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Conversion to laparotomy in bening gynecologic laparoscopic surgery; Can surgical experience be protective?

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Abstract

Laparoscopy is a surgical technique that is frequently used in the treatment of benign cases, but the conversion to open surgery (CTOS) complication is higher than laparotomy. In some cases, a conversion from laparoscopic surgery to open surgery is necessary to prevent or treat difficulties. In this study, the effect of surgical expertise on CTOS was evaluated on patients who had undergone laparoscopic surgery for benign indications. A total of 305 patients were included during the study period. These patients were divided into two groups: CTOS group (7 patients) and successful laparoscopy group (298 patients). Benign gynecological laparoscopy operation was converted to open surgery in 7 of 305 patients (2.29%) included in this study. Open surgery significantly prolonged hospital stays in patients compared to laparoscopic surgery. While wound infection was observed in 3 patients who underwent open surgery, no infection was observed in laparoscopic surgery group. Obtained results demonstrated that age, body mass index, sufficient surgical expertise, history of previous abdominal surgery and endometriosis, obstetrical status, abdomino-pelvic adhesions, and frozen pelvis did not create risk factor for CTOS in the treatment of benign cases with laparoscopic surgery. It was concluded that the conversion to open surgery is connected with technical problems instead of complication management or surgical complexity.

Keywords: Gynecology, laparoscopy, surgery, conversion to open surgery, laparotomy

Introduction

Laparoscopic operations have become most performed gynecological procedures over the last decades, particularly in benign cases. In the literature, there is nearly a consensus that laparoscopy has numerous advantages over laparotomy including reduced blood loss, lower postoperative pain, shorter hospitalization, and faster recovery [1]. Moreover, the major complication rates of benign gynecologic laparoscopy are similar or lower with laparotomy [2]. However, laparoscopy has a specific complication that is not present in laparotomy such as the risk of conversion to open surgery (CTOS). The incidence of complications during the CTOS is higher in laparoscopy than direct laparotomy [3].

The rate of CTOS in benign case mainly depending on the level of laparoscopic operations; 0.3 % for level 1, 1.6% for level 2 and 6.3-15 % for level 3 [4-6]. Although numerous risk factors were defined such as, obesity, pelvic adhesions, technical difficulties etc., since laparoscopy requires long learning curve, insufficient surgical experience has been represented as the most determining risk factor [7]. However, there is lack of data on whether the high surgical expertise decreases the risk in the patients who has other risk factors of CTOS, or not. There is paucity of data analyzing conversion to laparoscopy across all levels of benign

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gynecologic laparoscopy, as well.

The objective of this study was to evaluate the effect of surgical expertise on CTOS by using database of experienced high-volume surgeon. Furthermore, the current report was aimed to determine significant preoperative and intraoperative risk factors to enhance risk stratification and provide proper patient selection for laparoscopic surgery, as well.

Material and Methods

Study design and study group

This is a multi-center and retrospective study performed at Izmir Private Can Hospital Izmir, Turkey and Atatürk Training and Research Hospital, Katip Çelebi University, Izmir, Turkey. The initial cohort assessed for eligibility comprised 321 women who had undergone laparoscopic surgery for benign indications by an experienced (20 years) and high-volume surgeon (Cenk Mustafa GÜVEN) from 2018 to 2022. By definition it was considered that only those surgeons who had performed 5-10 laparoscopic gynecological surgeries monthly, could be defined as a high-volume surgeon [8].

The gynecologic laparoscopic operations were classified into three groups according to their complexity. Diagnostic laparoscopy and tubal ligation were defined as "level 1 operation", ovarian cystectomy, oophorectomy, salphingoophorectomy, salphingectomy, salpingostomy, simple adhesiolysis, Grade 1-2 endometriosis operations, ligamentopexy for correction of retroverted uterus and LVAH were defined as "level 2 operation", and total laparoscopic hysterectomy, myomectomy, tubal anastomosis, Sacro colpopexy, retroperitoneal dissections and Grade 3-4 endometriosis operations were defined as "level 3 operations" [9].

