Journal of Clinical and Medical Images

Case Series

ISSN: 2640-9615 | Volume 8

# Exploring the Heterogeneity of Tubo-Ovarian Abscess: A Case Series Revealing Diverse Clinical Scenarios

**Pranjali D[1], Madhusudan D[2], Mounica GKN[3], Suyash G[4], Sunil C[5], Ankur S[6] and Priyanshi C[7]**

[1]MSSr Adv, Department of obstetrician and Gynecologist, Base Hosp, Delhi Cantt

[2]MS, Maternal-fetal medicine specialist, Sr Adv, Department of obstetrician and Gynecologist, Base Hosp, Delhi Cantt

[3]MBBS, Resident, Department of obstetrician and Gynecologist, Base Hosp, Delhi Cantt

[4]MS, Senior Advisor, Department of obstetrician and Gynecologist, Base Hosp, Delhi Cantt

[5]MS, Classified Specialist, Department of obstetrician and Gynecologist, Base Hosp, Delhi Cantt

[6]MS, Classified Specialist, Department of obstetrician and Gynecologist, Base Hosp, Delhi Cantt

[7]MS, Graded specialist, Department of obstetrician and Gynecologist, B8ase Hosp, Delhi Cantt

***Corresponding author:**

Dr Suyash Goel,
Department of obstetrician and Gynecologist,
Base Hosp Delhi Cantt, Delhi 110010, India

Received: 12 Aug 2024

Accepted: 16 Sep 2024

Published: 21 Sep 2024

J Short Name: JCMI



**Keywords:**

Tubo-ovarian abscess; pelvic inflammatory disease; salphingo-oopherectomy; xanthogranulomatous oophoritis; endometrioma

**Citation:**

Suyash G, Exploring the Heterogeneity of Tubo-Ovarian Abscess: A Case Series Revealing Diverse Clinical Scenarios. J Clin Med Img. 2024; V8(3): 1-7

## 1. Abstract

**1.1. Introduction:** Tubo-ovarian abscess represents a severe form of pelvic inflammatory disease with high morbidity. Tubo-ovarian abscess can have varied presentation with or without classical signs and symptoms and pose challenges in early diagnosis.

**1.2. Case Series:** This case series highlights different presentations of patients with tubo-ovarian abscesses. The first case demonstrates a patient who underwent hysterosalpingogram, later developed pelvic inflammatory disease resulting in a Tubo-ovarian abscess. Our second patient presented with pain abdomen without fever. Ultrasound showed a ovarian dermoid cyst. Laparoscopic intervention showed a pus filled peritoneal cavity with a large Tubo-ovarian abscess which was managed with laparotomy and saphingo-opherectomy. The third case demonstrates a missed abscess on sonography with finding of tubo-ovarian abscess during laparoscopy. Dense intrapelvic adhesions were identified in all 3 cases, leading to a challenging intraoperative course.

**1.3. Conclusion:** Tubo-ovarian abscesses can exhibit diverse presentations, often deviating from the classic triad of fever, abdominal pain, and leucocytosis. While ultrasonography is commonly used in pelvic inflammatory disease (PID) assessment, its sensitivity in identifying tubo-ovarian abscesses may be limited due to overlapping conditions necessitating advanced imaging. The management of these cases need an individualized approach. Medical management, with or without aspiration, laparoscopic cystectomy, adhesiolysis, or an open approach, may be required. In certain instances, hysterectomy with adnexectomy may be deemed necessary.

## 2. Introduction

A tubo-ovarian abscess (TOA) is a serious complication that arises in approximately 15-30 % of women with pelvic inflammatory disease (PID) and predominantly affects women of reproductive age, with a peak incidence in the age group 20-40 years. It is characterized by the formation of an infected collection involving the fallopian tubes and ovaries. The clinical manifestations of a Tubo-ovarian abscess include the presence of an adnexal mass, fever, leucocytosis, pelvic pain, dyspareunia and vaginal discharge [1,2,3]. However, the presentations of this disease can exhibit significant variability ranging from having asymptomatic mass to rupture, peritonitis and sepsis. The management of tubo-ovarian abscess poses significant challenges due to its potential for long-term complications and the risk of poor reproductive outcomes.

