ONCOLOGY

A multicentric trial (Olympia—MITO 13) on the accuracy of laparoscopy to assess peritoneal spread in ovarian cancer

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OBJECTIVE: The objective of the study was to prospectively evaluate the accuracy of laparoscopy performed in satellite centers (SCs) to describe intraabdominal diffusion of advanced ovarian cancer (AOC).

STUDY DESIGN: Patients with a clinical/radiological suspicion of AOC were included in the protocol. SCs were selected among those surgeons, spending a short intensive training period at the coordinator center (CC) to learn the application of staging laparoscopy (S-LPS) in AOC. All women underwent S-LPS at the SCs, and the surgical procedure was recorded and blindly reviewed at the CC. Calculating specificity, positive and negative predictive values, and the accuracy for each parameter with respect to the CC assessed the diagnostic performance of S-LPS. The Cohen's kappa was used to test the interobserver agreement of each parameter.

RESULTS: One hundred sixty-eight cases were considered eligible for the study. A per-protocol analysis was performed on 120 cases. The worst laparoscopic assessable feature was mesenteric retraction, whereas the remaining variables ranged from 99.2% (peritoneal carcinomatosis) to 90% (bowel infiltration). All but 1 SC (SC number 4) reached an accuracy rate of 80% or greater for both single parameters and overall score. The Cohen's kappa and the *P* value for overall predicitive index value were 0.685 and .01, respectively, but improved to 0.773 and .388 after removing the SC number 4 from the analysis.

CONCLUSION: S-LPS allows an accurate and reliable assessment of intraperitoneal diffusion of disease in AOC patients in trained gynecological oncology centers.

Key words: accuracy, carcinomatosis, laparoscopy, ovarian cancer, specificity

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Most women with ovarian cancer are diagnosed at an advanced stage of disease, when large intraperitoneal dissemination has already occurred.[1] Nevertheless, maximal cytoreduction is considered by several authors the best option for cure to offer to these patients because residual tumor (RT) after primary surgery is one of the most important prognostic factors in advanced ovarian cancer (AOC).[2,3]

The number of women with AOC who undergo an optimal cytoreductive procedure widely varies in the literature, depending on either surgeon's training/philosophy and patient's characteristics.[4] Therefore, a certain number of women still undergo explorative laparotomy only, followed by neoadjuvant chemotherapy.[5] To preoperatively identify those patients able to achieve optimal cytoreduction (RT less than 1 cm),[4] thus avoiding unnecessary laparotomies, several approaches have been attempted, including assessment of CA-125 serum levels and computed tomography (CT) scan.[6,7] However, the CA-125 serum

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levels do not always reflect tumor burden, and CT scan has been unreliable in predicting resectability of the disease.[8] Moreover, the accuracy of these parameters has been limited by several factors, such as the number of patients, retrospective nature of the studies, and the highly different rates of optimal cytoreduction among the centers.[9]

In this context, we first demonstrated that laparoscopy is able to provide the same information as standard laparotomy regarding intraperitoneal diffusion of AOC and consequently to accurately assess the chances of optimal cytoreduction in these women.[10] Thus, we set up a laparoscopy-based quantitative predictive model (predictive index value [PIV]), which provides an objective score related to intraabdominal disease diffusion and predicts the likelihood of optimal cytoreduction.[11]

As a subsequent step, we validated the performance of this model in a larger prospective cohort of AOC patients[12] and tested its reliability in the gynecological oncology fellowship.[13] Moreover, the validation of the score in an external center[14] suggests that the laparoscopic description of peritoneal cancer dissemination is feasible and objective. Nevertheless, to definitively demonstrate the reliability of a model, its prospective application is needed in other centers (satellite centers [SCs]) with different surgical background with respect to the one where it was developed (coordinator center [CC]).

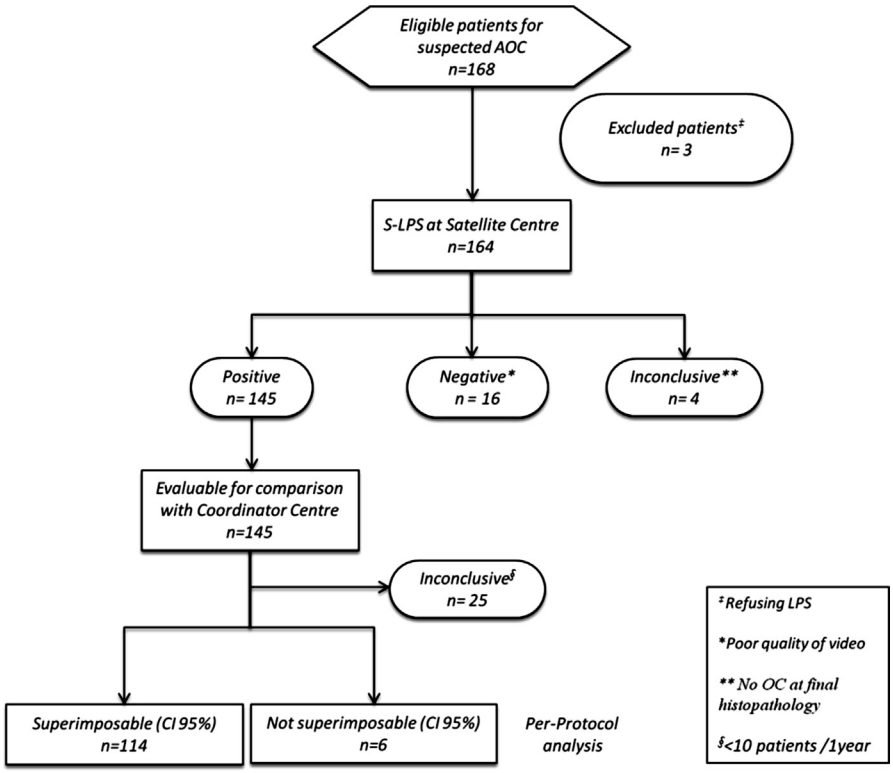
The prospective multicentric trial Olympia-MITO 13 has been designed to report the accuracy of laparoscopy to describe intraabdominal diffusion of AOC performed in different SCs with respect to CCs in the same patient. Indeed, the purpose of this study was to verify the reproducibility of the scoring system in the description of the tumor spread rather than testing the ability of the model to predict the likelihood of optimal cytoreduction.