After the first analysis of patients' data, 305 patients were included in this study. Women who had converted to open surgery because of malignant frozen section report were excluded from study (16 patients). The patients were divided two groups. The patients whose surgery was converted to laparotomy were defined as CTOS group (7 patients) and the patients who were operated laparoscopically defined as successful laparoscopy (SL) group (298 patients).

Ethical approval was obtained from the local ethics committee of Atatürk Training and Research Hospital, Katip Çelebi University, Izmir, Turkey (26.05.2022-IRB # 0249). All protocols were conducted under the principles of the Declaration of Helsinki.

Data collection

The following data were obtained and recorded from electronic medical records: demographic characteristics (age, body mass index, previous abdominal scar, and gravida-parity), intra- and postoperative complications, existence of adhesions, existence of frozen pelvis picture, length of hospitalization and reoperation rates and the reason for converting to open surgery stated in the operation report.

Surgical approach

All procedures were performed under general anesthesia while the patients were in the dorsal lithotomy position. A Foley catheter was placed for drainage and was kept in place until postoperative 6-24 hour according to type of operation. A single shot of first-generation cephalosporin 1 g (2 g of cephalosporin if patient weighed 80 kg or more) was administered prophylactically.

The patients without any abdominal scar and normal uterus were initially insufflated from the umbilicus with a Veress needle. After enlarging the umbilical incision, a 10-mm scope was placed in the abdomen followed by giving a 20o Trendelenburg position. The patients with single vertical abdominal incision or two or more Pfannenstiel incisions and big uterus were initially insufflated from palmer point with a Veress needle and then a 10-mm scope was placed from umbilicus. The patients with multiple vertical or mixed abdominal incisions were initially insufflated from palmer point with a Veress needle and then a 5-mm scope was placed from same area (Figure 1).

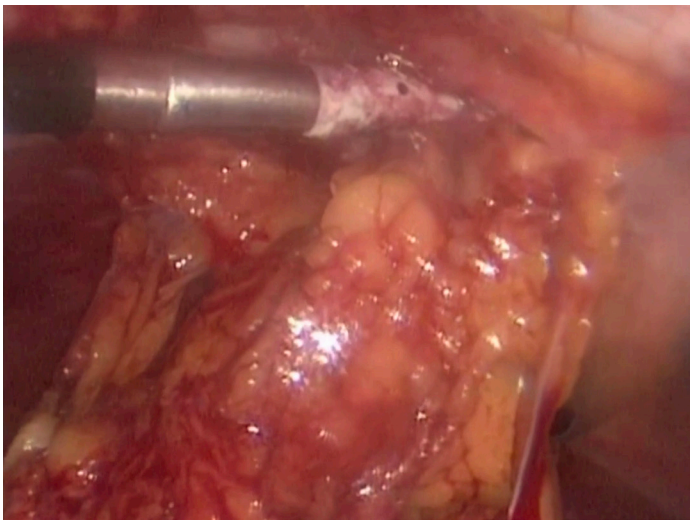

Figure 1. Periumbilical adhesiolysis. A view from palmer point with 5 mm optic

After abdominal inspection, if periumbilical area was free of adhesions a 10-mm scope was placed from umbilicus. In case of adhesions were detected, accessory trocars were placed under the vision 5-mm scope and peri umbilical adhesiolysis were underwent (Figure-1), followed 10-mm scope insertion from umbilicus. Following main trocar entry, 5-mm trocar sheaths were placed in both lower quadrants, approximately 3-4 cm medial to the crista iliaca anterior superior on both sides. Another 5-mm sheath was placed on the midclavicular line bilaterally, approximately 4 cm above the lower sheaths, in all cases [10].

Statistical Analysis

All analyses were subject to a significance detection threshold of $p<0.05$ and were performed on IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA). For the normality check, the Shapiro-Wilk test was used. Data are given

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as mean ± standard deviation or median (minimum - maximum) for continuous variables according to normality of distribution, and as frequency (percentage) for categorical variables. Between-groups analyses of continuous variables were performed with the independent samples t-test (parametric assumptions) or the Mann-Whitney U test (non-parametric). Categorical variables were analyzed with chi-square tests.

