

Therapeutic Management Strategy of Endometriomas

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ABSTRACT

Background: Endometrioma is a distinct and common pelvic manifestation of endometriosis. Due to its functional impact, it can hinder the lives of many young women aspiring to get pregnant. Establishing a precise and early diagnosis in order to define the optimal therapeutic strategy, while balancing efficacy and safety, represents a challenge. The aim of our study was to enumerate the various therapeutic methods for managing an endometrioma and their respective indications, and to develop a therapeutic management strategy based on recent recommendations and our practice conditions.

Methods: This was a descriptive retrospective study, conducted at the Department of Gynecology and Obstetrics B of the Tunis Maternity and Neonatology Center for over 5 years (January 2017-December 2021). All patients with a confirmed diagnosis of endometrioma through anatomopathological examination were included.

Results: One hundred and five women with endometrioma were included. The prevalence of endometrioma among ovarian tumors and genital endometriosis was 23.7% and 46.2%, respectively. The average age of the patients was 35.8 ± 8.7 years. Chronic pelvic pain was the primary reason for consultation (62%). The diagnosis of endometrioma was preoperatively established through ultrasound in 75 patients (71%). Laparoscopic surgery was the first-line therapeutic decision (88.5%). Intra-peritoneal cystectomy was the most performed surgical procedure (57%), followed by fenestration-electrocoagulation (32%) and radical treatment (10.4%). Recurrence was observed in 21 patients. Recurrence management included ultrasound-guided ethanol sclerotherapy (42.8%), expectant management (28.5%), or radical treatment with adnexectomy (9.5%). Among the 18 patients consulting for infertility, five successfully achieved pregnancy.

Conclusions: The diagnosis of endometrioma demands a holistic therapeutic approach. Different therapeutic options should be well-defined and customized to each patient. Preserving ovarian function while avoiding debilitating recurrences and lengthy therapeutic journeys is crucial for women of reproductive age.

Keywords: Endometrioma, Endometriosis, Surgery, Medical treatment, Infertility

Introduction

Endometriosis is a prevalent and benign gynecological condition affecting women of reproductive age. Defined by the presence of endometrial stromal and epithelial cells outside the uterine cavity, it poses significant health challenges due to its chronic inflammatory nature and multifactorial pathophysiology [1].

Endometriosis significantly impacts patients' quality of life, manifesting as chronic pain, infertility, and the need for repetitive, often expensive treatments. Among its manifestations, ovarian endometriomas represent the most frequent localization of pelvic endometriosis. These cystic formations, lacking a proper

wall structure, originate from invaginated surface implants or metaplasia, complicating their therapeutic approach [2].

The management of ovarian endometriomas has evolved with the development of diverse therapeutic strategies ranging from conservative observation to invasive surgical interventions. Conservative options, including watchful waiting, are reserved for asymptomatic cases or pre-IVF scenarios. Conversely, novel minimally invasive techniques such as ultrasound-guided puncture with ethanol sclerotherapy have emerged for recurrent endometriomas [3].

Surgical approaches remain cornerstone interventions, with validated techniques including intra-peritoneal cystectomy, fenestration, and radical options for severe cases. However, the

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laparoscopic approach is the gold standard due to its minimally invasive nature and precision.

Despite advancements, therapeutic decisions for endometriomas remain contentious, influenced by factors such as age, lesion extent, and reproductive goals. This study aims to delineate the therapeutic options for endometriomas, explore their respective indications, and propose a practical strategy adapted to contemporary recommendations and local practice contexts [4].

Methods

Study Design and Setting

This study was a retrospective, descriptive, monocentric analysis conducted at the Department of Gynecology and Obstetrics B of the Tunis Maternity and Neonatology Center. The study covered a five-year period from January 2017 to December 2021, focusing on patients diagnosed with ovarian endometriomas.

Study Population

• Inclusion Criteria

Patients were included if they underwent surgery for a pelvic or abdominopelvic mass with a histologically confirmed diagnosis of endometrioma, whether suspected preoperatively or identified incidentally during surgery for other conditions.

• Exclusion Criteria

Patients were excluded if the histopathological examination did not confirm the diagnosis of an ovarian endometrioma, or if their medical records were incomplete or inaccessible.

Data Collection

Data were retrieved from hospital records, operative reports, and histopathology registers. Information was systematically recorded using a computerized data extraction sheet. Key variables included

- 1. Epidemiological Data:** Age, marital status, medical and surgical history, gynecological and obstetric history, including hormonal status, parity, and history of ovarian cysts or infertility.
- 2. Clinical Data:** Symptoms, reasons for consultation, and findings from abdominal and gynecological examinations.
- 3. Paraclinical Data:** Results of imaging studies (ultrasound, MRI, CT scans, hysterosalpingography) and biological markers (CA35 and AMH).
- 4. Therapeutic Management:** Details of surgical interventions (indication, surgical approach, intraoperative findings, procedures performed, complications, and immediate postoperative outcomes).
- 5. Follow-Up:** Postoperative clinical evolution, recurrence rates, and fertility outcomes.

