Scrotal Abscess in a Japanese Patient Caused by *Prevotella bivia* and *Streptococcus agalactiae*, Successfully Treated with Cefazolin and Amoxicillin: A Case Report

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**Background:** Infections caused by *Prevotella bivia*, a gram-negative anaerobic bacillus, are rare, with no reported cases in Japan. We present a novel case of scrotal abscess in a Japanese patient co-infected with *Prevotella bivia* and *Streptococcus agalactiae*.

**Case Presentation:** A 41-year-old uncontrolled diabetic man complained of swelling and pain in the scrotum. On examination, computed tomography revealed an abscess of 5-cm diameter in the scrotum. Then, the abscess was incised and drained. He was treated with cefazolin empirically. *Prevotella bivia* and *Streptococcus agalactiae* were identified in the pus cultures obtained from the abscess. However, the susceptibility tests for *Prevotella bivia* could not be submitted. Seven days following admission, the pain reduced, and the drainage slowed. The patient was discharged on day 14 when cefazolin was discontinued and oral amoxicillin (750 mg/day) was started. Amoxicillin was continued until day 42; improvement was confirmed.

**Conclusion:** To the best of our knowledge, this case is the first report of *Prevotella bivia* in Japan. We suggest that cephem antibiotics such as cefazolin may be effective against *Prevotella bivia* in Japan.

**Keywords:** case report, *Prevotella bivia*, *Streptococcus agalactiae*, cefazolin, amoxicillin

**Background**
Approximately 90% of skin infections are caused by *Staphylococcus aureus* and *Streptococcus pyogenes*, sometimes in combination with anaerobic bacteria such as *Bacteroides* and *Prevotella* species.¹,² *Prevotella* species are present in the vaginal flora and can cause pelvic inflammatory diseases along with perirectal abscess.³,⁴ *Prevotella bivia* is a gram-negative anaerobic bacillus whose virulence is presumably enhanced by low oxygen tension in a polymicrobial environment.⁵ *Prevotella bivia* infections in humans are rare, with only 18 published cases in 44 years.⁶–⁲³ Since most *Prevotella bivia* strains are β-lactamase-positive,²⁴ clindamycin, amoxicillin/clavulanate, metronidazole, and imipenem are the recommended antibacterial agents.²¹,²⁵ However, antibiotic resistance varies across countries,²⁶ and it is unknown whether *Prevotella bivia* strains in Japan are β-lactamase positive.

To the best of our knowledge, there have been no reported cases of *Prevotella bivia* infections in Japan. Herein, we present a case of scrotal abscess in a Japanese patient that was caused by *Prevotella bivia* and *Streptococcus agalactiae*, and successfully treated using cefazolin followed by amoxicillin.
Case Presentation

A 41-year-old man visited the urology department of JR Tokyo General Hospital with complaints of swelling and pain in the scrotum that had commenced 3 days earlier. A urologist diagnosed epididymitis and prescribed levofloxacin at 500 mg/day. However, the symptoms did not improve, and the patient visited the dermatology department of JR Tokyo General Hospital (day 0).

On admission, he presented with a temperature of 36.5°C, a blood pressure of 131/80 mmHg, and a heart rate of 100 beats per minute. His height and weight were 164 cm and 94.8 kg, respectively (body mass index: 35.2 kg/m²). Local examination revealed that the scrotum was markedly swollen. The laboratory workup on day 0 revealed elevated levels of serum C-reactive protein (6.71 mg/dL) (normal: ≤0.30 mg/dL) and white blood cells (13,800/μL) (normal: ≤8600 mg/dL). Furthermore, untreated diabetes was diagnosed owing to high hemoglobin A1c level (11.5%) (normal: ≤6.0%), and insulin-enhancing therapy was initiated on day 0. The patient’s anti-streptolysin O antibody titer was 49 U/mL (normal: ≤239 U/mL), and no renal or hepatic dysfunction was observed. Test results for syphilis (rapid plasma reagin and Treponema pallidum hemagglutination) and human immunodeficiency virus antibodies were negative. The patient had not visited a medical institution for about 20 years; therefore, he declared no medical history. His partner was a woman, and he did not engage in commercial sex. Notably, there was no family history.