This case series aims to present and analyse three distinct cases of tubo-ovarian abscess, highlighting the diverse clinical scenarios encountered in practice. By examining these cases, we aim to enhance our understanding of the condition and provide valuable insights into diagnosis and treatment strategies.

The pathogenesis of Tubo-Ovarian Abscess involves ascending infection from the lower genital tract, primarily through the fallopian tubes. The most common microorganisms that were recovered from these Tubo-Ovarian Abscesses were Chlamydia species, Escherichia coli, Neisseria gonorrhoeae, Bacteroides fragilis, Bacteroides species, Peptostreptococcus, Peptococcus, and aerobic streptococci [4,5]. The risk factors associated with the development of Tubo-Ovarian Abscess are similar to those for sexually transmitted infections (STI) which include a history of previous STI/ PID, intrauterine device use, sexual activity at an early age, multiple sexual partners, immunosuppression, and poor health care. Infection also occurs via childbirth, abortion (therapeutic or elective), endometrial biopsy and hysterosalpingogram (HSG). Though low, there is a risk of a Tubo-Ovarian Abscess secondary to oocyte retrieval in women with endometriomas undergoing in vitro fertilization [6.7].

The prevalence of Pelvic Inflammatory Disease and Tubo-Ovarian Abscess is significantly higher among women with endometriosis. Genital tract infections and spontaneous rupture of endometriotic cysts are implicated in the occurrence of tubo-ovarian abscesses associated with ovarian endometriosis [8,9,10]. Possible mechanisms postulated are, an immunologically abnormal condition in endometriosis, which can make pelvic organs more susceptible to infection, the weakened cystic wall of endometriomas may be more prone to bacterial invasion compared to healthy ovarian epithelium and the presence of blood within endometriomas can create an environment that facilitates the spread of infection [11,12].

Among the frequently encountered conditions in the differential diagnosis are appendicitis, pelvic inflammatory disease (PID), ovarian malignancies, ovarian torsion etc. Direct visualization or imaging studies are crucial for reaching a definitive diagnosis. Pelvic ultrasonography, with a reported sensitivity of 93% and specificity of 98%, is a valuable tool in this process. If the ultrasound evaluation is inconclusive, computed tomography (CT) and magnetic resonance imaging (MRI) can provide better definitions and help identify abscesses [13, 14]. Differentiating between tubo-ovarian abscess and ovarian malignancies can be challenging due to overlapping imaging features. Conventional MRI may not always provide clear distinctions between the two conditions, and positron emission tomography with computed tomography (PET-CT) also has limitations as both conditions can exhibit FDG uptake. However, additional techniques like diffusion-weighted imaging (DWI) and dynamic contrast-enhanced MRI can aid in better characterization. Tubo-Ovarian Abscesses typically show diffusion restriction due to the presence of purulent material [15,16].

The management of suspected Tubo-Ovarian Abscess depends on the clinical presentation. In cases where Tubo-Ovarian Abscess is accompanied by sepsis, the recommended approach involves resuscitation, administering broad-spectrum antibiotics, and performing early surgical intervention. Unilateral adnexectomy is acceptable for unilateral abscesses. Hysterectomy and bilateral salpingo-oophorectomy may be necessary for overwhelming infection or in cases of chronic disease with intractable pelvic pain. Nevertheless, in clinically stable patients, intravenous antibiotics and delayed surgery or avoidance of surgery can be considered.5,13 Percutaneous drainage guided by imaging is a less invasive approach and is preferred for stable patients with smaller abscesses [17].

With prompt and adequate treatment, the majority of patients experience relief from symptoms and abscess resolution, whereas delayed or inadequate therapy can lead to its rupture, sepsis, infertility, chronic pelvic pain, and adhesion formation [18]. In a study conducted by Hubboul A in 2016, surgical drainage was recommended more often and at an earlier stage, especially for larger abscesses and in younger patients desirous of preserving fertility. Laparoscopic surgical drainage was found to be a safe and preferable procedure. However, conservative medical management may still be an acceptable option, with a success rate of 77%.

