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Impact of Trainees Involvement on Surgical Outcomes of Abdominal and Laparoscopic Myomectomy in Tertiary Care Hospital

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ABSTRACT

Myomectomy was one of the most frequently performed gynecologic procedures. It was a core competency of training in the field of Obstetrics and Gynecology internationally and was increasingly performed. **Objective:** To find the impact of trainee's involvement on surgical outcomes of abdominal and laparoscopic myomectomy in tertiary care hospital. **Methods:** This retrospective study was conducted at Iqra National University Department of Allied Health Sciences Peshawar from May 2022 to January 2023. Data were collected from 245 patients who had undergone abdominal and laparoscopic myomectomy in tertiary care hospital. Data were collected by using questionnaire which include all the information related to demographic, socioeconomic status of patients, trainee's information, operative details, preoperative measures, postoperative measures, length of hospital stay, blood loss during surgery. **Results:** Data were collected from 245 patients from hospital records. Mean age in group A was 42.01 ± 8.23 years and group B 41.76 ± 9.09 years. Mean uterine size in trainee involved group was 10.2 ± 2.1cm and in group B was 10.5 ± 2.3 cm. In simple abdominal myomectomy, procedures performed with trainees took longer compared to those without trainees, with a mean operative time of 110 ± 20 minutes versus 90 ± 15 minutes, respectively ($p < 0.05$). **Conclusions:** It was concluded that trainee involvement in abdominal and myomectomies surgeries create a significant but negative impact on surgical outcomes due to increased operative time and complications.

INTRODUCTION

Myomectomy is one of the most frequently performed gynecologic procedures. It is a core competency of training in the field of Obstetrics and Gynecology internationally and is increasingly performed in a minimally invasive fashion. However, myomectomies are complex surgical procedures, with the risk of blood transfusion as high as 10%. It is therefore prudent that we understand the impact of trainee's involvement on outcomes of myomectomy to balance education with patient safety [1]. To our knowledge, whether trainee's involvement is associated with surgical outcomes of myomectomy is unknown. Furthermore, no studies have evaluated the impact of an abdominal versus (vs) laparoscopic approach to myomectomy. Surgical trainees play a pivotal role in the delivery of surgical care, contributing to patient outcomes through their participation in various procedures [2]. Abdominal and laparoscopic myomectomy, commonly performed to treat symptomatic uterine fibroids, represent intricate surgical interventions that require skillful execution and precise technique [3]. The impact of trainee involvement in these procedures on surgical outcomes, including safety, efficacy, and patient recovery,

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has garnered significant interest in the medical community. Treatment systems for uterine leiomyoma can incorporate medical choices, (for example, oral contraceptives, progesterone, gonadotropin-delivering chemical agonist (GnRHa), particular progesterone receptor modulators, or the blend of relugolix-estradiol-norethisterone), careful mediations (like hysterectomy, laparoscopic myomectomy, and hysteroscopic myomectomy), and non-careful choices (uterine artery embolization) [4]. Uterine artery embolization is a helpful strategy to save the uterus if a patient encounters significant dying [5]. Notwithstanding potential confusions associated with uterine artery embolization, the primary concern is harm to the ovarian vascular stockpile [6]. The myomectomy can protect richness and keep up with the physical trustworthiness of the pelvic floor. Patients are progressively choosing laparoscopic myomectomy on account of the fast headway of negligibly intrusive methods. Nonetheless, utilizing a fibroid morcellator and different issues limit the utilization of this methodology [7]. The laparoscopic electric fibroid morcellator has been generally utilized in laparoscopic myomectomy since the U.S. Food and Medication Organization (FDA) endorsed its clinical use in 1995. It might likewise prompt the scattering of sores, for example, parasitic leiomyomata, iatrogenic endometriosis, and disease movement [8]. Freeman AH *et al.*, reflectively reviewed the data of 4478 patients going through laparoscopic myomectomy, and the incidence of uterine sarcomas was 0.54%. Uterine sarcoma incidence in individuals matured 50 to 60 years was pretty much as high as 10/375 (2.6%), and utilizing a fibroid morcellator expanded the gamble of harmful growths spreading to the abdominopelvic cavity [9]. Consequently, the FDA expressed the use of fibroid morcellator and alerts in 2014, restricting the use of laparoscopic myomectomy. Tertiary care hospitals serve as vital centers for surgical training, providing trainees with opportunities to develop their surgical skills under the guidance of experienced mentors [10]. The involvement of trainees in abdominal and laparoscopic myomectomy procedures offers valuable hands-on experience, facilitating skill acquisition and professional development [11]. However, the extent to which trainee participation influences surgical outcomes, such as operative time, intraoperative complications, blood loss, length of hospital stay, and postoperative morbidity, remains a subject of investigation and debate [12].

