

# The Impact of the First Assistant's Experience on the Perioperative Outcome of Patients Undergoing Laparoscopic Hysterectomies for Benign Diseases: A Retrospective Analysis

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## Abstract

**Objective:** This study aims to assess the impact of the experience of an assistant surgeon on the perioperative outcome in laparoscopic gynecological surgeries for benign diseases.

**Materials and Methods:** This was a retrospective review of 572 laparoscopic hysterectomies performed between 2019 and 2024. Data were stratified into two groups based on the experience of the first assistant: Group 1, in which assistant surgeons were experienced (had already assisted in >15 surgeries), and Group 2, in which assistant surgeons were new (had assisted in <15 surgeries). Outcomes were compared between the groups. The primary outcome was the perioperative complication rate, and the secondary outcomes were operative time, estimated blood loss, length of hospital stays, rate of conversion to laparotomy, and rate of reoperation.

**Results:** Among the total cases included, 245 were assisted by an experienced assistant surgeon (Group 1) and 327 by a novice first assistant (Group 2). A statistically significant difference was noted for the baseline characteristics among the groups; diabetes mellitus was higher in Group 2, whereas previous cesarean section and intra-abdominal adhesions were higher in Group 1. Operative time, amount of blood loss, and conversion to laparotomy rate were significantly higher in Group 2. However, after adjusting for the age, body mass index, comorbid conditions, weight of the uterus, and intraoperative adhesions, using inverse probability of treatment weighting, only operating time remained significantly higher in Group 2 (121 min vs. 84 minutes,  $p$ -value <0.001).

**Conclusion:** The inclusion of a novice first assistant in laparoscopic hysterectomy did not adversely impact operative outcomes. (J GYNECOL SURG 41:164)

**Keywords:** first assistant, experience, laparoscopy, hysterectomy, perioperative outcome

## Introduction

Minimal access surgery for benign gynecological disorders has been widely adopted by surgeons and patients over the last few decades.<sup>1</sup> As the technology evolved, so did the surgical skills and complexity of the cases. At equipped centers, advanced surgeries like grade 4 endometriosis, complex adnexal lesions, and reconstructive surgeries are being performed through this route.

Although the complications decrease as surgeons' experience in laparoscopy grows, the growing difficulty of some procedures in gynecological surgery may increase the frequency of severe complications. The rapid increase in the number of procedures being performed, the introduction of new equipment, and variability in the training of surgeons and assistants all contribute to the complication rate.<sup>2,3</sup> According to published studies, the overall rate of laparoscopic complications ranges from 0.4% to 3% during the initial learning year.<sup>4</sup>

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Laparoscopy is teamwork, and the primary surgeon cannot perform the surgery alone and definitely requires good assistants. In our operation theatre setup, we perform surgery with the help of three assistant surgeons: one to hold the camera and one to hold the vaginal manipulator and to assist the surgery from the right side.<sup>2</sup> Laparoscopic gynecological surgery requires a considerable amount of surgical experience to overcome the learning curve due to the absence of tactile sense, visual-spatial discordance (confusion in correlating the 2D surgical field visible on the monitor and the actual 3D field in the abdominal cavity), and the use of various surgical instruments.<sup>5</sup>

In a teaching institute, residents are rotated every few months, and primary surgeons are left with new sets of assistants. However, it is important to mention that the experience of the first assistant is essential for trainees of total laparoscopic hysterectomy (TLH) so that they can acquire the skills of a primary surgeon and implement them for their own future performance of the procedure. Undoubtedly, patient safety is of paramount importance and should not be compromised. So, to find an equilibrium between a trainee's education and patient safety, an audit is essential to assess its effects on the occurrence of severe complications.

A few studies have investigated the learning curve for the assistant surgeon in laparoscopic colorectal surgery,<sup>6</sup> but none in gynecological surgeries. Recently, one study from Japan has reported the influence of assistant surgeons on organ injury in laparoscopic gynecological surgery.<sup>7</sup>

This study aims to assess the impact of the experience of an assistant surgeon on the perioperative outcome in laparoscopic gynecological surgeries for benign diseases.

## Materials and Methods

This was a retrospective cohort study done at single center at a teaching institute.