Results

A total of 305 patients (298 patients in the SL group and 7 patients in the CTOS group) were included in this study. Demographics and the baseline characteristics of the patients were similar in both groups (23 cases were classified as level 1, 73 cases were classified as level 2 and 202 cases were classified as level 3) (Table 1).

While the mean operation time was similar in both groups, the length of hospital stay was significantly longer in the CTOS group (Table 2). While adhesiolysis were performed in 94 cases, 19 cases were defined as to be frozen pelvis in the SL group (Figure 2). Adhesiolysis were performed in 3 patients and 1 case were defining as to be frozen pelvis picture in CTOS group.

Six (2.01 %) major intraoperative complications were encountered in the SL group (4 major vascular bleeding and 1 bladder perforation, 1 uncomplete ureteric tear). While vascular and bladder complications were managed laparoscopically, as it was so close to bladder the ureteric tear were treated via laparotomy. 1 patient were diagnosed as a uretero-vaginal fistula and 1 patient were diagnosed as uretero-vaginal fistula postoperatively in the SL group. There was no postoperative major complication rest of the operation in the CTOS group. 1 case were reoperated in early postoperative course for major intraabdominal bleeding managed with laparotomy in SL group (after level-2 operation).

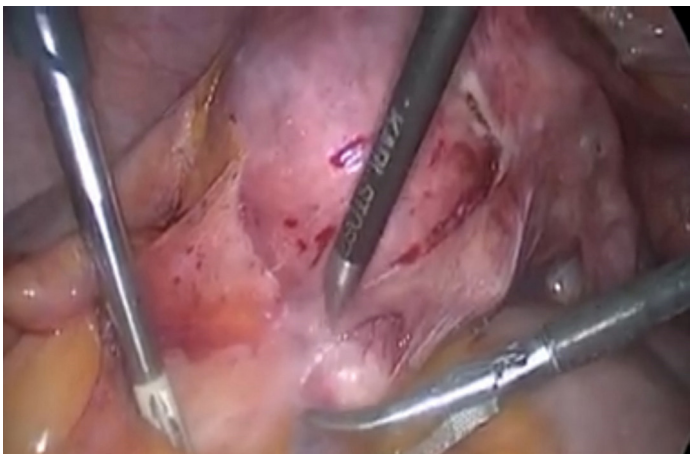

Figure 2. Image of frozen pelvis

There was no reoperation in CTOS group. While no surgical site infection was encountered in the SL group, 3 cased were diagnosed as surgical site infection requiring prolonged usage of antibiotics in the CTOS group. The length of hospital stay was significantly longer in the CTOS group (Table 2).

Totally 2.29% (7 patients in 305 total cases) of operations were converted to open surgery during benign gynecologic laparoscopy, as to be 0 case in level 1 laparoscopy, 2 cases in level 2 laparoscopy, and 5 cases in level 3 laparoscopy, respectively. The most common operation which had been converted to open

Table 1. Comparison of demographic and baseline characteristics of patients

	SL Group (n=296)	CTOS Group (n=7)	*p* value
	Mean±SD	**Mean±SD**	
Age	40.55±5.97	44.43±4.77	0.895
	Median [25%-75%]	**Median [25%-75%]**	
Body Mass Index (kg/m2)	20.7 [min:19.7–max:24.1]	21.55 [min:20.2-max:24.75]	0.765
Gravida	4 [min:0–max:6]	3 [min:0–max:7]	0.376
Parity	3 [min0–max:4]	2 [min:0–max:4]	0.789
	n (%)	**n (%)**	***p* value**
Diagnosis of Endometriosis			
Grade I-II	43 (14.53)	0	N/A
Grade III-IV	36 (12.16)	1 (14.28)	0.657
Laparoscopic Surgery Levels			
Level 1	23 (7.7)	0	N/A
Level 2	73 (24.4)	2 (28.5)	0.768
Level 3	202 (68.3)	5 (71.4.1)	0.545
Prior Abdominal Scar			
Only Pfannenstiel	67 (22.4)	2 (28.5)	0.125
Multiple Pfannenstiel	34 (11.4)	1 (10.4)	0.434
Only vertical	7 (2.3)	0	N/A
Mixed (transvers, vertical, Mc Burney)	25 (8.4)	1 (10.4)	0.657

