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IMPRINT CYTOLOGY IN FROZEN SECTION: A DIAGNOSTIC CLUE IN PELVIC ACTINOMYCOSIS MASQUERADING AS BILATERAL OVARIAN MALIGNANCY – A CASE REPORT

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ABSTRACT

Pelvic actinomycosis is a chronic invasive inflammatory condition of the female genital tract caused by anaerobic filamentous bacteria, producing suppurative granulomatous inflammation leading to abscess formation, tissue plane invasion, and extensive fibrosis. Pelvic actinomycosis involving the adnexa can closely resemble ovarian malignancy, both on clinical and radiological evaluation.

We report a case of a 37-year-old multiparous woman with a history of intrauterine contraceptive device (IUCD) use who presented with abdominal pain and bilateral adnexal masses. Further radiological imaging revealed bilateral complex adnexal mass lesions with obliteration of fat planes with the uterus and focal infiltration into the upper rectum, raising strong suspicion for ovarian neoplasm. Given the marked intraoperative concern for malignancy, frozen section with imprint cytology was performed, which revealed dense inflammatory infiltrate with multinucleated giant cells, suspicious of an infective etiology. Routine histopathological examination demonstrated actinomycotic colonies surrounded by marked xanthogranulomatous inflammation involving bilateral adnexa and omentum. Special stains, including Gram's stain, periodic acid–Schiff, and Gomori methenamine silver, highlighted filamentous organisms, confirming the diagnosis. This case highlights the valuable role of imprint cytology during frozen section in differentiating infective pathology from malignancy.

KEYWORDS: Pelvic actinomycosis, Frozen section, imprint cytology, Intrauterine contraceptive device (IUCD), Xanthogranulomatous inflammation.

INTRODUCTION

Actinomycosis is an uncommon, chronic, slowly progressive invasive bacterial infection caused by Actinomyces species, most commonly Actinomyces israelii. These organisms are normal commensals of the oropharynx, gastrointestinal tract, and female genital tract but may become pathogenic when mucosal integrity is disrupted following surgery, trauma, or the presence of foreign body [1–3]. Once the mucosal barrier is breached, the organisms can invade deeper tissues, producing granulomatous inflammation characterized by abscess formation, fibrosis, and mass-like lesions composed of branching filamentous bacteria [4, 5].

Within the female genital tract, the actinomyces species are known to colonize the normal flora. Asymptomatic colonization of bacteria has been documented in cervical cytology specimens, including A. israelii, A. meyeri, A. neuii, and A. turicensis, particularly among IUCD users, thus suggesting an association between prolonged IUCD use and pelvic actinomycosis.

Imaging modalities such as ultrasonography, CT, and MRI do not reliably distinguish infection from malignancy because of extensive inflammatory changes [5]. Though microbiological investigation remains diagnostic, its clinical utility is limited due to fastidious anaerobic growth requirements. Hence, preoperative diagnosis remains challenging due to nonspecific radiological findings and low microbiological yield.

We report a case of bilateral adnexal actinomycosis with omental involvement clinically suspected as ovarian carcinoma, highlighting the diagnostic contribution of intraoperative imprint cytology during frozen section study.

Case Report

A 37-year-old multiparous woman (P3L3) presented with diffuse abdominal pain and bilateral pelvic masses for three weeks duration. She had a history of IUCD usage. There was no significant history of fever or weight loss. Nil significant past medical history.

Ultrasonography showed bilateral heterogeneous adnexal masses with internal vascularity. Contrast-enhanced CT (Fig 1A) and MRI revealed bilateral complex adnexal lesions with suspected infiltration of adjacent structures and bilateral

hydroureteronephrosis, raising clinical suspicion of ovarian malignancy. An ill-defined collection in the left iliac fossa suggestive of an evolving inflammatory abscess was also noted.

The patient initially underwent intraoperative frozen section and laparotomy, which revealed bilateral tubo-ovarian complexes appeared as irregular, firm masses with dense pelvic adhesions and markedly distorted pelvic anatomy. Areas of fibrotic induration and focal inflammatory thickening were noted in the omentum. In view of these intraoperative findings of advanced pelvic pathology, the procedure was converted to total abdominal hysterectomy with bilateral salpingo-oophorectomy and omentectomy.

