



Review

Is Chronic Pelvic Inflammatory Disease an Exclusively Medical Gynecological Disease, or It May Be a Surgical Challenge?

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Abstract: Pelvic inflammatory disease is an infectious condition affecting women’s upper genital tract, including the uterus, fallopian tubes, and ovaries. It primarily arises from an infection that spreads upward from the lower genital area. The relationship between chronic pelvic pain and coexisting conditions is a key focus in its diagnosis and treatment. This type of pain is also considered a form of reflex dystrophy, involving both neurological and psychological components, the first line treatment consists in antibiotherapy. For patients with complex or severe pelvic abscesses, surgical intervention may be considered in selected cases. The primary surgical techniques employed are open and laparoscopic surgery, both aimed for abscess removal. MRI or Doppler ultrasonography may be employed when there is a suspicion of adnexal torsion, adenomyosis or deep pelvic endometriosis, especially if the ultrasound results are unclear or inconclusive. Laparoscopic surgery has increasingly become favored by both healthcare professionals and patients. Moreover, laparoscopy has emerged as the most valuable tool for diagnosing chronic pelvic pain. The approach to treating pelvic abscesses in women of reproductive age depends greatly on clinical assessments, individual patient factors, and the desire to preserve fertility. However, laparoscopy may present technical difficulties in patients with severe pelvic abscesses, particularly those with extensive adhesions or a closed-off pelvic area, requiring advanced surgical expertise. Women with associated conditions such as endometriosis often experience a more severe form of pelvic inflammatory disease, which is less responsive to antibiotics and more frequently requires surgical resolution. The surgical treatment should be performed individualized to the clinical condition of the patient and the time of intervention must be carefully chosen.

Keywords: pelvic inflammatory disease; infection; open surgery; laparoscopic surgery; abscesses; fertility



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1. Introduction

Pelvic inflammatory disease (PID) represent the infectious condition of the female upper genital tract, which can result in pathologies such as endometritis, salpingitis, oophoritis, pelvic peritonitis, and perihepatitis. *Staphylococcus aureus*, *Streptococcus*, *Mycoplasma*, *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, but also various viruses may be responsible for the development of PID [1–3]. If the acute disease is not treated in time, it may progress into a pelvic abscess as the condition worsens. This abscess represents a more severe condition within gynecological diseases and includes manifestations such as ovarian abscess, fallopian tube abscess, fallopian tube-ovarian abscess or abscesses resulting from acute peritonitis and inflammation of the pelvic connective tissue [4]. Pelvic abscesses

are among the most severe infections in the reproductive tract, typically presenting as acute/subacute/chronic or recurrent infections of the pelvic organs [1,5]. Clinically, pelvic abscesses exhibit a wide array of symptoms, including recurrent lower abdominal pain, loss of appetite, fever and tender abdominal masses. Some patients may experience a sensation of anal pressure, and there are instances of clinically undetected cases, posing a significant threat to women's health.

2. Predictors of Disease Recurrence

Symptoms and signs commonly observed in acute PID such as pelvic pain, endometritis or confirmed infections are not reliable indicators of the development of chronic sequelae [6]. Additionally, even if the acute infection is clinically or microbiologically resolved, this does not eliminate the possibility of future long-term complications like chronic pain, ectopic pregnancies or infertility. As a result, healthcare providers should be cautious in assuming that a patient fully recovering from PID is free from the risk of experiencing long-term complications. Moreover, individuals who have had PID previously face a higher likelihood of recurrence. Data from a secondary examination involving more than 800 individuals with mild to moderate PID participating in the PEACH randomized trial indicated recurrence rates of 15 percent at 35 months and 21 percent at 84 months. Adolescents were found to be 50 percent more prone to a recurrence compared to adults, and also experienced quicker recurrence times [7].

3. Tubal Damage

PID can result in irreversible damage to the fallopian tube, particularly the endosalpinx. Modifications in the fallopian tube, such as the cessation of ciliary motion, fibrosis, and blockage can cause hydrosalpinx, tubal infertility, and ectopic pregnancy [8].