Materials and Methods

Study design

Olympia-MITO 13 is a prospective multicentric trial registered (ClinicalTrials.gov, no. NCT01595204). Each center obtained the approval of the local ethical committee before enrolling patients. The design of the study is shown in Figure 1.

FIGURE 1
Flow diagram according to STARD statement



AOC, advanced ovarian cancer; *LPS*, laparoscopy; *S-LPS*, staging laparoscopy; *STARD*, Standards for the Reporting of Diagnostic Accuracy Studies.

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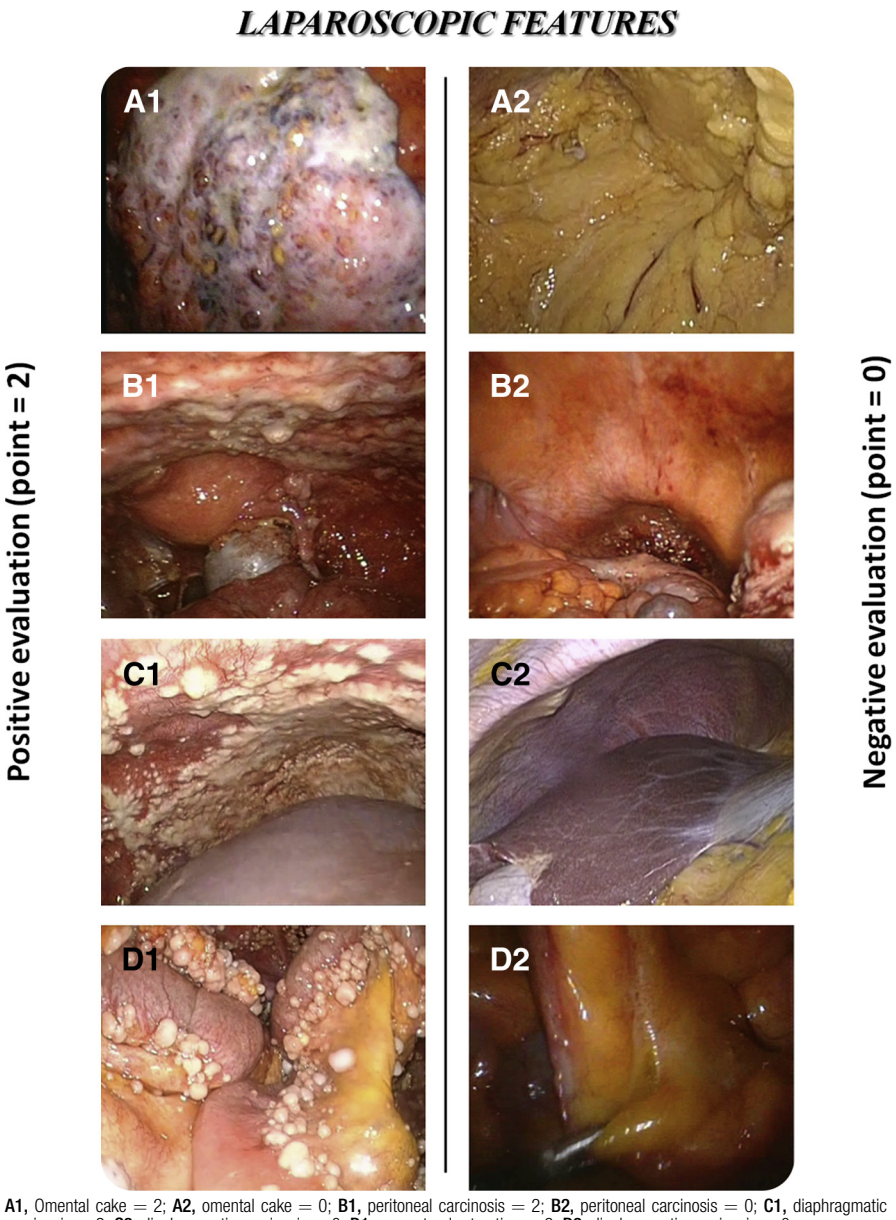
Women with first clinical and/or radiological diagnosis of advanced ovarian/fallopian tube or primary peritoneal cancer (International Federation of Gynecology and Obstetrics stages III-IV) were consecutively evaluated by a gynecologic oncologist who proposed the trial. Women accepting to be scheduled in the study signed an informed consent to be included in the protocol. Preoperative evaluation of the patients consisted of a complete physical and gynecological examination, assessment of CA-125 serum levels, Eastern Cooperative Oncology Group (ECOG) performance status, chest X-ray, abdominopelvic CT scan, and sonography.