Imprint cytology on frozen section revealed clearer morphological details compared to the frozen section. The smears showed a dense inflammatory infiltrate composed predominantly of plasmacytoid cells, raising suspicion for a neoplasm with plasmacytoid morphology or possible deposits associated with an inflammatory response. Multinucleated giant cells were also noted in the background, without cytological atypia (Fig 2A).

Frozen section examination of bilateral adnexal masses and omental deposits revealed sheets of inflammatory cells composed predominantly of plasma cells, lymphocytes, foamy histiocytes, and multinucleated giant cells (Fig 2B). No evidence of surface epithelial or stromal malignancy was identified. Based on these findings, no definitive evidence of malignancy was rendered intraoperatively.

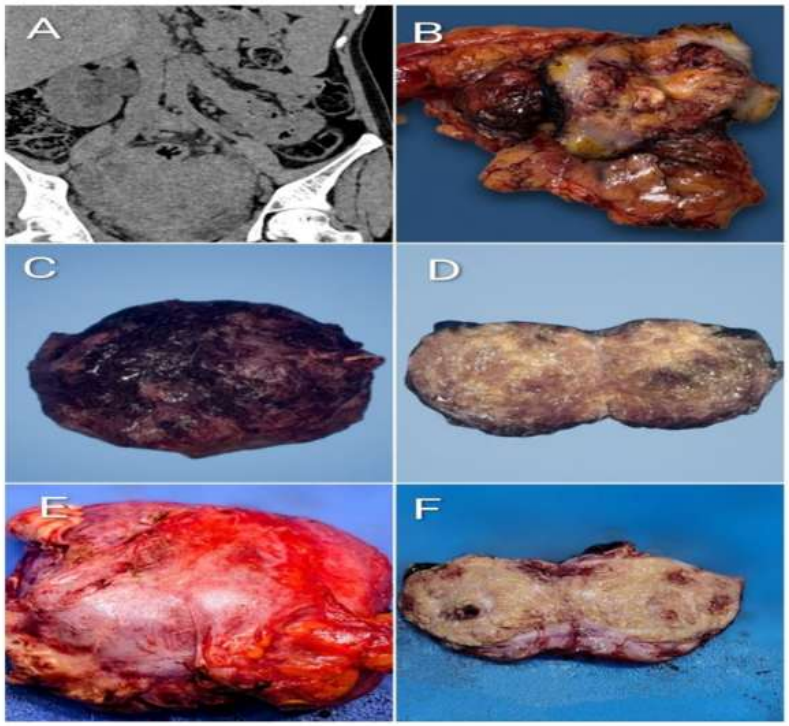
Gross Findings - The right adnexal mass measured 9x8.5x3.2 cm, and the cut surface was grey-white to grey-yellow with focal cystic areas (Fig 1E, 1F). The left adnexal mass measured 6x5.5x2.5 cm, and the cut surface was grey-white to grey-yellow and firm in consistency (Fig 1C,1D). The omental tissue measured 7.6x7.5x1.9 cm and displayed focal firm necrotic areas (Fig 1B). Uterus and bilateral tubes were unremarkable.

Histopathological Findings - Microscopy of bilateral adnexal masses and omental tissue revealed dense chronic inflammatory infiltrate composed predominantly of foamy histiocytes, lymphocytes, and plasma cells with focal neutrophilic aggregates. Multiple colonies composed of tangled masses of delicate, branching filamentous organisms arranged in a radiating “sunburst” or rosette-like pattern (Fig 3A). At the periphery, eosinophilic club-shaped projections were noted, representing the Splendore–Hoeppli phenomenon.