Patients with PID may develop hydrosalpinx, a postinflammatory condition where the damaged fallopian tube may become obstructed, fill with sterile fluid, and enlarge. Even when PID has resolved, the hydrosalpinx can persist. Previous surgical damage or adhesions to the fallopian tube can also lead to hydrosalpinx. Hydrosalpinx can be associated with pain or it might be asymptomatic; some patients who do not show symptoms may present with tubal factor infertility. In the context of in vitro fertilization (IVF), hydrosalpinx can adversely affect pregnancy rates, implantation, early pregnancy loss, preterm birth, and live delivery outcomes [8,9]. Therefore, salpingectomy, involving the removal of the hydrosalpinx, is often recommended before IVF to enhance these outcomes.

4. Ectopic Pregnancy

Tubal damage from PID raises the risk of a tubal pregnancy. Additionally, the increased expression of certain implantation-related proteins may contribute to this pathophysiology [10].

According to a prospective study, those with laparoscopically-confirmed PID have a higher incidence of ectopic pregnancy in their first pregnancy following laparoscopy compared to those with normal laparoscopic results (7.8 vs. 1.3 percent) [11]. The chance for an ectopic pregnancy also grows with the number and severity of PID episodes. For patients with one, two, or three episodes of PID, the ratios of ectopic to intrauterine pregnancies were 1:15, 1:6, and 1:3. Furthermore, in cases of a single episode of mild, moderate, or severe PID, the ratios were 1:35, 1:25, and 1:5.

5. Infertility

Both symptomatic and asymptomatic PID can result in permanent damage to the fallopian tube, particularly the endosalpinx. Alterations in the fallopian tube such as loss of ciliary action, fibrosis, and occlusion can cause tubal infertility [12]. Additionally, there may be other mechanisms contributing to infertility.

According to a prospective study involving 1760 Swedish patients suspected of having PID who underwent diagnostic laparoscopy and desired pregnancy, a higher percentage

of those with laparoscopically-confirmed PID (group 1) failed to conceive compared to those with normal laparoscopic findings (group 2) (16 versus 2.7 percent); this follow-up extended up to 25 years [11]. Tubal factor was responsible for 68 percent of the infertility cases diagnosed; none of the patients in group 2 had tubal factor infertility.

Subclinical PID, characterized as histologic endometritis without symptoms of acute PID, also seems to impair subsequent fertility, even in patients treated for chlamydia, gonorrhea, and bacterial vaginosis [13]. Conversely, treating cervicitis without endometritis does not appear to affect fertility similarly.

Among the pathogens causing PID, *Chlamydia trachomatis* is notably linked with a higher risk of infertility. Roughly one in four women dealing with tubal factor infertility at an infertility clinic possesses serum antibodies against *C. trachomatis* [14], and there is an inverse correlation between the serum titers of *C. trachomatis* antibodies and pregnancy rates [14,15]. A particular study highlighted that pregnancy rates for women with the highest and lowest antibody titers were 59% and 73%, respectively, seven years after infection [16]. These findings indicate that infertility following PID could stem, in part, from the body's immune response to chlamydial infection, where a high antibody titer may indicate a more intense inflammatory response.

One study revealed that women with PID who delayed seeking treatment for three or more days had a threefold higher likelihood of being diagnosed with infertility compared to those who sought treatment promptly [17]. According to another study, it was found that despite timely intervention, long-term consequences like infertility, ectopic pregnancy or chronic pelvic pain often ensue. These outcomes are believed to be a result of scarring and adhesion formation that occur as the infection-damaged tissues heal [18].

Regarding the frequency of PID episodes, data from a review indicated that the pregnancy rates after one, two or more episodes of PID were 89, 77 and 46% [19]. Furthermore, the severity of the infection impacts reproductive outcomes: a more severe PID being equivalent with a lower rate of live birth [20].

6. Dysmenorrhea and Differential Diagnosis

Dysmenorrhea is frequently described as an unavoidable aspect of menstruation. Consequently, when discussing this painful symptom with adolescents and their parents, it tends to be significantly underestimated and considered a normal condition [21].