Absolute exclusion criteria were represented by any clinical condition contraindicating laparoscopy (American Society of Anesthesiologists [ASA] of 3 or greater) and/or large masses occupying the entire abdomen or infiltrating the abdominal wall, not allowing a safe and reliable laparoscopic evaluation. All eligible patients were considered the intention-to-treat population.

All SC surgeons were experienced gynecologic oncologists in ovarian cancer management and laparoscopic surgery. However, all SC surgeons took part in a training course on ovarian cancer management and radical surgery for at least 2 months at the CC. The course consisted of a direct participation to surgery for advanced ovarian cancer with the CC's surgeons, comparison of laparoscopic and laparotomic features, and discussion of the patients' clinical outcome. These learning groups can add opportunities to share experiences and learn from each other, reducing the number of procedures for acquiring proficiency and minimizing the disagreement in the laparoscopic evaluation.[13]

FIGURE 2
Positive and negative evaluations of laparoscopic features (omental cake, peritoneal carcinosis, diaphragmatic carcinosis, mesenteral retraction) according to Fagotti's scoring model



A1, Omental cake = 2; **A2,** omental cake = 0; **B1,** peritoneal carcinosis = 2; **B2,** peritoneal carcinosis = 0; **C1,** diaphragmatic carcinosis = 2; **C2,** diaphragmatic carcinosis = 0; **D1,** mesenteral retraction = 2; **D2,** diaphragmatic carcinosis = 0.

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All women included in the study were submitted to staging laparoscopy (S-LPS) at the SC, and the surgical procedure was performed according to our previously published data.[12] Video registration of S-LPS was carried out at the SC to assess the following parameters: peritoneal and diaphragmatic carcinomatosis, omental cake, mesenteral retraction, bowel and stomach infiltration, and superficial liver metastases.

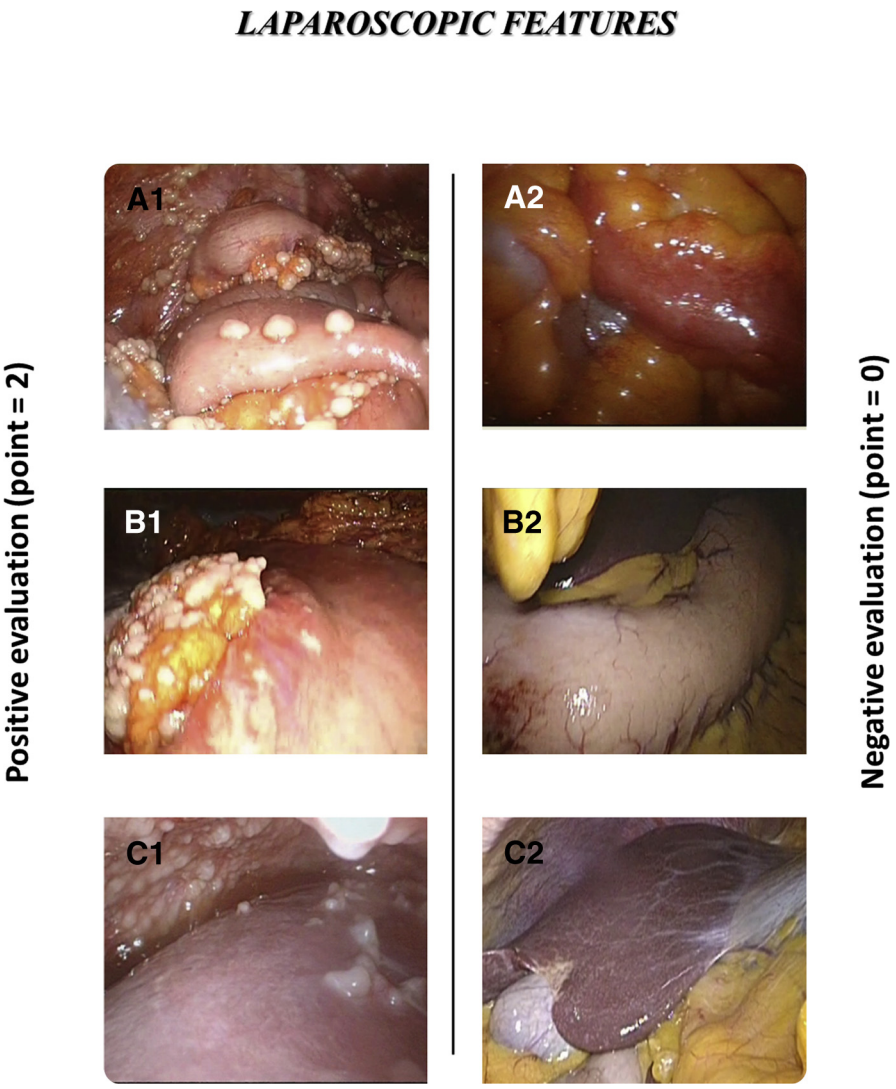
The necessary characteristics required to define a positive appraisal for each laparoscopic features were previously discussed, and each positive evaluation received a score of 2.[11] Specifically evaluations included the following: (1) peritoneal carcinomatosis, a score of 2 was allotted only to the patients with massive peritoneal involvement as well as with a miliary pattern of distribution; on the contrary, the score was 0 in the case of carcinomatosis involving limited area (as along the paracolic gutter or the pelvic peritoneum) being surgically removable by peritonectomy; (2) diaphragmatic disease: a score of 2 was agreed in the case of widespread infiltrating carcinomatosis or confluent nodules to the utmost part of the diaphragmatic surface; (3) mesenteric disease: a score of 2 was granted when large infiltrating nodules or an involvement of the root of the mesentery were supposed on the basis of limited movements of the various intestinal segments. On the other hand, small nodules potentially treated by ABC were not considered for scoring; (4) omental disease: a score of 2 was allotted when tumor diffusion was observed along the omentum up to the large stomach curvature, whereas isolated localization were excluded; (5) bowel infiltration: a score of 2 was agreed in the case that a bowel resection was assumed or when extended carcinomatosis on the ansae was observed; (6) stomach infiltration: a score of 2 was granted when an obvious neoplastic involvement of the gastric wall was observed; and (7) liver metastases: a score of 2 was allotted in the case of surface lesions larger than 2 cm (Figures 2 and 3).