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Table 2. The comparison of mean operation time, length of hospital stays, adhesiolysis, intra- and postoperative complications

	SL (n=298)	CTOS (n=7)	*p* value
	Mean±SD	Mean±SD	
Mean Operation Time	73.55±33.97	68.00±4.77	0.775
Length of Hospitalization (hours)	25.00±1.00	34.00±1.00	**0.001**
	n (%)	n (%)	
Adhesiolysis			
Yes	94 (31.54)	3 (42.86)	0.673
No	204 (68.46)	4 (57.14)	0.178
Frozen Pelvis Dissection	19 (6.38)	1 (14.28)	0.145
Major Intraoperative Complication	6 (2.01)	0	N/A
Reoperation	1 (0.34)	0	N/A
Postoperative Complication	2 (0.67)	0	N/A
Major Wound Infection	0	3 (42.86)	**0.001**

surgery was total laparoscopic hysterectomy (TLH) with 5 cases. No operation was converted to open surgery due to adhesions or frozen pelvis. Endometriosis and related conditions were not a reason for conversion to open surgery in any case. The causes of conversion were hypercapnia in 1 case, technical difficulty in 2 cases, inadequate uterine mobilization in 3 cases, and management of complication in 1 case, respectively.

Discussion

Since laparoscopy, particularly advanced laparoscopic procedures require long and challenging learning curve unlike laparotomy and-or robotic surgery, it has been questioning whether surgeons have sufficient surgical skills or not [11]. Besides it is unclear the meaning of "Sufficient Surgical Expertise" [12]. It would be logic to assume that obtaining sufficiency in the ability requires repetitive efforts. In benign gynecologic laparoscopic surgery, relation between surgical volume and outcomes is well established [13]. Although most of previous studies report low rate of CTOS with high surgical expertise [12], Richards reported that surgical expertise did not seem as a protective for CTOS [14]. But she mentioned, as well, an active credentialing system in their hospital which matching more complex case with more skilled high-volume surgeon. In our opinion surgical expertise is still a factor in this situation, although the study could not be differentiated it.

It has been clearly defined that operative and diagnostic gynecologic laparoscopy pose low rate of major complications [2,15]. CTOS is both a complication and is a risk factor for occurrence of intra- and postoperative complications [15]. In this study the rate of intraoperative major complications of all level laparoscopy was lower than previous reports [16,17], despite the large number of level-3 surgeries, if we excluded the rate of CTOS. It was founded that the CTOS mostly related with technical problems instead of complication management or surgical complexity, as well. Moreover, most of the time intraoperative complications were managed without requiring to conversion to laparotomy.

The rate of CTOS varies according to the type of laparoscopic surgeries; endometriosis (%2.7) [18], hysterectomy (6%-8%) [6,12] and ectopic pregnancy (12.2%) [19]. Moreover, the studies analyzed of all types of gynecologic laparoscopic surgeries reported different rates of CTOS [15,20]. Richards and co-workers reported a rate of 0.7% conversion to laparotomy in all types of bening gynecologic laparoscopy. In this study, the rate of conversion was 2.29%. In our opinion these differences mainly related with the type of surgeries. While our data came from mainly advanced gynecologic surgeries (level 3), the surgeries in her study were mostly consist of less likely to undergo conversion to laparotomy [14]. In another study, Sokol reported the rate of conversion to open surgery as to be 6.3% in all types of gynecologic laparoscopy, including malignant cases [20]. Because of malignancy increase the rate of CL dramatically, we excluded the malignant cases from this study.

While previous studies claimed that obesity is a non-dependent risk factor for conversion to open surgery for all types of gynecologic laparoscopy [6,21-23], in this study we did not find any correlation in this manner. In one case, obesity was related indirectly with CTOS, by causing limited lung capacity and leading hypercarbia during pneumoperitoneum. In our opinion, surgical expertise overcome obesity related problem such as difficult abdominal access, and distorted anatomy due to excessive fatty tissue. Although any of previous studies did not compare the rate of CTOS in gynecologic laparoscopy of different surgical expertise levels, specific surgical strategies and skilled operative techniques have been associated improved surgical outcomes in obese patients [23].

