

Laparoendoscopic single-site surgery for the assessment of peritoneal carcinomatosis resectability in patients with advanced ovarian cancer

D. Rossetti¹, S.G. Vitale², F.A. Gulino², A.M.C. Rapisarda², G. Valenti², M. Zigarelli²,
G. Sarpietro², L. Frigerio¹

¹ Department of Obstetrics and Gynecology, "Papa Giovanni XXIII" Hospital, Bergamo

² Department of General Surgery and Medical Surgical Specialties, University of Catania, Catania (Italy)

Summary

Purpose of investigation: To evaluate the feasibility, safety, and effectiveness of laparoendoscopic single site surgery (LESS) for the assessment of peritoneal carcinomatosis resectability in patients with advanced stage ovarian cancer (AOC). *Materials and Methods:* The authors retrospectively reviewed the medical records of patients affected by advanced stage ovarian cancer who underwent LESS for operative work-up. A standard cytoreductive laparotomy surgery (CRS) was performed. *Results:* Fifty-two women affected by AOC underwent LESS for operative work-up. The peritoneal cancer score was completed in 49 (94%) patients by use of LESS; 34/37 (92%) patients considered with a resectable disease were effectively optimally debulked and 15/52 (28%) patients considered with an unresectable disease received before neoadjuvant chemotherapy (NACT) and then underwent surgery. *Conclusion:* LESS is feasible, safe, and is an alternative minimally invasive procedure to assess the resectability of AOC patients.

Key words: Laparoendoscopic single-site surgery (LESS); Single-port laparoscopy; Advanced epithelial ovarian cancer; Peritoneal carcinomatosis; Residual tumor.

Introduction

Residual tumor (RT) after cytoreductive surgery (CRS) is the main prognostic factor in advanced ovarian cancer (AOC) [1]. The main issue in these patients is to identify who are the candidates for complete primary CRS [2]. Several preoperative minimally invasive scoring systems were evaluated to predict the optimal resectability of AOC in order to minimize the disadvantages of the open exploration and the consequent delay in neoadjuvant chemotherapy (NACT) initiation [3]. However, there is no unanimous consensus about the use of laparoscopy for the operative work-up in AOC patients. The most common complications described in literature using this technique are blood loss, bowel trauma, bladder lacerations, and conversion to laparotomy [4]. Innovative approaches such as laparoendoscopic single-site surgery (LESS) have been introduced in order to minimize these complications and to facilitate surgery. LESS was considered as a possible alternative to classical laparoscopic procedures in malignant gynecological cancer [5]. Patients underwent surgery via a single 1.5- to 2.5-cm umbilical incision with a multichannel single port. However, medical literature is devoid of clear information regarding the use of LESS in the assessment of AOC cases. Here, the authors' objective was to assess the feasibility of LESS in AOC operative work-up.

Materials and Methods

This is a retrospective study performed at the "Papa Giovanni XXIII Hospital", in Bergamo, Italy, from January 2009 to September 2014. Subjects were identified through clinical databases using the following diagnoses and procedures codes: epithelial ovarian cancer, NACT, diagnostic laparoscopic procedure, and cytoreduction, debulking. Inclusion criteria for the study included subjects who had a LESS procedure in order to evaluate the possibility of an optimal cytoreduction (no macroscopical residual tumor). Preoperative evaluation included general and gynecological examination. Pelvic ultrasonography, CA 125 assay, and computed tomography (CT) of the chest, abdomen, and pelvis are routinely performed in this hospital. 18F-FDG PET/CT is performed as part of the preoperative work-up in some patients. An umbilical incision of 1.5 to 2.5 cm was performed and a multichannel single port was placed. The "octo-port" consists of a retractor component and a cap component, which contains a harbor that is mounted onto a retractor component, and multiple channels to introduce laparoscopic instruments and a scope. In addition, the device includes two valves for insufflation and exhaust and a tag to facilitate removal. The authors created 12-mm Hg of pneumoperitoneum, and they introduced the optical system. The peritoneal cavity and intra-abdominal organs were examined. Ascitic fluid was aspirated and its volume was recorded in ml. Fifty-two anatomic sites were classified as normal, not seen, or containing tumor. Biopsies were taken to obtain a histological diagnosis. For each patient, the authors computed the "Fagotti score" based on LESS findings and this score was used to predict resectability [6]. "Fagotti score" is based on the presence or ab-

Revised manuscript accepted for publication July 30, 2015

Table 1. — Patient demographics and surgical characteristics.

