Abdominopelvic actinomycosis, when should we think about it?

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Learning objectives

Actinomycosis is an infrequent invasive bacterial disease caused by Actinomyces spp., anaerobic Gram-positive bacteria that normally colonize the human mouth and digestive and genital tracts.

Actinomycosis occurs most frequently in the cervical facial, abdominal and thoracic regions and although its overall incidence is decreasing, pelvic actinomycosis has recently become more prevalent due to the use of an IUD.

Radiologists must be aware of those typical presentations, but also that actinomycosis may mimic a malignancy process in various anatomical sites.

In this review, we aim to describe the overview of the different species of Actinomyces and the three main clinicopathologic presentations of actinomycosis (cervicofacial, pulmonary and abdominopelvic) and also we want to show some cases of abdominal-pelvic actinomycosis mimicking malignant neoplasm, diagnosed in our institution.
Background

Bacteria of the genus *Actinomyces* belong to the Actinobacteria phylum and Actinomycetales order. Besides *Actinomyces*, *Propionibacterium propionicum*, has often been reported as an agent of actinomycosis-like infections. More than 30 species of *Actinomyces* have been described but *Actinomyces israelii* is the most prevalent species isolated in human infections and is found in most clinical forms of actinomycosis. Thus, *A. israelii* and *A. gerencseriae* (formerly *A. israelii* serotype 2) are responsible for about 70% of cervicofacial infections.

As these microorganisms are not virulent, they require a break in the integrity of the mucous membranes and the presence of devitalized tissue to invade deeper body structures and cause human illness.

Establishment of human infection may require the presence of companion bacteria, which participate in the production of infection by inhibiting host defenses. These companion bacteria appear to act as copathogens that enhance the relatively low invasiveness of actinomycetes. Once infection is established it typically spreads contiguously, ignoring tissue planes and invading surrounding tissues or organs.

Actinomycetes are prominent among the normal flora of the oral cavity but less prominent in the lower gastrointestinal tract and female genital tract, for that reason, the cervicofacial involvement is the most common clinical form of actinomycosis.

The bacteriological identification of *Actinomyces* from a sterile site confirms the diagnosis of actinomycosis. However, isolation and identification of these causative bacteria occur in only a minority of cases.

Moreover, the identification of *Actinomyces* in mucosa, where these bacteria are normal inhabitants, is of little significance in the absence of sulfur granules or a typical clinical syndrome, highlighting the importance of microbiological investigations in combination with histologic analysis.

The most appropriate clinical specimens are tissue from surgical biopsy or pus and swabs must be avoided. Finally, clinicians should indicate suspicion for actinomycosis to the microbiologist to ensure that prolonged culture on appropriate media and in an appropriate atmosphere is performed.
Findings and procedure details

Abdomino-pelvic

Intra-abdominal organ involvement is the second in frequency after thoracic disease. The pathogenesis of abdominal actinomycosis is poorly understood. Actinomyces bacteria normally inhabit the colon, predominating in areas of stagnation such as the cecum and appendix. Those organisms require injury to the normal mucosa to penetrate and cause disease so predisposing factors include previous abdominal surgical operations, intestinal necrosis, foreign bodies, appendicitis and perforation.

Some authors suggest that inflammatory or neoplastic processes may contribute to actinomycosis development too.

Pelvic actinomycosis recently has become more prevalent, especially in women using IUDs in whom that device produces an injury to the normal mucosa and an ascending infection from the lower genital tract.

There are no specific signs or symptoms of abdominopelvic actinomycosis. The most common physical examination findings include a palpable mass and the most common clinical presentation includes abdominopelvic pain, nausea, vomiting, fever, weight loss, and defecation disturbances.

Establishing a diagnosis of abdominopelvic actinomycosis preoperatively is difficult because of the nonspecific nature of clinical, laboratory, and radiographic findings.

The use of radiographic studies in these cases may be helpful to establish the extent of the abdominal or pelvic organs involved and to show features of the wall of the mass. Most common findings in CT scan study include mural invasion with stricture formation, mass effect with tapered narrowing of the lumen, and thickened mucosal folds (Fig. 1 on page 8 and Fig. 2 on page 8). It usually reveals a pelvic mass with a mean size of 6-7 cm and with cystic lesions. A tubo-ovarian abscess strongly suggests pelvic actinomycosis (Fig. 3 on page 9). In many cases the radiologic findings are similar to those of Crohn’s disease, intestinal tuberculosis, and malignant tumors. A pelvic MRI is
also performed frequently to evaluate the extension of the mass and several reports have described that Actinomyces associated masses are of intermediate signal intensity on T1-weighted images and of intermediate to low signal intensity on T2-weighted sequences. Colonoscopic examination doesn´t have pathognomonic findings but it has been an indispensable diagnostic tool for excluding mucosal diseases, like colitis and neoplasms.

In most cases the diagnosis is made during the operation and confirmed by pathologic examination. A preoperative diagnosis is only made in 10% cases. Some authors have suggested that CT guided fine needle aspiration can be both diagnostic and therapeutic and can prevent unnecessary surgical treatment but usually the sample received is difficult to analyze, so we believe that in cases where the CT findings are nonspecific, surgical exploration is necessary not only for diagnostic but also for therapeutic reasons like necrotic debridement removal.