As obesity, the existence of previous abdominal scars was reported as a cause for high rates of conversion to open surgery [15,20,24]. Problems of abdominal cavity access have been well defined among patients with previous abdominal scar during laparoscopy [25]. Problematic Veress needle insertion may

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cause dramatic consequences including blood loss, vascular and/or intestinal injury and high rates of CTOS [26]. Therefore, various techniques such as left upper quadrant approach has been advised in the presence of previous abdominal scar to overcome the abdominal entry related complications [26,27]. Granata and co-workers reported that left upper quadrant approach was underused vast majority of gynecologists despite it offers safer entry in patients with previous abdominal scars, big abdominal mass, and umbilical hernia [28]. Although it was not clear why many gynecologists hesitate using left upper quadrant approach, in our opinion, it may be reflective of low surgical expertise. In this study we used left upper quadrant Veress needle entry for selected cases (from palmar point) and achieved pneumoperitoneum in all cases without any complication. Moreover, we used a 5-mm optic from palmer point, is the case of existence of severe periumbilical adhesions (Figure 1).

Intraabdominal particularly intrapelvic adhesions are among the most feared picture for gynecologist which may be met at first glance of abdominal cavity. Although some adhesions can form without any surgical, infectious or endometriosis history, laparotomy incisions, particularly midline vertical incisions were associated with high rate of formation intraabdominal adhesion [29]. Pelvic adhesions and frozen pelvis have been reported as important risk factors for CTOS [6,15,20,30]. They reported that not only difficult adhesiolysis but the increased rate of complications during adhesiolysis causes high rates of CTOS. In this study, although our rate of adhesiolysis during laparoscopy was higher than previous reports, none of the case was converted to laparotomy due to failed adhesiolysis or complication occurred during adhesiolysis. We agree with literature on the claim of laparoscopy is safer and more suitable for adhesiolysis than laparotomy [31]. However, laparoscopic adhesiolysis particularly during dissection of frozen pelvis requires high levels of surgical expertise. No complication was occurred due to adhesiolysis even during frozen pelvis dissection in our cases, as well.

In the literature, unexpected surgical (e.g., inadequate uterine mobilization) or technical difficulties were reported as common indication for CTOS [6,15,20]. In this study, surgical and/or technical difficulties were demonstrated as the most determined factor for CTOS. Inadequate uterine mobilization was commonest reason for conversion during our cases. Adequate uterine mobilization is mandatory for during TLH in regard of safety [32]. Uterine mobilization may be limited because of big uterus and lateral located myomas. In our opinion, insisting laparoscopic surgery in the case of limited uterine mobilization may cause high rates of complication. Therefore, while conversion to laparotomy due to limited uterine mobilization may be indicative of failed preoperative workup, it indicates high surgical expertise, preoperatively.

In this report, the conversion to laparotomy was associated with longer hospital stay and higher rate of wound infection. Previous studies reported worse surgical outcomes in CTOS than SL, including long postoperative stay [15,20]. Although we did not include only laparotomy control group, in this study the wound infection rate of CTOS was higher than only laparotomy when compared the literature [33]. This may be reflective of occurrence of infection safety breaches during conversion to open surgery.

Conclusion

In conclusion, this study mainly revealed that in case of sufficient surgical expertise, age, obesity, obstetrical status, history of previous abdominal surgery and endometriosis, existence abdomino-pelvic adhesions and frozen pelvis, and occurrence of complication, were not certain risk factors for conversion to open surgery during benign gynecologic laparoscopies. It was founded that the conversion to open surgery mostly related with technical problems instead of complication management or surgical complexity, as well. Besides, most of the time intraoperative complications were managed without requiring to conversion to laparotomy.

Conflict of interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that they have received no financial support for the study.

Ethical approval
Ethical approval was obtained from the local ethics committee of Atatürk Training and Research Hospital, Katip Çelebi University, Izmir, Turkey (26.05.2022-IRB # 0249). All protocols were conducted under the principles of the Declaration of Helsinki.

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