Case Report

Perinephric Abscess and Empyema Thoracis due to *Arcanobacterium bernardiae*

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ABSTRACT

While urinary tract infections are common, the severe complications of renal and perinephric abscess formation are infrequent especially when associated with pyothorax. We report the first case of *Arcanobacterium bernardiae* causing perinephric abscess and empyema thoracis. (*J Infect Dis Antimicrob Agents 2010;27:103-8.*)

Note: This case had been presented and discussed in the Interhospital Case Conference on Infectious Diseases (ICCID), 26 March 2010, Bangkok, Thailand**.**

CASE REPORT

A 60-year-old man was referred to Siriraj Hospital with a 3-week history of high fever, dysuria and left loin pain. He also complained of a 12- kg weight loss within a month. He had known medical history of poorly controlled diabetes mellitus, and a several-year history of left renal stones. One week prior to admission at Siriraj Hospital, he developed progressive breathlessness and then was admitted in the local hospital. Ceftazidime was given intravenously due to possible diagnosis of melioidosis, but there was no improvement.

On examination, he was febrile with temperature of 39°C, heart rate was 110/min, and respiratory rate was 30/min. The physical examination was remarkable for decreased breath sounds on the left chest and a mass with tenderness on the left flank.

Initial laboratory tests revealed WBC of 34,960/mm^3 with 94 percent neutrophil. The hemoglobin was 9.2 g/dl. Urinary examination showed pyuria and hematuria. Serum creatinine level was 0.9 mg/dL and serology of HIV infection was negative. A computerized tomography scan of abdomen demonstrated a 13 cm of fluid collection with enhancing rim located behind left kidney which extended to muscle and subcutaneous tissue of back, left psoas muscle as well as pelvocalyceal system. Multiple calculi at upper pole, lower pole and

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ureteropelvic junction were also noted with distension of pelvocalyceal system (Fig. 1). In addition, plain chest radiograph revealed a large amount of left pleural effusion.

Open surgical drainage was performed due to diagnosis of a large renal abscess and perinephric abscess. One hundred ml of pus was found at left posterior pararenal space as well as perinephric and psoas areas. Left radical nephrectomy was ultimately required due to extensive abscesses and nephrolitiasis with non-functioning kidney. Gram stain from pus demonstrated numerous gram-positive rods, club-shaped with few gram-positive cocci. Furthermore, thoracocentesis was also performed to evaluate the cause of pleural effusion. The pleural fluid was turbid with WBC of 66,100/mm^3 and neutrophil of 87 percent. Its characteristics were consistent with exudative effusion. Gram stain from pleural fluid showed the same findings as that of pus from renal abscess. Because of diagnosis of empyema thoracis, intercostal tube drainage was indicated.

On admission, empirical intravenous antibiotic with ceftriaxone 2 g daily and clindamycin 600 mg thrice daily were initiated. Subsequently, aerobic culture of both pus and pleural effusion yield pinpoint, glossy and circular colonies which showed gram-positive short rods without branching as well as relatively coccoid (Fig. 2 and 3). Initially, this isolate was identified as coryneform bacteria. However, to determine the species, 16S ribosomal DNA (rDNA) of the isolate was sequenced. From the Genbank-EMBL database, the result showed that its sequences were 100 percent identical to that of *Arcanobacterium bernardiae*. Nevertheless, the culture from blood and

Figure 1. An abdominal computerized tomography scan showed a large amount of fluid collection with rim enhancing behind left kidney, extending to left psoas muscle and subcutaneous tissue of the back. Multiple calculi with hydronephrosis of left kidney were demonstrated.

Figure 2. Pleural fluid and pus culture showed colonies appearing circular and glassy on blood agar with diameters of 0.2 to 0.5 mm.

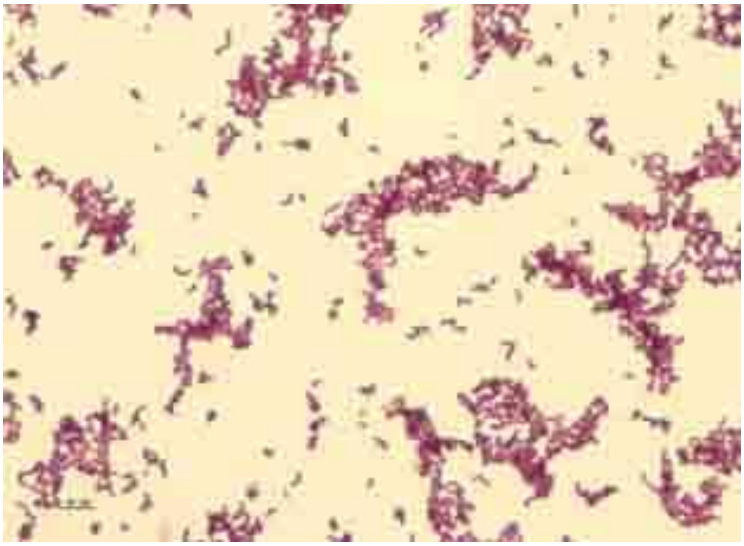

Figure 3. Gram stain from colonies showed short gram-positive rods without branching.

