

Intraoperative Complications During Gynecologic Laparoscopy: Does Previous Surgery Matter?

Pooja R Patel¹; Alpa M Nick²; Michael Frumovitz²; Anna Militello³; Kathleen M Schmeler²; Pamela T Soliman²; Ricardo dos Reis²; Pedro T Ramirez^{2,*}

¹Department of Obstetrics and Gynecology, University of Texas Medical Branch in Galveston, Galveston, USA

²Department of Gynecologic Oncology and Reproductive Medicine, University of Texas Anderson Cancer Center, Houston, USA

³Department of Gynecology, University of Verona, Verona, Italy

*Corresponding author: Pedro T Ramirez, Department of Gynecologic Oncology and Reproductive Medicine, University of Texas Anderson Cancer Center, Houston, Texas, USA. Tel: +1-7137455498. Fax: +1-7137927586. Email: E-mail: peramire@mdanderson.org.

Received: June 13, 2013; Accepted: April 12, 2014

Background: The benefits of laparoscopy over laparotomy include lower blood loss, decreased length of hospital stay, and decreased postoperative pain. It is unknown, however, whether patients with previous surgeries are good candidates for laparoscopic surgery.

Objectives: To determine whether the location and type (laparoscopic surgery vs. laparotomy) of previous abdominal surgery is associated with increased complication rates during subsequent laparoscopic gynecologic surgery.

Patients and Methods: A total of 903 consecutive patients who underwent gynecologic laparoscopy from January 2000 to January 2009 were recruited to the study. Intervention: Patients were stratified according to whether they had previous abdominal surgery or not. Patients who had undergone previous surgery were further stratified according to the location of surgery (lower abdominal surgery only, upper abdominal surgery only, or both lower and upper abdominal surgery), as well as type of surgery (laparoscopy or laparotomy). Incidence of complications during subsequent gynecologic laparoscopy was then compared between patient subgroups.

Results: Intraoperative complications occurred in 15 (4%) of the 337 patients with no previous surgery, 1 (2%) of the 53 patients with previous upper abdominal surgery, 16 (4%) of the 422 patients with previous lower abdominal surgery, and 4 (4%) of the 91 patients with previous upper and lower abdominal surgery. Rates of complications did not differ significantly among these groups. Among patients with previous laparotomy and also prior laparoscopy complication rates did not differ significantly by location of previous surgery. When patients were stratified according to location of previous surgery, rates of complications did not differ among the patients with a history of laparoscopy versus laparotomy.

Conclusions: Our findings suggest that previous abdominal surgery, regardless of location or surgical approach, should not be a contraindication to gynecologic laparoscopy.

Keywords: Laparoscopy; Surgery; Gynecologic

1. Background

It is well-known that laparoscopy has several advantages over laparotomy, including decreased length of hospital stay, lower blood loss and transfusion rate, faster return of bowel function, decreased requirements for pain medication, and faster return to daily activities (1-5). However, some physicians have been slow to adopt this approach in patients with prior abdominal surgery, due to a fear of intraoperative complications.

Only a few studies have focused on previous surgery and risk of intraoperative complications in subsequent laparoscopy. A recent study by Wang et al. (6) showed an increased incidence of intraoperative complications during laparoscopic hysterectomy in patients with previous cesarean delivery compared to patients without previous cesarean delivery, although the difference was not sta-

tistically significant (14.2% vs. 8.8%, $P = 0.076$). In another study, Kumakiri et al. (7) stratified a group of 357 patients undergoing gynecologic laparoscopy on the basis of type of previous abdominal surgery and found an increased incidence of complications in patients with previous abdominal myomectomy and excisional endometriosis surgery (7). When reviewing the literature, however, we noted a paucity of data on the relationship between the site of prior surgery and the incidence of intraoperative complications. Bouasker et al. (8) stratified 233 patients who underwent laparoscopic cholecystectomy after previous abdominal surgery according to the location of the previous surgery (upper abdomen vs. lower abdomen). The results indicated significant correlations between upper abdominal surgery and higher rate of adhesions,

Implication for health policy/practice/research/medical education:

The results of our study suggest that patients with previous abdominal surgery, specifically lower abdominal surgery, may not be at increased risk for intraoperative complications when undergoing subsequent gynecologic laparoscopy.

