



Single-Port Laparoscopy Versus Conventional Multi-Port Laparoscopy in Benign Ovarian Cyst Surgery: Operative and Cosmetic Outcomes

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Abstract: Background: **Objective:** To compare the outcomes of single-port laparoscopy with conventional multi-port laparoscopy in the treatment of benign ovarian cysts. **Methods:** It was a comparative cross-sectional study in the Department of Gynecology and Obstetrics of a Liaquat University Hospital Hyderabad. A total of 136 patients who had benign ovarian cysts were recruited and divided into two groups: single-port laparoscopy (n=68), and multi-port laparoscopy (n=68). A structured proforma was used to collect data on the demographic variables, operative time, blood loss, postoperative pain (VAS), hospital stay, recovery time, complications, and cosmetic satisfaction. The data were statistically analyzed with SPSS version 26, and the p-value of 0.05 was taken to be significant. **Results:** There were, no significant differences between the two groups in terms of baseline characteristics. The single-port group had a much higher operative time, but with a slight decrease in blood loss. Single-port patients had much less postoperative pain, less hospitalization, and an earlier time to resume normal functions (p<0.001). **Conclusion:** Single-port laparoscopy is a safer and more effective approach than multi-port laparoscopy. Despite requiring a longer surgical procedure, single-port laparoscopy has better postoperative recovery and aesthetic benefits.

Keywords: Single-port laparoscopy; benign ovarian cyst; minimally invasive surgery.

INTRODUCTION

Benign ovarian cysts are the most frequent gynecological disorders that affect women of childbearing age, with maximum frequency observed between the ages of 20 and 50 years.[1] These cysts can be asymptomatic or manifested by pelvic pain, menstrual abnormalities, or problems like torsion, rupture, and, infrequently, malignant change.[2] Epidemiological evidence indicates that ovarian cysts represent a considerable percentage of the adnexal mass that is presented in the gynecology practice worldwide, thus playing a significant role in the surgical workload.[3, 4]

The management of benign ovarian cysts has over the past few decades, changed significantly with the introduction of minimally invasive surgery.[5] The traditional multi-port laparoscopy has emerged as the new gold standard of surgical therapy because it has benefits over laparotomy, such as minimized postoperative pain, a shorter hospital stay, accelerated recovery, and better cosmetic results.[6, 7] Nevertheless, these advantages are not without the possible disadvantages, which include port-site infections, scarring, and dissatisfaction of the patient with the cosmesis in multi-port laparoscopy, necessitating multiple abdominal openings.[7]

Laparoendoscopic single-site surgery (LESS), another name for single-port laparoscopy, is a novel surgical technique aimed at further minimizing operative trauma.[8] It involves the use of a single incision, usually at the umbilicus, and intends to minimize access morbidity besides improving cosmetic results. Single-port laparoscopy provides several benefits, such as reduced postoperative pain, fewer days off, and significantly higher patient satisfaction with abdominal wall appearance, and recent studies have demonstrated that it is just as safe and successful as conventional techniques.[9] Recent findings indicated that the rates of cosmetic satisfaction are as high as 97.7% in single-port procedures and about 71.5% in multi-port strategies.[10]

Although these results were encouraging, adoption of single-port laparoscopy has been reluctant due to the technical challenges, including instrument crowding, reduction in triangulation, and a steep learning curve in comparison to conventional multi-port laparoscopy.[11] Certain studies show a clear advantage in the postoperative recovery and cosmetic outcome, but others show no substantial differences in the significant parameters of the operations, and additional comparative analysis is required.

It is necessary to objectively assess the clinically significant distinction between single-port

laparoscopy and the conventional multi-port technique in the treatment of benign ovarian cysts, given the focus on patient-centered outcomes, specifically postoperative discomfort, recovery, and cosmetic satisfaction. Moreover, within resource-constrained contexts and changing surgical practices, defining evidence-based choices of surgical approach can determine ideal patient care and quality of life as well as enhance surgical decision-making. Thus, it is timely as well as clinically pertinent to directly compare the operative and cosmetic results of these two techniques. The goal of the current study was to compare the cosmetic results and surgical techniques of single-port and traditional multi-port laparoscopies for the surgical management of benign ovarian cysts.