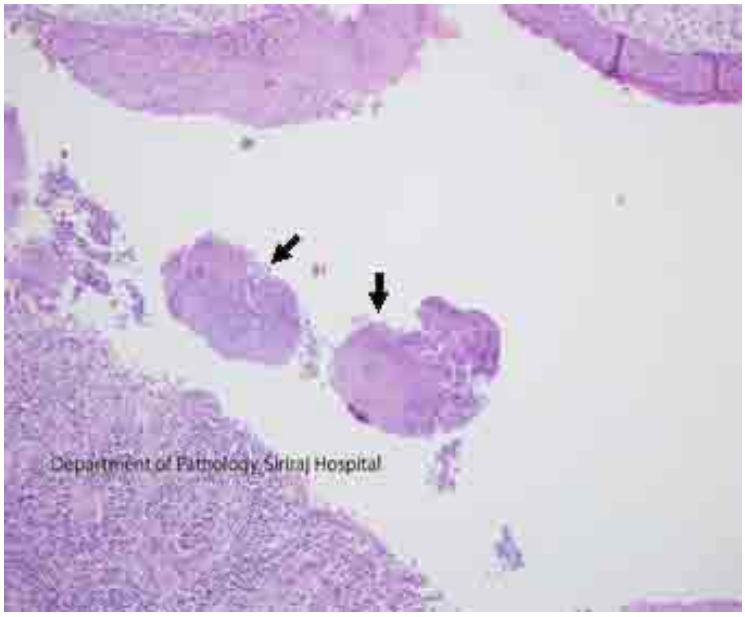

Figure 4. Histopathology of left kidney revealed multiple actinomycotic-like abscesses with calcification and multiple renal calculi.

urine were negative. Histopathology of left kidney also revealed multiple actinomycotic-like abscesses with calcification and multiple renal calculi as well as perinephric inflammation (Fig. 4).

After diagnosis of disseminated arcanobacterial infection, involving renal, perinephric, psoas abscess and empyema thoracis, the antibiotic regimens previously given were continued. Regarding empyema thoracis, the intercostals drainage tube was left in place totally for a month. The patient rapidly improved and

was discharged after 30 days of admission with oral clindamycin 900 mg daily. The duration of oral clindamycin was totally 3 months. During the follow-up period, his clinical condition was marked improved and his body weight increased of 9 kgs.

DISCUSSION

Renal and perinephric abscesses are rare disease entities resulting from infections in or surrounding the kidneys.[1] Several predisposing factors are identified such as diabetes mellitus, urinary calculi, urinary obstruction and immune compromised patients.[2] A recent study form Korea showed that systemic diseases such as diabetes mellitus (44.6%) and liver cirrhosis (12.5%) were much more common than renal or urologic disorders (16.1%).[1]

In prior antibiotic era, renal abscesses that develop by hematogenous bacterial seeding mostly often cause cortical abscesses. This is most commonly associated with *Staphylococcus aureus.*[1,2] Currently, ascending infections, which usually involve medulla, account for more than 75 percent of cases and most are caused by gram-negative organisms such as *Escherichia coli* and *Klebsiella pneumoniae*.[1,2]

Pulmonary complications occur in up to 20 percent of renal and/or perirenal abscesses and associated findings of chest radiographs often include an elevated or fixed hemidiaphragm, pleural effusion, empyema, lung abscess, lower lobe infiltrates or atelectasis.[3] However, the association of perinephric abscess and pleural empyema are uncommon. A report in 1976 showed perinephric abscess or renal infection are presented in 4 percent of 122 pleural empyemas.[4]

Actinomyces and *Arcanobacterium* species are generally described as straight or slightly curved rods having slender filaments with true branching. It is preferentially anaerobic but some species grow well in an aerobic atmosphere.[5] Advances in genotypic testing utilizing comparative 16S ribosomal RNA (rRNA) gene sequencing or DNA probes methods[6] caused the change of the previous classification as coryneform taxa to the new species as *Actinomyces* or *Arcanobacterium,* despite the lack of typical branching or anaerobic conditions for optimal culture.[7]

Common organisms from Genus *Arcanobacterium* in several reports, such as *A. haemolyticum* and *A. pyogenes,* are isolated from a wide variety of pyogenic human disease conditions, with septicemia, abscesses, endocarditis or pharyngitis.[7,12] Very few reports with *Arcanobacterium bernardiae* are implicated in human infections. *Actinomyces bernardiae* was first described in the literature in 1987. It has formerly been classified as CDC coryneform group 2 bacteria[7] but it was proposed as *Actinomyces bernardiae* afterward in 1995.[5,7] It has been assigned as *Arcanobacterium bernardiae* by Ramos et al. in 1997.[8] It was first isolated from human urine, blood and abscesses.[5] The majority of this organism was isolated from abscesses[7] but its pathogenicity in humans remains poorly defined.