Copyright © 2014, Minimally Invasive Surgery Research Center and Mediterranean & Middle Eastern Endoscopic Surgery Association. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

increased risk of operative complications, prolonged operative time, and prolonged hospital stay (8). However, with respect to gynecologic laparoscopy, there are limited data examining the relationship between location of previous surgery and risk of intraoperative complications for gynecologic laparoscopy.

2. Objectives

The objective of our study was to determine whether previous abdominal surgery and details regarding previous abdominal surgery were associated with the incidence of complications during gynecologic laparoscopic surgery.

3. Patients and Methods

After Institutional Review Board approval was obtained, the medical records of patients who underwent gynecologic laparoscopy at The University of Texas MD Anderson Cancer Center (MDACC) from January 2000 to January 2009 were reviewed. Data collected and analyzed for this study included age, race/ethnicity, body mass index (BMI), and information about previous abdominal surgery, including surgical site and type of surgery (laparoscopy vs. laparotomy). Robotic surgeries were excluded from the study. Patients were first stratified according to whether they had previous abdominal surgery or not. Patients with previous surgery were further subdivided according to site of previous surgery, yielding the following categories:

- 1) No previous abdominal surgery.
- 2) Lower abdominal surgery, defined as previous abdominal surgery below the umbilicus.
- 3) Upper abdominal surgery, defined as previous abdominal surgery above the umbilicus.
- 4) Both, defined as previous surgeries both above and below umbilicus.

The rate of intraoperative complications was then compared among these groups. The upper abdominal surgery, lower abdominal surgery, and "both" categories were subdivided into laparoscopy versus laparotomy and rate of intraoperative complications was compared. These categories were then further subdivided according to the number of previous surgical procedures (1 versus multiple). Again, rate of intraoperative complications was compared. The laparoscopic procedures that the patients subsequently underwent at MDACC were categorized as:

- 1) Low complexity, which included diagnostic laparoscopy and second-look laparoscopy;
- 2) Medium complexity, which included bilateral salpingo-oophorectomy, unilateral salpingo-oophorectomy, unilateral or bilateral ovarian cystectomy, adhesiolysis, bilateral tubal ligation, and hysterectomy;
- 3) High complexity, which included radical hysterectomy, pelvic/para-aortic lymphadenectomy, splenectomy, or bowel resection. Intraoperative complications were defined as vascular injury, bladder/ureteral injury, bowel injury, hemorrhage from uterine artery, or other. The incidence of intraoperative complications for each patient

category was calculated using Fisher's exact test. Two sided p-values were calculated and a p-value of less than 0.05 was considered statistically significant. For the analysis of demographic characteristics, p-values were adjusted for multiple comparisons in analysis of variance (ANOVA). All data were analyzed using SPSS 12.0 software (SPSS, Inc., Chicago, IL).

4. Results

A total of 903 patients underwent gynecologic laparoscopy at MDACC during the study period. Of these, 337 (37%) had no previous abdominal surgery, 53 (6%) had previous upper abdominal surgery only, 422 (47%) had previous lower abdominal surgery only, and 91 (10%) had previous upper and lower abdominal surgery.

Age, BMI, and race for the patients in the various patient subgroups are summarized in Table 1. Both age and BMI varied significantly among the groups ($P < 0.001$; $P = 0.002$ respectively). Of the 903 patients in the study, 407 (45%) had subsequent gynecologic laparoscopy related to malignancy. Eighty-four patients (9%) underwent low-complexity surgery, 709 (79%) underwent medium-complexity surgery, and 110 (12%) underwent high-complexity surgery.