Hence, the publication of these cases is essential as although tubo-ovarian abscess is a known complication of pelvic inflammatory disease, there is still a need to elucidate the diverse manifestations and treatment responses observed in different cases. Each case provides an opportunity to explore unique aspects, atypical presentations, complications, and a systematic approach to clinical decision-making.

Informed Consent from each patient was obtained.

**3. Case 1**

A 28-year-old nulligravida, underwent hystero-salpingography as part of the evaluation for primary infertility, which revealed the presence of a left hydrosalpinx. However, following the procedure, the patient developed symptoms indicative of acute Pelvic Inflammatory Disease. She was hospitalized and administered intravenous antibiotics for a duration of 10 days, which resulted in symptomatic improvement.

Two weeks later the patient presented with complaints of high-grade fever and pelvic pain which gradually increased in intensity over one week. Ultrasonography revealed the presence of a left tubo-ovarian complex cyst (Figure 1). Further evaluation with pelvic MRI demonstrated a large, multi-loculated cystic lesion measuring 5.8 x 10.3 x 6.1 cm in the left adnexa. The lesion exhibited multiple thin septations extending anterior to the uterus. No free fluid was observed in the Pouch of Douglas (POD), and there were no significant pelvic lymph node enlargement. The clinical picture and imaging findings were consistent with a diagnosis of a Left Tubo-Ovarian Abscess.

The patient received broad-spectrum intravenous antibiotics and planned for laparoscopy and proceed. Intraoperatively, the uterus appeared normal in size but deviated to the right. A large Tubo-Ovarian Abscess was visualized (Figure 2), and the ovary was not separately visualized. POD was obliterated by the tubo-ovarian mass and the right ovary was enlarged and adherent to the left Tubo-Ovarian Abscess. Pelvic cavity contained copious straw coloured fluid. Adhesions involving the omentum and bowel were carefully separated by blunt dissection and left salpingo-oophorectomy was done followed by peritoneal lavage. Straw coloured pelvic collection was sent for culture and sensitivity testing.

Following surgery, intravenous antibiotics were continued for a duration of 14 days. Culture and sensitivity testing of the peritoneal fluid revealed the presence of Coagulase Negative Staphylococcus. However, tuberculosis polymerase chain reaction (TB PCR), and GeneXpert testing yielded negative results for genital tuberculosis. No bacterial growth was observed in the pus obtained from the abscess. Histopathological examination revealed the presence of endometriosis in the ovary, along with xanthogranulomatous oophoritis and fallopian tube without any pathological changes (Figure 3). The patient experienced uneventful post-operative recovery and conceived spontaneously five months after the surgery.

**Figure 1**: Ultrasound showing left tubo-ovarian multiloculated cyst (9.7x 5.5 x 8.7 cm)

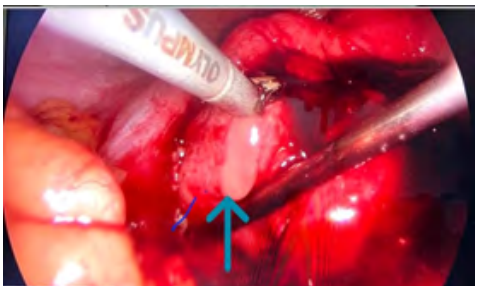

**Figure 2:** Laparoscopic visualization of left Tubo-ovarian abscess with purulent contents

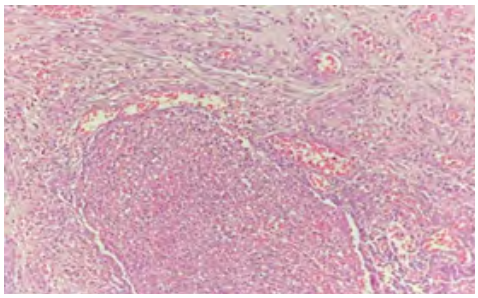

**Figure 3:** Photomicrograph showing ovarian endometriosis and infiltration and replacement of ovarian stroma by foamy histiocytes suggestive of xanthogranulomatous oophoritis.

