Editorial



# Can 3D imaging really help the surgeon perform laparoscopic gastric surgery?

**Fabio Cianchi, Francesco Coratti, Ileana Skalamera, Caterina Foppa, Fabio Staderini**

Department of Surgery and Translational Medicine, Center of Oncological Minimally Invasive Surgery, University of Florence, Florence, Italy

*Correspondence to:* Fabio Cianchi, MD. Department of Surgery and Translational Medicine, Center of Oncological Minimally Invasive Surgery, University of Florence, Largo Brambilla 3, 50134 Florence, Italy. Email: fabio.cianchi@unifi.it.

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One of the major limitations of conventional laparoscopy is the lack of depth perception due to the planar image from two-dimensional (2D) monitors. For this reason, complex surgery using the laparoscopic approach is still a challenge compared with open surgery. Three-dimensional (3D) imaging systems have been introduced to overcome this technical obstacle and improve laparoscopic skills and performance, such as operative time and accuracy. There have been a number of experimental trials comparing the use of 2D and 3D laparoscopy: essentially, 3D laparoscopy resulted in better performance time and lower error rates with specific tasks in experimental settings, and this was especially seen for novice surgeons (1-3).

The results of clinical trials comparing the two techniques are still equivocal, mainly due to the heterogeneity of the studies, the different types of surgical procedures analyzed and varying experience levels of the surgeons involved. However, some studies have demonstrated that 3D laparoscopy significantly reduces operative and anastomosis times during surgery for prostate cancer (4), operative time during laparoscopic cholecystectomy (5) and intraoperative blood loss during radical prostatectomy (6).

Recently, the possible impact of 3D laparoscopy has been evaluated even during surgery for gastric cancer. Minimally invasive surgery for gastric cancer has evolved rapidly and increased in popularity during the last two decades mainly in the Far East and for patients with early-stage tumors (7). Nevertheless, the development of laparoscopic surgery for gastric cancers in the Western world has been slow because most gastric cancers are diagnosed in an advanced stage for which laparoscopic gastrectomy is not yet considered an acceptable alternative to standard open surgery (8). This skepticism is basically due to the technical complexity of laparoscopic gastrectomy and concerns the feasibility of performing an oncologically acceptable lymphadenectomy and intracorporeal anastomosis, and especially esophagojejunostomy in laparoscopic total gastrectomy. For these reasons, laparoscopic gastrectomy is considered one of the most difficult operations, requiring a long learning curve of about 40–50 cases.

Lu *et al.* (9) have conducted a randomized, controlled trial comparing clinical outcomes of 3D and 2D laparoscopic surgery for gastric cancer. They analyzed a very high number of patients, 109 in the 3D group and 112 in the 2D group, operated on by three surgeons during a very short period, exactly 7 months. All the three surgeons participating in the trial had performed at least 100 laparoscopic-assisted gastrectomies. There were no significant differences between the 3D and 2D groups with respect to clinico-pathological characteristics, with the mean body index being very low in both groups (22.5 and 22.6 kg/m$^2$, respectively). There was a total of 75 (67%) gastrectomies in the 2D group and 43 (39.4%) in the 3D group, and 37 (33%) and 66 (60.6%) partial gastrectomies in the two groups, respectively. In all patients, a mini-laparotomy was made on the epigastric area and used to both retrieve the specimen and perform the anastomoses. The authors did not find any significant differences in surgical performance (in particular operative time and number of retrieved lymph nodes) nor in the short-term

clinical outcomes between the two groups, except for intraoperative blood loss that was greater in the 2D group.

Although the study by Lu *et al.* is an interim report, these preliminary results seem to show limited advantages of 3D laparoscopy over conventional 2D in gastric surgery. However, the presence of potential biases in the design of the study must be considered. First of all, the three surgeons participating in the trial were skilled laparoscopic surgeons, with a large experience in minimally invasive surgery for gastric cancer. As mentioned above, a number of experimental studies on 3D laparoscopy have demonstrated that this technique can improve surgical performance mainly in novices who had never performed laparoscopic surgery. Therefore, it is likely that 3D laparoscopy can actually help less-experienced surgeons to shorten their learning curve and improve their skills in performing laparoscopic surgery for gastric cancer. Another critical point is that a mini-laparotomy had been made in both partial and total gastrectomies to perform open gastro-jejunal and esophago-jejunal anastomosis, respectively. But 3D technology has been introduced with the specific aim to help the surgeon in technical demanding situations such as laparoscopic suturing and anastomosis completion, especially for suturing in narrow spaces such as during esophagojejunostomy.