A total of 35 (4%) patients experienced complications during subsequent gynecologic laparoscopy. We first analyzed the incidence of intraoperative complications by location of previous surgery. Among the 337 patients with no prior surgery, 15 (4%) had intraoperative complications during laparoscopic surgery. Among the 53 patients who had a history of upper abdominal surgery, only 1 (2%) patient had an intraoperative complication at the time of laparoscopy. Of the 422 patients with a history of lower abdominal surgery, 16 (4%) patients had an intraoperative complication. Of the 91 patients with a history of both upper and lower abdominal surgery, 4 (4%) patients had an intraoperative complication. There were no significant differences in the incidence of intraoperative complications between these groups.

We next analyzed the incidence of intraoperative complications by location and type of surgery. Among the patients with previous laparoscopic surgery, complication rates were as follows: among the 32 patients with a history of upper laparoscopy, there were no intraoperative complications; among the 106 patients with a history of lower laparoscopy, 4 (4%) sustained intraoperative complications; and among the 7 patients with a history of both upper and lower laparoscopy, none sustained intraoperative complications.

Among the 21 patients with a history of upper laparotomy, 1 (5%) patient had an intraoperative complication during subsequent laparoscopic surgery. Among the 316 patients with a history of lower laparotomy, 12 (4%) patients had intraoperative complications. Among the 40 patients with a history of both upper and lower laparotomy, 3 (8%) had intraoperative complications. There were no significant differences in the incidence of intraoperative-

Table 1. Age, Body Mass Index, and Race/Ethnicity by Characteristics of Previous Abdominal Surgery Were There any Sig Differences Between Groups with Regards to Age or BMI?

	No Surgery (n = 337)	Previous Laparotomy			Previous Laparoscopic Surgery		
		Upper Abdomen only (n = 21)	Lower Abdomen only (n = 316)	Both Upper and Lower Abdomen (n = 40)	Upper Abdomen Only (n = 32)	Lower Abdomen Only (n = 106)	Both Upper and Lower Abdomen (n = 7)
Age, y	49	56	49	57	53	46	42
BMI, kg/m ²	27	35	27	31	34	27	35
Ethnicity, No. (%)							
Caucasian	252 (75)	16 (76)	238 (75)	33 (83)	22 (69)	72 (68)	4 (57)
African American	14 (4)	3 (14)	20 (6)	2 (5)	2 (6)	14 (13)	0 (0)
Asian	17 (5)	0 (0)	13 (4)	0 (0)	0 (0)	2 (2)	0 (0)
Hispanic	51 (15)	2 (10)	42 (13)	4 (10)	8 (25)	18 (17)	3 (43)
Other	2 (1)	0 (0)	3 (1)	57	0 (0)	0 (0)	0 (0)

Table 2. Incidence of Intraoperative Complications by Location of Previous Surgical Procedure

Comparison Groups by Location	Comparison Groups by Type of Previous Procedure(s)	P Value (Two-Sided)
Upper abdomen	No surgery	0.49
Lower abdomen	No surgery	0.59
Both upper and lower abdomen	No surgery	0.78
Upper abdomen	Lower abdomen	0.71

Table 3. Incidence of Intraoperative Complications by Location and Type of Previous Surgical Procedure

Comparison Groups by Location	Comparison Groups by Type of Previous Procedure(s)	P Value (Two-Sided)
Upper ^a , laparotomy	No surgery	1.00
Lower ^a , laparotomy	No surgery	0.57
Both, laparotomy	No surgery	0.48
Upper, laparoscopy	No surgery	0.38
Lower, laparoscopy	No surgery	0.59
Both, laparoscopy	No surgery	1.00
Upper, laparotomy	Lower, laparotomy	0.59
Upper, laparoscopy	Lower, laparoscopy	0.57
Upper, laparotomy	Upper, laparoscopy	0.41
Lower, laparotomy	Lower, laparoscopy	0.77
Both, laparotomy	Both, laparoscopy	1.00

^a Upper indicates upper abdomen; lower indicates lower abdomen; both indicates both upper and lower abdomen.