All women who underwent laparoscopic gynecological surgery for benign disease between January 1, 2019, and July 2024 were included in the study. As experienced surgeon was defined as a surgeon who had performed at least 75 TLH surgeries in the past.<sup>8</sup> Data pertaining to demographic data, indications of surgeries, comorbidities, surgical data, surgical techniques, operative time, blood loss during surgery, Intraoperative complications, and postoperative complications, and

length of hospital stay were recorded using MRD (medical records department) files of the patients. All the surgeries were performed by a single experienced laparoscopic surgeon. To assess the impact of the first assistant surgeon, patients were categorized in two groups: Group 1, in which assistant surgeon were experienced (had already assisted in >15 surgeries), and Group 2, in which assistant surgeons were new (had assisted in <15 surgeries)<sup>9</sup>

The primary outcome was the perioperative complication rate, including both intraoperative and postoperative complications, and the secondary outcomes were operative time, estimated blood loss, length of hospital stay, rate of conversion to laparotomy, and rate of reoperation.

Intraoperative complications included injury to major vessels, the bladder, the ureter or the bowel and conversion to laparotomy. Postoperative complications were categorized according to Clavien–Dindo Classification,<sup>10</sup> with grade >2 complications defined as major and < grade 2 complications defined as minor.

## Data Analysis

Normality of data was assessed using the Shapiro–Wilk test. Continuous data were represented as mean ( $\pm$ SD) or median (interquartile range). Categorical data were represented as frequency and percentage. The chi-square test or Fisher's exact test was used to compare categorical variables between the two groups, and the Mann–Whitney U test for continuous variables. A  $p$ -value <0.05 was considered statistically significant.

In order to assess whether the presence or absence of an experienced first assistant affected the perioperative complication rate or the operative time, we used propensity score-based inverse probability of treatment weighting (IPTW) to confirm any background differences between the two groups. First, we calculated PS for the Group 1 patients for baseline characteristics using binary logistic regression analysis, then we used the IPTW approach to balance the confounders in both the groups, giving a weight of 1/PS to Group 1 and 1/1-PS to Group 2. A standardized mean difference of <0.1 was considered as balanced.

## Results

The study included 572 laparoscopic hysterectomies performed between 2019 and 2024. All the cases were operated

TABLE 1. BASELINE CHARACTERISTICS OF PATIENTS BEFORE AND AFTER INVERSE PROBABILITY WEIGHTING

Variables	Before inverse probability weighting				After inverse probability weighting		
	Group 1 (n = 245) (Median range; percentage)	Group 2 (n = 327) (Median range)	p-value	SMD	Group 1 (n = 245) (Median range; percentage)	Group 2 (n = 327) (Median range; percentage)	SMD
Age (years)	42 (38–49)	41 (38–49)	0.73	0.043	41.2 (38.6–51)	40 (39–52.1)	0.07
BMI (Kg/m <sup>2</sup> )	23.4 (20.6–28.9)	23.1 (20–29)	0.56	0.02	23.4 (20.6–29)	23.4 (19.8–29)	<0.001
Hypertension	34 (13.8%)	38 (11.6%)	0.81	0.03	35 (13%)	37 (11.3%)	0.03
Diabetes mellitus	15 (6.1%)	27 (8.2%)	0.04	0.23	17 (7.2%)	23 (7%)	0.002
Cardiac disease	9 (3.6%)	7 (2.1%)	0.34	0.53	8 (3.2%)	7 (2.1%)	0.03
Previous cesarean section	104 (42.4%)	98 (30.7%)	0.03	0.21	84 (34.2%)	114 (35%)	0.004
Intraoperative adhesions	127 (51.8%)	131 (40%)	0.001	0.185	113 (46.1%)	147 (45%)	0.004
Specimen weight (grams)	258 (146–432)	236 (146–425)	0.82	0.06	256 (149–446)	236 (146–434)	0.018

BMI, body mass index; SMD, standardized mean difference.

TABLE 2. COMPARISON OF PERIOPERATIVE OUTCOMES AMONG THE TWO GROUPS

Parameters	Group 1 (n = 245) (Median, range/percentage)	Group 2 (n = 327) (Median, range/percentage)	p-value
Operative time (minutes)	94 (54–144)	116 (76–216)	0.001
Blood loss (milliliter)	146 (38–346)	183 (46–458)	0.05
Organ injury	2 (0.8%)	3 (0.9%)	0.48
Rate of conversion to laparotomy	4 (1.6%)	8 (2.4%)	0.01
Postoperative blood transfusion	12 (4.8%)	18 (5.5%)	0.19
Post-operative complication (>grade 2 Clavein–Dindo classification)	10 (4%)	18 (5.5%)	0.06
Length of hospital stay (Days)	4 (3–7)	4 (4–8)	0.84
Rate of Re-operation	0	1 (0.3%)	

