Klebsiella pneumoniae: An Emerging Pathogen of Pyogenic Liver Abscess

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Abstract

Before 1980's, the most common cause of pyogenic liver abscess was *Escherichia coli* but more recently *Klebsiella pneumoniae* is being increasingly reported in patients from Asian countries and United States. This report focuses on two cases of pyogenic liver abscess caused by the emerging pathogen *Klebsiella pneumoniae* in a regional hospital diagnosed and treated successfully.

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Received: 10 Dec 2008
Accepted: 13 Feb 2009

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Basu S. *OMJ*. 24, 131-133 (2009); doi:10.5001/omj.2009.28

Introduction

Pyogenic liver abscess (PLA) is a rare but potentially life threatening infection with a mortality rate ranging from 10-40%.[1] *Escherichia coli* has been reported as the predominant pathogen in Western countries.[2] Recent studies however, showed that *Klebsiella pneumoniae* has become a major pathogen of PLA.[3,4] The clinical presentation of PLA may be subacute or chronic usually presenting non-specific symptoms consisting of fever, Right Upper Quadrant (RUQ) pain, chills, malaise, anorexia and vomiting. An early diagnosis is important for devising an adequate therapeutic strategy that revolves around intravenous antibiotics, percutaneous catheter drainage or aspiration and surgery. Between 2002-2007, two out of every fifteen cases with liver abscesses were caused by *Klebsiella pneumoniae*. The patients recovered successfully following different therapeutic modality. Other cases were differentiated from this pyogenic liver abscess by amoebic and echinococcal serology and were excluded from this study.

Case Report 1

A 58 year old Omani female presented to the Accident and Emergency (A&E) department with upper abdominal pain of one week duration accompanied by fever, malaise and nausea. The patient was a known diabetic and general examination showed signs of dehydration, hepatomegaly and distended abdomen. On palpation, tenderness was found in the right hypochrondrium. Laboratory data showed raised enzyme levels of Alanine Aminotransferase ALT) 63.8 IU/L, Alkaline Phosphatase (ALP) 424 IU/L, Aspartate Aminotransferase (AST) 46.1 IU/L, increased direct bilirubin (7.31 mmol/L), White Blood Cell (WBC) count 10.6 K/µl with neutrophilia (78.2%). Ultrasound examination demonstrated an enlarged liver with an 80 × 55 × 50 mm single hypoechoeic lesion with fluid component in the right lobe along with multiple ill defined satellite lesions. About 40 ml of pus was obtained under ultrasound guided aspiration. The pus contained Gram negative rods under Gram stain microscopy. *Klebsiella pneumoniae* (*K. pneumoniae*) was isolated from the pus and the antimicrobial susceptibility pattern performed according to Clinic Laboratory Standars Institute (CLSI) guidelines, the isolate exhibited sensitivity towards gentamicin, augmentin, ceftazidime, ceftriaxone, ciprofloxacin, amikacin, cefotaxime and resistance towards ampicillin. [5]

After 5 days of initial antibiotic combination therapy with amikacin (1g IV q12h) and ceftazidime (1.5g IV q8h for 5 days), it was followed by ciprofloxacin (0.5g IV q12h for 12 days). Ultrasound follow-up 4 weeks after the initial presentation showed resolution of hepatic abscess. The patient made an uneventful recovery from the hepatic abscess.

Case Report 2

A 47 year old Omani diabetic female presented to the A&E department with fever, chills, rigors, mild cough, poor oral intake and inability to walk for 2 days. The episode was associated with upper abdominal pain, constipation and a headache. On general examination, the patient was conscious but hypotensive, tachycardic and with a subfebrile temperature of 37.7°C. Systemic examination elicited epigastric tenderness without any hepatosplenomegaly. Ultrasound examination revealed a solitary large space occupying a lesion measuring 68 × 54 × 40 mm in the right lobe with non-homogenous echotexture. No definite abscess wall was observed surrounding the lesion. Laboratory investigations showed elevated AST (106 IU/L), ALT (60.8 IU/L), ALP (354.9 IU/L) and direct bilirubin (11.2 mmol/L) levels. Amoebic and echinococcus serology was negative. *Klebsiella pneumoniae* was isolated from both the blood and urine of the patient indicating septicemia. The isolate was sensitive to gentamicin, augmentin, cefuroxime, and cephradine but resistant to cotrimoxazole and ciprofloxacin. After combination therapy of augmentin (2g IV q6h) and gentamicin (1.7g IV q8h) for three weeks the patient did not respond. Ultrasound guided percutaneous drainage of

the abscess with a catheter drainage was performed. The patient recovered successfully and was discharged two weeks after a follow up ultrasound showed full resolution.