The main objective of the study is to find the impact of trainee's involvement on surgical outcomes of abdominal and laparoscopic myomectomy in tertiary care hospital.

METHODS

This quasi-experimental study was conducted at Iqra National University Department of Allied Health Sciences Peshawar from May 2022 to January 2023. Data were collected from 245 patients after calculating sample size using the Open Epi calculator. The calculation included a 95% confidence level, 80% study power, an anticipated effect size of 0.3, and the prevalence of outcomes based on pilot data (0.2). Adjustments were made to account for the quasi-experimental design and division into two groups. Data collection was conducted after obtaining informed consent from the patients. Patients who had undergone surgery in hospital and willing to participate in the study were included. Those who were not willing to provide data were excluded from the study. Data were divided into two groups: Group A: cases where trainee participated in the surgery procedure, Group B: cases where no trainee present and surgery were done by attending surgeon. Data were collected by using designed questionnaire which include all the information related to demographic, socioeconomic status of patients, trainees information, operative details, preoperative measures, postoperative measures, length of hospital stay, blood loss during surgery. The reliability of questionnaire was tested by using SPSS version 29.0. Cronbach alpha for questions was between 0.70 to 0.85. The validity of the data was checked by expert from surgery departments from Iqra National University, department of Allied health sciences. The primary outcome measures were operative time and transfusion rate. Secondary outcomes were length of hospital stay, major and minor complications after surgery. Trainee involvement and intraoperative participation were also recorded. Data were then entered into SPSS. We conducted bivariate analysis to compare the two groups using Chi-square tests for categorical variables and independent t-tests for continuous variables. For mean differences between the two groups, independent t-tests were applied. Percentage differences between the groups were analyzed using Chi-square tests. P value <0.05 were considered as significant. Ethical approval was received by the Ethical Review Committee (ERC) Iqra National University, Peshawar under Ref No: INU/AHS/286-22.

RESULTS

Among the 120 cases involving trainees, 67% (n=80) had trainees assisting in the surgery, 17% (n=20) had trainees leading the surgery, and 17% (n=20) were observing only. This distribution indicates that the majority of trainee involvement was in supportive roles, with a smaller proportion taking on leadership or observational roles. The data reflects a significant focus on hands-on training through assistance, while leadership and observation offer

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opportunities for different levels of engagement in surgical procedures(Figure 1).

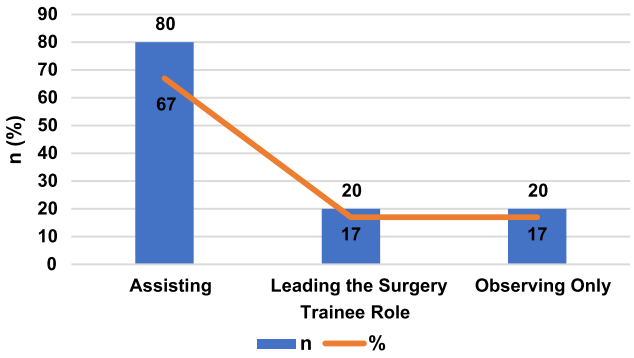

Figure 1: Distribution of Trainee Roles in Surgeries

Data were collected from 245 patients from hospital records. Table 1 showed that the mean age in group A was 42.01 ± 8.23 years and group B 41.76 ± 9.09 years. Mean uterine size in trainee involved group was 10.2 ± 2.1cm and in group B was 10.5 ± 2.3 cm. BMI was slightly lower in the Trainee-Involved Group (25.5 ± 3.2 kg/m^2 vs. 26.0 ± 3.5 kg/m^2). Hypertension (60% vs. 50%), diabetes mellitus (30% vs. 34%), and other comorbidities (10% vs. 16%) were somewhat more prevalent in the Trainee-Involved Group. The uterine size was slightly smaller in the Trainee-Involved Group (10.2 ± 2.1 cm vs. 10.5 ± 2.3 cm), with a higher median number of fibroids (4 (3-6) vs. 3 (2-5)). Myoma locations showed minor differences, with 40% fundus, 35% body, and 25% cervix in the Trainee-Involved Group compared to 45% fundus, 30% body, and 25% cervix in the Attending Surgeon-Only Group. Preoperative anemia was present in 20% of the Trainee-Involved Group and 18% of the Attending Surgeon-Only Group(Table 1).

