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CASE REPORT

ARDS and systemic sepsis from Actinomycosis related IUCD infection

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Six weeks following a reinsertion of a levonorgestrel intrauterine contraceptive device (IUCD), this 43 year old lady was admitted with severe abdominal pain. Radiological investigations indicated fluid collection in the rectovaginal area. The differential diagnosis included pelvic inflammatory disease with a possible pyosalpinx. The condition of the patient deteriorated further developing bilateral pleural effusions and pulmonary edema despite antibiotics. Patient started improving after CT guided aspiration of the pelvic abscess. Further management with antibiotics was administered after blood cultures showed an Actinomycosis infection. This patient presenting with a non-pulmonary cause of sepsis deteriorated rapidly and developed Adult Respiratory Distress syndrome. Although Actinomycosis is detected incidentally on cervical cytology in asymptomatic patients with an intrauterine device, it may present with lethargy, pyrexia and rigors. Prior to removal/re-insertion of an IUCD, cervical smears specifically for *actinomyces* should be done and patients should be treated with antibiotics if positive. The IUCD should then be introduced 6 weeks later. IUCD's should not be left in situ beyond their expiry date.

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Introduction

Actinomycosis in humans is a disease caused either by *Actinomyces israelii*, *A gerencseriae* and *Propionibacterium propionicus*. *Actinomyces Israeli* (principal pathogens) are Gram-positive rods. They are mostly commensals, living in the vagina, mouth and colon. A break in the mucosa for example during the insertion of Intrauterine Contraceptive Device (IUCD) will cause invasion of tissues by this bacterium.

With reference to IUCD related infections, two known mechanisms have been explained by which actinomyces israelii may lead to Pelvic Inflammatory Disease (PID). One mechanism describes how the string of the IUCD acts as a vehicle for ascent of the microbe from the vagina into the uterine fundus.[1]

The second mechanism describes how an IUCD which would have been kept in situ beyond its expected date of change/removal, undergoes calcium encrustation and disintegration. These calcium encrusted plastic fragments migrate through the cervical canal into the uterus providing an ideal surface for colonization and spread of the organism.[1] However this is mostly related to the Lippes loop IUCD which were left in situ for years on end as they did not expire.

We would suggest a third mechanism by which an infection is introduced into the uterine cavity. When removing the IUCD on expiry, you are also removing the "protective" mucous plug which would have been produced by the progestin releasing device. Hence if there is *actinomyces* present within the cervical canal, it can be reintroduced into the cavity upon re-insertion. This argument re-enforces the need to carry out smear tests prior to re-insertion of IUCD.

Actinomycosis detected in cervical smears may be present in symptom free patients. However early symptoms include low grade fever, chills and rigors. Eventually, late presentations include pelvic pain, foul smelling discharge leading to hospital admission with abscess formation.[1] Actinomycosis infection is sensitive to Penicillin.

The Case

A 43 year old athletic lady with a known case of endometriosis was admitted with sudden onset of right iliac fossa pain (RIF). A change of IUCD had been done 6 weeks before admission. Upon examination, tenderness with guarding was present in the RIF. A pregnancy test was negative and a chest X-ray and abdominal X-ray reported no abnormalities beside an IUCD in situ. Eventually a computed tomography scan (CT scan) was done which noted a fluid collection of 55mm in diameter between the uterus and rectum.

A transvaginal gynaecological ultrasound was done which reported an IUCD in situ, a cystic ovary in the right adnexae of mixed echogenicity and a small follicle in the left ovary. The pouch of Douglas was clear.

The patient was given analgesia and started on Piperacillin/Tazobactam and Metronidazole intravenously (IV). During her admission she developed bilateral lower limb pitting edema up to thighs and shortness of breath (SOB). Hypoalbuminaemia was also reported on blood tests. Eventually the SOB worsened, developing bilateral pleural effusions and bilateral lower lobe lung collapse. A Brain Natriuretic Peptide (BNP) was requested as the patient presented with a clinical picture of heart failure. BNP was reported to be high. An echocardiogram confirmed normal left ventricular dimensions, normal wall motions,

left ventricular ejection fraction >60%, normal: left atrium, right atrium and right ventricle excluding heart failure. Bumetanide and Albumin supplements were administered to reduce the extravasation of fluid secondary to sepsis.

The main diagnosis established was systemic sepsis due to PID, with development of Acute Respiratory Distress Syndrome (ARDS) and lower limb edema. The possible cause of PID was a pyosalpinx following IUCD insertion. The IUCD was removed.