Surgical Techniques

The surgical procedures included

- **Conservative Approaches:** Intraperitoneal cystectomy (stripping technique) and fenestration-destruction with bipolar coagulation.
- **Radical Approaches:** Unilateral or bilateral oophorectomy and adnexectomy.

Specimens were retrieved using endoscopic bags, and endometriotic implants were scored according to the revised American Society for Reproductive Medicine (rASRM) classification.

Postoperative and Medical Treatments

Postoperative management included prescription of hormonal treatments, where indicated, and ethanol sclerotherapy for recurrent cases. Treatment efficacy was evaluated during follow-up visits, focusing on recurrence, chronic pelvic pain, and fertility outcomes.

Statistical Analysis

Data were analyzed using descriptive and inferential statistics. Continuous variables were expressed as means with standard deviations, while categorical variables were reported as frequencies and percentages.

Results

At the conclusion of our study, we obtained the following findings:

Epidemiological Data

Frequency of Ovarian Endometriomas

During the five-year study period (from January 2017 to December 2021), 443 cases of ovarian tumors (including endometriomas) were managed in our department. Of these, 11 cases were ovarian endometriomas, accounting for 23.7% of all ovarian tumors.

In total, 2311 gynecological surgeries (including laparotomy and laparoscopy) were performed during this period, of which 988 were laparoscopic procedures. Thus, ovarian endometriomas represented 4.5% of the total surgical activity in our department. Furthermore, we identified 227 cases of genital endometriosis during the same period, meaning that ovarian endometriomas accounted for 46.2% of all phenotypes of genital endometriosis.

Patient Profile

Age

The average age of the patients was 35.8 years \pm 8.7 years. A notable variation in age groups was observed. The most affected age group was between 31 and 40 years, accounting for 43.8% of all operated endometriomas (46 patients).

For the extreme ages in our series:

- The youngest patient was a 17-year-old adolescent with no notable medical history, presenting with an inaugural peritoneal syndrome.
- The oldest was a 71-year-old postmenopausal woman managed for a suspected malignant ovarian mass.

Medical and Surgical History

Of the 11 patients in our study, 41 had a history of abdominopelvic surgeries.

The different surgical histories are summarized in Table 1:

Surgical History	Number of Cases
Adnexal mass	21
Ectopic pregnancy	1
Cesarean section	6
Tubal ligation	2
Myomectomy	1
Tubo-ovarian abscess	1
Appendectomy	3
Cholecystectomy	2

Additionally, medical histories were noted in 22 patients (20.9%), as detailed in Table 2:

Medical History	Number of Cases
Hypertension	3
Pacemaker-assisted arrhythmia	1
Dyslipidemia	1
Type 2 diabetes	2
Allergic conjunctivitis	1
Allergic rhinitis	1
Allergic asthma	1
Thyroid dysfunction	2
Anemia	1
Chronic kidney failure (on dialysis)	1
Anxiety	5
Depression	3

Gynecological history

Hormonal Status

In our series, 99 patients were in the reproductive phase, while 6 were postmenopausal.

Fertility

Among the 11 cases, 26 women were unmarried (25%). Infertility was present in 34 patients (43% of married women, 32.3% of the entire cohort), with primary infertility in 70.5% of cases. The average duration of infertility was 5.3 years, ranging from 1 to 22 years.

Ovarian Cyst History

In this series, 21 patients (20%) had a history of ovarian cysts, with 19 managed surgically and 2 treated medically. Of the surgically treated cysts, 14 were endometriomas, while the rest were benign cysts confirmed histopathologically.

Family History

No significant family history of endometriosis or related conditions was noted.

Clinical Study

Reasons for Consultation

The reasons for consultation among the patients in our series are presented in Table 3:

Reason for Consultation	Number of Cases	Percentage (%)
Chronic pelvic pain	65	62%
Infertility	18	17%
Acute pelvic pain	13	12%
Menstrual disorders	5	5%
Abdominal volume increase	2	2%
Incidental discovery	2	2%

Chronic pelvic pain was often associated with other symptoms. In 80% of patients presenting with menstrual disorders (primarily menometrorrhagia), a polomyomatous uterus was identified. For the two cases of increased abdominal volume:

- The first patient (25 years old) had a history of surgically treated endometrioma and presented with abdominal volume increase due to recurrence of endometriomas.
- The second patient (19 years old) had a left ovarian endometrioma measuring 24 cm that extended to the umbilicus.

Symptoms

Chronic Pelvic Pain

Reported by 83 patients (79%), chronic pelvic pain was intense to unbearable in 40% of cases and rarely isolated.

Acute Pelvic Pain

Severe localized pelvic pain was accompanied by vomiting in 54% of cases and fever in 31%. Of the 13 patients consulting in emergency, three underwent surgery for pelviperitonitis, which revealed ruptured cysts with variable pelvic effusion.

Dysmenorrhea

Dysmenorrhea was present in 59 patients (56%), described as severe and resistant to first-line analgesics.

