Pyomyositis, Deep Neck Infection and Brain Abscess Caused by *Klebsiella pneumoniae* in a Non-diabetic Patient

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**Abstract**

Pyomyositis and deep neck infection caused by *Klebsiella pneumoniae* in non-diabetics are rare in Taiwan. *Streptoccus spp.* and *Klebsiella pneumoniae* are the leading pathogens for community-acquired brain abscess while liver abscess is the most likely source of *K. pneumoniae* brain abscess. A case of 59-year-old man with chronic hepatitis C without diabetes mellitus suffered from fever, painful swelling with erythematous change of his right lower leg and right submandibular region for one week. Pyomyositis and deep neck infection were diagnosed according to the computed tomography (CT) of the right lower leg and neck. Blood, wound and pus cultures all yielded growth of *K. pneumoniae*. Fasciotomy with debridement on his right lower leg and local incision and drainage were performed. The finding of abdominal ultrasound was consistent with liver cirrhosis but no liver abscess was noted. Cefotaxime was administered intravenously every eight hours. Multiple brain abscesses were found incidentally as we followed neck CT on the 10th hospital day. A Neurosurgeon was consulted for stereotactic aspiration, and culture of aspirated abscess yielded no growth of bacteria, fungus or mycobacterium. We increased the frequency of cefotaxime from every eight hours to every six hours a day to expedite better penetration into the central nervous system. Brain CT was followed and the size of abscess obviously reduced after a complete courses of antimicrobial therapy. Ultimately, the patient was discharged with the improved physical condition and has since been followed up at our outpatient department. 

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**Key word:** pyomyositis, deep neck infection, brain abscess, *Klebsiella pneumoniae*, liver cirrhosis

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Introduction

Bacterial pyomyositis in tropical or temperate areas is usually associated with gram- positive organisms, and *Staphylococcus aureus* is the most common causative pathogen. However, skeletal muscle infection due to aerobic gram-negative bacilli is rare, even in tropical areas [1]. *Streptococcus viridans* spp are the most commonly isolated organisms causing deep neck infection in the non-diabetic group, and they are consistent with a higher rate of odontogenic infections [2]. On the other hand, *K. pneumoniae* is the most common causative pathogen in patients with diabetes mellitus. Here, we describe a non-diabetic patient without liver abscess presenting with pyomyositis, deep neck infection and brain abscess caused by *K. pneumoniae*. To our knowledge, this is a very rare case worldwide. Physicians should be aware of this disease. Early diagnosis, abscess drainage and adequate antimicrobial treatment are necessary to these patients.

Case report

A 59-year-old man was admitted to our hospital because of painful swelling with erythematous change of his right lower leg and right submandibular region for about one week. It was associated with fever and chills for two days. The patient had a history of chronic hepatitis C virus infection with liver cirrhosis. He recalled no recent exposure to seawater or ingestion of raw seafood, and there was no history of diabetes mellitus or pulmonary tuberculosis.

On admission, the patient showed the following vital signs: blood pressure 96/52 mmHg; pulse 89 beats/min; respiration 18/min; and body temperature 38.0°C. Physical examination revealed tender masses and warmth sensation on right lower leg and submandibular region. Laboratory data indicated leukocytosis with neutrophil predominance, anemia, and thrombocytopenia (WBC count 13,700/mm³, neutrophil/lymphocyte 82%/15%, hemoglobin 8.3 g/dL, platelet count 57,000/mm³). Blood biochemistry data read as follows: alanine aminotransferase 16 U/L; aspartate aminotransferase 20 U/L; sodium 129mmol/L; potassium 4.2 mmol/L; serum urea nitrogen 22 mg/dL; creatinine 1.0 mg/dL; postprandial blood sugar 196mg/dL initially and the subsequent levels of fasting glucose were all below 100mg/dL; albumin 2.8 g/dL; and C-reactive protein 5.2 mg/L.