A CT guided drainage of abscess was done. Eventually the patient continued to spike fever and antibiotics were switched to Teicoplanin and Meropenam IV. Blood cultures were obtained which cultivated *Actinomyces*. Eventually the patient still continued to experience fluctuating fevers in view of a recollection of the abscess and antibiotics were switched to Benzylpenicillin and Clindamycin IV.

Discussion

The relationship between cervical smears and its association with PID

The presence of actinomyces-like organisms on cervical smears is uncommon (only 7% of smears).[2] Many studies reported that incidence of *Actinomyces*-like organisms in IUCD's is higher. Positive smears are not diagnostic, nor a predictor of pelvic actinomycosis. Therefore most patients are treated conservatively unless symptomatic.

According to Merki-Feld GS et al. levonorgestrel-releasing IUCD users have a lower incidence of actinomyces-like organisms compared to copper-IUCD users. Women who have an IUCD insitu are more likely to develop bacterial vaginosis compared to the general public. This makes an environment favourable to anaerobes within the vagina facilitating actinomyces growth. [3-4]

Removing IUCD's once actinomycosis is detected still remains controversial. Treating conservatively usually results in negative cervical cytology after 4-6 weeks. Merki-Feld GS et al suggested IUCD removal should be done within a period of 3-5 days after starting treatment rather than immediately upon detection. Reinsertion should be done 4-6 weeks later.[3]

Studies by Chatwani. A and Amin-Hanjani. S conducted in Philadelphia showed that negative follow up smears, had a success rate of 100% when the option of IUCD removal combined with antibiotics was considered, 97.4% for IUCD removal alone, and 36.8% for antibiotics therapy alone. Hence it was concluded that the best way to manage actinomycoses is by removal of the IUCD with or without antibiotics. Patients who had multiple antibiotics including penicillin and tetracyclins had a better outcome compared to those patients who were on monotherapy.[5]

Actinomycosis and PID

Patients' with actinomycotic IUCD colonization have a greater risk of developing actinomycotic tubo-ovarian and subphrenic abscesses then those women with no IUCD colonization.[6] A period of at least 4-6 weeks of therapy is usually recommended. Most patients with pelvic masses underwent hysterectomy and bilateral salpingo-oophorectomy in addition to penicillin and IUCD removal; a few were successfully treated with drainage of an intra-abdominal abscess just like in this case.

Fluid extravasation in systemic sepsis leading to ARDS

In this case the initial signs of bilateral lower edema and increased SOB in such a young, healthy haemodynamically stable patient were surprising. Considering the patient's past medical history of intense physical body training; cardiomyopathy induced heart failure was being considered as a differential. A BNP of 457 (high) reinforced the decision to do an echo which excluded such pathology. Other causes of bilateral lower limb edema such as renal failure and liver failure were excluded through normal blood work up.

Upon reviewing the case; the development of pleural effusions, persistent lower limb edema, and hypoalbuminaemia made the final diagnosis of fluid extravasation and ARDS secondary to sepsis more likely. In studies done by Nakamura T et al. BNP levels were positively correlated in septic patients having high CRP levels without echocardiographic evidence of systolic dysfunction or volume overload.[7]

Furthermore, a positive correlation was found between a high BNP in septic shock patients and Sequential Organ Failure Assessment scores and prognosticated survival. Hence one can argue that BNP can be used as an independent prognostic marker in severe sepsis, being higher in non-survivors than survivors up to 72 hours post admission.[8-9]

Acute respiratory distress syndrome is a serious complication of severe sepsis, increasing mortality rates.[10] Underlying mechanisms are characterized by inflammation and endothelial dysfunction. Dysregulation of angiopoietin and Von Willebrand factor in endothelial injury are common findings in indirect causes of ARDS (non-pulmonary causes).[11] 6-7% of adult patients with sepsis in Western countries eventually develop ARDS. Once sepsis sets in, progression to ARDS is rapid. Hence identifying and treating sepsis early will reduce the need for patients to receive mechanical ventilation.[12] Main treatment of ARDS is to maintain adequate tissue perfusion and avoid hypoxia.

Conclusion

The overall learning points of this case including: 1. IUCD's should be removed immediately upon expiring; 2. Cervical cytology smears with specific request to screen for *Actinomyces* should be done prior to removal and/or re-insertion of IUCD's. 3. Removal of IUCD and treatment with antibiotics is the best option for *Actinomyces* positive smears. 4. ARDS secondary to systemic sepsis is an indicator of poor prognosis hence immediate treatment is recommended, BNP can be used as an independent prognostic marker in severe sepsis.

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