Methodology

This investigation was done through a comparative cross-sectional study design to compare and contrast the outcomes of operative and cosmetic surgeries in patients undergoing surgery on benign ovarian cysts done using 'single-port laparoscopy' versus the 'conventional multi-port laparoscopy'. The research was conducted in the Department of Gynecology and Obstetrics of a Liaquat University Hospital Hyderabad. The study lasted a year, starting on 1st January 2025 and ending on 31st December 2025. Each of the procedures was conducted by senior laparoscopic surgeons who possessed sufficient expertise in both 'single-port and multi-port laparoscopic' procedures to minimize bias, which depends on the operator. The hospital context offered a stable clinical setting wherein there were standard surgical procedures and postoperative management. The OpenEpi version 3.01 was used to compare two proportions; the expected cosmetic satisfaction was 90% in the 'single-port group' and 70% in the 'multi-port group', with 95% confidence level and 80% power.[12] The obtained sample size was 124 patients, which was increased to 136 (68 patients in each group) to account for potential dropouts.

During this time, individuals who met the inclusion criteria and presented with benign ovarian cysts were enrolled via non-probability consecutive sampling. Based on the type of operation, the patients were divided into two groups: Patients who underwent a single-port laparoscopy were in Group A, and patients who had a standard laparoscopy (multi-port laparoscopy) were in Group B. Each group was split based on the surgeon's desire, the patient's suitability, and the equipment's accessibility. Women between the ages of 18 and 45 who had planned laparoscopic cystectomy and benign ovarian cysts on ultrasonography were eligible. The patients who were excluded from the study included those with

suspected malignancy, patients who had undergone a previous surgery with a large abdomen, pregnant women, and those with severe comorbid conditions that were contraindicated for laparoscopy.

Data were gathered through a pre-designed and structured proforma. The initial demographic data were collected at the time of admission and included age, BMI, parity, and the clinical presentation. Preoperative examination, by providing a detailed history, physical examination, ultrasonographic observations, and relevant laboratory tests, was used to make the diagnosis of a benign ovarian cyst. The trained surgeons performed surgery according to the same standardized operating procedures. The operating team recorded intraoperative information, including the type of operation (single or multi-port laparoscopy), duration of operation (between skin incision and closure), estimated blood loss, and intraoperative complications.

Postoperative parameters were measured by the trained personnel who were not directly involved in the surgical process to minimize observer bias. At 24 hours after surgery, postoperative pain was measured using the Visual Analog Scale (VAS). It also involved the follow-up of patients by the outpatient department

to determine the outcome of wound healing and cosmetic outcome, as well as the time it took patients to resume normal activities.[13] The cosmetic satisfaction was measured using a validated scar assessment scale during follow-up visits (typically 2-4 weeks postoperative). Data collected were verified as complete and accurate before entering them into the database.

All data collected were analyzed and inputted in Statistical Package of Social Sciences (SPSS) version 26. The quantitative variables included age, operative time, blood loss, pain score, and length of stay in the hospital, and were expressed in the form of mean $\pm$ standard deviation (SD). Before inferential statistics was applied, the Shapiro-Wilk test was used to test the normality of data distribution. To compare the two groups, 'the independent sample t-test was used. The presence of complications and level of cosmetic satisfaction were categorical variables and represented as frequencies and percentages, and were analyzed using the chi-square test and fisher's exact test'. A p-value of less than 0.05 was considered to be statistically significant.