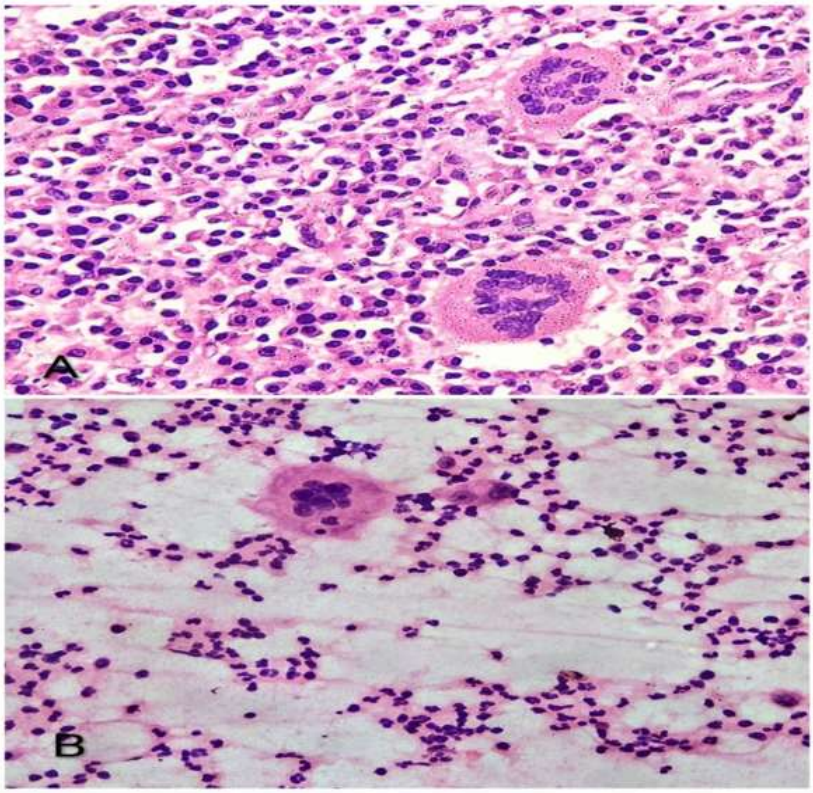
Gram stain demonstrated Gram-positive branching filamentous bacilli within the bacterial colonies (Fig 4A). Periodic acid–Schiff (PAS) stain highlighted PAS-positive filamentous colonies (Fig 3B), while Gomori methenamine silver (GMS) stain shows slender branching filamentous organisms (Fig 4B), supporting the diagnosis of actinomycosis.

Sections from fallopian tubes showed chronic salpingitis. Pelvic lymph nodes showed reactive lymphoid hyperplasia. The above findings confirmed the diagnosis of bilateral actinomycotic salpingo-oophoritis with xanthogranulomatous inflammation.

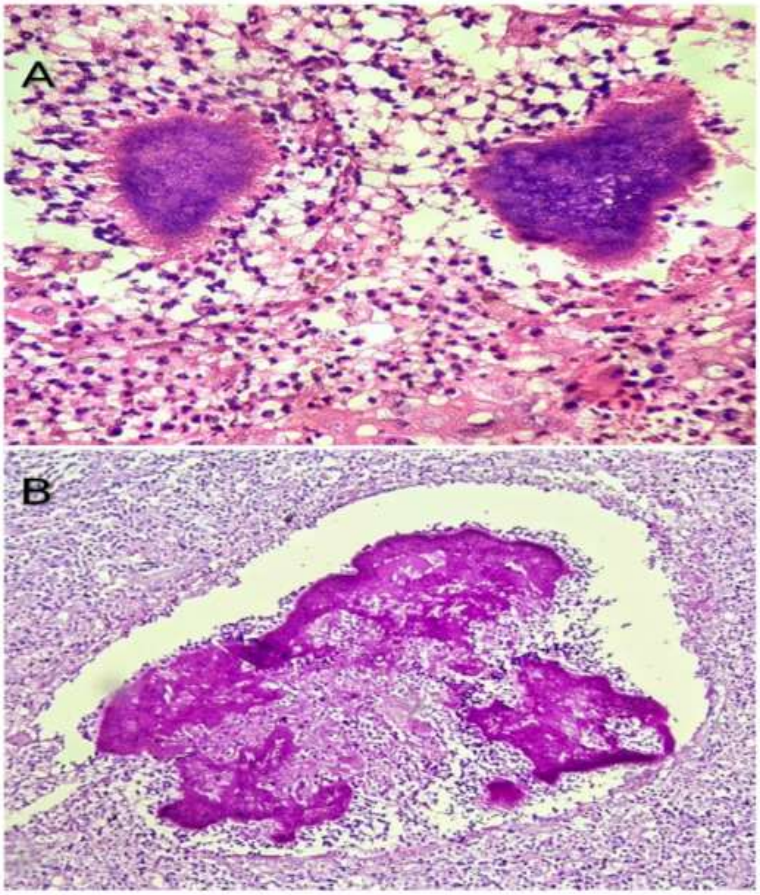
Patient was given long-term antibiotic therapy with periodic follow-up. No symptoms of recurrence noted.