In cases of primary dysmenorrhea, the physical examination generally reveals no significant abnormalities. During the pelvic exam, the uterus is typically found to be of normal size, mobile and non-tender. Common findings in primary dysmenorrhea include the absence of abnormal vaginal discharge and adnexal masses [22].

In contrast, signs that may suggest secondary dysmenorrhea include: older age, presence of vaginal discharge that is whitish-gray (could signal PID), a friable cervix, (might indicate a STI), additional symptoms (such as vaginismus, dysuria, dyspareunia, dyschezia, infertility) [23], heavy menstrual bleeding with an increase in the size of the uterus (potentially suggesting adenomyosis), abnormal bleeding accompanied by an enlarged, asymmetrical uterus (may be indicative of leiomyomas), evidence of obstructive anatomical abnormalities (may suggest a Müllerian anomaly), identification of pelvic masses such as neoplasms, endometriomas or cysts on the ovaries [24].

A pelvic examination is crucial for evaluating dysmenorrhea, particularly when secondary dysmenorrhea is suspected [25]. This examination is vital for diagnosing underlying conditions and directing appropriate management. On the other hand, for an adolescent who is not sexually active and exhibits typical symptoms of primary dysmenorrhea, a pelvic examination is generally not necessary [26]. This approach helps avoid unnecessary procedures and focuses diagnostic efforts on cases where further investigation is needed, thereby ensuring that resources are appropriately allocated to patients with potentially more complex or serious conditions. Moreover, ultrasound is considered to be highly effective for identifying the causes of secondary dysmenorrhea [25–27].

Patients who are considered at risk for PID or in cases where sexually transmitted infections are suspected, may need to undergo endocervical/vaginal swabs. These diagnostic tests are crucial for detecting infections and assessing the presence of PID, providing important information for accurate diagnosis and appropriate treatment [25,27].

MRI or Doppler ultrasonography may be employed when there is a suspicion of adnexal torsion, adenomyosis or deep pelvic endometriosis, especially if the ultrasound results are unclear or inconclusive [25]. MRI is particularly valuable for diagnosing Müllerian anomalies due to its detailed imaging capabilities, but is generally reserved for cases where initial imaging does not provide sufficient information.

For patients suspected of having endometriosis who wish to preserve their fertility, laparoscopy is considered to be useful.

7. Chronic Pelvic Pain and Possible Concomitant Pathologies with PID

Up to one-third of patients with PID develop chronic pelvic pain, which is defined as pain lasting at least six months, occurring below the umbilicus, and severe enough to impair daily functioning [28,29]. Although the exact cause remains unclear, it is suggested that the pain arises from scarring and adhesions formed due to inflammation related to the infection.

Research utilizing data from the PID evaluation and randomized trial identified recurrent PID as the most significant risk factor for developing chronic pelvic pain, with an odds ratio of 2.84 [28]. Other factors influencing this outcome include smoking (odds ratio of 1.65) and a lower mental health score (odds ratio of 2.71). A follow-up study revealed that patients with recurrent PID were more than four times as likely to experience chronic pelvic pain compared to those without recurrence (odds ratio of 4.2) [29].

Chronic pelvic pain is a debilitating and persistent condition localized within the pelvis, affecting a significant number of women. It is often characterized by a lowered pain threshold due to prolonged pain exposure, making even minor stimuli feel painful. This type of pain, known as centralized pain, frequently stems from or is exacerbated by past physical or emotional trauma.

The management of chronic pelvic pain is particularly challenging due to the scarcity of evidence-based treatment options. Typically, treatment focuses on identifying and addressing the underlying causes.

Chronic pelvic pain is estimated to affect between 4 and 16 percent of women [30], highlighting the need for clinicians to maintain a high index of suspicion when evaluating persistent pelvic discomfort. Effective management usually requires a multidisciplinary approach, integrating various healthcare professionals to ensure comprehensive care and effective pain relief. Treatment options may include non-invasive methods such as cognitive behavioral therapy or hormone replacement therapy, but some cases may necessitate more invasive interventions like total hysterectomy.

The relationship between chronic pelvic pain and coexisting conditions is a key focus in its diagnosis and treatment [31]. This type of pain is also considered a form of reflex dystrophy, involving both neurological and psychological components [32,33].