Dyspareunia

Deep dyspareunia was noted in 36% of cases.

Dysuria and Defecation Pain

Dysuria was present in three patients, including one case of urinary retention due to a 15 cm endometrioma. Pain during defecation was reported by one patient.

Symptoms and their frequencies are summarized in Table 4:

Symptoms	Number of Cases	Percentage (%)
Chronic pelvic pain	83	79%
Acute pelvic pain	13	12%
Dysmenorrhea	59	56%
Deep dyspareunia	38	36%
Dysuria	3	2.8%
Pain during defecation	1	1%

Physical Examination

Physical examination, including abdominal and gynecological assessment (speculum and vaginal touch), was performed in 76% of cases. For virginal patients, gynecological examination was omitted. The key findings were:

- **Adnexal mass**
- Identified in 11 cases, one of which extended beyond the umbilicus, and five were painful upon pelvic touch.
- **Abdominopelvic tenderness**
- Present in 32 cases.
- **Pelvic defense**
- Localized in five cases, with three cases showing generalized peritoneal contracture.
- **Abnormal uterine bleeding**
- Observed in six cases during speculum examination.
- **Bladder distension:** Noted in one case.

Pre-Therapeutic Assessment

Pelvic Ultrasound

Pelvic ultrasound was performed for all patients, with

endovaginal ultrasound in 76% of cases, often supplemented by transabdominal imaging for virginal patients.

The average size of endometriomas on ultrasound was 6.7 cm (range: 3-24 cm). Table 5 summarizes the ultrasound findings:

Ultrasound Characteristics	Number of Cases	Percentage (%)
Shape: Rounded	98	93.3%
Shape: Oblong	7	6.6%
Laterality: Unilateral	89	84.7%
Laterality: Bilateral	16	15.2%
Wall thickness: Thin	100	95.2%
Wall thickness: Thick	5	4.7%
Echogenicity: Echogenic	92	87.6%
Echogenicity: Anechogenic	12	11.4%
Echogenicity: Hypoechoic	1	0.9%
Structure: Unilocular	89	84.7%
Structure: Multilocular	16	15.2%

Diagnostic Confirmation

Ultrasound identified endometriomas as the primary diagnosis in 71.4% of cases.

Pelvic Magnetic Resonance Imaging (MRI)

Pelvic MRI was performed for 20 patients (19% of cases). The indications for MRI are detailed in Table 6:

Indication for MRI	Number of Cases	Percentage (%)
Atypical ovarian mass on ultrasound (suspicious for malignancy)	9	45%
Suspected extra-ovarian endometriosis	6	30%
Large tumor (uncertain origin)	2	10%
Associated pathology	3	15%

Among the 11 cases where diagnostic uncertainty existed due to atypical ultrasound features or large tumor size, MRI provided the following insights:

- In six cases, the diagnosis of endometrioma was confirmed.
- In four cases, MRI identified atypical ovarian cystic lesions without signs of malignancy, later confirmed as endometriomas histologically.
- In one case (classified O-RADS 4), MRI findings in a postmenopausal woman suggested malignancy. Surgical and histopathological findings ultimately confirmed the lesion as benign.

Abdominopelvic Computed Tomography (CT)

CT was performed in 10 patients (9% of cases):

- Seven cases were for acute symptoms (e.g., acute pelvic pain, fever, or vomiting) to rule out appendicitis or other surgical emergencies.
- Two cases involved large masses, confirming ovarian origin.
- One case was for preoperative staging of a suspected malignant lesion, which was later confirmed benign

Hysterosalpingography

Hysterosalpingography was systematically performed in 18 patients followed for infertility (17.1% of cases). Results are summarized in Table 7:

Hysterosalpingography Findings	Number of Cases
Normal	13
Intracavitary polyp	2
Intracavitary fibroid	1
Unilateral tubal obstruction	2

Laboratory Investigations

Tumor Markers

CA-35 was measured preoperatively in 73 patients (69.5%). It was elevated in 70% of cases, with extremely high values (>1000 IU/mL) in three patients.

- Patient 1: CA-35 = 7346 IU/mL; ruptured endometrioma (7 cm) with stage III endometriosis.
- Patient 2: CA-35 = 248 IU/mL; intact endometrioma (5 cm) with stage III endometriosis.
- Patient 3: CA-35 = 322 IU/mL; bilateral endometriomas (7 cm and 4 cm) with stage IV endometriosis.

Anti-Müllerian Hormone (AMH)

AMH levels were measured preoperatively in 28 patients (26.6%), primarily young women desiring pregnancy or undergoing infertility evaluation.