- Fig 1A: Shows bilateral tubo ovarian mass lesion with hydronephrosis
- Fig 1B : shows gross image of omental deposit
- Fig 1C and 1D : shows gross image and cut surface of left ovary
- Fig 1E and 1F : shows gross image and cut surface of right ovary



- Imprint cytology (fig 2A), frozen section(fig 2B) – showing dense inflammatory infiltrate predominantly composed of plasma cells and multinucleated giant cell.



- Fig 3A : Histopathological section showing actinomycotic sulfur granules with surrounding eosinophilic radiating material consistent with the Splendore–Hoeppli phenomenon
- Fig 3B :PAS stain showing filamentous colonies and sulphur granules

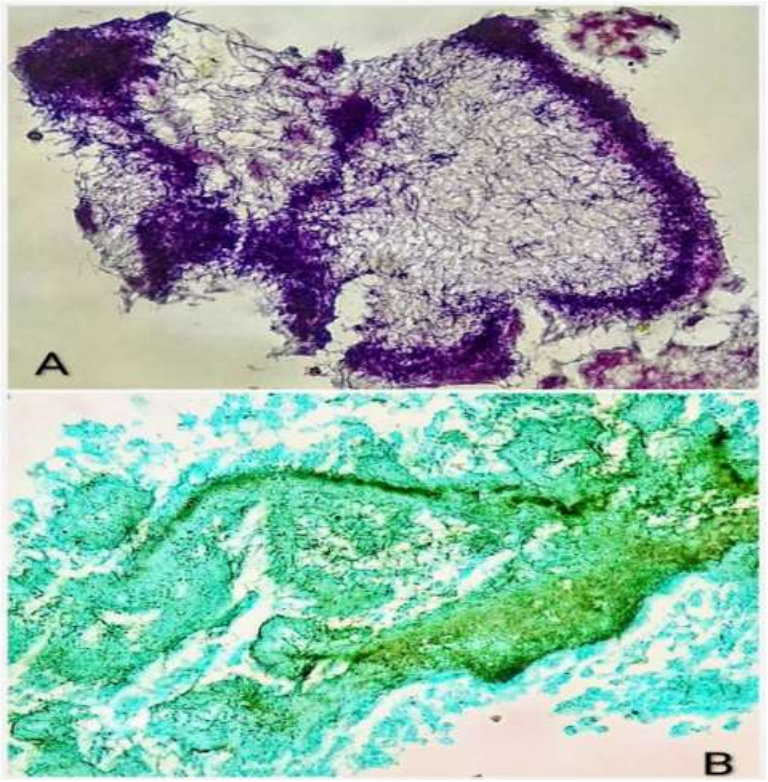


Fig 4A : Methamine silver stain showing black filamentous organism within sulphur granules

Fig 4B : Gram stain showing gram positive, branching, filamentous organisms

DISCUSSION

Pelvic actinomycosis represents an uncommon yet important diagnostic mimic in gynecological malignancy. Although Actinomyces species form part of the endogenous genital tract flora, invasive disease reflects a breakdown of mucosal barriers, most frequently in the setting of prolonged intrauterine device use. The pathogenesis is characterized not by hematogenous dissemination but by slow, contiguous spread accompanied by intense suppurative inflammation and progressive fibrosis. This distinctive biological behavior explains its propensity to form infiltrative pelvic masses that simulate advanced malignancy. The clinical presentation is often nonspecific, dominated by lower abdominal pain, adnexal masses, and occasionally constitutional symptoms. Radiological assessment typically reveals complex masses with adjacent tissue infiltration and distortion of anatomical planes [3, 4]. These features closely parallel imaging findings seen in epithelial ovarian carcinoma, particularly when bilateral adnexal involvement and omental thickening are present. In the current case, the bilateral nature of the lesions, along with extensive adhesions and mass effect, strongly favored a preoperative diagnosis of carcinoma.