Table 1: Demographic Data of Patients(n=245)

Variables	Trainee-Involved Group (Mean ± SD) / N (%)	Attending Surgeon Only Group (Mean ± SD) / N (%)	p-Value
Age (Years)	42.01 ± 8.23	41.76 ± 9.09	0.25
Socioeconomic Status*			
Low	48 (40%)	44 (35%)	0.12
Medium	54 (45%)	63 (50%)	0.25
High	18 (15%)	19 (15%)	0.55
BMI (Kg/m^2)	25.5 ± 3.2	26.0 ± 3.5	0.005
Comorbidities			
Hypertension	72 (60%)	63 (50%)	0.12
DM	36 (30%)	43 (34%)	0.35
Others	12 (10%)	20 (16%)	0.35
Uterine Size (cm)	10.2 ± 2.1	10.5 ± 2.3	0.3
Myoma Location			
Fundus	48 (40%)	56 (45%)	0.45
Body	42 (35%)	38 (30%)	0.65
Cervix	30 (25%)	31 (25%)	0.55
Preoperative Anemia	Yes: 24 (20%)	Yes: 22 (18%)	0.002
	No: 96 (80%)	No: 103 (82%)	
Fibroid Number	Median (IQR)	4 (3-6)	1.15 (1.05-1.30)
Previous Abdominal Surgery	36 (30%)	31 (25%)	0.4
Type of Surgery			
Abdominal	84 (70%)	100 (80%)	-
Laparoscopic	36 (30%)	25 (20%)	-
Use of Morcellation			
Yes	54 (45%)	50 (40%)	-
No	66 (55%)	75 (60%)	-
Uterine Weight (g)	300.09 ± 50.12	280.98 ± 60.01	0.05
Blood Transfusion Rate	18 (15%)	13 (10%)	0.25

* Low SES: This typically refers to individuals or groups with lower income, less education, and jobs that may be less secure or lower in status; Middle SES: This group includes individuals or groups with moderate income, higher education levels, and more stable or prestigious jobs compared to the low SES group; High SES: This category includes individuals or groups with higher income, advanced education, and high-status or highly secure jobs.

Mean operative time in trainee involved group was higher (150 ± 30 min) as compared to other group (130 ± 25 min). Mean blood loss in group A was 300 ml and in group B was 250 ml, p value was <0.05 which was non-significant. Length of hospital stay were also increased 3(IQR: 2-5)days in trainee involved group(Table 2).

Table 2: Comparative Analysis of Operative Parameters

Variables	Trainee-Involved (Mean ± SD)	Attending Surgeon Only (Mean ± SD)	p-Value
Operative Time (minutes)	150 ± 30	130 ± 25	0.001
Blood Loss (mL)	300 (IQR: 200-400)	250 (IQR: 150-350)	0.001
Length of Hospital Stay (Days)	3 (IQR: 2-5)	2 (IQR: 1-3)	0.002

This study compares the mean operative time between surgeries involving trainees and those performed solely by attending surgeons, assessing the impact of trainee involvement on procedural efficiency(Figure 2).

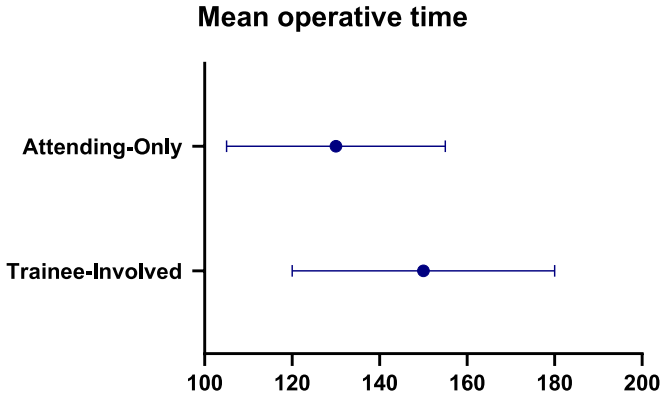

Figure 2: The Comparison of Mean Operative Time in Trainee-Involved Group and Attending Surgeon-Only Group

In simple abdominal myomectomy, procedures performed with trainees took longer compared to those without trainees, with a mean operative time of 110 ± 20 minutes versus 90 ± 15 minutes, respectively (p < 0.05). Similarly,

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complex abdominal myomectomies and laparoscopic procedures also exhibited prolonged operative times when trainees were involved, with mean times of 180 ± 30 minutes and 150 ± 25 minutes, respectively, compared to procedures without trainees ($p < 0.01$ and $p < 0.05$, respectively)(Table 3).

Table 3: Operative Time According to type of Myomectomy and Trainee Involvement

Types of Myomectomy	Involvement	Mean Operative Time (Minutes) (Mean ± SD)	p-Value
Simple Abdominal	Trainee-Involved	110 ± 20	0.002
	Attending Surgeon-Only	90 ± 15	
Complex Abdominal	Trainee-Involved	180 ± 301	0.01
	Attending Surgeon-Only	50 ± 25	
Laparoscopic	Trainee-Involved	150 ± 25	0.011
	Attending Surgeon-Only	120 ± 20	

Pre-operative data includes the size of the fibroids, the number of fibroids, and preoperative hemoglobin levels. Both groups were comparable with no significant differences in these variables(Table 4).

