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Laparoscopic Surgery in the Management of Ovarian Masses

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Abstract

Background: Ovarian masses, including benign cysts, endometriomas, and ovarian cancer, are common in clinical practice and vary in severity. While many remain asymptomatic early on, they can lead to advanced disease and complications if not detected early. Traditionally, exploratory laparotomy was used for surgical management, but advancements in minimally invasive laparoscopic surgery have led to its adoption as the gold standard. Laparoscopy offers advantages such as reduced postoperative pain, faster recovery, and better cosmetic outcomes. It also provides superior visualization, improving surgical precision and safety, even for larger masses, with positive outcomes reported in several cases.

Aim of the study: The study aims to evaluate the safety and practicality of laparoscopic surgery for large ovarian masses that are presumed to be benign before surgery.

Methods: This prospective observational study was conducted at Prime Hospital, Dubai, over one year, enrolling 115 female patients with ovarian masses from June 2019 to July 2024. Inclusion criteria included patients aged 10+ years with ultrasonographically confirmed ovarian cysts and no preoperative malignancy indicators. Exclusion criteria were contraindications for laparoscopic surgery and ultrasonographic signs of malignancy. Laparoscopic procedures were performed under general anesthesia, with cystectomy, oophorectomy, or hysterectomy based on clinical factors. Data on demographics, clinical findings, tumor markers, complications, and postoperative follow-up were collected. Histopathological analysis confirmed diagnoses. Data were analyzed using SPSS, with continuous variables expressed as mean±SD and categorical data as percentages.

Result: The study involved 115 participants, predominantly aged 21-30 years (60.87%), with a mean BMI of 24.56±1.87 kg/m². Most had no children (41.74%) and reported infertility (44.35%) and dysmenorrhea (36.52%). Ultrasonography revealed ovarian cysts (49.57%) with sizes of 4-6 cm. Preoperative complications occurred in 16.52%, mainly cyst rupture. Laparoscopic oophorectomy or salpingo-oophorectomy was the most common procedure (40.87%), with serous cyst adenoma being the most frequent diagnosis (43.48%). Surgical outcomes included a mean operation time of 65.78 minutes and minimal blood loss (39.62 mL). Postoperative complications included fever (22.61%) and port site infection (11.30%).

Conclusion: Laparoscopic surgery effectively manages ovarian masses, including large benign cysts, with minimal complications, reduced blood loss, and faster recovery. Procedures like oophorectomy and salpingo-oophorectomy showed a mean operation time of 65.78 minutes and an average hospital stay of 3.89 days, offering significant advantages over traditional methods.

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Introduction

Ovarian masses are commonly encountered in clinical practice and represent a diverse group of benign and malignant growths that form within the ovaries. These growths can range from small, asymptomatic cysts to larger, potentially life-threatening tumors that significantly impact women's health and quality of life [1]. Ovarian masses include a variety of conditions, such as benign cysts, endometriomas, teratomas, and ovarian cancer, each of which has unique clinical features and treatment requirements [2]. Approximately 5-10% of women will undergo surgical management for suspected ovarian neoplasms during their lifetime [3]. The early detection and timely management of ovarian masses are critical for improving patient outcomes and reducing associated risks [4]. Many ovarian masses remain asymptomatic in their early stages, which often leads to delayed diagnosis and advanced disease at the time of detection [1,4]. Traditionally, exploratory laparotomy was the most commonly used surgical approach, largely because it minimized the risk of intraperitoneal implantation in the event of unexpected malignant transformation [5]. However, laparotomy often involves extensive abdominal incisions, which could cause significant discomfort, particularly for younger women [6]. With the advancement of surgical techniques, minimally invasive laparoscopic surgery has increasingly been adopted in the management of ovarian masses, offering numerous advantages over traditional methods [7]. Laparoscopy has become the gold standard for the surgical management of adnexal masses in recent years [7]. This technique is associated with several benefits, including reduced postoperative pain, less reliance on analgesics, faster recovery, and improved cosmetic outcomes due to smaller incisions [8]. Additionally, patients who undergo laparoscopic surgery experience quicker mobilization, which decreases the risk of complications such as deep vein thrombosis (DVT). The ability to perform the procedure with minimal incisions also results in shorter hospital stays and a quicker return to normal activities. One significant consideration when deciding between laparoscopic and laparotomy approaches is the size of the ovarian mass. The definition of a "large" ovarian cyst varies, with some studies defining a large cyst as one greater than 10 cm in diameter, while others consider cysts that extend above the umbilicus to be large [5]. The laparoscopic management of large ovarian cysts has been documented in several case reports, with positive outcomes indicating that the technique can be effective for larger masses [9]. The use of a laparoscope provides superior visualization of the pelvic area, allowing for better magnification and illumination, which enables the surgeon to assess the mass and surrounding structures [10] accurately. This enhanced visibility improves the precision of the surgery and contributes to its overall safety and efficacy. Furthermore, laparoscopic surgery offers substantial cosmetic benefits, especially in gynecological procedures, as smaller incisions result in less scarring [10]. However, there is ongoing debate regarding the safety and feasibility of laparoscopic surgery for larger ovarian masses, especially those greater than 10 cm or extending above the umbilicus [11]. The study aims to evaluate the safety and practicality of laparoscopic surgery for large ovarian masses that are presumed to be benign before surgery.