Therapeutic Management

Surgical treatment

Indications for Surgery

Surgery was performed either emergently or electively after case discussion. Table 8 summarizes surgical indications:

Indication	Number of Cases	Percentage (%)
Endometrioma with severe pelvic pain	70	66.6%
Endometrioma >3 cm	30	28.5%
Endometrioma with infertility	23	21.9%
Organic ovarian cysts	7	6.6%
Suspected malignancy	8	7.6%
Adnexal torsion suspicion	10	9.5%
Pelvipерitonitis	3	2.8%
Ovarian cyst with urinary retention	1	0.9%

Surgical Approaches

Laparoscopy was the initial approach in 93 patients (88.5%). Five cases required conversion to laparotomy due to severe adhesions (4 cases) or a large cyst (>20 cm). Primary laparotomy was performed in 12 cases, primarily for suspected malignancy or large masses.

Operative Findings

Average cyst size was 7 cm. Key findings included:

- Pelvic effusion (17.1%).
- Dense adhesions (35.2%).
- Complicated cysts (17.1% ruptured, 0.9% torsion, 2.8% infected).

Surgical techniques

Conservative Treatment

The most common procedure was intraperitoneal cystectomy (stripping technique), performed in 60 patients (57.1%). In cases where adhesions caused accidental rupture of the cyst (14 cases), extensive peritoneal lavage was performed.

The second conservative option, performed in 34 patients, involved cyst drainage, wall biopsy, and electrocoagulation of the cyst's remaining walls.

Radical Treatment

Radical surgery (annexectomy or oophorectomy) was performed in 11 patients (10.4%), primarily in postmenopausal women or patients with severe recurrence. Bilateral annexectomy was performed in 8 cases, and unilateral annexectomy in 2 cases.

Table 9 summarizes the indications for radical surgery

Radical Surgery Indication	Number of Cases
Suspected ovarian malignancy	3
Symptomatic ovarian cysts	2
Associated uterine myomas requiring hysterectomy	5
Severe recurrence with homolateral mass	1

Associated Procedures

- Peritoneal cytology was performed in 68% of cases.
- Directed biopsies of suspected peritoneal lesions were performed in all patients with visible implants.
- Peritoneal implants were excised in two patients with extensive stage IV endometriosis.
- Appendectomy was performed in one patient with endometriotic involvement of the appendix.

Surgical Complications

Intraoperative complications were noted in two patients (1.9%), both involving intestinal injuries during adhesiolysis in stage IV endometriosis. Immediate surgical repair was performed without postoperative complications.

Postoperative Outcomes

No major postoperative complications were observed. The average hospital stay ranged from 1 to 7 days.

Medical Treatment

Postoperative Medical Therapy

Postoperative hormonal treatment was prescribed to 64 patients (61%), with an average duration of 4.8 months. The prescribed therapies are summarized in Table 10:

Postoperative Medical Treatment	Number of Patients	Percentage (%)
GnRH analogs (Decapeptyl® 11.25 mg)	32	50%
Combined oral contraceptives	17	27%
Progestins (Dienogest 2 mg)	13	20%
Hormone replacement therapy	2	3%

Preoperative Medical Therapy

Two patients received hormonal therapy preoperatively for persistent ovarian cysts. Pain management included NSAIDs and first-line analgesics.

Evolution and Therapeutic Outcomes

Recurrence

Recurrence was noted in 21 patients (20%), with an average recurrence time of 16.35 months. Recurrence was more frequent after fenestration and coagulation procedures (61.9%). Homolateral recurrence was reported in 86% of cases.

Treatment for recurrence included:

- **Conservative Surgery:** 4 cases.
- **Ethanol Sclerotherapy:** 9 cases.
- **Expectant Management:** 6 cases.

Chronic Pelvic Pain

Persistent chronic pelvic pain was reported by 20 patients (24%). Contributing factors included recurrence, stage IV endometriosis, and extensive adhesions.

Fertility Outcomes

Among 18 patients treated for infertility, five achieved pregnancy:

- Three through spontaneous conception.
- Two through assisted reproductive technology (ART).

Discussion

This study is a retrospective, descriptive, monocentric analysis conducted over a period of five years. It included 11 women diagnosed with ovarian endometriomas confirmed through histopathological examination. The patients' ages ranged from 17 to 71 years, with an average age of 35.8 years. The majority of cases (94.28%) were identified in women of reproductive age, highlighting the prevalence of the condition during the active genital period [1,2].

Pelvic pain was the most common clinical presentation, reported in 62% of cases, followed by infertility, observed in 43% of the patients. These findings underscore the significant impact of endometriomas on patients' quality of life and reproductive health [3,4]. Emergency consultations were less frequent, with some patients presenting with acute abdominal pain and signs of peritoneal irritation [5,6].

Diagnostic approaches relied heavily on imaging. Preoperative ultrasound accurately identified endometriomas in 71.4% of cases, supported by pelvic MRI in atypical cases or when malignancy was suspected [7-9]. Elevated CA35 levels, exceeding 1000 UI/ml in severe cases, were noted in 70% of patients, but this marker alone was not sufficient for diagnosis due to its limited specificity [10,11].