Age (years)	64 (54-77)
BMI	24 (18-34)
Blood Loss (ml)	110 (50-700)
Operative Time (minutes)	75 (40-190)
Use of additional port	2/51
Conversion to laparotomy	1/52
Operative complications	1/52
Postoperative stay	3 (2-7)
Major perioperative complications	0/15

sence of omental cake, peritoneal carcinosis, diaphragmatic carcinosis, mesenteric retraction, bowel and/or stomach infiltration, and liver metastases. Patients in whom LESS indicated non-resectable disease (Fagotti score > 8) underwent NACT. Patients considered with a resectable disease were operated by laparotomy. LESS operative outcomes and assessment feasibility were considered for the analysis.

Results

During the study period, 52 patients affected by AOC underwent a LESS procedure in order to evaluate the opportunity to achieve an optimal CRS. Median patient age and body mass index were 64 (range 54-77) years and 24 (range 18-34), respectively. Patient demographics and surgical characteristics are showed in Table 1. The evaluation of the peritoneal carcinomatosis score was carried out successfully in 51 (98%) patients. One (2%) conversion to laparotomy was observed for a bowel injury during adhesiolysis. Two cases required an additional trocar port for adhesiolysis of severe pelvic adhesion. The mean operative time for these procedures was 75 (range, 40-190) minutes. Table 2 gives the main features of the 51 evaluated sites. Median values were 6 for the “Fagotti score”. The most frequently sites which were not assessable with LESS were gastrosplenic ligament, spleen, pars flaccida, lesser omental sac, pelvic nodes, lombo-aortic nodes, and hepatic pedicle. Sixteen of 52 (31%) patients, with a “Fagotti score” > 8, received NACT before interval debulking surgery. In this group of patients, the mean time to chemotherapy was three (2-7) days. No grade 3 or 4 perioperative complications were observed after LESS procedure.

Discussion

The findings of the present study suggest that LESS for operative work-up in AOC is feasible and safe, with 98% of patients with a complete abdominal evaluation. Intraoperative complications were observed in 2% of the cases. No major postoperative complications were reported. Medical literature is devoid of clear information regarding surgical outcomes and complications related to peritoneal carcinomatosis scoring performed with LESS. In the past, tumor

Table 2. — Fagotti score in 51 patients.

	Normal	Containing tumor	Not seen
Peritoneal carcinosis	12 (23%)	39 (77%)	0
Omental cake	24 (47%)	27 (53%)	0
Diaphragmatic carcinosis	28 (55%)	20 (39%)	3 (6%)
Mesenteric retraction	34 (67%)	15 (29%)	2 (4%)
Bowel infiltration	15 (29%)	33(65%)	3 (6%)
Stomach infiltration	38(74%)	6 (12%)	7 (14%)
Superficial liver metastasis	32 (62%)	13 (26%)	6 (12%)

resectability in AOC patients was evaluated using laparotomy. Compared to laparotomy, laparoscopy was associated with shorter hospital stay, quicker patient recovery, and quicker intestinal transit recovery, thereby allowing more rapid initiation of NACT if needed [6, 7]. In order to reduce the impact of surgery in patients who are candidates for NACT, new instruments are considered as alternative to the classical laparoscopic surgery. LESS is a specific surgical technique in which the surgeon inserts a single multiple ports into the abdominal cavity [8]. LESS has been used to evaluate and treat patients with benign and malign gynecological disease with encouraging results in terms of operative and postoperative outcomes [5]. The present authors considered this technique as alternative approach to assess the carcinomatosis score in 52 patients affected by AOC. As reported using laparoscopic technique, also in this series, the authors experienced particular difficulties to explore sites like gastrosplenic ligament, spleen, lesser omental sac, pelvic and lumbo-aortic nodes, and hepatic pedicle. These limitations in most of the case were due to the presence of multiple adhesions [9]. The presence of adhesions led the present authors to place an accessorial trocar in two cases and in one case a laparotomy to manage an intestinal injury was performed. The literature reported a concordance ranging from 82% to 94% in patients considered optimal resectable during laparoscopic evaluation and the residual tumor at the end of the debulking [10]. In the present series, 34/37 (92%) patients considered with resectable disease, were effectively optimal debulked. Time to chemotherapy is an important factor for a successful multimodality treatment. Literature data reported the adverse consequences in terms of outcomes in case of long chemotherapeutic delay. In the present experience, time to recover in patients operated with LESS was seven (4-11) days. No chemotherapeutic delays were observed.