Methodology and Materials

This meticulously designed prospective observational study was undertaken in the Department of Obstetrics and Gynecology at Prime Hospital, Dubai, UAE. The research spanned for five years from June 2019 to July 2024. Using a purposive sampling strategy, a total of 115 female patients presenting with ovarian masses were carefully selected to form a well-defined cohort. The inclusion of participants was based on stringent criteria to ensure the robustness and clinical significance of the findings.

Inclusion Criteria

- Female patients aged 10 years or older with ovarian cysts confirmed by ultrasonography.
- Individuals with no preoperative indications of malignancy, as determined through comprehensive history-taking, clinical examinations, imaging findings, and tumor marker evaluations.

Exclusion Criteria

- Patients with contraindications for laparoscopic surgery due to medical reasons.
- Cases with ultrasonographic evidence suggestive of malignancy, including thick septations, papillary projections, low vascular resistance, and pulsatility index abnormalities.

Surgical Procedure

All procedures were performed under general anesthesia to ensure optimal patient comfort and surgical precision. Pneumoperitoneum was established using a Veress needle, followed by the introduction of one 10 mm trocar and two 5 mm trocars for laparoscopic instrumentation. In many cases, a third suprapubic 5 mm port was introduced to facilitate enhanced visualization and ease of dissection. The surgical dissection primarily utilized curved scissors and plain grasping forceps, with bipolar coagulation employed for meticulous hemostasis. A thorough examination of the cyst wall, the interior of the capsule, and surrounding visceral organs was conducted to identify any suspicious signs of malignancy. The initial approach involved cyst aspiration, followed by procedures tailored to the patient's clinical scenario, including cystectomy, oophorectomy, or total hysterectomy. The choice of procedure was influenced by factors such as the patient's age, parity, associated pathology, and fertility

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aspirations. For cases where cystectomy was performed, the capsule was carefully separated from the remaining ovarian tissue using graspers, with bipolar coagulation applied to control bleeding. In instances where cystectomy was not feasible, the affected ovary (and sometimes the salpinx) was mobilized and excised using bipolar coagulation and cold scissors. If concurrent uterine pathology was identified, a salpingo-oophorectomy followed by hysterectomy was performed, with specimens retrieved vaginally.

Data Collection

Clinical data were systematically gathered through patient histories, physical examinations, ultrasonography findings, and laboratory investigations, including tumor marker assessments. Perioperative and postoperative complications were meticulously recorded, along with the duration of hospital stay. Patients were followed for a three-month period postoperatively to monitor delayed complications. A structured data sheet facilitated comprehensive data documentation. Histopathological analysis of all specimens was performed to confirm diagnoses and assess malignancy risk. Prior to participation, all patients received detailed explanations of the study objectives, methodology, and potential outcomes. Informed written consent was obtained to ensure voluntary enrollment. Baseline demographic and clinical data were treated with the utmost confidentiality, and the study protocol was approved by the institutional ethics review board in adherence to international ethical standards.

Data Analysis

The collected data were systematically organized into tabular and graphical formats to ensure clarity and facilitate comprehensive interpretation. Statistical analyses were conducted using SPSS software, version 26. Continuous variables were expressed as mean±standard deviation (SD), while categorical variables were summarized as frequencies and percentages.

