

Natural Orifice Transluminal Endoscopic Surgery

Christian Camenzuli

Surgery underwent a tremendous revolution in the past two centuries. From what was a barbaric death sentence in the 19th century, through the invention of anesthesia, antisepsis and improved surgical technique, it is now a profession that offers the hope of cure to many patients.¹ Today the focus of progress within this field is lead by offering a faster less painful recovery whilst making interventions safer and preferably scarless.² These aims are being reached by developments in endoscopic technology and it is within this historic background that the concept of natural orifice transluminal endoscopic surgery (NOTES) has developed.

The original understanding of NOTES dates back to almost two decades ago. It promotes the ability to perform surgical procedures after gaining access from natural cavities. The original operations considered included transgastric cholecystectomy and transgastric appendectomy. These procedures were carried out with flexible instruments and a number of problems were encountered. They included having reliable closure of the opened viscus, prevention of infection, maintaining spatial orientation, having appropriate devices and tools to work with and difficulties with the management of intra-abdominal complications.³

Flexible instruments used in the original concept of NOTES limit the ability of the surgeon to perform efficient dissection of tissues, consequently prolonging the time of surgery to the point that the procedure does not remain minimally invasive. Research has been directed to develop new flexible instruments as part of working platforms so as to facilitate the execution of pure NOTES techniques.⁴ These instruments however have not caught up with the rapid progress of surgical techniques. The latter, together with many other difficulties including problems with training surgeons to perform the procedures safely and efficiently, has led the drive to perform NOTES to lose momentum.

Today NOTES techniques are being integrated with established laparoscopic (using rigid instruments) and robotic techniques in what is being called Hybrid NOTES. Some examples of Hybrid NOTES procedures that have reached routine clinical practice in some centers include transvaginal/transanal hybrid NOTES colectomy,⁵⁻⁶ transanal total mesenteric excision (TaTME),⁷ transvaginal hybrid NOTES appendectomy⁸ and transvaginal hybrid NOTES cholecystectomy.⁹

Published literature so far shows that using a Hybrid NOTES technique offers patients less post-operative pain with a superior cosmetic result.¹⁰ These techniques are at the forefront of surgical care today and are the most likely direction NOTES will take in the near future.¹¹

Christian Camenzuli M.D. MSc (Cardiff) FRCSEd
FEBS(Gen Surg)
christian.camenzuli@gov.mt

References

1. Gawande A. 2012. Two Hundred Years of Surgery. *NEJM* 366, pp1716-23.
2. Mack M. 2001. Minimally invasive and robotic surgery. *JAMA* 285(5), pp568-572. doi:10.1001/jama.285.5.568.
3. Rattner D, Kalloo and ASGE/SAGES Working Group. 2006. ASGE/SAGES Working Group on Natural Orifice Transluminal Endoscopic Surgery. October 2005. *Surgical endoscopy* 20(2), pp329-33.
4. Lee H., Kim K., Seo J. and Sohn D. 2017. Natural orifice transluminal endoscopic surgery with a snake-mechanism using a movable pulley. *International journal of medical robotics and computer assisted surgery* doi: 10.1002/rcs.1816.
5. Senft J., Warschkow R., Diener M., Tarantino I., Steinemann D., Lamm S., Simon T., Zerz A., Müller-Stich B. and Linke G. 2014. The transvaginal hybrid NOTES versus conventionally assisted laparoscopic sigmoid resection for diverticular disease (TRANSVERSAL) trial: study protocol for a randomized controlled trial. *Trial* 20(15), pp454. doi: 10.1186/1745-6215-15-454.
6. Fuchs K., Breithaupt W., Varga G., Schulz T., Reinisch A. and Josipovic N. 2013. Transanal hybrid colon resection: from laparoscopy to NOTES. *Surgical endoscopy* 27(3), pp746-52. doi: 10.1007/s00464-012-2534-7
7. Xu W., Xu Z., Cheng H., Ying J., Cheng F., Xu W., Cao J. and Luo J. 2016. Comparison of short-term clinical outcomes between transanal and laparoscopic total mesorectal excision for the treatment of mid and low rectal cancer: A meta-analysis. *European journal of surgical oncology* 42(12), pp1841-1850. doi: 10.1016/j.ejso.2016.09.002.
8. Bernhardt J., Steffen H., Schneider-Koriath S. And Ludwig K. 2015. Clinical NOTES appendectomy study: comparison of transvaginal NOTES appendectomy in hybrid technique with laparoscopic appendectomy. *International journal of colorectal disease* 30(2), pp259-67. doi: 10.1007/s00384-014-2081-x.
9. Dhillon K., Awasthi D. And Dhillon A. 2017. Natural orifice transluminal endoscopic surgery (hybrid) cholecystectomy: The Dhillon technique. *Journal of minimal access surgery* 13(3), pp176-181. doi: 10.4103/0972-9941.207838.
10. Steinemann D., Müller P., Probst P., Schwarz A., Büchler M., Müller-Stich B. and Linke G. 2017. Meta-analysis of hybrid natural-orifice transluminal endoscopic surgery versus laparoscopic surgery. *British Journal of Surgery* 104(8), pp977-989. doi: 10.1002/bjs.10564.
11. Bernhardt J., Sasse S., Ludwig K. and Meier P. 2017. Update in Natural Orifice Transluminal Endoscopic Surgery (NOTES). *Current opinion in gastroenterology* 33(5), pp346-351. doi: 10.1097/MOG.0000000000000385.

Cover Picture:

‘Rough seas’

Oil on canvas with palette knife

By Victor Grech

Victor Grech is a consultant paediatrician with a special interest in paediatric cardiology. He has a PhD in this field and another in science fiction. He is the editor of the journals *Images in Paediatric Cardiology* and the *Malta Medical Journals* and co-chairs HUMS, the Humanities, Medicine and Sciences Programme at the University of Malta.