complications between these groups. Table 4 shows the distribution of types of intraoperative complications sustained among the patients in each category. Among the 15 patients with a history of no surgery who sustained intraoperative complications, 3 (20%) patients sustained a vascular injury with no surgery, 4 (27%) patients sustained a ureteral/bladder injury, 2 (13%) patients sustained a bowel injury during trocar placement, and 6 patients sustained an injury classified as "other". Among the 12 patients with a history of lower laparotomy, 2 (17%) patients sustained a

vascular injury (1 of which was during trocar placement), 4 (33%) patients sustained ureteral/bladder injury, 2 (17%) patients sustained a bowel injury, 1 (8%) patient sustained hemorrhage from uterine artery and 3 (25%) patients sustained an injury classified as "other". Among the 3 patients with a history of both upper and lower laparotomy, 1 patient sustained a vascular injury during trocar placement, 1 patient sustained a ureteral/bladder injury and 1 patient sustained a bowel injury during trocar placement. Among the 4 patients with a history of lower laparoscopy,

Table 4. Intraoperative Complications by Location and Type of Previous Surgery

	Vascular Injury	Ureteral/Bladder Injury	Bowel Injury	Hemorrhage From Uterine Artery	Other
No surgery (n = 337)^a	3	4	2 (2) ^b	0	6
Lower^b, laparotomy (n = 316)	2 (1)	4	2	1	3
Upper^b, laparotomy (n = 21)	0	0	0	0	1
Both, laparotomy (n = 40)	1 (1)	1	1 (1)	0	0
Lower, laparoscopy (n = 106)	2	1 (1)	0	0	1
Upper, laparoscopy (n = 32)	0	0	0	0	0
Both, laparoscopy (n = 7)	0	0	0	0	0

^a Numbers in parentheses signify injuries that occurred during trocar placement.

^b Upper indicates upper abdomen; lower indicates lower abdomen; both indicates both upper and lower abdomen.

2 patients sustained a vascular injury, 1 patient sustained a ureteral/bladder injury during trocar placement, and 1 patient sustained an injury classified as “other”.

With regard to the impact of number of previous surgical procedures (1 vs. >1) on the rate of intraoperative complications, there was only enough power to perform relevant statistical analysis on patients with previous lower abdominal surgery. Of the 269 patients who had only 1 prior lower abdominal procedure, 10 (4%) patients had intraoperative complications during subsequent laparoscopy. Of the 152 patients who had more than 1 previous lower abdominal procedure, 6 (4%) had intraoperative complications during subsequent laparoscopy. The difference in intraoperative complication rates between these groups was not significant ($P = 1.0$) (Tables 2 and 3).

5. Discussion

Our results suggest that when comparing patients with previous abdominal surgery and patients without previous abdominal surgery, there is no significant difference in the incidence of intraoperative complications during subsequent gynecologic laparoscopy. These findings provide evidence that patients with previous abdominal surgery, specifically lower abdominal surgery, may not be at increased risk for intraoperative complications when undergoing subsequent gynecologic laparoscopy. In addition, our finding of no difference in complication rates suggests that open lower abdominal surgery in particular may not be a contraindication to laparoscopy.

To the best of our knowledge, there are no publications on the location of previous abdominal surgery and its impact on subsequent gynecologic laparoscopy. The current literature does have a few studies that address previous surgery and intraoperative complications during subsequent laparoscopy (6-8). Wang et al. (6) showed an increase, albeit not statistically significant, in intraoperative complications in patients with previous cesarean deliveries. With regards to number of previous surgical procedures, Dubuisson et al. analyzed a group of 1000 patients with or without previous abdominal surgery who underwent subsequent laparoscopic procedures and

found that the rate of intestinal adhesions significantly increased with the number of prior abdominal surgical procedures; however, they did not comment on the association between adhesions and intraoperative complications during the laparoscopic procedure (9).