A crucial diagnostic limitation in actinomycosis is the low microbiological yield. Culture requires strict anaerobic conditions, and prior empirical antibiotic therapy frequently renders results negative[5], hence histopathological examination becomes central to diagnosis. The identification of sulfur granules composed of filamentous organisms arranged in radiating patterns within an inflammatory exudate remains the most reliable morphological hallmark [6]. Surrounding granulomatous and suppurative reactions further reinforce the chronic infective nature of the lesion.

Owing to its chronic suppurative and fibrosing nature, delayed diagnosis can lead to significant complications such as tubo-ovarian abscess formation, dense pelvic adhesions, hydrosalpinx, ureteric compression causing hydronephrosis, bowel involvement leading to obstruction or perforation, and fistula formation (rectovaginal or enterocutaneous). Early recognition, surgical intervention, and prompt initiation of prolonged high-dose penicillin therapy are therefore crucial to prevent irreversible structural damage. Timely treatment significantly reduces morbidity and improves overall prognosis. While a unilateral tubo-ovarian mass is a common presentation described, extremely rare bilateral adnexal involvement with dense fibrosis in this case significantly heightens clinical suspicion for malignancy [7]. Such cases often proceed to extensive surgical management because the preoperative distinction from carcinoma is very challenging. An intraoperative frozen section, therefore, plays a vital role. In this case, imprint cytology provided clearer delineation of the inflammatory cellular milieu compared to frozen section evaluation [9]. Frozen sections demonstrated dense inflammatory infiltrate with limited optimal appreciation of cellular details. In contrast, imprint smears offered superior cytomorphological preservation, allowing better visualization of macrophages, plasma cells, and giant cells in a clean background. The absence of cohesive epithelial clusters, cytological atypia, or malignant stromal fragments on imprint smears was particularly helpful in excluding surface epithelial carcinoma intraoperatively.

Imprint cytology has the advantage of rapid preparation, minimal artefact, and enhanced cellular detail compared to frozen sections, especially in inflammatory and necrotic lesions. In mass-forming infections such as actinomycosis, where fibrosis and suppuration may obscure diagnostic features on frozen sections, imprint smears can highlight the predominance of inflammatory cells and reactive changes without the distortion introduced by cryostat processing. In the present case, the well-preserved cytomorphology on imprint smears strengthened intraoperative diagnosis in ruling out malignancy. Furthermore, imprint cytology reduces the risk of overinterpreting reactive epithelial changes as malignancy, particularly in extensively inflamed adnexal masses. Reactive mesothelial cells, histiocytes, and degenerating cells may

appear atypical in frozen sections due to freezing artefacts; however, cytological smears often allow clearer differentiation based on nuclear chromatin pattern, absence of significant pleomorphism, and lack of abnormal mitoses. Thus, imprint cytology served as a valuable adjunct to frozen section examination in diagnosing pelvic actinomycosis.

Learning Points

- **Pelvic actinomycosis should be considered in the differential diagnosis of complex adnexal masses**, especially in women with a history of prolonged intrauterine contraceptive device (IUCD) use.
- **The disease frequently mimics advanced ovarian malignancy due to its infiltrative**, mass-forming nature and nonspecific radiological features, making preoperative diagnosis challenging.
- **Imprint cytology is a valuable adjunct to intraoperative frozen section**, providing superior cytomorphological detail and facilitating distinction between inflammatory lesions and malignancy during surgery.
- **Early histopathological diagnosis followed by prompt**, prolonged antibiotic therapy can prevent unnecessary radical surgery, reduce morbidity, and improve patient outcomes.
- **Delayed recognition may result in serious complications, including tubo-ovarian abscess**, fistula formation, bowel obstruction, and hydronephrosis, emphasizing the importance of early clinical suspicion.

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