one a single laparoscopic surgeon. Among the total cases included, 245 were assisted by an experienced assistant surgeon (Group 1) and 327 by a novice first assistant (Group 2). Table 1 describes the baseline characteristics of the cases included in the study. Statistically significant differences were noted for few baseline characteristics; the number of diabetic cases was higher in group 2 (6.1% vs. 8.25%,  $p$ -value 0.04), and patients with previous cesarean section and intra-abdominal adhesions were higher in Group 1 (42.4% vs. 30.7% at  $p$ -value 0.03; 51.8% vs. 40% at  $p$ -value 0.001, respectively).

Table 2 describes the perioperative outcomes of the included cases. Operative time was significantly higher in Group 2 with 94 minutes vs. 116 minutes at a  $p$ -value of 0.001. Amount of blood loss and conversion to laparotomy were also significantly higher in group 2 (146 mL vs. 183 mL and 1.6% vs. 2.4%, respectively). The postoperative complication rate was higher in Group 2 compared with Group 1, but that did not reach statistical significance. Rates of visceral injury were similar in both groups. Total 5 visceral injuries occurred among a total of 572 cases, 3 in Group 2 and 2 in Group 1. Among them, all were detected intraoperatively except the small bowel injury, which was diagnosed on the third postoperative day. (Table 3).

After adjusting for age, body mass index, comorbid conditions, weight of the uterus, and intraoperative adhesions using inverse probability of treatment weighting, only operating time remained significantly higher in Group 2. (Table 4).

## Discussion

Laparoscopic surgeries are technically demanding procedures and require coordination and support from the assistants, unlike the open surgeries. The reported learning curve is around 75–100 cases for laparoscopic hysterectomies.<sup>8</sup> However, laparoscopy is teamwork, and the outcome depends on the seamless coordination of the entire surgical team. The

first assistant plays a crucial role by maintaining a clear operative field, providing adequate traction, and ensuring a smooth procedure. A skilled first assistant must overcome mirror imaging—a visual illusion that leads to paradoxical movements—when grasping tissue and providing adequate counter-traction.<sup>11</sup> Therefore, the experience of the first assistant surgeon is pivotal for achieving better perioperative outcomes.

A primary surgeon may feel tense while operating with a novice first assistant. So, we evaluated the impact of the experience of the first assistant on perioperative outcome. We found that though the operative time increased with the involvement of a novice first assistant, it did not lead to an enhanced major intraoperative or postoperative complication rate.

Barber et al. evaluated the impact of trainee involvement in benign hysterectomy on perioperative outcome involving 22,499 cases. They reported that trainee involvement was not associated with major complications in laparoscopic hysterectomy (3.0% vs. 2.9%,  $p$ -value .78).<sup>12</sup> Yuce et al., while comparing the complication and readmission rate for the laparoscopic bariatric surgeries stratified according to the level of the first assistant's experience, concluded that though the operative time was longer, there was no difference in the complication or readmission rate.<sup>13</sup> Igwe et al did a retrospective review of a national surgical database of laparoscopic hysterectomy, stratifying data according to involvement of residents in the perioperative outcome. They reported that in total laparoscopic hysterectomy for benign conditions, resident involvement had led to longer surgical times and minor differences in postoperative blood transfusion rate. However, overall complications, severe complications, and 30-day mortality rates remained similar.<sup>14</sup> In the present study too, intraoperative blood loss was higher with the involvement of a novice assistant, but that did not reach statistical significance. Rather than viewing increased operative time as a standalone marker of surgical quality, we

TABLE 3. DESCRIBES THE CHARACTERISTICS OF VISCERAL INJURIES

Case	Type of injury	Type of first assistant	Time of diagnosis	Management
1	Ureteral	Experienced	During surgery	Ureteric reimplantation
2	Small bowel	Non-experienced	3 <sup>rd</sup> day of surgery	Ileostomy and secondary repair
3	Ureteric injury	Non-experienced	During surgery	Ureteric reimplantation
4	Rectal injury	Experienced	During surgery	Primary repair
5	Bladder injury	Non-experienced	During surgery	Intraoperative bladder repair