Treatment primarily involved laparoscopic cystectomy, which was performed in 88.5% of cases [12,13]. Laparoscopic-to-open conversion occurred in 4.7% of cases, mainly in patients with extensive adhesions or multi-scarred abdomens [14]. Radical surgical approaches, such as oophorectomy or annexectomy, were reserved for select cases, particularly postmenopausal women or those with suspected malignancy [15,16].

Medical management played a key role in postoperative care. Hormonal therapies, including Dienogest and GnRH analogs, were utilized to manage symptoms and prevent recurrence [17,18]. However, challenges such as short treatment durations and variable adherence impacted outcomes [19]. Minimally invasive alternatives, like ethanol sclerotherapy, were explored for recurrent endometriomas or in preparation for assisted reproductive techniques like IVF [20,21].

Recurrence of endometriomas was observed in 20% of cases, emphasizing the importance of long-term, individualized management strategies [22,23]. Despite recurrence, fertility outcomes were promising. Among 18 patients undergoing treatment for infertility, five achieved pregnancies, three of which were spontaneous [24,25].

This study's strengths include its focus on a significant sample size and the seniorized, standardized management of endometriomas in accordance with recent international guidelines [26,27]. However, its monocentric and retrospective nature, along with a relatively short follow-up period and some missing data, were identified as limitations. These factors highlight the need for broader, multicentric studies to enrich the scientific understanding of endometriomas and their management.

Epidemiology

Endometriosis is a benign disease with a natural history driven by two key mechanisms: chronic neuroinflammation and hormone dependence. It often affects women over an extended period, sometimes lasting decades. As such, its prevalence is a more accurate measure than incidence [28]. Historically, endometriosis was considered rare due to limited diagnostic methods, like laparotomy. With the advent of laparoscopy, the reported prevalence has significantly increased among women presenting with pelvic pain and infertility [29].

According to the World Health Organization (WHO), endometriosis affects approximately 10% of women of reproductive age globally, translating to around 190 million people [30]. Prevalence rates vary across regions: 26% in Africa, 17% in Europe, and 19% in the Americas. These differences may stem from variations in etiological factors and diagnostic capabilities, necessitating further studies for preventive strategies.

Ovarian endometriomas are one of the major phenotypes of endometriosis, affecting 17–44% of patients and constituting 35% of all benign ovarian cysts [31,32]. In Tunisia, pelvic endometriosis prevalence ranges between 6.5% and 11.9% [33]. Studies have shown endometriomas comprise 31.5% to 69% of pelvic endometriosis cases and 11.8% to 17.7% of all ovarian tumors operated on during the same period. In this study, endometriomas accounted for 46.2% of pelvic endometriosis cases and 23.7% of ovarian tumors, aligning with literature data.

Age of Occurrence

In this study, the average age of patients was 35.8 years, with the highest prevalence between 31 and 40 years (43.8% of cases) [22]. These findings are consistent with Tunisian studies over the past decade and international literature, which places the peak incidence of endometriosis between 25 and 45 years [23].

Postmenopausal cases of endometriosis are less common, with prevalence estimates ranging from 2% to 5% [31,34]. However, endometriosis in adolescents, particularly those presenting with chronic pelvic pain, is increasingly recognized [32].

In our series, six patients (5.7%) were postmenopausal, including one aged 71 years. Three patients (2.6%) were under 20 years old, the youngest being 17. These figures may underestimate true prevalence, as many adolescents remain asymptomatic or do not seek medical attention [33,35].

Comorbidities

Endometriosis is associated with systemic inflammation and an increased risk of cardiovascular complications, autoimmune diseases, and psychiatric disorders. Elevated levels of CRP, homocysteine, fibrinogen, IL-17, and IL-33 contribute to a hypercoagulable state and inflammation [28,36]. Genetic overlap with cardiovascular diseases has also been suggested, with microRNAs implicated as potential biomarkers for endometriosis [29].

Autoimmune conditions like lupus, Sjögren's syndrome, rheumatoid arthritis, and thyroid diseases frequently co-occur with endometriosis [22,37]. Recent studies indicate a slightly elevated risk of breast and endometrial cancers among women with endometriosis [31,34]. These comorbidities necessitate personalized diagnostic and therapeutic approaches [32].

In this study, we observed cardiovascular diseases (e.g., hypertension and arrhythmias), allergic conditions (e.g., asthma and rhinitis), thyroid disorders, diabetes, anemia, chronic renal failure, breast cancer, and psychiatric conditions like anxiety and depression [17,18]. Recognizing and managing these comorbidities is critical for holistic patient care [19,20].

Diagnosis and Pre-Treatment Assessment

Ovarian endometriomas rarely occur in isolation. They are often markers of more extensive pelvic endometriosis. Managing an endometrioma requires considering potential coexisting lesions and their impacts on adjacent structures [21,30].

History Taking

A detailed history is crucial in diagnosing ovarian endometriomas. It should include an assessment of risk factors, presenting complaints, symptom severity, and the patient's expectations, particularly regarding fertility [23].