Conclusion

Ovarian cancer is diagnosed in advanced stages (FIGO III-IV) in 70% among women affected influencing therapy strategies (NACT, primary surgery) and the possibility to reach a complete cytoreduction that plays a main

role as prognostic factor [1, 11]. Laparoscopy should be preferred instead of laparotomy as stadiation procedure in early-stage ovarian cancer but is also useful in AOC where preoperative data collecting suggest an inoperability. Laparoscopy, thus, should reduce the number of invasive laparotomic exploration, complications related with this open procedure and anticipate alternative approach, such as NACT in these women with AOC [3,12]. LESS was considered as a possible alternative to classical laparoscopic approach, including staging procedure, in malignant gynecological cancer with the benefit to reduce the number of trocar accesses and consequentially related complication [5]. In conclusions, LESS is feasible, safe, and is a possible alternative minimally invasive procedure to assess the resectability of AOC patients.

References

- [1] Griffiths C.T.: "Surgical resection of tumor bulk in the primary treatment of ovarian carcinoma". *Natl. Cancer Inst. Monogr.*, 1975, 42, 101.
- [2] Chi D.S., Liao J.B., Leon L.F., Venkatraman E.S., Hensley M.L., Bhaskaran D., Hoskins W.J.: "Identification of prognostic factors in advanced epithelial ovarian carcinoma". *Gynecol. Oncol.*, 2001, 82, 532.
- [3] Chéreau E., Ballester M., Selle F., Cortez A., Daraï E., Rouzier R.: "Comparison of peritoneal carcinomatosis scoring methods in predicting resectability and prognosis in advanced ovarian cancer". *Am. J. Obstet. Gynecol.*, 2010, 202, 178.e1.
- [4] Nezhat F.R., DeNoble S.M., Liu C.S., Cho J.E., Brown D.N., Chuang L., et al.: "The safety and efficacy of laparoscopic surgical staging and debulking of apparent advanced stage ovarian, fallopian tube, and primary peritoneal cancers". *JSLs*, 2010, 14, 155.
- [5] Fader A.N., Escobar P.F.: "Laparoendoscopic single-site surgery (LESS) in gynecologic oncology: technique and initial report". *Gynecol. Oncol.*, 2009, 114, 157.
- [6] Fagotti A., Ferrandina G., Fanfani F., Ercoli A., Lorusso D., Rossi M., Scambia G.: "A laparoscopy-based score to predict surgical outcome in patients with advanced ovarian carcinoma: a pilot study". *Ann. Surg. Oncol.*, 2006, 13, 1156.
- [7] Vergote I., De Wever I., Tjalma W., Grambergen M., Van Den Broeck J., Van Dam P.: "Neoadjuvant chemotherapy or primary debulking surgery in advanced ovarian carcinoma: a retrospective analysis of 285 patients". *Gynecol. Oncol.*, 1998, 71, 431.
- [8] Bradford L.S., Boruta D.M.: "Laparoendoscopic single-site surgery in gynecology: a review of the literature, tools, and techniques". *Obstet. Gynecol. Surv.*, 2013, 68, 295.
- [9] Varnoux C., Huchon C., Bats A.S., Bensaid C., Achouri A., Nos C., Lécure F.: "Diagnostic accuracy of hand-assisted laparoscopy in predicting resectability of peritoneal carcinomatosis from gynecological malignancies". *Eur. J. Surg. Oncol.*, 2013, 39, 774.
- [10] Stoeckle E., Bourdarias L., Guyon F., Croce S., Brouste V., Thomas L., Floquet A.: "Progress in survival outcomes in patients with advanced ovarian cancer treated by neo-adjuvant platinum/taxane-based chemotherapy and late interval debulking surgery". *Ann. Surg. Oncol.*, 2014, 21, 629.
- [11] Jemal A., Siegel R., Ward E., Murray T., Xu J., Smigal C., Thun M.J.: "Cancer statistics, 2006". *CA Cancer J Clin.*, 2006, 56, 106.
- [12] Benedet J.L., Bender H., Jones H. 3rd, Ngan H.Y., Pecorelli S.: "FIGO staging classifications and clinical practice guidelines in the management of gynecologic cancers. FIGO Committee on Gynecologic Oncology". *Int. J. Gynaecol. Obstet.*, 2000, 70, 209.

Address reprint requests to:
 S.G. VITALE, M.D.
 Department of General Surgery and
 Medical Surgical Specialties
 University of Catania
 Via Santa Sofia 78
 95123 Catania (Italy)
 e-mail: vitalesalvatore@hotmail.com