**Cervicofacial**

Cervicofacial actinomycosis, also called "lumpy jaw syndrome," is the most common form caused by Actinomyces israelii. The sites most commonly involved include the submandibular space, cheek, parotid gland, teeth, tongue, nasal cavity, gingival and oral space, hypopharynx, medial aspect of aryepiglottic fold, parapharyngeal space, hyoid area and the cartilage area of the thyroid. Most cases of cervical actinomycosis are odontogenic in origin and occur predominantly in immunocompetent individuals. Actinomyces are usually of low pathogenicity and cause disease only in the setting of previous tissue injury, for example, as a complication of a maxillo facial trauma, after surgical procedures and/or dental manipulations, or in patients presenting poor oral hygiene.

Actinomycosis can present in a variety of forms and may mimic other infections such as tuberculosis, other chronic granulomatous lesions, fungal infection or even malignancy. The infection most commonly presents as a suppurative or indurative chronic mass with discharging sinuses frequently located at the border of the mandible, with or without cervical lymphadenopathy. The common initial signs and symptoms of infection such as fever, sudden onset of cervicofacial pain, swelling, erythema, edema and suppuration may be absent. The infection develops silently in a subacute form, as a solid mass, slowly increasing in size with erosion and infiltration the cervicofacial bones.

Imaging techniques such as CT and MRI usually yield nonspecific findings, contributing only to define radiological features of the mass (limits and borders of the lesions, homogeneity and density of the content, localization, invasion of surrounding organs etc).
Pulmonary

Pulmonary actinomycosis is the third most common type of actinomycosis, after that occurring in cervicofacial and abdominopelvic locations and it results mainly from aspiration of oropharyngeal or gastrointestinal secretions. For this reason, individuals with poor oral hygiene or preexisting dental disease, have an increased risk for developing pulmonary actinomycosis but also patients with chronic lung disease.

The disease is mostly diagnosed at the chronic phase, in patients presenting nonspecific symptoms, similar to those of other chronic lung infections or thoracic cancer. General symptoms such as weight loss, fever, and night sweats may be present in this location.

At early stages of the disease, a focal pulmonary consolidation occurs that secondly lead to constitution of a peripheral mass, with or without cavitation, which could invade adjacent tissue. Imaging of pulmonary actinomycosis is not specific, and is frequently confused with malignancy (mass) or tuberculosis (cavitation). The main CT findings are consolidation, lymph node enlargement, atelectasis, cavitation, ground glass opacity, and pleural effusion. Pleural involvement, with thickening, effusion, or empyema is sometimes associated. (Fig. 6 on page 12)

The gold standard for diagnosing pulmonary actinomycosis is histological examination and bacterial culture of a lung biopsy, obtained by percutaneous biopsy guided by CT scan or by open surgical resection.
Fig. 1: 47 years old female presented to the emergency department with abdominal pain, nausea and vomiting and a palpable mass. An abdominal radiograph (A) shows distended small bowel and we can see that the woman uses an IUD (black arrow). CT confirms the dilated small bowel and a grade 2 hydronephrosis (B) due to an heterogeneous and enhancing pelvic mass surrounding the uterus (C).

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Fig. 2: The MRI performed in the same patient shows the rectosigmoid wall thickening with low signal intensity on the T2WI (A). The axial T1 C+ (after the administration of Gadolinium) (B, C) shows the enlargement of the uterus and the rectum wall thickening, all surrounded by enhancing pelvic fat and pseudotumoral inflammatory tissue with obliteration of the fat planes. The patient underwent a radical surgery because the malignant appearance of her lesions but finally the anatomopathological analysis demonstrated no evidence of malignancy and Actinomyces was isolated.

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**Fig. 3:** Middle-aged woman presented with low abdominal pain. The axial CECT (A) and the axial T1 C+ MR (B) demonstrates an heterogeneous and enhancing pelvic tissue surrounding the uterus and the ovaries with inflammatory changes in the adjacent fat. We can also see thick-walled cystic masses with wall enhancement suggestive of tubo-ovarian abscess. These abscess show high signal intensity in the coronal T2WI MR (C) due to their fluid contents.

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Fig. 4: Axial CECT (contrast enhancement) demonstrates lobulated, mildly enhancing soft tissue mass arising in the left paramedian posterior oropharyngeal wall (black arrow). Large adenopathies are not evident. It first suggested squamous cell carcinoma but the anatomopathological examination showed no evidence of malignancy and finally the patient was diagnosed with oropharyngeal actinomycosis.

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Fig. 5: The orthopantomography shows bone lucencies in the left mandible rami due to osteomyelitis following left mandibular radiotherapy. The patient showed bone exposure and a sinus tract and the microbiological analysis indentified Actinomyces.

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Fig. 6: Computed tomography scan revealing a left focal pneumonia without cavitation, due to Actinomyces spp., in an immunosuppressed woman. Note the non-specific findings that can simulate other infectious pathologies.

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Conclusion

In conclusion, although the diagnosis of abdominopelvic actinomycosis only with imaging techniques and laboratory tests is difficult, it should always be included in the differential diagnosis in patients with abdominal masses with tumor of inflammatory characteristics. It should be suspected when we see on a CT scan a solid mass with focal areas of attenuation or a cystic mass with a thickened wall showing inhomogeneous contrast enhancement that tends to invade adjacent tissues or structures, especially if the patient is a woman who uses an intrauterine device and suffers abdominal pain and a palpable mass is detected in the clinical examination.
References