Results

Baseline demographic and clinical features were similar between the two groups. The average age of patients in the single-port group was 32.4 ± 6.8 years, whereas in the multi-port group was 33.1 ± 7.2 years, with no statistically significant difference. Likewise, other variables, such as BMI, parity status, cyst size, and cyst laterality, were also similar among the two groups (Table 1).

In terms of operative outcomes, the average operative time was much longer in the single-port group (62.5 ± 10.2 minutes) than in the multi-port group (54.3 ± 9.1 minutes) ($p < 0.001$). Nevertheless, the single-port method showed a statistically significant decrease in intraoperative blood loss. (Table 2).

The postoperative outcomes revealed that in comparison with the multi-port group, patients who received single-port laparoscopy had much lower pain scores at 24 hours, shorter hospital stay, and earlier resumption of normal daily activities ($p < 0.001$). Regarding cosmetic outcomes, a much larger percentage of patients in the single-port group stated that they were satisfied with the appearance of their scars, and a proportion of patients in the multi-port group had a relatively higher proportion of fair and poor results ($p = 0.002$). (Table 3).

Table 1: Baseline Demographic and Clinical Characteristics of the Study Participants (n=136)

Variable	Single-Port (n=68)	Multi-Port (n=68)	p-value
Age (years)	32.4 ± 6.8	33.1 ± 7.2	0.56
BMI (kg/m ²)	24.8 ± 3.5	25.2 ± 3.9	0.48
Parity (nulliparous %)	30 (44.1%)	28 (41.2%)	0.72
Cyst size (cm)	5.6 ± 1.4	5.8 ± 1.6	0.39
Side of cyst (Right %)	36 (52.9%)	34 (50.0%)	0.73

Table 2: Operative Outcomes of the Study Participants (n=136)

Variable	Single-Port (n=68)	Multi-Port (n=68)	p-value
Operative time (minutes)	62.5 ± 10.2	54.3 ± 9.1	$<0.001^*$
Blood loss (mL)	48.6 ± 12.5	52.8 ± 14.1	0.04^*
Intraoperative complications	3 (4.4%)	4 (5.9%)	0.69
Conversion to open surgery	1 (1.5%)	1 (1.5%)	1.00

Table 3: Postoperative and Cosmetic Outcomes of the Study Participants (n=136)

Variable	Single-Port (n=68)	Multi-Port (n=68)	p-value
Pain score (VAS at 24 hrs)	3.2 ± 1.1	4.6 ± 1.3	<0.001*
Hospital stay (days)	1.8 ± 0.6	2.4 ± 0.7	<0.001*
Return to normal activity (days)	6.5 ± 1.9	8.2 ± 2.1	<0.001*
Cosmetic Outcome			0.002*
Excellent	46 (67.6%)	28 (41.2%)	
Good	18 (26.5%)	26 (38.2%)	
Fair	4 (5.9%)	10 (14.7%)	
Poor	0 (0%)	4 (5.9%)	
Overall Satisfaction			0.003*
Satisfied	64 (94.1%)	52 (76.5%)	
Not satisfied	4 (5.9%)	16 (23.5%)	

DISCUSSION

The baseline demographic and clinical variables in the current study were similar in both groups, which is a characteristic of the correct group matching and reduction of confounding bias. Qiong Xia et al. (2026) also discovered these results, demonstrating that in individuals with benign ovarian cysts, there were no appreciable variations in the baseline variables between the single-port and the multi-port. [10] Similarly, the validity of comparative laparoscopic analyses was also established as similar demographic distributions were confirmed by Shan S et al. (2024) in their cohort study.[14]

In the operative outcomes, our study established that the single-port group had a higher operative time. This aligns with the evidence that was presented by Shan et al. (2024), who explained that longer operative time was due to technical difficulties like the crowding of instruments and the loss of triangulation.[14] This, however, was not the case with Xia et al. (2026), who found that there was no statistically significant difference between the two techniques in terms of operative time, meaning that surgical expertise and learning curve could alleviate this limitation.[10] In a similar manner, Xiaoying Wang et al. (2021) have

stated that the overall difference in the duration of the operative time has a tendency to diminish as the experience of the surgeons increases.[15]