By summing the scores relative to all parameters, a laparoscopic value for each patient (total PIV) has been calculated.

Negative and inconclusive cases were considered not evaluable because of the poor quality of the video and the unexpected other malignancies at definitive histology, respectively.

Positive cases consisted of evaluable videos, which were blindly revised at the CC, Division of Gynaecologic Oncology, Catholic University of the Sacred Heart in Rome, Italy, whose evaluation was considered as the reference standard. In fact, the correspondence between the laparoscopic model and laparotomy-verified parameters was demonstrated by a previously published paper.[10] At the CC, a second blind laparoscopic assessment of video for each parameter, and overall PIV was performed and statistical analysis elaborated.

FIGURE 3
Positive and negative evaluations of laparoscopic features (bowel infiltration, stomach infiltration, superficial liver metastasis) according to Fagotti's scoring model



A1, bowel infiltration = 2; **A2,** bowel infiltration = 0; **B1,** stomach infiltration = 2; **B2,** stomach infiltration = 0; **C1,** superficial liver metastasis = 2; **C2,** superficila liver metastasis = 0.

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The prediction of optimal cytoreduction by S-LPS and the following effective surgical management of these patients were considered outside the aim of the present study, but they will be the objective of a future clinical trial. Here the goal was to verify the accuracy of the laparoscopic model in describing intraabdominal diffusion of AOC in different SCs, with respect to a CC. Any correlation with CA-125 serum levels as well as the abdominal CT scan assessment were not analyzed. Any clinical decision about surgical management of these women was outside the aim of the study, and it was taken independently by each SC.

Statistical analysis

Assuming the laparoscopic evaluation of the CC as the gold standard to describe the intraperitoneal tumor spread, we tested the null hypothesis that the possibility of correctly identifying the peritoneal spread by the SC was not more inferior than 80%. The cutoff of 80% was arbitrarily chosen because of the lack of literature data and according to our previously published papers (ie, the overall accuracy of the model was approximately 75%).[11]

This study was designed as a noninferiority trial and the sample size, calculated according to Simon's design,[15] using an alpha error of 0.01 and a beta error of 0.90, resulted in at least 75 cases, as the whole population.

To avoid any bias related to the inexperience of the SC in treating AOC patients, it was planned a priori to perform a per-protocol analysis only in those centers enrolling at least 10 patients in 1 year.

The diagnostic performance of S-LPS at the SC was assessed by calculating specificity, positive and negative predictive values (PPV and NPV, respectively), and accuracy for each parameter with respect to the CC. The Cohen's kappa was used to test the concordance between SCs for each parameter.

Finally, the overall PIV was calculated for each woman in the SC and tabulated in the Bland-Altman plot.[16] The median PIV distribution in each SC was compared with the CC median PIV by the Cohen's kappa test and accuracy.[17]

Significance was assumed at a $P < .05$. Statistical calculations were performed using the Statistical Package for Social Sciences (version 17.0; SPSS Inc, Chicago, IL).

RESULTS

From March 2010 to March 2012, 24 SCs agreed to participate to the prospective multicentric trial Olympia-MITO 13 (protocol identification NCT01595204). Seventeen (70.8%) did actually enroll patients. One hundred sixty-eight cases with suspicious primary advanced ovarian/peritoneal cancer were considered eligible for the study. Three women (1.8%) refused S-LPS and were then excluded. The remaining patients were submitted to S-LPS at the SCs, and no intraoperative complications were registered. Sixteen cases (9.5%) showed poor quality of the video, whereas 4 cases (2.4%) resulted in other malignancies at definitive pathological findings. One

hundred forty-five patients (86.3%) were evaluable at the CC (Table 1).