Result

The study population (N=115) primarily consisted of individuals aged 21-30 years, who made up 60.87% of the participants. The mean BMI of the group was 24.56±1.87 kg/m². Regarding parity, most participants had no children (41.74%), followed by those with one child (29.57%) (Table 1). In terms of clinical characteristics based on Table 2, infertility (44.35%) and dysmenorrhea (36.52%) were the most common symptoms, with 39.13% reporting dull aching abdominal pain. The ultrasonographic findings revealed that 49.57% had ovarian cysts ranging from 4-6 cm in size. Pre-operative complications were observed in 16.52%, with cyst rupture being the most common (Table 2). Table 3 shows the types of laparoscopic procedures employed in this study, where the majority underwent laparoscopic oophorectomy or salpingo-oophorectomy (40.87%), and serous cyst adenoma was the most frequent histopathological diagnosis (43.48%). According to Table 5, tumor marker testing revealed that most participants had normal levels of CA-125 (78.26%), CEA (98.26%), CA19-9 (97.39%), and LDH (99.13%). In Table 6, surgical outcomes showed a mean operation time of 65.78 minutes, with an estimated blood loss of 39.62 mL. Postoperative hemoglobin levels averaged 10.9±1.4 g/dL, and the mean hospital stay was 3.89±2.21 days. Common postoperative complications included fever (22.61%) and port site infection (11.30%).

Table 1: Demographic profile of the study population (N=115).

Variable	Frequency (n)	Percentage (%)
Age (in year)		
Oct-20	7	6.09
21-30	70	60.87
31-40	33	28.7
41-50	3	2.61
>50	2	1.74
BMI (kg/m²)		
Mean±SD	24.56±1.87	
Parity		
0	48	41.74
1	34	29.57
2	27	23.48
3	6	5.22
4	0	0

Table 2: Clinical characteristics of the study population (n = 115).

Variable	Frequency (n)	Percentage (%)
Symptoms		
Asymptomatic	23	20
Dull aching abdominal pain	45	39.13
Acute abdominal pain	26	22.61
Dysmenorroea	42	36.52
Infertility	51	44.35
Abdominal Lump	1	0.87
Abnormal uterine bleeding	2	1.74
Size of ovarian cyst (Ultrasonographic findings)		
4-6 cm	57	49.57
7-9cm	47	40.87
10-12cm	10	8.7
13-15 cm	1	0.87
Pre-operative complication		
Cyst rupture prior to drainage	19	16.52
Haemorrhage from ovary	7	6.09
Injury to the omentum	2	1.74
Injury to inferior epigastric Vessels	1	0.87
Injury to the bowel	0	0

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Table 3: Types of laparoscopic procedures employed in this study.

Procedure	Frequency (n)	Percentage (%)
Laparoscopic cystectomy	22	19.13
Laparoscopic oophorectomy/ salpingo- oophorectomy	47	40.87
Laparoscopic adnexectomy followed by hysterectomy	35	30.43
Laparoscopy followed by Laparotomy(conversion)	11	9.57

Table 4: Histopathological characterization of collected specimens.

Histopathology	Frequency (n)	Percentage (%)
Serous cyst adenoma	50	43.48
Mucinous cystadenoma	32	27.83
Dermoid	14	12.17
Endometrioma	15	13.04
Borderline serous cystadenoma	4	3.48

Table 5: Levels of tumor markers in clinical samples.

Tumour markers	Normal		Raised	
	n	%	n	%
CA-125	90	78.26	25	21.74
CEA	113	98.26	2	1.74
CA19-9	112	97.39	3	2.61
LDH	114	99.13	1	0.87

Table 6: Surgical outcomes among study populations (N=115).

Surgical Outcome	Frequency (n)	Percentage (%)
	Mean±SD	
Operation time (min)	65.78±2.54	
Estimated blood loss	39.62±1.87	
Postoperative Hb (g/dl)	10.9±1.4	
Mean hospital stay	3.89±2.21	
Complications		
Fever	26	22.61
Port site infection	13	11.3
Port site fistula	1	0.87