The most frequently encountered causes of chronic pelvic pain are irritable bowel syndrome, interstitial cystitis, chronic uterine pain disorders, peripheral neuropathy and musculoskeletal pelvic floor pain. These etiologies are commonly identified in patients with persistent pelvic discomfort and should be thoroughly evaluated during the diagnostic assessment to guide appropriate management and treatment strategies. Other pathologies include gynecological diseases (endometriosis, pelvic inflammatory disease, leiomyoma, adenomyosis, hydrosalpinx), gastroenterological diseases (inflammatory bowel disease, celiac disease, hernias), neurological diseases (ilioinguinal or iliohypogastric nerve entrapment, spinal cord injury), musculoskeletal disease (fibromyalgia, piriformis syndrome, coccygodynia) and urological diseases (recurrent cystitis, chronic urolithiasis, bladder cancer).

It is important to note that deep infiltrating endometriosis (DIE) is recognized as the most aggressive form of endometriosis. This type of endometriosis can invade deeply into

the pelvic tissues, affecting the entire pelvic cavity. It can lead to extensive anatomical distortions and functional impairments of essential organs, such as the bladder, bowel, and reproductive organs. The extensive involvement and disruption caused by DIE often results in a profound and debilitating impact on the patient's quality of life, manifesting as severe pain, reduced functional capacity, and significant emotional distress. The diagnosis of DIE relies on clinical and physical examinations, imaging, and, if necessary a biopsy of the lesions. Additionally, it is well known that patients with endometriosis have an elevated risk of developing PID [34] and are also more likely to experience concurrent bowel involvement, with prevalence rates varying between 2 and 46% [35]. There is also an association between PID and ovarian malignancy, as antibodies produced in response to an infection with *Chlamydia trachomatis* are known to double the risk of developing ovarian cancer [36].

Even more, PID has been linked to painful bladder syndrome. According to a study investigating the association between painful bladder syndrome and PID, patients diagnosed with bladder pain syndrome/interstitial cystitis were significantly more likely to have a history of PID (41.7% in study group compared to 15.4% in control group) [37].

As stated in the beginning of this review, it has been found that PID is associated with an increased risk of developing hydrosalpinx [8].

8. The Role of Noninvasive Techniques

Ultrasonography is commonly used as a imaging modality for diagnosing suspected PID, particularly when the clinical findings are unclear. It plays a critical role in identifying complications of PID, which can influence the choice between surgical and medical treatment approaches. Ultrasonography is a noninvasive technique characterised by a high accessibility. This method's ability to provide immediate and detailed insights into the patient's condition makes it an essential tool in the diagnostic and management process for PID [38–40].

Ultrasonography is usually preferred over CT scanning as the first-line imaging tool for assessing adolescents with pelvic pain, primarily due to the risk of radiation. Transvaginal sonography provides detailed images of the uterus and adnexa. In contrast, transabdominal sonography offers a broader view of the pelvic region. The choice of whether to conduct transabdominal or transvaginal sonography first and whether an additional examination is necessary to obtain a final diagnosis is determined by the specific clinical imaging practices and protocols [39,41,42].

MRI is a valuable imaging technique when ultrasonographic results are unclear [43,44]. In cases of acute PID, MRI can identify (with a higher sensitivity and specificity) conditions such as endometritis, salpingitis and cervicitis.

Sometimes a CT scanning may be used to evaluate nonspecific pelvic pain, with PID being identified incidentally. While CT scanning is very sensitive and effective at detecting various pelvic abnormalities, it may not be as precise as ecography when it comes to distinguishing between tubal and ovarian pathologies. Therefore, if the diagnosis of PID remains uncertain, it is recommended to confirm the findings with ultrasonography to ensure accurate diagnosis and appropriate management [40,45].

Ultrasound aspiration or CT-guided aspiration may be conducted for pelvic abscesses or tubo-ovarian abscesses. One benefit of image-guided drainage compared to surgery is the preservation of the ovaries [46].