A per-protocol analysis was performed on 120 cases. As shown in Table 2, the worst assessable feature was mesenteric retraction, which was not evaluated in 31 of 120 cases (25.8%). The remaining variables were quite homogeneously valuable, ranging from 99.2% (peritoneal carcinomatosis) to 90% (bowel infiltration). The main obstacles that prevented the SCs from assessing the laparoscopic features were the presence of tumor adhesions and diffused carcinomatosis or the absence for previous surgery, such as for omentum. The interrate agreement between SCs and the CC was calculated by Cohen's kappa for each parameter and ranged from 0.63 (stomach infiltration) to 0.87 (omental involvement).

The PPV and NPV and accuracy rate for each parameter and for overall PIV were then calculated in every SC. All but 1 SC reached an accuracy rate of 80% or greater for both single parameters and overall PIV. The overestimation of peritoneal and diaphragmatic carcinomatosis resulted in a very low PPV (18.2% and 66.7%, respectively) in the SC number 4, thus negatively influencing the previously defined cutoff accuracy of 80% or greater for each variable (peritoneal and diaphragmatic carcinomatosis, 35.7% and 78.7%, respectively) and for overall PIV (50%) (Figure 4 and Appendix; Supplementary Table). The interrate agreement (Cohen's kappa) and the *P* value for the overall PIV were 0.685 and .01, respectively, but improved to Cohen's kappa = 0.773 and *P* = .388 after removing the SC number 4 from the analysis (Table 3).

Overall PIV was superimposable in 59 of 120 patients (49.2%), and 114 cases (95%) ranged within 95% confidence interval (CI) (Figure 5). Regarding 6 patients not included within 95% CI, 4 (3.3%) received an underestimation and 2 (1.6%) an overestimation of the diffusion of the disease.

Comment

In the light of some recent advances in ovarian cancer treatment,[19-21] the correct timing to perform debulking surgery is a crucial point in the natural history of the disease.

In this context, the availability of a minimally invasive approach, such as S-LPS, able to directly visualize intraperitoneal cavity as the preferred site of ovarian cancer diffusion, is a great diagnostic opportunity for the surgeon to draw a more individualized management of AOC. However, the introduction of a laparoscopic assessment to predict optimal cytoreduction in AOC into clinical practice may be biased by other subjective tools, such as patients' and surgeon's characteristics.

In our opinion, although such a dilemma can be ascribed to many other predictive tools, as, for example, CA-125 serum levels or CT scan, the intrinsic value of any objective evaluation still remains undoubted. In addition to its safety in terms of complications and survival, the reproducibility of the technique seems the most important challenge to the large diffusion of this approach.[12,22] The present study offers the scientific bases to definitively

TABLE 1
Patient characteristics

Parameter	n (%)
Eligible cases	168
Evaluable cases[a]	145 (86.3)
Member centers	24
Enrolling centers	17 (70.8)
Evaluable centers[b]	10 (58.8)
Median age (y) (range)	62 (32–92)
Median ECOG PS (range)	1 (0–2)
Histology[c]	
Type I	12 (8.2)
Type II	133 (91.8)
Stage	
IIIC	113 (77.9)
IV	32 (22.1)

ECOG, Eastern Cooperative Oncology Group; *PS*, performance status.

[a] Not included for refusing staging laparoscopy, poor quality of video, or other malignancies; [b] Center enrolling at least 10 cases/year; [c] According to Kurman and Shih.[18]

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TABLE 2
Accuracy of laparoscopic assessment for each parameter (per-protocol analysis)

Parameter	Not evaluable, n (%)	False positive, n (%)	False negative, n (%)	NPV, %	PPV, %	Specificity, %	Accuracy, n (%)	Cohen's kappa
Omental cake	3 (2.5)	5 (4.2)	2 (1.7)	95.8	92.8	90.2	110 (94.0)	0.878
Peritoneal carcinomatosis	1 (0.8)	15 (12.6)	1(0.8)	97.9	78.9	75.8	103 (86.5)	0.733
Diaphragmatic carcinomatosis	2 (1.6)	8 (6.7)	3 (2.5)	92.9	89.6	83.0	107 (90.7)	0.802
Mesenteral retraction	31 (25.8)	4 (4.4)	4 (4.4)	94.0	82.6	94.0	81 (91.0)	0.766
Bowel infiltration	12 (10.0)	8 (7.4)	11(10.1)	81.7	83.3	86.0	89 (82.4)	0.646
Stomach infiltration	8 (6.6)	4 (3.5)	3 (2.6)	97.0	63.6	96.1	105 (93.7)	0.632
Superficial liver metastasis	4 (3.3)	5 (4.3)	4 (3.4)	95.7	78.3	94.7	107 (92.2)	0.752

NPV, negative predictive value; *PPV*, positive predictive value.

