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## Paronychia Due to *Prevotella bivia* That Resulted in Amputation: Fast and Correct Bacteriological Diagnosis Is Crucial

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***Prevotella bivia* is mainly associated with endometritis. The case of a patient with paronychia in a thumb due to *P. bivia* resulting in osteitis and amputation is reported. The species was not acknowledged in the first bacterial culture 2 weeks before surgery.**

### CASE REPORT

A 45-year-old-male Caucasian truck driver and work manager experienced paronychia in his left thumb. He had no history of previous trauma. The medical history included adiposity (174 cm, 110 kg) and non-insulin-dependent diabetes mellitus (NIDDM). The diabetes was discovered 6 months earlier during a health checkup and was regulated by diet and administration of metformin twice daily. A few months after the NIDDM diagnosis, the patient achieved good metabolic control, resulting in an HbA1C level of 5.9% and a fast plasma glucose reading of 6.5 mmol/liter. Four days after manifestation of the paronychia, he attended a general practitioner and was prescribed isoxazolyl penicillin (flucloxacillin). A specimen was sent for microbiological analysis and revealed (3 days later) abundant growth of both  $\beta$ -hemolytic streptococci group B (GBS) and anaerobic gram-negative rods. The GBS was identified by CAMP (Chrisie-Atkins-Munch-Peterson) test, cefadroxil susceptibility, and Streptex (Murex). No further susceptibility testing was done, but the GBS was considered susceptible to penicillin V, ampicillin, cefadroxil, cefuroxime, and clindamycin according to the continuous Swedish Antimicrobial Resistance Policies (14). The anaerobic rod was not further characterized. Five days later, the patient was again admitted to the general practitioner due to aggravating symptoms. Since necrosis and swelling had occurred, the patient was referred to Department of Orthopedics for revision of the wound. An X ray of the finger was taken and was interpreted as showing no signs of osteitis. A careful reexamination showed, however, that the periosteum was damaged, suggesting osteitis (Fig. 1). Three days later, the patient came for a checkup, but the symptoms were worse, and he was therefore referred to the Department of Hand Surgery. A new culture was taken and revealed abundant growth of both a streptococcus belonging to the *Streptococcus milleri* group and anaerobic gram-negative rods, which were classified as *Prevotella bivia*. The nonhemolytic streptococcus was identified by mannitol and sorbitol fermentation tests (both negative), its capability to hydrolyze arginine and esculin, and, finally, a negative Voges-Proskauer test. The streptococcus was susceptible to penicillin

G, ampicillin, isoxazolyl penicillin, cefuroxime, erythromycin, clindamycin, vancocin, and linezolid, as examined by disk diffusion tests or E-test (penicillin G MIC, 0.032 mg/liter [Bio-disk]). *P. bivia* was isolated on supplemented blood agar plates containing Columbia II agar, L-cysteine, hemin, and vitamin K<sub>1</sub> and was found to be obligately anaerobic. The isolate was classified as *P. bivia* by the RapID ANA II system (>99.9% probability; Innovative Diagnostic Systems). The RapID ANA II test does not, however, discriminate between *Bacteroides tectus*, a species that can be found in dog and cat wound bites, and *P. bivia* (2). The key biochemical reactions used to differentiate these two species are growth in 20% bile and esculin hydrolysis. Our *P. bivia* isolate fulfilled both criteria: i.e., it did not grow in the presence of bile and was devoid of esculin hydrolysis. The bacterial organism was  $\beta$ -lactamase positive by the cefinase disk method, and the isolate was found to be susceptible to imipenem (MIC, 0.008 mg/liter), clindamycin (MIC, 0.032 mg/liter), and metronidazole (MIC, 1.0 mg/liter) by E-tests. At the Department of Hand Surgery, intravenous treatment with cefuroxime and metronidazole was initiated, and surgical debridement of the infected tissue was done daily. In addition, topical application of gentamicin to the wound was performed. After a week, the condition improved. However, despite thorough debridement and resection of the infected bone, the hand surgeons were forced to amputate the thumb's distal phalanx and half of the proximal phalanx. The antibiotic regimen was changed to oral administration of clindamycin, and this treatment was continued for 4 weeks.