Prothrombin and activated partial thromboplastin times were 20.7 seconds (normal control 11.5 seconds) and 51.3 seconds (normal control 30.0 seconds), respectively.
Computed tomography (CT) of right lower leg revealed soft tissue swelling with loculated fluid collections with marginal enhancement in the calf muscle (Figure 1) that was compatible with pyomyositis. Furthermore, the computed tomography of neck revealed swelling, loculated fluid accumulations at the right masseter muscle and parotid space with lymph node enlargement (Figure 2), compatible with right deep neck infection with lymphadenopathy. A plastic surgeon and an oral surgeon were consulted. Fasciotomy with debridement at right lower leg and local incision and drainage of buccal area were performed, respectively. Furthermore, cultures of the blood, wound and pus all yielded growth of *Klebsiella pneumoniae* which were susceptible to all tested antimicrobial agents except ampicillin and ciprofloxacin. Abdominal ultrasound finding was consistent with liver cirrhosis with massive ascites and pleural effusion but no liver abscess was noted. Cefotaxime 2.0 g intravenously every eight hours was administered since admission and fever subsided gradually. Erythematous change and swelling of right lower leg and right submandibular region also showed improvements. On the 10th hospital day, the oral surgeon arranged computed tomography of lower neck to follow-up the lesion. Multiple marginally
enhanced nodules in brain parenchyma were found incidentally. Meanwhile, there was no headache, fever, neurological defect or consciousness disturbance. Further computed tomography of the brain revealed multiple ring-enhancing lesions over bilateral basal ganglions, which strongly suggested brain abscesses (Figure 3) via radiologist’s ascertainment. Stereotactic aspiration on the frontal burr hole was performed by the neurosurgeon on the 23rd hospital day. The culture of aspirated abscess did not yield growth of bacteria, fungus or mycobacterium. Then, we increased the dosing frequency of cefotaxime from every eight hours to every six hours a day, and the patient had received a full course of antimicrobial treatment for eight weeks. However, a series of brain CT scan still showed obviously decreased enhancement lesions even after a complete course of treatment (Figure 4). Ultimately, the patient’s physical condition improved gradually and the wound healed well. He was then discharged and has been followed up at our outpatient department.

Discussion

Pyomyositis is a purulent infection of skeletal muscle. It often occurs in the absence of penetrating trauma or spreads from a contiguous septic focus. Up to 95%
of cases are caused by *S. aureus*, and 1-5% are caused by *Streptococcus pyogens* [3]. Besides, gram-negative organisms are uncommon etiologies, accounting for less than 10% of the cases in North America [4]. Our case is the first one that presented concomitantly as pyomyositis, deep neck infection and brain abscess in a non-diabetic patient.

*K. pneumoniae* is a commonly isolated organism attributed to the high incidence of pus culture in patients with diabetes mellitus [5]. One paper postulated that a high serum glucose concentration may facilitate the formation and growth of the polysaccharide of the *K. pneumoniae* capsule which is a virulent factor with anti-phagocytic function and serum complement resistance in vitro, hence increasing its virulence and causing serious disseminated infections in diabetic patients [6]. Poor glycemic control is also a risk factor for susceptibility to serotype K1/K2 *K. pneumoniae* liver abscess and complicated endophthalmitis but does not significantly affect the phagocytosis of non-K1/K2 *K. pneumoniae* [7]. Another study in which 12 of 14 *K. pneumoniae* isolated from Taiwanese patients with liver abscess and endophthalmitis were *K. pneumoniae* serotype K1 [8]. In Taiwan, *K. pneumoniae* is a pathogen associated with higher incidence of septic metastatic lesions in liver abscess [9,10]. It has been also known to be a common cause of invasive infections, including bacteremia, pneumonia, endo-ophthalmitis and meningitis in Taiwan [11]. Our case is interesting because no liver abscess was found and several glucose levels measured were normal during hospitalization. However, there is also a limitation of this case: OGTT test should have been done to rule out diabetes mellitus. Accordine to one paper, that quadriceps, gluteal, and iliopsoas muscles are the most commonly affected anatomic sites [12]. In our case, the right calf muscle and right deep neck region were affected; neither was a commonly affected region listed by the paper.