Discussion

Benign ovarian tumors are among the most prevalent conditions encountered by gynecologists [1]. Laparoscopic surgery is frequently employed in the management of benign ovarian cysts within the field of obstetrics and gynecology [12]. For many years, laparoscopy has been recognized as a standard approach for treating benign ovarian tumors. It is regarded as the gold standard for small to moderate-sized ovarian cysts; however, experienced surgeons can also manage larger cysts laparoscopically despite the potential risk of cyst rupture and spillage of malignant cells [13]. This technique offers several advantages, including reduced operative blood loss, a lower incidence of postoperative complications, shorter hospital stays, diminished pain, and expedited recovery compared to traditional laparotomy [14]. In our study, the demographic analysis indicated that most participants were aged between 21 and 30 years, constituting 60.87% of the cohort, with an average BMI of 24.56 kg/m². This observation is consistent with findings from prior research [15,16]. Additionally, our data revealed that nulliparous women represented the largest subgroup at 41.74%, which supports existing literature that identifies a greater prevalence of ovarian cysts or tumor among women who have never been pregnant [17]. Our analysis of clinical characteristics revealed that the predominant symptoms were infertility, affecting 44.35% of patients, followed by dull abdominal pain, reported by 39.13% of individuals. These findings align with previously published literature regarding the prevalence of symptoms in cases of ovarian cysts [15,18]. Interestingly, 20% of our patients were asymptomatic, a finding that aligns with several studies reporting similar rates of incidental asymptomatic ovarian masses [18]. Ultrasonographic findings showed in this study small to moderate size ovarian cysts ranging from within the 4–9 cm range, with a smaller proportion exceeding 10 cm. These findings align with those of previous studies [15]. However, there are also several case reports documenting the successful laparoscopic removal of significantly larger ovarian cysts, measuring up to 21-22 cm [19]. In the present study, laparoscopic oophorectomy/ salpingo-oophorectomy was the most frequently performed procedure (40.87%), followed by laparoscopic adnexectomy with hysterectomy (30.43%). This aligns with current surgical practices that favor laparoscopic methods for their minimal invasiveness and quicker recovery times [15]. The conversion rate to laparotomy (9.57%) observed in our study is comparable to the rates reported in similar studies [20]. Histopathology results indicated that serous cystadenoma was the most prevalent (43.48%), followed by mucinous cystadenoma (27.83%) and endometrioma (13.04%). Our findings align closely with a study by Farag et al., which noted similar histological distributions, with serous and mucinous cystadenomas being the most common benign ovarian masses across various age groups [21]. Notably, only 3.48% of cases were borderline serous cystadenomas, a predominantly benign nature of large ovarian masses suitable for laparoscopic surgery, which is corroborated by other studies [15,20]. In our study, the CA-125 marker was raised in 21.74% of patients, a finding that underscores the importance of this marker in differentiating malignant from benign ovarian masses. Studies have shown that elevated CA-125

levels can correlate with disease severity and may serve as a prognostic indicator [22]. The surgical outcomes outlined in Table 6 demonstrate a mean operation time of 65.78 minutes and an estimated blood loss of 39.62 ml, indicating that laparoscopic surgery is efficient and minimizes invasiveness. These outcomes are consistent with the findings of Harkki-Siren et al., who reported similar times and blood loss in their laparoscopic series [23]. Postoperative complications were minimal, with fever being the most common (22.61%) and port site infections occurring in 11.30% of patients. While these complications are not uncommon, they are generally manageable and do not undermine the overall safety of laparoscopic procedures. Moreover, the mean hospital stay of 3.89 days is notably shorter than that reported in open surgery cases, reflecting the advantages of laparoscopic techniques in promoting quicker recovery [20]. Our results underscore the benefits of laparoscopic surgery in enhancing patient outcomes, reducing recovery time, and minimizing hospitalization costs.

Limitations of the study:

The sample size of 115 patients, although sufficient for statistical analysis, may not fully represent the broader spectrum of ovarian masses encountered in clinical practice. The study focused only on benign masses, excluding those with potential malignancy, which may affect the applicability of the results to more complex cases. The short follow-up period of three months may also limit the ability to assess long-term outcomes and recurrence rates of ovarian masses.

Conclusion And Recommendations

In conclusion, laparoscopic surgery proves to be an effective and safe approach for managing ovarian masses, including larger cysts presumed benign before surgery. The study demonstrated that laparoscopic techniques, such as oophorectomy and salpingo-oophorectomy, resulted in minimal postoperative complications, reduced blood loss, and quicker recovery times. With a mean operation time of 65.78 minutes and a hospital stay averaging 3.89 days, laparoscopic surgery offers significant advantages over traditional methods. These findings emphasize the feasibility of laparoscopic procedures for a wide range of ovarian masses, improving patient outcomes, reducing complications, and enhancing recovery.

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