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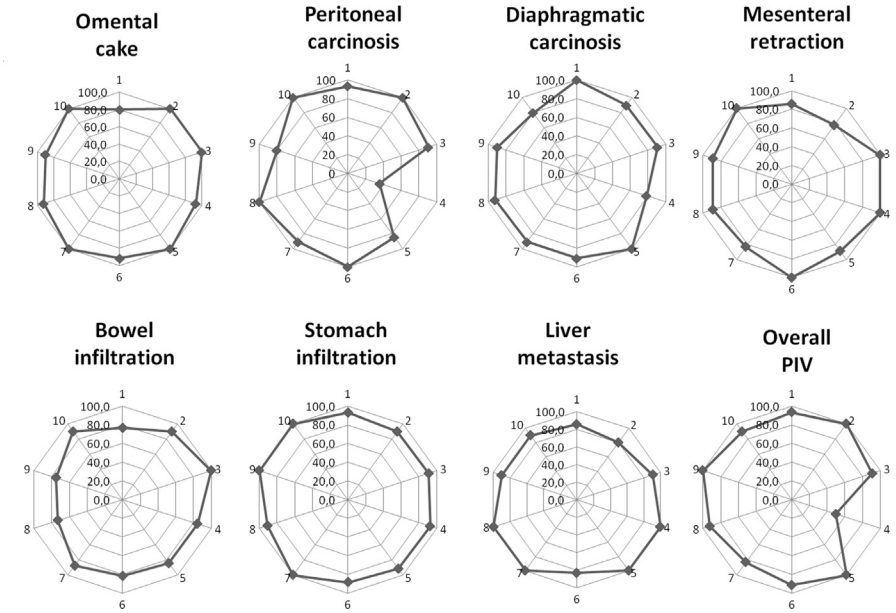
FIGURE 4
Accuracy of each parameter and PIV in the SCs



The evaluation of each laparoscopic parameter and PIV is represented by a decagon. The vertices of the decagons (from 1 to 10) correspond to the SCs. The percentages of accuracy (from 0 to 100) are indicated on the axes for each SCs. The *black boxes* express the accuracy achieved by SCs.

PIV, predictive index value; *SC*, satellite center.

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recommend S-LPS as a valid diagnostic tool in the algorithm of treatment of advanced ovarian cancer patients. In particular, it shows that, following some simple rules, as previously defined,[11] many centers are able to correctly describe AOC intraperitoneal diffusion by S-LPS instead of standard laparotomy.

The specificity of each laparoscopic feature in all centers ranged between 75.8% (peritoneal carcinomatosis) and 96.1% (stomach infiltration), with the highest accuracy rate for omental cake (94.0%) and the lowest for bowel infiltration (82.4%). The quite disappointing low performance of peritoneal carcinomatosis may be influenced by the highest rate of false-positive cases, which reached 12.6%. From a clinical point of view, it means that women with few peritoneal nodules were considered positive at the SCs and negative at the CC, thus disregarding the definition of peritoneal carcinomatosis previously stated for the laparoscopic model.[11]

It is conceivable that such error can be easily corrected through a larger sharing of the laparoscopic criteria and/or a longer training of some SCs' surgeons in a specific fellowship program on both laparoscopy and oncologic surgery, based on published data.[13] This is the case of SC number 4, which failed to reach the previously defined cutoff accuracy of 80% or greater, for both peritoneal and diaphragmatic carcinomatosis. Nevertheless, the full

TABLE 3
Accuracy of PIV in the satellite centers

Variable	Satellite center, median PIV (range)	Coordinator center, median PIV (range)	*P* value	Cohen' s kappa	Accuracy, %
Center 1	8 (0–12)	8 (0–12)	.713	0.865	93.3
Center 2	5 (0–14)	5 (0–8)	.739	1.00	100.0
Center 3	2 (0–12)	2 (0–14)	.898	1.00	90.9
Center 4	6 (0–8)	2 (0–8)	.039	0.169	50.0
Center 5	8 (2–14)	8 (2–14)	.650	1.00	100.0
Center 6	7 (0–12)	6 (0–14)	.514	0.833	91.6
Center 7	5 (0–10)	4 (0–8)	.319	0.636	83.3
Center 8	8 (2–12)	6 (2–12)	.545	0.847	92.3
Center 9	2 (0–12)	3 (0–12)	.853	1.00	100.0
Center 10	2 (0–8)	3 (0–8)	.529	0.615	90.0
Overall centers	6 (0–14)	4 (0–14)	.01	0.685	84.1
Overall centers removing center 4	6 (0–14)	6 (0–14)	.388	0.773	88.6

PIV, predictive index value.

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implementation of the laparoscopic model cannot ignore the theoretical and clinical background in gynecologic oncology, in which S-LPS finds its maximal application. For instance, in our institution, we have learned over time that the presence of carcinomatosis over the anterior diaphragm surface is often associated with the presence of tumor along the posterior declivous areas, whose removal would require extensive peritonectomy or even diaphragmatic resection. Moreover, although the evaluation of each laparoscopic feature is interesting, its assessment was not chosen on the basis of a direct correlation with the chances of optimal cytoreduction but rather to fully describe the intraabdominal diffusion of the disease. Thus, in no case should they be deemed as indices of inoperability by themselves: only the combination of them, expressed by the PIV, could be considered as an indirect sign of the biological aggressiveness of the tumor.