TABLE 4. INVERSE PROBABILITY OF TREATMENT WEIGHTING (IPTW) ANALYSIS FOR PERIOPERATIVE OUTCOME

<i>Blood loss (mL)</i>	<i>Group 1</i>	<i>Group 2</i>	<i>IPTW estimator</i>	<i>p-value</i>
	<i>(Median or percentage)</i>	<i>(Median or percentage)</i>		
Non-adjusted	146	183	NA	0.05
Adjusted	153	169	0.43	0.46
Rate of conversion to laparotomy				
Non-adjusted	1.6%	2.4%	NA	0.01
Adjusted	1.7%	2.0%	0.21	0.38
Operative time (minutes; median)				
Non-adjusted	94 (54–144)	116 (76–216)	NA	0.001
Adjusted	84 (56–152)	121 (78–216)	0.03	<0.001

believe that gentle tissue handling, meticulous execution of each surgical step, and achieving adequate hemostasis are more crucial. Chen et al. also proposed that operative time inadequately serves as a surrogate for the quality of laparoscopic colorectal surgery. Consequently, shorter operative times do not necessarily indicate technical excellence.<sup>15</sup>

In the present study, we observed a slightly increased amount of blood loss and conversion to laparotomy in Group 2, but after adjusting for the confounders, the difference became insignificant. So, the findings of this study align with the other studies that have demonstrated the safety of involving novice first assistants in laparoscopic hysterectomy.<sup>13,14,16</sup> Other studies in the field of general or gastrointestinal surgery that have evaluated the perioperative outcome with trainee or resident's involvement have reported similar findings.<sup>17–19</sup>

Cai et al. explored potential reasons why having an inexperienced assistant during surgery doesn't significantly impact complication rates.<sup>17</sup> The lack of experience in the first assistant surgeon might be compensated by the overall competence of the surgical team, intentional clear verbal instructions to the first assistant for better support and involvement, and additional assistants to distribute tasks more evenly.

Reducing operative time for patients undergoing laparoscopic hysterectomy with a novice first assistant could potentially lead to lower perioperative complication rates. Prior simulation training has been demonstrated to enhance efficiency when trainees transition to the operating room.<sup>20</sup> Alternatively, they should be allowed to act as a first assistant till defined surgical steps, and then the experienced assistant would take over, This would increase their skill and confidence level as well as limit the potential for increased operative time and resulting perioperative complications.

Strengths of the study are that all the included cases were performed by a single surgeon and hence reduce the impact of the surgeon's skill on the outcome, large number of cases have been included, and data are from a teaching institute where residents are rotated every few months, hence giving a true reflection of trained and novice first assistant. The limitations of the study are the retrospective nature of the analysis and hence prone to unmeasured factors bias. In addition, we did not include the complications beyond 30 days of operation that might have underestimated the complication rate.

## Conclusion

Our findings have suggested that involvement of a novice first assistant surgeon did not lead to an increase in major

intra- or postoperative complications. So, given the experience level of the first assistant and the complexity of surgical cases, encouraging the participation of inexperienced first assistants in total laparoscopic hysterectomy is essential for training and exposure.

## Acknowledgment

The authors acknowledge the explicit work of our laparoscopy team members.

## Authors' Contributions

S.J.: Conceptualization, clinical work, writing and reviewing the article; V.C.J.: Data analysis and reviewing article; Shardha J.: Data collection and analysis; J.B.: Data collection. AI generative tool has not been used for conducting the study or writing the report.

## Ethical Approval and Consent to Participate

Study had been approved by institute ethical committee, AIIMS Patna, (AIIMS/Pat/IEC/2025/42), Written consent had been obtained from the study participants.

## Consent for Publication

Written consent for publication have been obtained from the participants.

## Availability of Data and Material

The anonymized data collected for this study will be available on reasonable request to the authors.

## Author Disclosure Statement

No competing financial interests exist.

## Funding Information

No funding was received for this article.

## References

- Hoffman CP, Kennedy J, Borschel L, et al. Laparoscopic hysterectomy: The Kaiser Permanente San Diego experience. *J Minim Invasive Gynecol* 2005;12(1):16–24.

