as well as a multi-centre platform is strongly advised for the implementation, assessment and validation of NOTES.

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