Additionally, computed tomography revealed an abscess with a diameter of 5 cm in the scrotum without gas image (Figure 1). There were no abnormal findings in the testes or epididymis. On day 0, the skin above the abscess was incised, which was drained, and the pus obtained was submitted for culture. We do not have a dedicated transport spitz for anaerobic bacteria. Therefore, we contacted the bacterial laboratory before the incision and asked them to prepare the culture in advance. About 5cc of pus was put into a sterilized spitz and transported to the bacterial laboratory within a few minutes for immediate culturing. Additionally, the blood culture was submitted on day 0. Intravenous administration of cefazolin (2 g/8 h) was empirically initiated as an antibacterial treatment for the scrotal abscess. The blood culture was negative. Culturing of the pus in the abscess revealed the presence of Prevotella spp. (RapID ANA II System, Thermo Fisher Scientific, United States) and Streptococcus agalactiae (group B) spp. (Prolex™ Streptococcal Grouping Latex Kit, IWAKI&CO., LTD., Japan). Furthermore, the antibiotic susceptibility pattern of Streptococcus agalactiae was done according to MICroFAST 7J, BECKMAN COULTER, United States; therefore, intravenous administration of cefazolin was empirically continued (Table 1). In Japan, the antibiotic susceptibility of Prevotella bivia could not be measured this time because it can be measured only at a specific research facility.

Although the symptoms exhibited improvements, pus drainage continued, and the pain persisted; therefore, a second pus culture was performed on day 7. A large number of gram-negative bacilli were observed and identified as Prevotella bivia (RapID ANA II System, Thermo Fisher Scientific, United States) on day 10 (the pus culture was negative for Streptococcus agalactiae). At this time, the pain subsided, and the pus drainage slowed. The patient was discharged on day 14 when cefazolin was...
Table 1 Antibacterial Sensitivity Test (MICroFAST 7, BECKMAN COULTER, United States) Results for Streptococcus agalactiae Cultured from the Pus Collected from the Patient's Scrotal Abscess

| Drug                        | MIC    | Interpretation |
|-----------------------------|--------|----------------|
| Ampicillin                  | 0.12   | Sensitive      |
| Penicillin G                | 0.06   | Sensitive      |
| Amoxicillin/clavulanate     | ≤0.25  | Not assessed   |
| Cefotiam                    | ≤0.5   | Not assessed   |
| Cefotaxime                  | ≤0.12  | Sensitive      |
| Ceftriaxone                 | ≤0.12  | Sensitive      |
| Cefepime                    | ≤0.5   | Sensitive      |
| Cefditoren pivoxil          | ≤0.06  | Not assessed   |
| Cefozopran                  | ≤0.12  | Sensitive      |
| Meropenem                   | ≤0.12  | Sensitive      |
| Erythromycin                | ≤0.12  | Sensitive      |
| Clindamycin                 | ≤0.12  | Sensitive      |
| Minocycline                 | ≤0.5   | Sensitive      |
| Vancomycin                  | 0.5    | Sensitive      |
| Chloramphenicol             | ≤4     | Sensitive      |
| Rifampicin                  | ≤1     | Not assessed   |
| Sulfamethoxazole/trimethoprim| ≤0.5   | Not assessed   |
| Levofloxacin                | >8     | Resistant      |
| Azithromycin                | ≤0.25  | Sensitive      |

Abbreviation: MIC, minimum inhibitory concentration (μg/mL).

In particular, when Prevotella bivia and Streptococcus agalactiae are co-infectious, they reportedly have a 100% chance of causing infection in a mouse model. Knowledge of other bacterial genera present is important when treating Prevotella bivia infections, since they may alter the pathogenicity of Prevotella bivia. Abscesses occurred in seven of the 19 cases, including our case. The presence of abscess formation in approximately 37% of reported cases of Prevotella bivia infection is considered a non-negligible finding. Prevotella bivia infection should also be kept in mind when the patient has an abscess. In many cases shown in Table 2, metronidazole or clindamycin was the chosen treatment. Prevotella bivia is susceptible to these drugs, as well as to amoxicillin/clavulanate and imipenem. However, our patient was successfully treated with cefazolin followed by oral amoxicillin.