Table 4: Preoperative Data

Preoperative Data	Trainee Involvement Group (Mean ± SD)	Attending Surgeon Only Group (Mean ± SD)	p-Value
Size of Fibroids (cm)	6.5 ± 2.1	6.3 ± 2.0	0.42
Number of Fibroids	3.2 ± 1.5	3.0 ± 1.6	0.30
Preoperative Hemoglobin (g/dL)	11.8 ± 1.2	11.9 ± 1.1	0.55

When trainees were present, a higher percentage of cases experienced surgical site infections (30% vs. 20%), hemorrhage (16% vs. 10%), wound dehiscence (8% vs. 6%), and urinary retention (6% vs. 4%) compared to cases without trainees. These differences were found to be statistically significant with p-values less than 0.05 for surgical site infection, wound dehiscence, and urinary retention, and less than 0.01 for hemorrhage (Table 05). In abdominal myomectomy, trainee involvement was not significantly associated with surgical site infection ($p = 0.108$) or wound dehiscence ($p = 0.294$)(Table 5).

Table 5: Post-Operative Complications

Post-Operative Complications	Involvement	Number of Cases N (%)	p-Value
Surgical Site Infection	Trainee-Involved	15 (30%)	0.108
	Attending Surgeon-Only	10 (20%)	
Hemorrhage	Trainee-Involved	8 (16%)	0.021
	Attending Surgeon-Only	5 (10%)	
Wound Dehiscence	Trainee-Involved	4 (8%)	0.294
	Attending Surgeon-Only	3 (6%)	
Urinary Retention	Trainee-Involved	3 (6%)	0.020
	Attending Surgeon-Only	2 (4%)	

DISCUSSION

The study demonstrated that surgeries involving trainee participation resulted in longer operative times, greater blood loss, and a higher incidence of both intraoperative and postoperative complications compared to those performed solely by attending surgeons. These outcomes align with existing literature, which frequently reports extended procedure durations and increased complication rates when trainees are involved [13]. Several factors may explain these differences. Trainees, especially those early in their training, may lack the technical proficiency and decision-making skills of experienced attending surgeons [14]. The increased complexity of procedures and the learning curve associated with laparoscopic techniques could further impact the outcomes of surgeries involving trainees. Barber et al. highlighted that the surgical approach influences how trainee involvement affects perioperative complications, with operative time serving as a key, potentially modifiable factor in this relationship [15]. Kim et al. also emphasized that the impact of trainee involvement on surgical outcomes varies based on the procedure, the skills required, and the training paradigms in place [16]. Interestingly, the study found that the majority of trainee involvement (67%) was in a supportive role, with fewer trainees taking on leadership (17%) or observational roles (17%). This suggests a significant emphasis on hands-on training through assistance, while leadership and observation offer opportunities for different levels of engagement during surgical procedures. Trainee involvement in laparoscopic myomectomy was associated with an increase in operative time. This may be due to the advanced technical skills required for laparoscopic procedures, which are often performed by more senior trainees or with more significant involvement from the attending physician [17]. Another potential factor is the use of robotic assistance, as robotic skills are generally acquired more rapidly than laparoscopic skills, potentially influencing trainee participation and operative efficiency. A cross-sectional study using ACS-NSQIP data supported this, finding that trainee involvement in common procedures like laparoscopic appendectomy, laparoscopic cholecystectomy, and open inguinal hernia repair significantly increased operative time, regardless of trainee seniority [18]. The association between trainee involvement and complication rates likely varies depending on the procedure, the skills required, and the training paradigms in place [19, 20]. For instance, when comparing resident and fellow involvement in abdominal myomectomy, no significant difference in operative time was found between groups. However, there was a higher rate of blood transfusions and complications in procedures involving fellows, possibly because fellows, as more senior and skilled trainees, were more likely to be involved in more complex cases.

CONCLUSIONS

Procedures involving trainees had longer operative times compared to those performed by attending surgeons

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alone. The trainee-involved group experienced slightly higher blood loss and longer hospital stays. These differences were statistically significant for primary outcomes such as operative time and blood loss. The presence of trainees was significantly associated with an increased risk of hemorrhage, although no significant associations were found for surgical site infections or wound dehiscence. While the trainee involvement may lead to longer procedure durations and a higher likelihood of certain complications, its effect on primary surgical outcomes was minimal. It was suggested that to make optimizing protocols for trainees to ensure safe and efficient surgical procedures.

Authors Contribution

Conceptualization: IAK, NK

Methodology: IAK, AN, HB, NK

Formal analysis: SK, AN, HB, IA

Writing, review and editing: SK, AN, HB, NK, IA

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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