There are some limitations to our study. The first limitation is the study's retrospective nature. Second, given the long study period, there may have been a decrease in complications due to a learning curve. In addition, the large number of surgeons included in this study may have resulted in a wide variety of techniques and skill levels. A potentially significant selection bias may also have existed when patients were assessed preoperatively, in that patients with multiple previous surgeries may not have been offered laparoscopy. When analyzing the demographic data, we found a statistically significant difference among the groups with respect to age and BMI. With regards to age, the trend suggested that older patients had a history of laparotomy, which is expected as only laparotomy was offered prior to the advent of laparoscopy. The analysis with regards to BMI may be more difficult to interpret as BMI is a potentially changing variable. This may be a reason we were unable to find a trend with regards to BMI. Finally, with respect to number of prior surgical procedures, the study only had sufficient power to perform statistical analyses on patients with previous lower abdominal surgery. Nonetheless, these results challenge the widely held belief that increased number of previous surgical procedures is associated with greater risk of intraoperative complications in subsequent laparoscopic surgery.

In summary, we found no association between location of previous abdominal surgery and intraoperative complications during subsequent gynecologic laparoscopy. Our results suggest that previous abdominal surgery, regardless of location or surgical approach, should not be a contraindication to gynecologic laparoscopy.

Authors' Contribution

Study concept and design: Patel, Nick, Frumovitz, Mitello, Schmeler, Soliman, Dos Reis Analysis and inter-

pretation of data: Patel, Dos Reis, Ramirez Drafting of the manuscript: Patel. Critical revision of the manuscript for important intellectual content: Patel, Nick, Frumovitz, Militello, Schmeler, Soliman, Dos Reis, Patel. Statistical analysis: Patel, Dos Reis.

References

1. Kaplan M, Salman B, Yilmaz TU, Oguz M. A quality of life comparison of laparoscopic and open approaches in acute appendicitis: a randomised prospective study. *Acta Chir Belg.* 2009;**109**(3):356–63.
2. Kornblith AB, Huang HQ, Walker JL, Spirtos NM, Rotmensch J, Cella D. Quality of life of patients with endometrial cancer undergoing laparoscopic international federation of gynecology and obstetrics staging compared with laparotomy: a Gynecologic Oncology Group study. *J Clin Oncol.* 2009;**27**(32):5337–42.
3. Walker JL, Piedmonte MR, Spirtos NM, Eisenkop SM, Schlaerth JB, Mannel RS, et al. Laparoscopy compared with laparotomy for comprehensive surgical staging of uterine cancer: Gynecologic Oncology Group Study LAP2. *J Clin Oncol.* 2009;**27**(32):5331–6.
4. Peters MJ, Mukhtar A, Yunus RM, Khan S, Pappalardo J, Memon B, et al. Meta-analysis of randomized clinical trials comparing open and laparoscopic anti-reflux surgery. *Am J Gastroenterol.* 2009;**104**(6):1548–61.
5. Medeiros LR, Rosa DD, Bozzetti MC, Fachel JM, Furness S, Garry R, et al. Laparoscopy versus laparotomy for benign ovarian tumour. *Cochrane Database Syst Rev.* 2009(2):CD004751.
6. Wang L, Merkur H, Hardas G, Soo S, Lujic S. Laparoscopic hysterectomy in the presence of previous caesarean section: a review of one hundred forty-one cases in the Sydney West Advanced Pelvic Surgery Unit. *J Minim Invasive Gynecol.* 2010;**17**(2):186–91.
7. Kumakiri J, Kikuchi I, Kitade M, Kuroda K, Matsuoka S, Tokita S, et al. Incidence of complications during gynecologic laparoscopic surgery in patients after previous laparotomy. *J Minim Invasive Gynecol.* 2010;**17**(4):480–6.
8. Bouasker I, El Ouaer MA, Smaali I, Khalfallah M, Ben Achour J, Najah N, et al. [Laparoscopic cholecystectomy on a previously operated abdomen]. *Tunis Med.* 2010;**88**(2):88–91.
9. Dubuisson J, Botchorischvili R, Perrette S. Incidence of intraabdominal adhesions in a continuous series of 1000 laparoscopic procedures. *Am J Obstet Gynecol.* 2010;**203**(2):1110–3.