Pelvic Actinomycosis-Like Disease Due to *Propionibacterium propionicum* after Hysteroscopic Removal of an Intrauterine Device

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A female patient presented with episodes of fever and pain in the lower right abdomen after hysteroscopic removal of an intrauterine device 2 months earlier. Pelvic actinomycosis originating from a tubo-ovarian abscess was diagnosed with *Propionibacterium propionicum*, formerly known as *Arachnia propionica*, as causative agent.

**CASE REPORT**

A 38-year-old woman presented at the emergency department with complaints of periodic fever and pain in the lower right abdomen 2 months after hysteroscopic removal of an intrauterine device (IUD). The temperature was 38°C. At gynecological examination, tenderness of the right lower abdomen was noticed with a bulging swelling in the recto-uterine pouch. Laboratory examinations showed a leukocytosis (13.4 × 10⁹/liter; normal value = 4.0 × 10⁹ to 10.0 × 10⁹/liter), an elevated C-reactive protein level (129 mg/liter; normal value = 1 to 10 mg/liter), an elevated erythrocyte sedimentation rate (45 mm; normal value = 0 to 25 mm), and a microcytic anemia (hemoglobin [Hb] = 11.4 g/dl; normal value = 12 to 16.1 g/dl), indicating the presence of a chronic infection. An abdominal-pelvic ultrasonography showed an enlarged right adnexum measuring 9 cm in diameter with a multilocular circumscribed fluid collection with a small echodense area and a larger transonic area with some free fluid in the recto-uterine pouch (Fig. 1, panel 1, A and B).

Pelvic inflammatory disease with a tubo-ovarian abscess was suspected, and antibiotic treatment consisting of doxycycline and metronidazole was administered. There was no clinical improvement after 2 days of treatment, and subsequently vaginal puncture of the abscess was performed. Gram stains of the abscess material showed a few Gram-positive, filamentous rods with possible branching, positive cocci in chains, and many polymorphonuclear leukocytes. Based on the results of the Gram stain, doxycycline was switched to penicillin to treat a possible actinomycosis.

After 2 days of incubation, smooth white colonies of branching Gram-positive rods and small colorless colonies of Gram-positive cocci were observed on the anaerobic medium, Columbia agar with 5% sheep blood (bioMérieux Benelux B.V., Boxtel, Netherlands). The Gram-positive rods were catalase and oxidase negative, and biochemical evaluation on the basis of the API Rapid ID 32 A test (bioMérieux Benelux B.V., Boxtel, Netherlands) identified the organism as *Propionibacterium propionicum*, formerly known as *Arachnia propionica*. The Gram-positive cocci were identified as *Parvimonas micra* and a *Peptostreptococcus* species using the same API Rapid ID 32 A test (bioMérieux Benelux B.V., Boxtel, Netherlands). The *P. propionicum* and *Peptostreptococcus* species were confirmed with 16S rRNA sequencing, and both showed >99.9% homology with representatives in GenBank. Sequence analysis of the *P. propionicum* strain resulted in 1,061 bp of the 5′ end from the 16S rRNA gene, which was given the GenBank accession number HQ413290. The highest homology was observed with the partial 16S rRNA sequence of *P. propionicum* with accession number AF285117.

Two days after the antibiotic switch to penicillin, no clinical improvement was observed. A computed tomography (CT) scan showed a multilocular lesion of 9 cm in diameter in the recto-uterine pouch (Fig. 1, panel 2, C and D, and panel 3, E).

An open laparoscopic procedure was performed and showed an enlarged right ovary of approximately 9 by 5 cm that was located behind the uterus and reached into the recto-uterine pouch. Several adhesions between the uterus and right adnexum were laparoscopically removed. The fallopian tube was also enlarged, and during manipulation pus was released from the right ovary. The left adnexum was partly visible due to adhesions but was considered normal. The abscess of the right ovary was drained, and a drain was left in situ in the recto-uterine pouch.

Gram stains of the abscess material again showed rare Gram-positive, filamentous rods with possible branching suggestive of actinomycosis, positive cocci in chains, and many polymorphonuclear leukocytes. Culture grew no aerobic organisms, but after 2 days there was growth of smooth white colonies of branching Gram-positive rods and small colorless colonies of Gram-positive cocci on the anaerobic medium, Columbia agar with 5% sheep blood (bioMérieux Benelux B.V., Boxtel, Netherlands). Results of identification by the API Rapid ID 32 A test (bioMérieux Benelux B.V., Boxtel, Netherlands) revealed *P. propionicum*, *P. micra*, and *Peptostreptococcus* species.

The patient showed a rapid clinical improvement after the operation and was released from the hospital 1 week later. All the cultured isolates were penicillin susceptible as determined by penicillin Etest (AB Biodisk, Solna, Sweden). The MICs for...
penicillin were 0.094 μg/ml for *P. propionicum*, 0.047 μg/ml for the *Peptostreptococcus* species, and 0.012 μg/ml for *P. micra*. The patient was treated for 4 weeks with 24 million units of penicillin intravenously, after which the treatment was continued with amoxicillin for 6 months orally. Follow-up of the right adnexum was performed with ultrasonography. After 6 months, the patient was well and ultrasonography and gynecologic investigation showed a normal aspect of both adnexa.