9. Treatment

Early and prompt initiation of treatment should be based on clinical suspicion [47,48]. Hospitalization is indicated for patients with conditions such as pregnancy, failure of outpatient management or PID complicated by a pelvic abscess.

For inpatient management, empirical treatment for PID includes:

- (a) Cefotetan IV combined with doxycycline orally, or
- (b) Cefoxitin IV with doxycycline orally, or

- (c) Clindamycin IV in combination with gentamicin IV
For outpatient management, the therapeutic options are:
 - (a) Doxycycline orally combined with ceftriaxone IM, or
 - (b) Cefoxitin IM with probenecid orally, or
 - (c) Another parenteral third-generation cephalosporin.

Additionally, if there is a concern about trichomonas infection or if recent vaginal instrumentation has occurred, metronidazole should be added to the treatment regimen.

Surgical intervention should be carefully weighed and limited to particular scenarios to ensure that fertility and hormonal function are preserved (especially in adolescents). For example, in endometriosis the goals of surgical intervention include eliminating visible signs of the disease, restoring anatomical integrity, supporting future pregnancy and improving the quality of life [49]. Pelvic pain in adolescents can be surgically treated similarly to adults. However, it tends to have a higher rate of recurrence in adolescents compared to premenopausal women, possibly due to higher levels of plasma estrogen or a more aggressive form of the disease [50]. Moreover, predictors for disease recurrence remain unidentified. All adolescents should receive postoperative hormonal therapy given the fact that it can prevent endometrioma recurrence and may also reduce the need for repeat surgeries (that could lead to damaging healthy tissue and diminishing ovarian reserve) [49,51]. Despite the limited effectiveness of medical treatments, surgery may be considered for women with significant painful symptoms or DIE for improving the quality of life or restoring the anatomy [52]. However, surgical interventions can lead to some side effects, including fibrotic tissues, adhesions or residual disease following deep infiltrating endometriosis resection [53].

10. Surgical Interventions

It is crucial to diagnose and treat PID promptly to minimize the risk of both immediate and long-term complications. Currently, the treatment for pelvic abscess primarily involves conservative drug therapies, with a focus on selecting antibiotics that cover a broad spectrum and specifically target the pathogens associated with PID [54]. Nonetheless, repeated use of antibiotics can often result in drug resistance and an imbalance of the body's natural flora in patients [2,55].

Patients with complex or severe pelvic abscesses are recommended to undergo surgical therapy to fully eradicate the lesions. Surgical intervention is indicated in the following scenarios [56]: (1) when medical therapy is ineffective, the abscess mass is chronic, or there is increasing growth; (2) if there is an occurrence or suspicion of an abscess rupture; and (3) if peritonitis and the possibility of toxic shock exist.

The primary surgical options available are open surgery and laparoscopic surgery, both of them being used to remove the abscess lesion. Since the first laparoscopic hysterectomy was performed by Reich H. in 1989, there have been significant advancements in laparoscopic techniques in gynecology. Consequently, laparoscopic surgery has gained increased popularity among both physicians and patients [57]. Recent years have seen an increase in the detection rate of PID due to improved health awareness among people and advancements in diagnostic technologies [47].

Laparoscopy, a minimally invasive surgical method utilized for both diagnostic and therapeutic purposes, has become the most useful diagnostic instrument for identifying chronic pelvic pain (CPP) [58]. In the last 30 years, the application of laparoscopy for CPP has escalated from 17% to 40%. Additionally, it represents 20% of hysterectomies conducted for benign conditions [59]. While certain studies suggest that laparoscopy positively influences the psychological aspects of CPP [60], other research points out that it neither impacts pain symptoms nor quality of life in the long term, with over half of the women suffering from CPP continuing to use pain relievers and experiencing a diminished quality of life [59,61].

11. The Indications for Laparoscopy and Laparotomy

Although there is a growing interest in noninvasive techniques, laparoscopy performed under general anesthesia continues to be crucial in the study of chronic pelvic pain. Nonetheless, an essential aspect remains who performs the laparoscopy, and the details must be meticulously documented. Surgeons tasked with conducting laparoscopies for CPP should possess the capability to efficiently complete the procedure within a reasonable timeframe and meet high standards, particularly in cases involving conditions like endometriosis, adhesions, ovarian cysts, and hydrosalpinx. The growing number of physicians skilled in advanced laparoscopic surgery could allow broader use of minimally invasive techniques for treating PID, including procedures like abscess debridement or washout. However, the efficacy of laparoscopy in women with severe PID is limited, with findings about its usefulness derived only from small-scale studies [62].