Findings of many studies suggest the bacteriologic pattern of deep neck infections is usually polymicrobial. Some of the most common organisms include *Streptococcus viridans*, *β-hemolytic Streptococci*, *Staphylococcus*, *K. pneumoniae*, *Peptostreptococcus*, and *Bacteroides* [2,5,13]. However, the causative organisms in the diabetic and nondiabetic groups were quite different. *Streptococcus viridans* spp. were still the most commonly isolated organisms in the non-diabetic group, consistent with a high incidence rate of odontogenic infections [1]. *K. pneumoniae* is the most common organism in the diabetic group in Taiwan [14]. However, our patient with *K.
pneumoniae infection does not have a history of diabetes mellitus. Furthermore, he is also different to previous Taiwan cases among whom Streptococcus viridans was the most commonly isolated organisms in the non-diabetic group of deep neck infection.

Brain abscess is a life-threatening infection common in young patients and in patients with diabetes mellitus. Brain abscess is mostly secondary to a focus of suppuration elsewhere in the body and may develop either via contiguous infection, trauma or a hematogenous route, but rarely from pyomyositis [15]. In recent studies from Taiwan, Streptococcus viridans and K. pneumoniae appear to be prevalent pathogens associated with hematogenous spreading [16,17]. Liver abscess is the most likely primary source of K. pneumoniae brain abscess. Diabetes mellitus, liver cirrhosis, neoplasm and end-stage renal disease are the most common underlying diseases. Metastatic septic abscess is a devastating complication of K. pneumoniae septicemia. The incidence of metastatic septic lesions of meningitis caused by K. pneumoniae bacteremia and hepatobiliary infection such as pyogenic liver abscess has been reported to be as high as 15.6% [18]. Although no bacteria, fungus or tuberculosis infection was detected via brain abscess material after stereotactic aspiration in our case, we still believed that our patient was suffering from K. pneumoniae brain abscess.

In conclusion, pyomyositis and deep neck infection caused by K. pneumoniae in non-diabetics without liver abscess are rare in the world. Because the patient had so many complications, only intensive treatment including complete drainage of any abscess combined with appropriate antibiotic therapy and early diagnosis of Klebsiella spp. related brain abscess due to disseminated character would improve the prognosis.

References


克雷伯氏菌在一位非糖尿病病人引起的膿肌炎症、深頸部感染及腦膿瘍

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摘要

克雷伯氏菌在非糖尿病病人造成的膿肌炎症及深頸部感染在台灣很少見。鏈球菌及克雷伯氏菌是社區型腦膿瘍的主因，但克雷伯氏菌造成的腦膿瘍常是因肝臓膿瘍而來的。本病例是一個59歲非糖尿病患但有慢性C型肝炎的病史。此次因右下肢及右下頦紅、腫、熱、痛及發燒一星期而求診。右下肢及頸部電腦斷層診斷為膿肌炎症及深頸部感染。病患於住院間接受右下肢筋膜切開併清創手術及右下頦接受切開引流手術。而血中及抽出之膿菌的細菌培養均為克雷伯氏菌。腹部超音波發現有肝硬化但無肝膿瘍。一開始使用每天3次cefotaxime抗生素除治療，但在住院的第10天頸部電腦斷層診斷追蹤檢查偶然發現有多發性腦膿瘍，經神經外科腦部穿刺，並無細菌、黴菌或分枝桿菌之發現。因爲屬中樞神經感染，我們把cefotaxime劑量加大為每天4次。在完整的抗生素治療後，追蹤腦部的電腦斷層診斷腦膿瘍的大小明顯減少，最後在情況穩定下出院。我們知道這個疾病在全世界實屬少見，並希望能以此病例提醒亞熱帶地區的醫師能對此疾病能有更多的認識，以期能早期診斷並適當治療。

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關鍵詞：膿肌炎症、深頸部感染、腦膿瘍、克雷伯氏菌、肝硬化

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