## 4. Case 2

42-year-old woman Parity1Living1Abortion1, presented with severe pain in the left iliac fossa for a duration of 10 days. She also reported heavy menstrual bleeding over the past two years, associated with dysmenorrhea for the last two years. On clinical examination patient was afebrile, vital parameters were within normal limits, per abdomen examination revealed tenderness in the left iliac fossa, leading to her admission for further evaluation.

Hematological parameters indicated mild anaemia and leukocytosis with neutrophilia. Pelvic ultrasound revealed a normal-sized uterus with an endometrial thickness of 16 mm. A cystic lesion measuring 8.1 x 7.6 cm, with thin septae and a mural nodule, was identified in the left adnexa (Figure 4) with normal surrounding vascularity. Left ovary was not separately visualized. The findings were suggestive of a left ovarian dermoid cyst in addition to multiple small uterine fibroids. Tumor markers were essentially within normal limits. Endometrial biopsy demonstrated secretory phase endometrium, and Pap smear showed no evidence of intraepithelial lesion or malignancy.

In view of suspected ovarian dermoid cyst, the patient was scheduled for laparoscopic cystectomy. However, upon visualization, uterus was fixed with bilateral tubo-ovarian masses adherent to uterus, omentum and intestines were observed, necessitating the conversion to laparotomy, hysterectomy with bilateral salpingo-oophorectomy (Figure 5 & 6) and adhesiolysis. The tubo-ovarian masses drained foul-smelling purulent content, which demonstrated growth of Gardenella Vaginalis and Micrococcus Luteus upon culture and sensitivity. Histopathological examination revealed bilateral ovarian endometriosis, xanthogranulomatous oophoritis, and chronic salpingitis. The omentum exhibited necro-hemorrhagic granulation tissue reaction and histopathology of uterus and cervix revealed chronic cervicitis, and the presence of uterine leiomyomas. The post-operative period was uneventful, and the patient received intravenous antibiotics for a duration of 07 days followed by 07 days of oral antibiotics. She showed symptomatic improvement and had recovered well as confirmed on follow up visit in two weeks.

**Figure 4:** Ultrasound showing features suggestive of dermoid cyst

**Figure 5:** Gross specimen of uterus with Tubo-Ovarian mass anterior view

**Figure 6:** Left Tubo-Ovarian mass posterior view

## 5. Case 3

32 yr old lady with history of one abortion admitted as a case of pain lower abdomen and fever with right ovarian complex cyst. She also desired evaluation and management for secondary infertility. On evaluation, Ultrasound showed right hydro-salpinx, right complex cyst measuring 10.4x14.7x16.3 cm, suggestive of a serous cystadenoma. Pelvic MRI scan showed right tubo-ovarian mass, predominantly cystic lesion, possibly right tubo-ovarian abscess with retroperitoneal lymphadenopathy. She was treated with IV antibiotics. She underwent open right ovarian cystectomy. Intra-operatively tubo-ovarian mass was found adherent to anterior abdominal wall. Adhesiolysis was done. Cyst was incised, multiple loculations were broken and 1000 ml sero-purulent discharge was drained form the cyst and the cyst wall was excised. Uterus could not be separately visualized from TO mass due to extensive dense adhesions and inflammation. POD appeared obliterated indicating frozen pelvis. No retroperitoneal lymph nodes were palpable. Size of the gross specimen was 12.5x3x2 cm with small amount whitish jelly like material noted on the inner surface of the cystic wall. Ovarian Cyst wall HPE showed findings consistent with luteal cyst. H&E stain sections showed cyst lined by flattened epithelium and comprising of underlying fibrous stroma along with luteinizing granulosa cells having eosinophilic cytoplasm. Areas of hemorrhage and dense neutrophilic inflammatory infiltrate along with eosinophilic cystic secretions noted. No atypia or malignancy noted. Pus culture showed Escherichia coli. Cystic fluid for cytology showed RBCs and few degenerated cells against proteinaceous background.