2. Kaya AC, Radosa MP, Zimmermann JSM, et al. Intraoperative and postoperative complications of gynecological laparoscopic interventions: Incidence and risk factors. *Arch Gynecol Obstet* 2021;304(5):1259–1269; doi: 10.1007/s00404-021-061927
3. Meyer R, Siedhoff M, Truong M, et al. Risk factors for major complications following minimally invasive surgeries for endometriosis in the United States. *J Minim Invasive Gynecol* 2023;30(10):820–826; doi: 10.1016/j.jmig.2023.06.002
4. Fuentes MN, Rodríguez-Oliver A, Naveiro Rilo JC, et al. Complications of laparoscopic gynecologic surgery. *JLSLS* 2014;18(3):e2014; doi: 10.4293/JLSLS.2014.0005800058.
5. Lee S. The impact of assistants' reverse alignment surgical skill proficiency on laparoscopic colorectal surgery. *Ann Coloproctol* 2022;38(6):432–441; doi: 10.3393/ac.2021.00689.0098
6. Hwang MR, Seo GJ, Yoo SB, et al. Learning curve of assistants in laparoscopic colorectal surgery: Overcoming mirror imaging. *Surg Endosc* 2010;24(10):2575–2580.
7. Tsuzuki Y, Hirata T, Tsuzuki S, et al. Does the experience of the first assistant affect organ injuries in laparoscopic hysterectomy for benign diseases? *Arch Gynecol Obstet* 2023;307(2):453–458; doi: 10.1007/s00404-022-06745-4
8. Terzi H, Biler A, Demirtas O, et al. Total laparoscopic hysterectomy: Analysis of the surgical learning curve in benign conditions. *Int J Surg* 2016;35:51–57; doi: 10.1016/j.ijso.2016.09.010
9. Rosen DB, Cario G, Carlton M, et al. An assessment of the learning curve for laparoscopic and total laparoscopic hysterectomy. *Gynaecol Endoscopy* 1998;7(6):289–293; doi: 10.1046/j.1365-2508.1998.00212
10. Clavien PA, Barkun J, de Oliveira ML, et al. The Clavien-Dindo classification of surgical complications: Five-year experience. *Ann Surg* 2009;250(2):187–196; doi: 10.1097/SLA.0b013e3181b13ca2
11. Johnston WK, Low RK, Das S, et al. Image converter eliminates mirror imaging during laparoscopy. *J Endourol* 2003;17(5):327–331.
12. Barber EL, Harris B, Gehrig PA. Trainee participation and perioperative complications in benign hysterectomy: The effect of route of surgery. *Am J Obstet Gynecol* 2016;215(2):215.e1–215.e2157; doi: 10.1016/j.ajog.2016.02.022
13. Yuce TK, Holmstrom A, Soper NJ, et al. Complications and readmissions associated with first assistant training level following elective bariatric surgery. *J Gastrointest Surg* 2021;25(8):1948–1954; doi: 10.1007/s11605-020-04787-0
14. Igwe E, Hernandez E, Rose S, et al. Resident participation in laparoscopic hysterectomy: Impact of trainee involvement on operative times and surgical outcomes. *Am J Obstet Gynecol* 2014;211(5):484.e1–484.e4847; doi: 10.1016/j.ajog.2014.06.024
15. Chen W, Sailhamer E, Berger DL, et al. Operative time is a poor surrogate for the learning curve in laparoscopic colorectal surgery. *Surg Endosc* 2007;21(2):238–243.
16. Kiran RP, Ahmed Ali U, Coffey JC, et al. Impact of resident participation in surgical operations on postoperative outcomes: National Surgical Quality Improvement Program. *Ann Surg* 2012;256(3):469–475.
17. Cai M, Syn NLX, Koh YX, et al. Impact of first assistant surgeon experience on the perioperative outcomes of laparoscopic hepatectomies. *J Laparoendosc Adv Surg Tech A* 2020;30(4):423–428; doi: 10.1089/lap.2019.0701
18. Sorokin I, Nelson J, Canvasser NE. Re: Robot-assisted laparoscopic radical prostatectomy: Assistant's seniority has no influence on perioperative course. *J Robot Surg* 2018;12(3):389–390; doi: 10.1007/s11701-018-0836-z
19. Li D, Du C, Wang W, et al. First assistant experience in total laparoscopic pancreaticoduodenectomy: Accelerating the learning curve for an operator. *BMC Surg* 2023;23(1):92; doi: 10.1186/s12893-023-01987-8
20. Gurusamy KS, Aggarwal R, Palanivelu L, et al. Virtual reality training for surgical trainees in laparoscopic surgery. *Cochrane Database Syst Rev* 2009(1):CD006575.

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