Laparoscopic surgery may offer clinical benefits compared to laparotomy for women with moderate to severe PID who require a surgical approach. According to Shigemi et al. [63], patients who underwent laparoscopy experienced fewer blood transfusions, shorter operation times (median 5 days in laparoscopy group, median 7 days in laparotomy group), and reduced postoperative hospital stays. On the other hand, no meaningful differences were observed in the rates of surgical complications, revision surgeries or in-hospital mortality. It was also reported by X. Jiang et al. that laparoscopic surgery is associated with less damage and tiny incisions in comparison with laparotomy [3]. Moreover, while bowel injury and wound infection were significant sources of complications in both groups, bowel injury was more frequently observed after laparotomy [63]. Intestinal obstructions were also more frequent after this approach. The comparison of urinary tract injury rates between the two groups showed no statistically significant difference. [64].

A proactive treatment strategy involving both drainage and intravenous antibiotics is considered the most effective way to prevent long-term complications related to tubo-ovarian abscesses (TOA). A prospective cohort study highlighted that C-reactive protein (CRP) is an inflammatory marker characterized by a high sensitivity and specificity for predicting tubo-ovarian abscesses in patients with complicated PID, and its levels significantly correlate with the rate of success of conservative management [65]. According to To et al. [66], women who received only antibiotics were more likely to need additional surgical interventions compared to those who also underwent image-guided drainage. In their research, the choice of treatment was not influenced by whether the abscess was bilateral. Long-term follow-up data showed no significant differences between the groups in terms of residual pain, pregnancy outcomes, or infertility rates.

A retrospective study conducted in Turkey on women with TOA reported that 26% of those who underwent surgery required either a subtotal or total hysterectomy [67], a rate that aligns with findings of Shigemi et al. [63]. Historically, to completely remove all infected tissue, procedures like total abdominal hysterectomy and bilateral salpingo-oophorectomy were performed [13,68]. Research indicates that less invasive surgical approaches have led to 10–20% of patients requiring subsequent revision surgery [69]. In the study conducted by Shigemi et al. [63], the rate of patients needing revision surgery was low following both open and laparoscopic procedures. This improvement may be attributed to recent advancements in treatment approaches, such as the initial use of broad-spectrum antibiotics, innovations in surgical techniques and equipment, and enhanced perioperative care.

The management of pelvic abscesses in reproductive-aged women is greatly influenced by clinical presentation, individual patient factors, and the goal of preserving fertility. Although there are published guidelines on PID and tubo-ovarian abscess from various medical societies, they do not provide definitive recommendations or a uniform approach to surgical treatment [70]. Traditionally, many surgeons opted for the laparotomic approach, but laparoscopic surgery has been recognized as a safe and effective alternative. Some guidelines suggest that laparoscopy can facilitate early disease resolution by separating adhesions and draining abscesses [71]. The widespread adoption of endoscopic surgery has brought several benefits, including shorter hospital stays, cosmetically favorable incisions,

and reduced rates of surgical site infections compared to open surgery. Furthermore, laparoscopy allows for direct visualization, which enhances diagnostic accuracy. However, laparoscopic surgery can pose technical challenges in some patients with pelvic abscess, especially those with severe adhesions and an obliterated pelvic cavity, necessitating high levels of surgical skill and experience. The average duration of hospital stay was longer in the drainage group compared to the antibiotic-only group (13 days vs. 7 days). Factors such as the size of the abscess, the patient's age, white blood cell count and serum CRP levels have been identified as significant predictors of inadequate response to antibiotics in various studies.