There are two possible reasons for this. First, the mixed infection by facultative anaerobe pathogen Streptococcus agalactiae is the factor that lowers the tissue oxygen tension and allows for the growth of anaerobic Prevotella bivia after eradication of the Streptococcus agalactiae, which was evidenced. Second, Prevotella bivia strains in Japan may be sensitive to cefazolin and amoxicillin, whereas strains in other countries are resistant. In support of cefazolin sensitivity, a similar antibiotic (flomoxef) has exhibited effectiveness against Prevotella bivia in an experimental animal model in Japan. Unfortunately, there was no drug susceptibility test for Prevotella bivia conducted in our case; thus, whether it was susceptible to cefazolin or amoxicillin is unknown.

Among the 19 patients in Table 2, five had no medical history, and 17 were 65 years old or younger. Thus, immune deficiency and aging may not be risk factors for Prevotella bivia infection, as they are for cellulitis. In Table 2, diabetes or obesity was observed in four of the 19 cases. Moreover, diabetes is common among Japanese people and thus may be a risk factor forPrevotella bivia infection.

In conclusion, we encountered a case of scrotal abscess caused by Prevotella bivia and Streptococcus agalactiae in a Japanese patient. To the best of our knowledge, there have been no reported cases of Prevotella bivia infections in Japan. Therefore, we suggest that cepham antibiotics such as cefazolin may effectively treat Prevotella bivia in Japanese patients if incision and drainage are properly performed.

Discussion and Conclusions
We encountered a case of scrotal abscess due to Prevotella bivia and Streptococcus agalactiae. Prevotella bivia is predominantly associated with low-grade infections in the female urogenital tract, presenting as endometritis, pelvic inflammatory disease, or perirectal or anal abscess. However, it can also cause infections in non-gynecological tissues.

Table 2 summarizes previous reports of Prevotella bivia infections as published in PubMed. Similar to our case, the case presented by Bekasiak et al involved a scrotal abscess and coinfection with a second bacterial genus. Additionally, coinfection occurred in 7 cases, including 2 cases with Prevotella bivia and Streptococcus anginosus, a well-known species that produces an abscess. The presence of co-infectious bacteria is important for Prevotella bivia infections.

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| Author          | Diagnosis                  | Age | Co-Infection                  | Medical History                        | First Therapy                                      | Second Therapy                                      | Third Therapy                                      |
|---------------|-----------------------------|-----|-------------------------------|----------------------------------------|---------------------------------------------------|-----------------------------------------------------|--------------------------------------------------|
| Grande-Del-Arco | Paronychia                  | 38  | F                             | Staphylococcus haemolyticus            | Onychomycosis                                     | Metronidazole (500 mg), cephalaxin (500 mg), every 8 h per os | Moxifloxacin (400 mg/day for 2 weeks) | Rifampicin (600 mg/day) |
| Boucher       | Nonpuerperal breast abscess | 39  | F                             | None                                   | IgA nephropathy (Berger’s disease), hypertension  | Flucloxacillin (500 mg/6 h)                         | Amoxicillin/clavulanate (625 mg/8 h), metronidazole (500 mg/8 h) | None |
| Mohan         | Renal and perinephric abscesses | 26  | F                             | Lactobacillus jensenii               | Stable renal cyst                                  | Cefepime, vancomycin                               | Ceftriazone (2 g/day), metronidazole (500 mg/8 h) | None |
| Samantara     | Intracranial abscess        | 50  | M                             | Methicillin-resistant Staphylococcus aureus | Head trauma                                        | Metronidazole                                     | None                                             | None |
| Bekasiak      | Scrotal abscess             | 27  | M                             | Gardnerella vaginalis                | Obesity                                            | Ceftriazone (1 g/day)                              | Cephalaxin (500 mg P.O., 4 times/day), metronidazole (500 mg, 3 times/day) | None |
| Kostov        | Fulminant generalized peritonitis | 39  | F                             | None                                   | None                                               | Gentamicin (120 mg/12 h, i.m.), cefazolin (2 g every 12 h, i.v.), metronidazole (500 mg every 8 h, i.v.) | Metronidazole (500 mg every 8 h, i.v.) | None |
| Masadeh       | Purulent proctitis          | 32  | M                             | None                                   | None (homosexual)                                  | Ceftriazone                                       | Doxycycline, metronidazole                         | None |
| Di Marco Berardino | Empyema               | 78  | M                             | None                                   | None                                               | Chronic obstructive pulmonary disease, chronic periodontitis | Levofloxacin (750 mg/day) | Intravenous clindamycin (600 mg/8 h) | Oral clindamycin (300 mg/6 h for 4 weeks) |
| Mirza         | Paronychia                  | 17  | F                             | Methicillin-sensitive Staphylococcus aureus | None                                              | Cefazolin                                         | Oral ciprofloxacin                                 | None |
| Mirza         | Paronychia                  | 55  | F                             | Enterococcus spp., Pseudomonas aeruginosa and melaninogenica | None                                              | Oral ciprofloxacin                                 | Oral clindamycin                                  | Oral ciprofloxacin |
| Janssen       | Abdominal wall phlebitis    | 55  | F                             | None                                   | Diabetes mellitus, renal transplantation, haemodialysis, obesity | Metronidazole                                    | Metronidazole, ceftriazone                        | None |