Risk Factors for Endometriosis

- 1. Hereditary Component:** Studies have shown that genetic predisposition contributes to 47% of endometriosis susceptibility. Women with a first-degree relative affected by endometriosis are at a significantly higher risk [24,38].
- 2. Congenital Uterine Anomalies:** Obstructive malformations, such as müllerian anomalies, are associated with a high prevalence of endometriosis (74.9% in some studies) [16,17].
- 3. Neonatal Characteristics:** Prematurity and low birth weight are linked to an increased risk of developing endometriosis later in life [18].
- 4. Menstrual Characteristics:** Early menarche, prolonged and heavy menstrual bleeding, and short cycles increase the risk of endometriosis [19,20].

5. Endocrine Disruptors: Exposure to substances like bisphenol A and phthalates is associated with endometriosis development [22,29].

Symptomatology

The classic symptoms of endometriosis, known as the “5 Ds,” include chronic pelvic pain, dysmenorrhea, deep dyspareunia, dyschezia, and dysuria [37]. Symptoms often correlate with lesion localization. Endometriomas, being highly innervated, are significant sources of pelvic pain. In this study, chronic pelvic pain was the most common complaint (62%), followed by infertility (17%). Dysmenorrhea was reported by 56% of patients, and dyspareunia by 36% [14,15].

Rare complications like ovarian torsion and rupture of endometriomas may present as acute abdomen. In this series, 12% of patients presented with acute pelvic pain, and four had ruptured endometriomas [16,17].

Physical Examination

Physical examination findings may include palpable adnexal masses, uterine retroversion with fixation, or tenderness in the posterior vaginal cul-de-sac. However, normal findings do not rule out endometriosis [39]. In this study, clinical examination revealed adnexal masses in only 11 patients [36].

Imaging

Ultrasound

Pelvic ultrasound is the first-line imaging modality for diagnosing ovarian endometriomas. A typical endometrioma appears as a unilocular cyst with homogeneous echogenicity (ground-glass appearance) and minimal Doppler flow [28]. In this study, 71% of cases were diagnosed preoperatively via ultrasound. However, atypical features like multilocular cysts and solid components may raise concerns about malignancy [21,30].

MRI

MRI is reserved for cases with inconclusive ultrasound findings or suspected malignancy. It can differentiate endometriomas from other ovarian cysts based on its ability to detect blood products. Hypersignal on T1 and shading on T2 sequences are characteristic findings [37,40].

Laboratory Investigations

The CA35 marker is nonspecific but may aid in disease monitoring [38]. Elevated levels (>35 U/mL) were found in 70% of patients in this study, with three cases exceeding 1,000 U/mL [26]. Research into biomarkers like microRNAs and advanced genetic tools is ongoing [17,18].

Treatment of Ovarian Endometriomas

Managing ovarian endometriomas requires a tailored approach that considers the patient's symptoms, reproductive desires, and the extent of the disease. Treatment options include medical therapy, surgical intervention, or a combination of both. Non-invasive approaches such as ethanol sclerotherapy (EST) and expectant management may also be considered in specific scenarios [28,36].

Medical Treatment

Medical therapy focuses on reducing pain and controlling disease progression by suppressing ovulation and inducing

hypoestrogenism [11,22].

Analgesics

Non-opioid analgesics like paracetamol are commonly used for chronic pelvic pain or dysmenorrhea, but evidence supporting their efficacy in endometriosis is limited [23]. Nonsteroidal anti-inflammatory drugs (NSAIDs) have shown some effectiveness, but recent studies indicate inconclusive results regarding their superiority over placebos [38,40]. Neuromodulators, such as tricyclic antidepressants and serotonin reuptake inhibitors, may be helpful in managing chronic pain [32].

Hormonal Therapy

Hormonal treatments aim to suppress ovulation and create a hypoestrogenic state to control symptoms. Options include:

- **Combined Oral Contraceptives (COCs):** Effective in reducing dysmenorrhea and pelvic pain, with some studies showing a reduction in endometrioma size [27,35].
- **Progestins:** Dienogest is particularly effective in reducing pain and endometrioma size, with studies reporting significant size reductions after six months of therapy [19,10].
- **Gonadotropin-Releasing Hormone Agonists (GnRH-a):** Used as second-line therapy, often in combination with add-back therapy to minimize hypoestrogenic side effects [10,12].
- **Post-Surgical Hormonal Therapy:** Shown to reduce recurrence rates and improve outcomes [13,14].

In this study, 61% of patients received postoperative hormonal therapy, with varying results. The short duration of treatment (mean 4.8 months) may have influenced these outcomes [15].

Menopausal Hormonal Therapy (MHT)

Limited evidence exists regarding the use of MHT in menopausal women with a history of endometriosis. However, combined estrogen-progestin therapies are preferred to minimize the risk of malignant transformation [16].

Emerging Therapies

Novel treatments under investigation include GnRH antagonists (elagolix, linzagolix), angiogenesis inhibitors, and natural compounds like resveratrol and curcumin. Further research is needed to establish their safety and efficacy [11,18].