## 6. Discussion

Our case series presents three distinct yet intriguing cases, each shedding light on complex gynecological pathologies with diagnostic and therapeutic challenges. These cases underscore the complexity of managing this condition and provides valuable insights into diagnosis and treatment strategies. It also highlights the need for comprehensive evaluation, early intervention, individualized management and a multidisciplinary approach to optimize patient outcomes.

Case 1 reveals a case of infertility who underwent HSG which exhibited hydrosalpinx. However, the development of a Tubo-Ovarian Abscess following the procedure highlights the importance of considering pelvic infection/ Tubo-Ovarian Abscess in the differential diagnosis of acute pelvic pain, even when symptoms temporarily improve with antibiotics. Complications of HSG include acute pelvic infection, bilateral hydrosalpinx/ pyosalpinx which can be diagnosed with Ultrasound, CT Scan or MRI and be managed with antibiotics, laparoscopic drainage or adnexectomy as indicated [19,20].

In this case the discovery of endometriosis in the ovary, accompanied by xanthogranulomatous salpingo-oophoritis (XGSO) and fallopian tube without pathological changes, is noteworthy. This may be due to pelvic endometriosis causing shedding of endometrial cells and consequent chronic inflammation reaching a ‘burn out’ phase finally leading to locally destructive xanthogranulomatous changes which manifested as a tubo-ovarian abscess. This rare coexistence warrants further research into potential links between endometriosis and xanthogranulomatous oophoritis. Numerous case reports describe similar lesions (XGSO) confirmed on histopathological examination in cases where pelvic inflammatory disease (PID) were not adequately treated. These cases often involve the coexistence of pelvic endometriosis and the cultures confirm the presence of microorganisms, and the patients typically present with primary infertility or chronic pelvic pain [21,22,23,24].

Despite the fact that the sonographic appearance of an adnexal

mass might be highly suggestive of a Tubo-Ovarian Abscess, it has been noted that there is often overlap with other entities, such as endometriosis, hemorrhagic cysts, dermoid cysts, and other cystic ovarian masses. In our case 2, the Tubo-Ovarian Abscess first manifested as a massive unilocular cystic mass with normal surrounding vascularity suggestive of a dermoid cyst, and in case 3, Ultrasound revealed a complex cyst consistent with a serous cystadenoma. This showcases the difficulties faced in distinguishing benign from complex pathologies with sonography alone and clinical and laboratory results play a crucial role in diagnosis. Further to this, approximately 20% of patients with Tubo-Ovarian Abscess are afebrile and may not have leukocytocis [3,25]. In the chronic phase, pain might be subtle or even nonexistent, further complicating the diagnosis. Thus, if clinical concern exists for this disease, a prompt diagnostic evaluation with MRI must be undertaken [16].

The diagnostic laparoscopy and proceed approach is commonly employed when there is uncertainty regarding the nature of tubo-ovarian masses based on imaging findings [26,27]. However, correlation with the clinical findings and findings from complementary imaging examinations, such as ultrasound examination, CT Scan and magnetic resonance (MR) imaging, is useful for establishing a definitive diagnosis [28].

The revelation of bilateral infective tubo-ovarian masses plastered to the uterus, bowel, and omentum in case 2 necessitated the performance of a total abdominal hysterectomy and bilateral salpingo-oophorectomy. The patient was ultimately found to have ovarian endometriosis and xanthogranulomatous salpingo-oophoritis. The presence of Gardenella vaginalis and Micrococcus luteus in the purulent drainage emphasises the potential role of these specific microorganisms in contributing to the pathology.