The single-port group experienced a slight but statistically significant reduction in intraoperative blood loss, according to the current study. Similar results were also documented by Wang et al. (2021), who found that single-port laparoscopy led to a reduction of intraoperative blood loss and better perioperative outcomes.[15] Also, Xia et al. (2026) did not observe any significant blood loss difference between groups, thereby indicating that the two methods were equally safe and effective in qualified hands.[10]

The use of single-port laparoscopy was overwhelmingly associated with the best postoperative recovery outcomes in our study, as it was significantly associated with a decrease in pain levels, reduced hospitalization, and an earlier return to normal daily activities. The results strongly coincide with Xia et al. (2026), who reported much lower VAS pain scores and quicker postoperative recovery in the single-port group.[8] Likewise, the study by Wang et al. (2021) showed a decrease in postoperative pain and a reduction in the length of stay with single-port surgeries.[12] Additionally, a systematic review by Feifei Ji et al. (2024) has found single-port laparoscopy to have lower postoperative pain and better recovery than multi-port in gynecological procedures.[16]

According to our study, the single-port group's cosmetic results significantly improved, with more patients reporting an outstanding scar look. Cosmetic satisfaction rates were as high as 97.7% in single-port procedures and 71.5% in multi-port surgeries, according to Xia et al. (2026), which provided strong support for this conclusion.[10] In the same manner, Shan et al. (2024) focused on the enhanced cosmetic satisfaction because of the umbilical incision that was concealed.[14] A systematic review published in 2023 also mentioned the superior cosmetic outcomes as one of the benefits of single-port laparoscopy.[17] The single-port group had much higher patient satisfaction in our study, which correlates with the results of several recent studies.[18] Reduced pain, quicker recovery, and improved cosmetic outcomes have been observed to contribute to improved satisfaction. The results are in line with Xia et al. (2026) and other recent studies that focus on patient-centered outcomes in minimally invasive surgery.[8] Moreover, even a meta-analysis by M ElSherbiney et al. (2023), which was performed in colorectal surgery, supports the overall benefits of single-incision laparoscopic methods, including a decrease in postoperative pain

and a higher level of cosmetic satisfaction, indicating that they can be generalized to other types of surgery.[6, 19] Moreover, a systematic review by E Tsiampa et al. (2021) emphasized that single-port laparoscopy does not deplete the ovarian reserve and shows similar safety rates, which further confirms its significance in gynecological surgery.[20]

Study limitations:

It was carried out in a single tertiary care hospital which limits the generalization of the study to other settings with different patient populations and surgical expertise. Second, the sample size was both statistically adequate and very small, which might have reduced the power in detecting smaller differences in unusual events such as intraoperative complications. Third, the selection of 'single-port versus multi-port' was not random, which posed the risk of selection bias relying on the surgeon and patients' preferences. Moreover, the cosmetic outcome and satisfaction of the patient were only measured over a comparatively short period of follow-up, which could not possibly reflect the long-term scar appearance and delayed complications. Finally, single-port laparoscopy may have had a learning curve, which may have influenced the duration of the operation and the technical performance, particularly during the initial period of the study.

CONCLUSION

'Single-port laparoscopy is safe and effective compared to conventional multi-port laparoscopy in the management of benign ovarian cysts, which offers the same safety during the procedure but the advantages of less postoperative pain, shorter hospital stay, faster recovery, and improved cosmetic outcomes'. Perhaps there is no link between the increased length of operation time and technical challenges and learning curve, but the apparent patient-related benefits of this form of minimally invasive operation would justify its consideration. With the improvement of surgical skills and tools, it is possible to apply single-port laparoscopy to the advantage of chosen patients who want the most optimal results when it comes to functional and cosmetic results.

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