Surgical Treatment

Surgery remains a cornerstone in managing ovarian endometriomas, particularly for symptomatic relief, infertility, or suspected malignancy. The choice of surgical technique depends on the patient's age, symptoms, and fertility plans [19,20].

Surgical Approach

- **Laparoscopy:** The preferred approach due to its minimally invasive nature, associated with lower postoperative pain, shorter recovery times, and better cosmetic outcomes [20,24].
- **Laparotomy:** Reserved for cases with large cysts, dense adhesions, or suspected malignancy [14,25].
- **Laparoconversion:** Occurs in 4.7% of cases in this study, primarily due to extensive adhesions or prior surgeries [25].

Techniques

1. Cystectomy (Stripping Technique):

- o The gold standard for treating endometriomas, involving the complete removal of the cyst wall to minimize recurrence.
- o Requires meticulous technique to preserve ovarian tissue and function. In this study, stripping was performed in most cases.
- o Risks include damage to the ovarian reserve, particularly with excessive use of coagulation.

2. Ablative Techniques:

- o Include laser vaporization or coagulation of the cyst wall. These are less damaging to ovarian tissue but associated with higher recurrence rates compared to cystectomy.

3. Three-Step Approach:

- o Involves drainage and biopsy, followed by hormonal therapy (e.g., GnRH-a) for 3 months, and subsequent re-evaluation and ablation. This approach minimizes ovarian damage and preserves fertility.

4. Radical Surgery:

- o Includes oophorectomy or salpingo-oophorectomy, considered for postmenopausal women, suspected malignancy, or extensive disease.

Surgical Complications

Intraoperative complications occurred in 1.9% of cases in this study, including bowel injuries. Proper expertise and adherence to best practices are crucial to minimize risks [14,25]. Complications like bowel injury, although rare, underline the necessity for experienced surgical teams and adherence to minimally invasive surgical protocols to ensure patient safety and successful outcomes [25].

Non-Surgical Approaches

Ethanol Sclerotherapy (EST)

Ethanol sclerotherapy (EST) involves draining the endometrioma and instilling ethanol to sclerose the cyst wall. It is a promising alternative for recurrent endometriomas, particularly in infertile women planning assisted reproductive techniques. Benefits include minimal invasiveness, low recurrence rates, and preservation of ovarian reserve [17,24].

In this study, EST was used in nine patients, primarily before assisted reproduction, with no reported complications. This aligns with findings from similar studies that report minimal adverse effects and successful outcomes following EST [18,40].

Expectant Management

Expectant management is appropriate for asymptomatic women with small endometriomas (<3 cm). Patients should be informed about potential risks, including rupture or malignancy, and monitored closely through regular imaging and clinical follow-up [41,42].

Recurrence, Fertility, and Prognosis of Ovarian Endometriomas

Recurrence of Endometriomas

The recurrence of ovarian endometriomas remains a significant challenge in their management, with rates varying based on treatment type, patient characteristics, and follow-up duration [14,43].

Recurrence Rates

- The recurrence rate of endometriomas after surgical treatment is estimated at 21.5% at two years and up to 40-50% at five years [40,44].
- Recurrences are often not confined to the original side, with similar rates of ipsilateral and contralateral recurrence [38].
- In this study, the recurrence rate was 20%, with a single case occurring after radical treatment. Variability in recurrence rates is evident across Tunisian studies, ranging from 5% to 20% [38,43].

Risk Factors for Recurrence

Factors contributing to recurrence include:

- **Younger age at the time of surgery** [14].
- **Advanced disease stage** (e.g., stage IV endometriosis) [17].
- **Adhesions and deep pelvic involvement** [18].
- **Suboptimal surgical techniques**, particularly in preserving ovarian tissue [19].

Management of Recurrence

Surgical reintervention for recurrent endometriomas is controversial due to its detrimental effects on ovarian reserve. Studies have shown:

- Second surgeries lead to greater reductions in anti-Müllerian hormone (AMH) levels and fewer antral follicles [15,16].
- Pregnancy rates decrease significantly following repeat surgeries, even with assisted reproduction [18].

Non-surgical options like ethanol sclerotherapy (EST) or hormonal therapy (e.g., dienogest) are preferred for recurrent cases, depending on the patient's symptoms and reproductive plans [18,20].

Fertility and Endometriomas

Endometriomas are often associated with infertility, and their management in this context requires a nuanced approach [20,19]. Several factors need to be considered, including ovarian reserve, the size and location of the cyst, and the patient's reproductive goals.

Should Endometriomas Be Surgically Removed?

The decision to surgically remove endometriomas in infertile patients depends on a delicate balance between potential benefits and risks. Current evidence suggests:

- Surgical removal of endometriomas does not significantly improve outcomes for assisted reproductive techniques (ART) such as in vitro fertilization (IVF) [18,19].
- Surgery may delay conception and negatively impact ovarian reserve by reducing the number of viable follicles [15].