Recently, Kanaji *et al.* (10) compared 2D and 3D displays in performing laparoscopic total gastrectomy and demonstrated that the 3D view could facilitate suturing in the narrow hiatal space which is surrounded by the lateral segment of the liver and diaphragm. In particular, 3D vision could shorten the time required for closure of the entry hole after stapled side-to-side esophagojejunostomy. Unfortunately, the study by Lu *et al.* did not address this important, potential advantage of 3D laparoscopy.

Finally, all the patients enrolled in the trial by Lu *et al.* had extremely low BMIs, and could thus be considered as "easy" patients to operate laparoscopically, especially when performing a D2 lymphadenectomy. On the other hand, it is likely that 3D laparoscopy may improve surgical performance especially in "difficult" patients such as those with high BMI in whom the stereoscopic vision might facilitate dissection of the adipose tissue and lymph nodes around the main gastric arteries.

In conclusion, it is still uncertain whether 3D laparoscopic surgery is superior to traditional 2D laparoscopy and future randomized clinical trials are needed to achieve conclusive results. Since the 3D imaging system has been introduced to overcome some of the technical difficulties of conventional 2D laparoscopy, a comparison between the two procedures should mainly be carried out regarding specific aims, such as the possibility to shorten the laparoscopic learning curve of less experienced surgeons, and to facilitate complex laparoscopic tasks and procedures such as suturing and intracorporeal anastomoses.

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## References

1. Smith R, Day A, Rockall T, et al. Advanced stereoscopic projection technology significantly improves novice performance of minimally invasive surgical skills. Surg Endosc 2012;26:1522-7.
2. Sakata S, Grove PM, Hill A, et al. Impact of simulated three-dimensional perception on precision of depth judgements, technical performance and perceived workload in laparoscopy. Br J Surg 2017;104:1097-106.
3. Harada H, Kanaji S, Nishi M, et al. The learning effect of

using stereoscopic vision in the early phase of laparoscopic surgical training for novices. Surg Endosc 2017. [Epub ahead of print].
4. Bove P, Iacovelli V, Celestino F, et al. 3D vs 2D laparoscopic radical prostatectomy in organ-confined prostate cancer: comparison of operative data and pentafecta rates: a single cohort study. BMC Urol 2015;15:12.
5. Currò G, La Malfa G, Lazzara S, et al. Three-Dimensional Versus Two-Dimensional Laparoscopic Cholecystectomy: Is Surgeon Experience Relevant? J Laparoendosc Adv Surg Tech A 2015;25:566-70.
6. Aykan S, Singhal P, Nguyen DP, et al. Perioperative, pathologic, and early continence outcomes comparing three-dimensional and two-dimensional display systems for laparoscopic radical prostatectomy--a retrospective, single-surgeon study. J Endourol 2014;28:539-43.
7. Koeda K, Nishizuka S, Wakabayashi G. Minimally invasive surgery for gastric cancer: the future standard of care. World J Surg 2011;35:1469-77.
8. Yamamoto M, Rashid OM, Wong J. Surgical management of gastric cancer: the East vs. West perspective. J Gastrointest Oncol 2015;6:79-88.
9. Lu J, Zheng CH, Zheng HL, et al. Randomized, controlled trial comparing clinical outcomes of 3D and 2D laparoscopic surgery for gastric cancer: an interim report. Surg Endosc 2017;31:2939-45.
10. Kanaji S, Suzuki S, Harada H, et al. Comparison of two- and three-dimensional display for performance of laparoscopic total gastrectomy for gastric cancer. Langenbecks Arch Surg 2017;402:493-500.

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