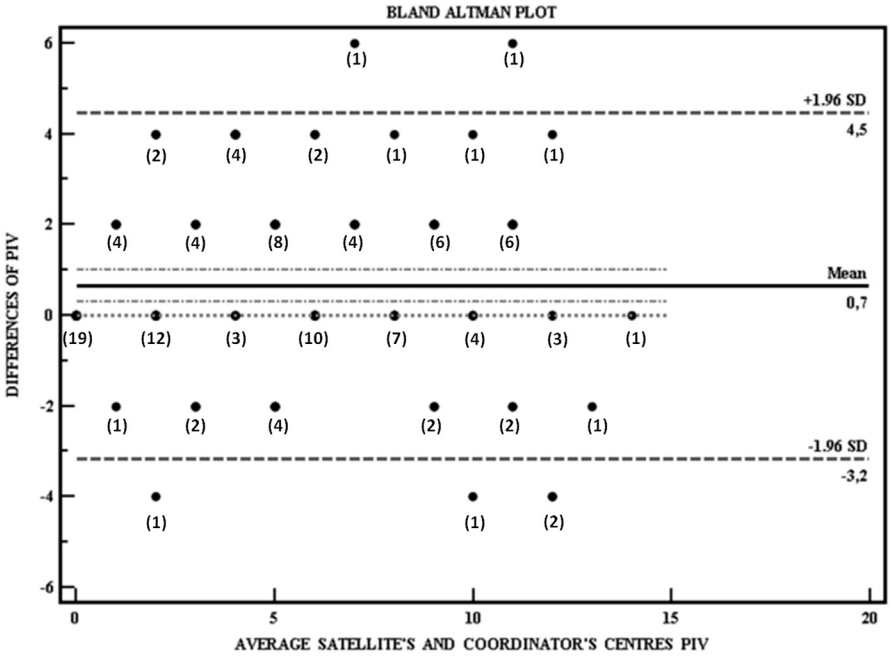
As expected, the median PIV elaborated in each SC showed no statistically significant difference with respect to the median PIV in the CC, except for SC number 4. Therefore, removing SC number 4 from the statistical analysis, the model achieves an accuracy rate of 88.6% with a $P = .388$. In our opinion, the identification of the error, in terms of both technical evaluation and SC, makes the model even more appealing, thanks to its ability to self-correct. Moreover, the removal of the failing SC represents a merely statistical artifact, switching the accuracy from 84.1% to 88.6% without changing the clinical impact of the study.

Indeed, about half of the patients showed a superimposable PIV between the SCs and the CC, with 95% of the cases lying within 95% CI. Regarding 6 women not included within 95% CI, only 2 (1.6%) received an overestimated score, hindering any possible optimal cytoreduction. However, considering that this value can be improved through an intensive training program,[13] it appears an excellent result so far.

Moreover, the issue of higher costs for S-LPS with respect to other standard diagnostic procedures such as CT scan or magnetic resonance imaging is questionable. In fact, because the histological diagnosis and surgical staging are mandatory in advanced ovarian cancer patients, S-LPS should be considered as the first surgical step to which these cases are submitted. In fact, the chance for the surgeon to move immediately toward maximal cytoreduction if the case is feasible greatly decreases the costs. Moreover, considering the nonnegligible rate of false-positives/negative values obtained with standard diagnostic procedures and the fast recovery of the patients after S-LPS to promptly start chemotherapy, it appears a good compromise between no surgical exploration and longitudinal exploratory laparotomy in advanced cases.

In conclusion, the routine use of S-LPS allows an objective assessment of intraperitoneal diffusion of disease in primary AOC patients. It has the potential to properly select high-risk cases for suboptimal debulking, related to the extension of disease. Such women can be referred to high-volume hospital with surgeons dedicated to extensive cytoreduction or they may be submitted to neoadjuvant chemotherapy. In addition, the correct description of anatomic spread, extent, and size of the tumor may be useful for designing future clinical trials.[22] ■

FIGURE 5
Comparison between PIV in the SCs vs CC (Bland-Altman's plot)



The Bland-Altman's plot shows a scatter diagram of the differences plotted against the averages of the 2 measurements (SCs and CC's PIV). *Horizontal lines* are drawn at the mean difference and at the limits of agreement, which are defined as the mean difference ± 1.96 times the standard deviation of the differences. In brackets, the number of cases for each scatter dot is reported.

CC, coordinator center; *PIV*, predictive index value; *SC*, satellite center.

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APPENDIX

SUPPLEMENTARY TABLE

Accuracy of each laparoscopic parameter in each SC

Variable	Assessable, %	Specificity, %	NPV, %	PPV, %	Accuracy, %
Center 1					
Omental cake	100.0	80.0	66.7	88.9	80.0
Peritoneal carcinomatosis	100.0	83.3	100.0	90.0	93.3
Diaphragmatic carcinomatosis	100.0	100.0	100.0	100.0	100.0
Mesenteral retraction	93.3	87.5	87.5	83.3	85.7
Bowel infiltration	86.6	80.0	66.7	85.7	76.9
Stomach infiltration	93.3	92.3	100.0	50.0	92.8
Superficial liver metastasis	93.3	80.0	100.0	66.7	85.7
Center 2					
Omental cake	100.0	100.0	100.0	100.0	100.0
Peritoneal carcinomatosis	100.0	100.0	100.0	100.0	100.0
Diaphragmatic carcinomatosis	100.0	83.3	100.0	80.0	90.0
Mesenteral retraction	90.0	85.7	85.7	50.0	77.8
Bowel infiltration	100.0	100.0	83.3	100	90.0
Stomach infiltration	100.0	90.0	100.0	n.a.	90.0
Superficial liver metastasis	100.0	80.0	100.0	n.a.	80.0
Center 3					
Omental cake	90.9	100.0	100.0	100.0	100.0
Peritoneal carcinomatosis	100.0	85.7	100.0	80.0	90.9
Diaphragmatic carcinomatosis	100.0	85.7	100.0	80.0	90.9
Mesenteral retraction	81.8	100.0	100.0	100.0	100.0
Bowel infiltration	100.0	100.0	100.0	100.0	100.0
Stomach infiltration	100.0	90.0	100.0	50.0	90.9
Superficial liver metastasis	100.0	100.0	90.9	n.a.	90.9
Center 4					
Omental cake	100.0	85.7	100.0	87.5	92.8
Peritoneal carcinomatosis	100.0	25.0	100.0	18.2	35.7
Diaphragmatic carcinomatosis	100.0	62.5	100.0	66.7	78.5
Mesenteral retraction	78.5	100.0	n.a.	n.a.	100.0
Bowel infiltration	92.8	90.9	90.9	50.0	84.6
Stomach infiltration	100.0	100.0	92.8	n.a.	92.8
Superficial liver metastasis	100.0	100.0	100.0	n.a.	100.0