**Discussion.** We report a patient with an actinomycosis-like pelvic process originating from a tubo-ovarian abscess 2 months after hysteroscopic removal of an IUD that was in situ for approximately 8 years. *P. propionicum*, *P. micra*, and *Peptostreptococcus* species were found as causative agents. Of these three, *P. propionicum* is the most pathogenic species, causing actinomycosis-like disease. *P. propionicum* has been isolated from patients with lacrimal canaliculitis, osteomyelitis, brain abscess, endodontic infections, chronic typanomastoiditis, renal abscesses, pulmonary abscesses, and cervico-facial actinomycosis (2, 4, 6, 10, 21, 23, 30, 33); in one case of chronic granulomatous disease with multiple episodes of chest trauma and microabscesses and granulomatous inflammation in lung tissue (26); and in one case of disseminated actinomycosis with a hepatic abscess (14). This case report represents the first finding of *P. propionicum* in association with pelvic disease.

Propionibacteria belong to the family of *Propionibacteriaceae* and are pleomorphic, slow-growing, non-spore-forming, Gram-positive, anaerobic bacteria. Species of propionibacteria can be found as members of commensal flora, especially on the skin, in the mouth, and in the gastrointestinal tract. They are generally nonpathogenic but become pathogenic in patients with implantation of foreign bodies, with immunosuppression, and after surgery or trauma. Four clinically relevant species of propionibacteria have been recognized: *Propionibacterium acnes*, *Propionibacterium avidum*, *Propionibacterium granulosum*, and *Propionibacterium propionicum* (20).

*P. propionicum* was first described by Pine and Hardin in 1959. At that time the organism was identified as *Actinomyces israelii* (27). Subsequent work by Buchanan and Pine suggested that this organism represented a new species, *Actinomyces propionicus*, on the basis of differences in metabolism, physiology, and cell wall composition (7). The organism was later reclassified again and placed in a new genus, *Arachnia*, under the name of *Arachnia propionica* (2). Further research later classified the organism in the genus *Propionibacterium*, under the name of *P. propionicum* (8, 11, 35).

*P. propionicum* differs from *Actinomyces* species by production of propionic acid from glucose and by the presence of diaminopimelic acid in the cell wall that resembles those of other *Propionibacterium* species (15, 25). Differentiation between the two different species can also be performed with 16S rRNA sequencing (1, 28).

*P. propionicum* and *A. israelii* are difficult to distinguish because both bacteria are microaerophilic to anaerobic and grow optimally under anaerobic conditions. The most pronounced differences of *P. propionicum* and *A. israelii* are differences in growth rate and colony morphology on Columbia agar with 5% sheep blood (bioMérieux Benelux B.V., Boxtel, Netherlands) incubated anaerobically. *P. propionicum* grows after 18 to 24 h of incubation as very small smooth white colonies with branches originating from a single point; after 7 to 14 days of incubation, the colonies get bigger and then resemble the colonies of *A. israelii* with its rough breadcrumb or molar structure. In contrast to *P. propionicum*, *A. israelii* starts to grow only after 7 to 10 days of incubation and its colony morphology immediately looks like a molar tooth.

*P. micra* and *Peptostreptococcus* species were also found in the actinomycosis-like pelvic lesions due to *P. propionicum*. We consider their presence to be that of “companion microbes.” These concomitant bacteria may serve as copathogens enhancing the progress of the disease. *Actinobacillus actinomycetemcomitans*, *Eikenella corrodens*, *Fusobacterium* spp., *Bacteroides* spp., *Capnocytophaga* spp., *Staphylococcus* spp., *Streptococcus* spp., and *Enterobacteriaceae* have been commonly isolated in various combinations depending on the site of infection (13, 16, 24, 29, 31, 32). The coinoculation of *P. micra* and *Peptostreptococcus* sp. in this case of an actinomycosis-like disease due to
P. propionicum therefore is not unusual. We consider P. propionicum to be the main pathogen, because in this case it is the only isolate that can cause an actinomycosis-like disease (2, 4, 6, 10, 14, 21, 23, 26, 30, 33). The contribution of P. micra and Peptostreptococcus sp. to pathogenesis, however, is difficult to assess, and it seems reasonable to consider them as being copathogens when designing the therapeutic regimen. Therefore, it is important to perform the identification and to determine the antimicrobial susceptibility of the concomitant bacteria in cases of actinomycosis or actinomycosis-like disease.

The first two cases of pelvic actinomycosis associated with a contraceptive device were reported by Brenner and Gehring in 1967 (5) and Henderson in 1973, who reported a tubo-ovarian abscess associated with an IUD (17). There are several studies reporting that pelvic actinomycosis is associated with prolonged use of an IUD (3, 18, 19, 34). In general the risk of acquiring contraceptive device were reported by Brenner and Gehring in criteria in cases of actinomycosis or actinomycosis-like disease. Hence, it is important to perform the identification and to determine the antimicrobial susceptibility of the concomitant bac-

To our knowledge, only one study reported two cases of actinomycosis in association with an IUD which were consid-
ered to be associated with P. propionicum. Diagnosis was con-

Nucleotide sequence accession number. The 1,061-bp se-

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