The CNGOF-HAS 2017 guidelines recommend the following:

- Avoid routine surgical removal of endometriomas before ART unless there are symptoms, concerns about malignancy, or interference with ovarian access during ART [15,13].
- Favor ART over surgery for asymptomatic infertile women [23,39].

Fertility Preservation

Fertility preservation is critical for women with endometriomas, particularly in the following scenarios:

- Recurrent endometriomas [13,14].

- Bilateral ovarian involvement [15].
- Large endometriomas (>5 cm) [15].
- Before repeat surgeries, as these can further deplete ovarian reserve [12,13].

Options for fertility preservation include oocyte or embryo cryopreservation, which should be discussed with patients as part of a comprehensive care plan [11,14].

Prognosis and Long-Term Considerations

Risk of Malignancy

Although endometriosis is considered a benign condition, ovarian endometriomas carry a slight risk of malignant transformation. Endometriosis-associated ovarian cancer (EAOC) predominantly includes clear cell and endometrioid carcinomas [15].

- The lifetime risk of developing EAOC is approximately 1.8%, compared to 1.3% in the general population [13,14].
- Regular monitoring and appropriate interventions are essential, particularly in patients with complex or recurrent cases [16,20].

Quality of Life and Psychosocial Impact

Endometriomas significantly impact the quality of life of affected patients due to:

- **Chronic pain**, which is often refractory to conventional analgesics [15].
- **Infertility**, which can cause emotional distress and impact social relationships [12].
- **Psychosocial effects**, such as fatigue, anxiety, and depression, which are frequently reported among women with endometriosis [20,19].

Comprehensive care plans should include psychological support and counseling to address these concerns [21,24].

Recommendations for Management

Based on recent guidelines (CNGOF-HAS 2017, ESHRE 2022), the following strategies are recommended:

1. **For Symptomatic Endometriomas:**
 - o Laparoscopic cystectomy is preferred for cysts larger than 3 cm, provided that the surgical technique carefully preserves ovarian function [38,40].
 - o Hormonal therapy, such as dienogest or combined oral contraceptives (COCs), is recommended for pain management and to reduce recurrence rates [42,44].
2. **For Infertility:**
 - o ART, such as IVF, should be prioritized over surgery for asymptomatic endometriomas [35].
 - o Fertility preservation options, such as oocyte or embryo cryopreservation, should be discussed with all patients at risk of reduced ovarian reserve [28,35].
3. **For Asymptomatic Endometriomas:**
 - o Expectant management is appropriate for small cysts (<3 cm), provided that regular monitoring is performed to detect potential complications like rupture or malignancy [15,18].
4. **For Recurrent Endometriomas:**
 - o Repeat surgery should be avoided unless there are refractory symptoms or complications, as repeated surgeries have a cumulative impact on ovarian reserve [20,21].
 - o Non-invasive options, such as ethanol sclerotherapy (EST)

or hormonal therapy, are preferred for managing recurrence [22,23].

5. During Pregnancy:

- o Multidisciplinary management is critical to address risks such as cyst rupture or infection [30,37].
- o Surgical intervention should be reserved for emergencies [37,40].

6. Patient Education:

- o Educate patients about the nature of endometriomas, treatment options, and potential complications [43].
- o Offer psychological support to help patients manage the emotional burden of the disease [38].

Conclusion

Endometriosis, a chronic, inflammatory, and hormone-dependent disease, affects approximately 10% of women of reproductive age. Ovarian endometriomas, a frequent manifestation, significantly impact patients medically, socially, and economically. Accurate and early diagnosis is essential to establish an optimal therapeutic strategy that balances conservative management with minimizing disease recurrence.

This retrospective, monocentric study conducted over five years included 11 women with histologically confirmed ovarian endometriomas. The prevalence of endometriomas among ovarian tumors and genital endometriosis was 23.7% and 46.2%, respectively, aligning with the literature. The patients' mean age was 35.8 years, with a wide age range (17–71 years), predominantly affecting women of reproductive age. Common symptoms included chronic pelvic pain (62%) and infertility (32.3%). Acute complications, such as torsion and rupture, were observed in 12% of cases.

Pelvic ultrasound was the primary diagnostic tool, confirming endometriomas in 71% of cases, complemented by pelvic MRI in atypical presentations. Laparoscopic surgery was the first-line treatment in 93 patients, with a low complication rate (1.9%) and radical surgery reserved for select cases. Postoperative hormonal therapy, including Dienogest, showed promise in reducing pain and recurrence, although adherence and efficacy varied.

Disease recurrence occurred in 21 patients (20%), often within 16 months, emphasizing the need for individualized, multidisciplinary management to minimize repeated surgeries and preserve ovarian reserve. Fertility outcomes were encouraging, with spontaneous and assisted pregnancies achieved in some cases.

To improve outcomes, it is crucial to establish specialized endometriosis units within Tunisian reference centers, enabling multidisciplinary expertise to mitigate the disease's impact on women's quality of life and fertility. A tailored, codified approach should focus on pain alleviation, infertility resolution, recurrence prevention, and safeguarding ovarian reserve.

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