



Minimally invasive approach for peritoneal surface malignancies: a surgical dilemma?

Riccardo Lemini¹, Tariq Almerey², Emmanuel Gabriel³

¹Department of Surgery, Section of Colon and Rectal Surgery, ²Department of Surgery, ³Department of Surgery, Section of Surgical Oncology, Mayo Clinic, Jacksonville, FL, USA

Correspondence to: Emmanuel Gabriel, MD, PhD. Department of Surgery, Division of Surgical Oncology, Mayo Clinic, 4500 San Pablo Rd, Jacksonville, FL 32224, USA. Email: gabriel.emmanuel@mayo.edu.

Comment on: Salti GI, Naffouje SA. Feasibility of hand-assisted laparoscopic cytoreductive surgery and hyperthermic intraperitoneal chemotherapy for peritoneal surface malignancy. *Surg Endosc* 2018. [Epub ahead of print].

Received: 12 September 2018; Accepted: 27 September 2018; Published: 29 September 2018.

doi: 10.21037/ales.2018.09.09

View this article at: <http://dx.doi.org/10.21037/ales.2018.09.09>

The enduring evolution of surgical techniques has led to a wider landscape of treatment approaches, especially for those conditions in which palliative care was the only viable option. Peritoneal carcinomatosis can occur in a variety of malignancies and represents one of these poorly prognostic conditions. The current surgical standard of care for peritoneal surface malignancies (PSM) consists of cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) (1).

Surgical management of PSM continues to improve. Specifically, the use of less invasive approaches to perform HIPEC is associated with lower perioperative morbidity and mortality, when compared to patients with similar peritoneal cancer index (PCI) and extent of disease (2). Several studies have analyzed the feasibility and effectiveness of minimally invasive surgery for PSM, focusing on which technique may guarantee better oncological and surgical outcomes (3-6). Salti *et al.* (7) recently published their manuscript in which they aimed to assess the feasibility of hand-assisted laparoscopic (HAL) CRS and HIPEC for PSM. They suggested this hybrid technique would bridge the gap between open and pure laparoscopic surgery, providing the surgeon with the advantages of both approaches, including tactile feedback, superior bleeding control, and the use of hand port as extraction site for the specimen.

Their analysis included eleven patients diagnosed with pseudomyxoma peritonei of non-colorectal origin, appendiceal adenocarcinoma, or colon adenocarcinoma. A comparison between the HAL CRS group and open CRS

group was performed, showing significantly less intraoperative blood loss and 3-day shorter length of stay (LOS) in the HAL group. Moreover, no difference was found in the rates of postoperative morbidities, 30-day readmission, and intraoperative outcomes. The analysis reported that HAL CRS and HIPEC for PSM was associated with acceptable perioperative outcomes, low rates of conversion to open, and morbidity, altogether supporting this approach as the first choice for select patients with PSM.

Specific advantages of the HAL CRS over the pure laparoscopic approach are a faster learning curve (8), tactile feedback for undetectable nodules, easier access to anatomic sites that might be challenging laparoscopically, and prompt access to the abdominal cavity that would save operative time in complex cases. To address the concern of oncologic equivalency, follow-up of HAL CRS patients showed no evidence for peritoneal recurrence. Therefore, Salti *et al.* promoted this hybrid approach as a feasible and reproducible technique that could be an additional option for surgeons treating PSM. In recent years, multiple studies have analyzed the outcomes of the surgical treatment of PSM, with a major focus on the feasibility and safety of the minimally invasive approach to treat this condition. Esquivel *et al.* (9) demonstrated that laparoscopic CRS and HIPEC are appropriate for patients with low-volume carcinomatosis and no small bowel involvement. Subsequently Facchiano *et al.* (2) published a systematic review of literature that aimed to evaluate potential indications of laparoscopic HIPEC and to assess its role in the treatment or prevention

of PSM. They concluded that laparoscopic HIPEC is a safe and effective procedure, the indication of which is however limited to the palliation of malignant ascites. Moreover, the investigators stated that the laparoscopic approach for CRS does not seem to be a good option, because of the higher risk of the tissue damage of intra-abdominal resections rather than that derived from laparoscopic incisions, and because of the loss of tactile feedback. Subsequently, this concern has been addressed by more contemporary studies that demonstrated minimally invasive approach to be safe, feasible and the primary choice for suitable patients (3,4).

In recent years, there has also been interest in a robotic-assisted approach for CRS. Gabriel *et al.* (10) described the first robotic-assisted approach for CRS-HIPEC in a low-grade appendiceal mucinous neoplasm with limited disseminated peritoneal adenomucinosis. Based on historical comparison, the robotic approach achieved as good post-operative outcomes as the laparoscopic approach compared to the open one, such as minimal blood loss, short LOS and well-controlled pain. Additional reported advantages of the robotic approach were better ergonomics for the surgeon, resting of the patient's abdominal wall weight on robotic instruments, and lower rates of conversion to open. The robotic approach also shares the well-described benefits for minimally invasive surgery, which is predominantly laparoscopic in the known literature.