Fagotti. Diagnostic accuracy of laparoscopy in advanced ovarian cancer. Am J Obstet Gynecol 2013. *(continued)*

SUPPLEMENTARY TABLE

Accuracy of each laparoscopic parameter in each SC *(continued)*

Variable	Assessable, %	Specificity, %	NPV, %	PPV, %	Accuracy, %
Center 5					
Omental cake	100.0	100.0	100.0	100.0	100.0
Peritoneal carcinomatosis	100.0	33.3	100.0	83.3	84.6
Diaphragmatic carcinomatosis	100.0	100.0	100.0	100.0	100.0
Mesenteral retraction	69.2	100.0	83.3	100.0	88.8
Bowel infiltration	92.3	100.0	75.0	100.0	84.6
Stomach infiltration	92.3	90.0	100.0	66.7	91.6
Superficial liver metastasis	100.0	100.0	100.0	100.0	100.0
Center 6					
Omental cake	100.0	80.0	100.0	87.5	91.6
Peritoneal carcinomatosis	100.0	100.0	100.0	100.0	100.0
Diaphragmatic carcinomatosis	91.6	80.0	100.0	85.7	90.9
Mesenteral retraction	41.6	100.0	100.0	100.0	100.0
Bowel infiltration	91.6	80.0	80.0	83.3	81.8
Stomach infiltration	75.0	n.a.	88.8	n.a.	88.8
Superficial liver metastasis	100.0	87.5	87.5	75.0	83.3
Center 7					
Omental cake	83.3	100.0	100.0	100.0	100.0
Peritoneal carcinomatosis	91.6	100.0	85.7	100.0	90.9
Diaphragmatic carcinomatosis	91.6	75.0	100.0	87.5	90.9
Mesenteral retraction	50.0	83.3	n.a.	n.a.	83.3
Bowel infiltration	66.6	83.3	100.0	66.7	87.5
Stomach infiltration	91.6	100.0	100.0	n.a.	100.0
Superficial liver metastasis	83.3	100.0	100.0	100.0	100.0
Center 8					
Omental cake	100.0	83.3	100.0	87.5	92.3
Peritoneal carcinomatosis	100.0	100.0	100.0	100.0	100.0
Diaphragmatic carcinomatosis	100.0	100.0	66.7	100.0	92.3
Mesenteral retraction	69.2	100.0	80.0	100.0	88.8
Bowel infiltration	84.6	100.0	50.0	100.0	72.7
Stomach infiltration	84.6	100.0	88.9	100.0	90.9
Superficial liver metastasis	92.3	100.0	100.0	100.0	100.0

Fagotti. Diagnostic accuracy of laparoscopy in advanced ovarian cancer. Am J Obstet Gynecol 2013. *(continued)*

SUPPLEMENTARY TABLE

Accuracy of each laparoscopic parameter in each SC *(continued)*

Variable	Assessable, %	Specificity, %	NPV, %	PPV, %	Accuracy, %
Center 9					
Omental cake	100.0	85.7	100.0	75.0	90.0
Peritoneal carcinomatosis	100.0	77.8	100.0	33.3	80.0
Diaphragmatic carcinomatosis	100.0	85.7	100.0	75.0	90.0
Mesenteral retraction	90.0	85.7	100.0	66.7	88.8
Bowel infiltration	80.0	75.0	75.0	75.0	75.0
Stomach infiltration	100.0	100.0	100.0	100.0	100.0
Superficial liver metastasis	100.0	100.0	88.8	100.0	90.0
Center 10					
Omental cake	100.0	100.0	100.0	100.0	100.0
Peritoneal carcinomatosis	100.0	100.0	100.0	100.0	100.0
Diaphragmatic carcinomatosis	100.0	100.0	66.7	100.0	80.0
Mesenteral retraction	90.0	100.0	n.a.	n.a.	100.0
Bowel infiltration	100.0	100.0	88.8	100.0	90.0
Stomach infiltration	100.0	100.0	n.a.	n.a.	100.0
Superficial liver metastasis	100.0	100.0	88.8	100.0	90.0

n.a., not available; *NPV,* negative predictive value; *PPV,* positive predictive value; *SC*, satellite center.

Fagotti. Diagnostic accuracy of laparoscopy in advanced ovarian cancer. Am J Obstet Gynecol 2013.