Numerous case reports with similar diagnosis have been published describing xanthogranulomatous oophoritis, salpingitis with chronic granulomatous infiltrates along with foamy histiocytes in the histopathological examinations. These studies also implicate infectious etiology, with bacterial cultures yielding the growth of E coli, Bacteroids fragilis, Salmonella typhi, Proteus vulgaris in these cases [22,29,30].

**7. Treatment Strategies**

The management of Tubo-Ovarian Abscess involves a multidisciplinary approach, balancing medical management and surgical intervention based on the patient's clinical status [5,13]. In a study by H Reich involved 25 women with pelvic abscesses who were treated laparoscopically by drainage/ adhesiolysis/ excision after IV antibiotics. Outcomes were assessed by relook laparoscopy in five cases, which showed normal pelvic anatomy. Four of seven women desiring pregnancy conceived. Early laparoscopic surgery combined with antibiotics seems effective for acute pelvic abscess [31]. Within our case series, the initial case showcases a successful result through laparoscopic drainage and unilateral salpingo-oophorectomy, culminating in a favourable pregnancy outcome. In contrast, the second case required hysterectomy and bilateral salpingo-oophorectomy due to severe infection and extensive adhesions. The third case highlights the complexities of managing Tubo-Ovarian Abscess when adhesions distort anatomy. In such scenarios, meticulous dissection and drainage play a pivotal role in ensuring positive results.

**8. Strengths and Limitations**

The publication of these cases is essential as although tubo-ovarian abscess is a known complication of pelvic inflammatory disease, there is still a need to elucidate the diverse manifestations and treatment responses observed in different cases. Each case provides an opportunity to explore unique aspects, atypical presentations, complications, and a systematic approach to clinical decision-making. Owing to the small sample size, this case series cannot be used to obtain statistical significance.

**9. Implications for Practice**

These cases collectively underscore several important clinical and management lessons. First, the diverse and sometimes subtle presentations of Tubo-Ovarian Abscess emphasize the need for a high index of suspicion in patients with risk factors, even in cases with seemingly unrelated symptoms. Second, accurate diagnosis requires a combination of clinical evaluation and imaging, and at times, a willingness to adjust the diagnosis based on evolving information. Third, the tailored management of Tubo-Ovarian Abscess, balancing medical and surgical approaches, underscores the importance of individualized care.

**10. Contributions to Literature**

This case series contributes to the medical literature by presenting unique clinical scenarios of Tubo-Ovarian Abscess, thereby expanding our understanding of the condition's variability. The cases provide valuable insights into effective diagnostic strategies and therapeutic approaches. They highlight the importance of considering Tubo-Ovarian Abscess in patients with risk factors, differentiating it from other conditions, and adapting treatment plans based on the patient's condition.

**11. Conclusion**

Tubo-ovarian abscess can have heterogenous presentations without the classic triad of fever, pain abdomen and leucocytosis. Ultrasonography which is routinely employed in evaluation of a Pelvic Inflammatory Disease may not be always sensitive to identify a Tubo-Ovarian Abscess due to overlapping conditions. A clinical suspicion should entail further evaluation with MRI. Owing to chronic nature of the disease, extensive adhesiolysis with prolonged laparoscopic surgery or even conversion to an open laparotomy are the possible considerations while operating Tubo-Ovarian Abscess.

### 12. Ethics Statement

The study was performed in a manner to conform with the Helsinki Declaration of 1975, as revised in 2000 and 2008 concerning the Human and Animal Rights and the authors followed the policy concerning informed consent.

### 13. Conflicts of Interest

The authors have none to declare.

### 14. Authors' Contributions

Each author contributed to conception and design, data collection and analysis, experiments, writing the first draft, and supervision. Each author contributed to the writing of the paper and has read and approved the final manuscript

### 15. Compliance with Ethical Requirements

Additional informed consent was obtained from all patients for whom identifying information is included in this article.

### 16. Availability of Data and Materials

The data supporting this study is available through the corresponding author upon reasonable request. The dataset used and/or analyzed during the current study are available from the corresponding author on reasonable request.

### 17. Acknowledgments

None

### 18. Funding

None

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