The minimally invasive approach was initially intended as the next step for surgical procedures in general. The quantity and quality of technological advances involved in surgery has increased dramatically in the last decade. However, a minimally invasive approach for CRS-HIPEC is not exempt from limitations. Patients need to be highly selected and without a large disease burden that would require more extensive debulking. The minimally invasive approach does not allow an easy exploration of the entire abdomen and pelvis to determine the actual PCI. Moreover, the lack of tactile feedback is one of the main concerns (11). Despite these limitations, the minimally invasive approach grants good visualization of view of the structures affected by PSM. Importantly, the selection of patients suitable for this approach allows good peri- and post-operative outcomes such as blood loss, pain control and LOS, and oncological outcomes, such as recurrence rate.

In conclusion, the minimally invasive approach for CRS-HIPEC, either purely laparoscopic, HAL, or robotic, has been shown to be feasible and characterized by safe long-term oncological and surgical outcomes. Minimally invasive CRS-HIPEC could be considered as first choice for select

patients. Further multi-institutional studies are needed to expand this branch of literature in order to create a large consensus on what should be the most appropriate surgical approach for PSM on an individualized basis.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Annals of Laparoscopic and Endoscopic Surgery*. The article did not undergo external peer review.

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/ales.2018.09.09>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Open Access Statement: This is an Open Access article distributed in accordance with the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 International License (CC BY-NC-ND 4.0), which permits the non-commercial replication and distribution of the article with the strict proviso that no changes or edits are made and the original work is properly cited (including links to both the formal publication through the relevant DOI and the license). See: <https://creativecommons.org/licenses/by-nc-nd/4.0/>.

References

1. Esquivel J, Sticca R, Sugarbaker P, et al. Cytoreductive surgery and hyperthermic intraperitoneal chemotherapy in the management of peritoneal surface malignancies of colonic origin: a consensus statement. *Society of Surgical Oncology. Ann Surg Oncol* 2007;14:128-33.
2. Facchiano E, Risio D, Kianmanesh R, et al. Laparoscopic hyperthermic intraperitoneal chemotherapy: indications, aims, and results: a systematic review of the literature. *Ann Surg Oncol* 2012;19:2946-50.
3. Fagotti A, Costantini B, Gallotta V, et al. Minimally invasive secondary cytoreduction plus HIPEC versus

- open surgery plus HIPEC in isolated relapse from ovarian cancer: a retrospective cohort study on perioperative outcomes. *J Minim Invasive Gynecol* 2015;22:428-32.
4. Fish R, Selvasekar C, Crichton P, et al. Risk-reducing laparoscopic cytoreductive surgery and hyperthermic intraperitoneal chemotherapy for low-grade appendiceal mucinous neoplasm: early outcomes and technique. *Surg Endosc* 2014;28:341-5.
 5. Sugarbaker PH, Van der Speeten K. Surgical technology and pharmacology of hyperthermic perioperative chemotherapy. *J Gastrointest Oncol* 2016;7:29-44.
 6. Almeray T, Gabriel EM, Torp KD, et al. Intraoperative fluid restriction in hyperthermic intraperitoneal chemotherapy. *J Surg Res* 2018;231:77-82.
 7. Salti GI, Naffouje SA. Feasibility of hand-assisted laparoscopic cytoreductive surgery and hyperthermic intraperitoneal chemotherapy for peritoneal surface malignancy. *Surg Endosc* 2018. [Epub ahead of print].
 8. Ozturk E, da Luz Moreira A, Vogel JD. Hand-assisted laparoscopic colectomy: the learning curve is for operative speed, not for quality. *Colorectal Dis* 2010;12:e304-9.
 9. Esquivel J, Averbach A, Chua TC. Laparoscopic cytoreductive surgery and hyperthermic intraperitoneal chemotherapy in patients with limited peritoneal surface malignancies: feasibility, morbidity and outcome in an early experience. *Ann Surg* 2011;253:764-8.
 10. Gabriel E, Elli E, Bagaria S, et al. Robotic-assisted cytoreductive surgery with hyperthermic intraperitoneal chemotherapy (CRS-HIPEC). *J Robot Surg* 2018. [Epub ahead of print].
 11. Arjona-Sanchez A, Esquivel J, Glehen O, et al. A minimally invasive approach for peritonectomy procedures and hyperthermic intraperitoneal chemotherapy (HIPEC) in limited peritoneal carcinomatosis: The American Society of Peritoneal Surface Malignancies (ASPSM) multi-institution analysis. *Surg Endosc* 2018. [Epub ahead of print].

doi: 10.21037/ales.2018.09.09

Cite this article as: Lemini R, Almeray T, Gabriel E. Minimally invasive approach for peritoneal surface malignancies: a surgical dilemma? *Ann Laparosc Endosc Surg* 2018;3:80.