**Discussion.** Several hundred different anaerobic species can be found in the indigenous human microflora of the host. The majority of these anaerobes are able to cause infection under certain circumstances. *Prevotella*, which was previously related to *Bacteriodes* spp., is one of the major genera of anaerobic gram-negative rods (5, 9). Members of the nonpigmented *Prevotella* group include at least 10 different species with *P. bivia* associated with infections of the female genital tract and occasionally with oral infections. In bacterial vaginosis and pelvic inflammatory disease, *P. bivia* often is isolated together with *Gardnerella vaginalis*, *Bacteroides ureolyticus*, *Prevotella corporis*, and *Peptostreptococcus* spp. (6, 19). Out of 131 anaerobes isolated from amniotic fluid with preterm premature rupture of membranes, 38 strains were diagnosed as *P. bivia* (13).

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FIG. 1. Radiograph of the left thumb with signs of osteitis (indicated by the arrow).

When Brook and Frazier studied the microbiology of perirectal abscesses in 144 patients, 71 isolates of *Prevotella* spp. were found in a total of 325 isolates (3). Fourteen of the 71 isolates were identified as *P. bivia*. Interestingly, a commensal relationship has been suggested between *P. bivia* and *G. vaginalis* (16). In bacterial vaginosis, Pybus et al. suggest that *P. bivia* increases the net ammonia production promoting the growth of *G. vaginalis* (16). Lactobacilli, on the other hand, exert antagonistic activities against *P. bivia* among both aerobic and other anaerobic species (18).

It is well known that most *P. bivia* isolates are  $\beta$ -lactamase positive. In a study with 159 bacterial vaginosis-associated anaerobic isolates from pregnant women in Japan and Thailand, 34 out of 36 *P. bivia* isolates were  $\beta$ -lactamase positive (15). As with our strain, all *P. bivia* isolates were susceptible to clindamycin, metronidazole, and imipenem.

*P. bivia* has been associated with septic arthritis in an immunocompromised patient treated with low doses of corticosteroids due to a severe and long-lasting rheumatoid arthritis (1). Moreover, *P. bivia* caused septic arthritis in a patient infected secondary to an intra-articular hip joint injection (11). *P. bivia* has also been found as the only species causing endocarditis in a patient with no previous history of cardiac lesions (10). The only clinical manifestations were multiple systemic bacterial emboli at least 7 months before diagnosis. In yet another study, *P. bivia* together with microaerophilic streptococci was isolated from a child with an intracranial abscess (8). Together with *Prevotella oralis* and *Prevotella loescheii*, *P. bivia* has also been isolated in an infected wound of the foot (17). Finally, *P. bivia* and *P. buccae* have also been described as the causative microorganisms in an orbital abscess with cellulitis affecting a terrier (7).

Several pieces of evidence exist confirming the seriousness of infections with *P. bivia*. In recent years, a growing body of evidence on mechanisms, which may possibly enhance *P. bivia*'s

pathogenic potential have been described. For example, the bacterium has elastolytic capacity, an ability that may possibly induce destruction of host tissues (13). In addition, there are data suggesting that *P. bivia* needs to grow in conjunction with an aerobic organism in order to cause disease. Our case also suggests that *P. bivia* needs to grow together with aerobic species in order to cause disease. In a rat pyometra model, it has been demonstrated that a mixture of aerobes and *P. bivia* considerably increases the pathogenicity of the anaerobic bacterium (12). In parallel, *P. bivia* and *Peptostreptococcus* spp. do not induce subcutaneous abscesses at concentrations as high as  $10^9$  CFU/ml in a mouse model (4). However, mixed cultures with *Escherichia coli* and *P. bivia* have caused infective abscesses. Moreover, *P. bivia* was the predominant microorganism after 2 weeks, whereas a higher number of *E. coli* cells was found in the acute stage of infection. The ability of *P. bivia* to coaggregate with facultative bacteria may thus account for its persistence in pathological sites, as we observed in the patient presented in this report.

Taken together, we have reported a rare case of a mixed skin infection and osteitis with *P. bivia* as a common denominator. Despite the fact that both a GBS and a streptococcus belonging to the *S. milleri* group were isolated in the first and second specimens, respectively, the importance of correct microbiological identification of anaerobes in addition to drug resistance patterns cannot be underestimated.

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