(Continued)
### Table 2 (Continued)

| Author    | Diagnosis                        | Age | Co-Infection          | Medical History                     | First Therapy                                                                 | Second Therapy                                                                 | Third Therapy                   |
|-----------|----------------------------------|-----|-----------------------|-------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------|
| Lepivert  | Necrotizing fasciitis            | 65  | None                  | Diabetes mellitus                   | Intravenous vancomycin (2g/24 h), piperacillin/tazobactam (4g/h)               | Intravenous amoxicillin-clavulanic acid (1g/6 h), levofloxacin (500 mg/12 h) | Oral amoxicillin/clavulanic acid, levofloxacin |
| Hsu       | Chest wall abscess               | 77  | None                  | None                                | Oral amoxicillin/clavulanate                                                   |                                   |                                   |
| Nalmas    | Penile abscess                   | 44  | Streptococcus constellatus | Hypertension, obstructive sleep apnea, mild asthma | Intravenous vancomycin, clindamycin, cefepime                                  | Intravenous vancomycin, clindamycin                                        | Oral amoxicillin/clavulanate (875 mg, twice/day) |
| Huits     | Lemierre’s syndrome              | 17  | None                  | None                                | Intra venous amoxicillin-clavulanic acid (1000/200 mg tds)                     | Benzy l-penicillin (6 million units tds IV), metronidazole (500 mg qid IV)    | None                             |
| Riesbeck  | Paronychia                       | 45  | β-hemolytic streptococci group B, Streptococcus milleri group | Adiposity, non-insulin-dependent diabetes mellitus | Isoxazolyl penicillin                                                         | Intravenous cefuroxime, metronidazole                                       | Oral clindamycin                  |
| Laiho     | Septic arthritis                 | 23  | None                  | None                                | Imipenem (1000 mg)                                                            | None                                                                           | None                             |
| Sagristà  | Inguinal syndrome                | 34  | None                  | None (unprotected sexual intercourse with a woman) | Doxycycline, ciprofloxacin                                                    | Oral amoxicillin/clavulanate                                                  | None                             |
| Our case  | Scrotal abscess                  | 41  | Streptococcus agalactiae (group B) | Diabetes mellitus                   | Levofoxacin                                                                   | Cefazolin                                                                      | Oral amoxicillin                  |

**Abbreviations:** F, female; M, male.

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### Ethics Approval and Consent to Participate
Submission of this manuscript has been approved by the JR Tokyo General Hospital’s ethics review board.

### Consent for Publication
We obtained written signed informed consent from the patient to publish his clinical details.

### Informed Consent
We obtained written signed consent from the patient to publish his clinical details.

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### Author Contributions
All authors contributed to data analysis, drafting or revising the article, gave final approval of the version to be published, agreed to the submitted journal, and agree to be accountable for all aspects of the work.

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