A. bernardiae bacteria are Gram-positive rods with coccobacilli predominating. The bacteria are nonmotile, nonsporulating and primary branching is not observed. Optimum growth is observed after 48 h of incubation in the presence of 5 percent CO_2. On blood agar, colonies are circular, smooth and reaching 0.2 to 0.5 mm after 48 h of incubation. The organism is facultative anaerobic without producing catalase. It produces acid from glucose, ribose, maltose and arabinose. Nitrate is not reduced and gelatin is not liquefied. Pyrazinamidase and ∝-glucosidase were positive.[7,10,12] It is identified by the ability to ferment maltose more rapidly than glucose, which separates it from other coryneform bacteria. It is distinguished from *A. pyogenes* by the inability to ferment sucrose,

mannitol and xylose.[7] However, identification of *Arcanobacterium* spp. at the genus level is difficult because it can be confused in primary culture with streptococcal-like bacteria.[5,12]

Only two cases of severe urinary tract infections from *A. bernardiae* were reported. These occurred in patients with an ureteroileocutaneostomy or an ureteroileal anastomosis due to renal calculi with hydronephrosis.[5,9] *A. bernardiae* was considered as a urinary pathogen particularly when bowel segments are used as bladder substitutes. Three other case reports of *A. bernardiae* are presented in orthopedic infections including septic hip arthritis in systemic lupus erythematosus patient who was treated with corticosteroids and cyclophosphamide, prosthetic joint infection and chronic osteitis of knee (coinfection with *S. aureus*).[11-13]

All *A. bernardiae* strains were susceptible to clindamycin, erythromycin, β-lactams, rifampin, tetracycline and vancomycin. However, ciprofloxacin and gentamicin showed only limited activity.[7] Successful treatments in human infection with β-lactams (amoxicillin), clindamycin plus fusidic acid and combination of rifampicin and ofloxacin have been reported.[5,12,13] Duration of treatment ranged from 3 weeks to 3 months.[12,13]

To our knowledge, this is the third case of severe urinary tract infection due to *A. bernardiae* and this is the first reported case that occurred without bladder substitutes. Our case is the first reported case of pyothorax associated with *A. bernardiae*. The pathogenic role of *A. bernardiae* in our observation seems rather obvious because this organism was found in 2 different specimens from sterile sites. In conclusion, this case report may suggest we consider *A. bernardiae* as a potential bacteria which is able to cause severe urinary tract infection in the patient who has had nephrolithiasis with urinary tract obstruction even without bladder substitutes.

References

1. Lee BE, Seol HY, Kim TK, et al. Recent clinical overview of renal and perirenal abscesses in 56 consecutive cases. Korean J Intern Med 2008;23:140-8.
2. El Nahas AR, Faisal R, Mohsen T, Al Marhoon MS, Abol-Enein H. What is the best drainage method for a perinephric abscess? Int Braz J Urol 2010;36:29-37.
3. Wang IK, Chuang FR, Chang HY, Lin CL, Yang CT. Acute pyelonephritis associated with transudative pleural effusion in a middle-aged woman without urinary tract obstruction. Med Princ Pract 2006;15:309-11.
4. Irving AD, Turner MA. Pleural empyema in association with renal sepsis. Br J Surg 1976;63:70-2.
5. Lepargneur JP, Heller R, Soulie R, Riegel P. Urinary tract infection due to Arcanobacterium bernardiae in a patient with a urinary tract diversion. Eur J Clin Microbiol Infect Dis 1998;17:399-401.
6. Brook I. Actinomycosis: diagnosis and management. South Med J 2008;101:1019-23.
7. Funke G, von Graevenitz A, Clarridge JE 3rd, Bernard KA. Clinical microbiology of coryneform bacteria. Clin Microbiol Rev 1997;10:125-59.
8. Ramos CP, Foster G, Collins MD. Phylogenetic analysis of the genus Actinomyces based on 16S rRNA gene sequences: description of *Arcanobacterium phocae* sp. nov., *Arcanobacterium bernardiae* comb. nov., and *Arcanobacterium pyogenes* comb. nov. Int J Syst Bacteriol 1997;47:46-53.
9. Ieven M, Verhoeven J, Gentens P, Goossens H. Severe infection due to *Actinomyces bernardiae*: case report. Clin Infect Dis 1996;22:157-8.
10. Sarkonen N, Kononen E, Summanen P, Kononen M, Jousimies-Somer H. Phenotypic identification of Actinomyces and related species isolated from human sources. J Clin Microbiol 2001;39:3955-61.
11. Adderson EE, Croft A, Leonard R, Carroll K. Septic arthritis due to *Arcanobacterium bernardiae* in an

immunocompromised patient. Clin Infect Dis 1998; 27:211-2.

12. Lo ez C, Tavani F, Wallet F, et al. An unusual case of prosthetic joint infection due to *Arcanobacterium bernardiae*. J Med Microbiol 2009;58:842-3.

13. Bemer P, Eveillard M, Touchais S, Redon H, Corvec S. A case of osteitis due to *Staphylococcus aureus* and *Arcanobacterium bernardiae* coinfection. Diagn Microbiol Infect Dis 2009;63:327-9.