Numerous studies have shown that image-guided drainage, either alone or combined with intracavitary antibiotic irrigation, yields high success rates in symptom resolution without the need for further interventions [72,73]. A systematic review involving 975 patients showed that image-guided drainage of tubo-ovarian abscesses achieved the highest success rates with fewer complications and shorter hospital stays compared to those undergoing laparoscopy [74]. On the other hand, other research indicates shorter hospital stays associated with laparoscopy as opposed to image-guided drainage. However, there is considerable variability in success rates, complication rates, and hospitalization durations across different studies, and these outcomes are not consistently reported.

Morbidity rates associated with the surgical management of TOA have been reported to range from 0.8 to 57% [1]. Carlson et al. [1] found that nearly half of the patients initially managed conservatively required subsequent laparoscopic exploration. Notably, early surgical intervention has been shown to offer significant advantages over delayed surgery, including shorter hospital stays, faster resolution of fever and reduced blood loss [75]. By carefully evaluating risk factors and recognizing patients who are unlikely to respond to initial medical treatment, timely surgical intervention can be facilitated. This approach often results in less complex surgeries and reduced morbidity rates.

Tubo-ovarian abscess may develop after oocyte retrieval, often due to direct inoculation of vaginal microorganisms, pre-existing pelvic inflammatory disease or an inadvertent needle puncture of the bowel [76,77]. The prevalence of endometrioma-related pelvic abscess has increased among patients undergoing IVF, particularly following oocyte retrieval. A retrospective study showed that PID in women with endometriosis tends to be more severe, resistant to antibiotics, and more likely to necessitate surgical intervention [77]. Fouks Y et al. found that women with TOA following fertility treatments exhibited more severe clinical symptoms and a more complicated clinical course compared to those with TOA unrelated to fertility treatments [78]. These patients also had higher rates of surgical intervention, conversions to laparotomy and complications. While specific data on the effects of pelvic inflammation on fertility treatment outcomes are limited, clinical pregnancy rates are significantly reduced when a TOA develops after an ART cycle.

The effectiveness of copious irrigation of the pelvic cavity, resecting adhesions, removing all necrotic debris, and the abscess capsule compared to image-guided drainage, particularly concerning fertility rates, remains uncertain. In a study by Buchweitz et al., it was found that in the organ-preserving group, 3 out of 16 patients achieved live births, whereas only 1 out of 24 women conceived in the non-organ preserving group. Additionally, the rate of complications was significantly higher in the group undergoing ablative treatment compared to the group that received organ-preserving surgery [79]. Previous studies have highlighted more extensive pelvic inflammation and a higher incidence of conversion to laparotomy in patients who have PID with endometriomas. This suggests that such patients might particularly benefit from early surgical intervention to improve their chances of a successful pregnancy outcome.

12. Conclusions

PID has been associated with painful bladder syndrome and ovarian malignancies. Patients with pelvic inflammatory disease may develop hydrosalpinx, a condition that may persist even when PID has resolved. A pelvic examination is essential for assessing

dysmenorrhea. In cases where patients are at risk for PID or where sexually transmitted infections are suspected, endocervical or vaginal swabs may be necessary for further evaluation. The first line treatment for PID consists in antibiotherapy. Ultrasonography should be the initial imaging modality used to diagnose suspected pelvic inflammatory disease. If the findings from ultrasonography are ambiguous or insufficient, MRI becomes a useful imaging technique to provide further clarity. For cases involving tubo-ovarian or pelvic abscesses, ultrasound- or CT-guided aspiration or drainage may be performed, along with appropriate antibiotic treatment to manage the infection. For patients with complex or severe pelvic abscesses, surgical intervention may be considered in selected cases. The primary surgical techniques employed are open and laparoscopic surgery, both aimed for abscess removal. Laparoscopic surgery has increasingly become favored by both healthcare professionals and patients. However, laparoscopy may present technical difficulties in patients with severe pelvic abscesses, particularly those with extensive adhesions or a closed-off pelvic area, requiring advanced surgical expertise. Women with associated conditions such as endometriosis often experience a more severe form of pelvic inflammatory disease, which is less responsive to antibiotics and more frequently requires surgical resolution. The surgical treatment should be performed individualized to the clinical condition of the patient and the time of intervention must be carefully chosen.

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