Discussions

Recently, Chan et al, reported that amongst cases of PLA caused by *Klebsiella pneumoniae*, 80% presented symptoms of fever, chills, and abdominal pain, while 54% were diabetic, 69% had solitary abscesses, 57% were positive for blood culture and 65% were positive for abscess culture.[6] In another study, 83% showed positive concurrent bacteremia.[3] Abscesses caused by *Klebsiella pneumoniae* were strongly associated with predisposed factors such as diabetes and were mainly solitary and monomicrobial in nature.[7] In both the cases discussed in this report, the patients were diabetic and had solitary lesions with monomicrobial features. The patients were presented with fever and upper abdominal pain and had a solitary abscess in the right lobe of the liver. The second case exhibited positive blood as well as urine culture, this is possibly due to prior antibiotic therapy, hence no organism was recovered from the pus. In the first case, the patient recovered successfully after a combined antimicrobial therapy of an aminoglycoside and a beta lactam for two weeks. However, in the second case, the patient had undergone percutaneous drainage. The approach for management of PLA varies. Some may be treated with antibiotics alone while others need percutaneous drainage or even open surgical drainage depending on the resolution status of the abscess in the follow up ultrasound or Computerized Tomography (CT) scan results.

PLA caused by *Klebsiella pneumoniae* occurring from hematogenous spread of distant foci has been the most common source of infection in the past. However, at present biliary diseases associated with ascending infection are common.[8-11] Recent series reports point out a high cure rate after antibiotic treatment without concomitant percutaneous drainage. However, most of the new reports recommend the necessity of some drainage procedure to ensure good outcome. CT or US guided percutaneous needle aspiration +/- catheter drainage is the initial method of choice with a success rate upto 90%.[12] Percutaneous aspiration without catheter placement has recently been found to have similar success rates as catheter placement with repeat aspiration required in approximately 50% of cases. Complications of percutaneous drainage include perforation of adjacent organs, pneumothorax, hemorrhage and leakage of abscess contents into the abdominal cavity. General recommendations are for at least one week of drainage with CT follow-up. Surgery is considered for patients with fever persisting for more than 2 weeks despite percutaneous catheter drainage and appropriate antimicrobial therapy, complex abscess, multiple abscess and percutaneously unreachable abscesses. Similarly loculated and highly viscous abscesses also need surgical incision and drainage.[13] Medical management should be considered for high risk drainage or with multiple/small abscesses. The duration of antibiotic therapy varies and may take several months if treated solely medically.[14,15] Usually in PLA the length of hospital stay varies from 17.4±8.7 days and current mortality rate due to PLA has reached upto 7.1%.[1] Old age and the presence of biliary disease were associated with higher mortality. Special attention should therefore be paid to the patients who are elderly or suffering from biliary tract diseases.

Abscesses caused by *Klebsiella pneumoniae* produce highly metastatic infections compared with other causative organisms (14.6 vs 3.8%). Surprisingly, the mortality rate with *Klebsiella pneumoniae* is lower compared to other organisms (4.1% vs 20.8%). Bad prognosis therefore is determined by the presence of respiratory symptoms (cough, dyspnea), size of abscess > 5cm and non *Klebsiella pneumoniae* organism. Endogenous endopthalmitis is frequently associated with a *Klebsiella pneumoniae* liver abscess and therefore routine fundoscopy should be carried out by an ophthalmologist once the condition of KP PLA is confirmed. Due to its good penetration into the vitreous compartment; ceftriaxone is the best choice for this condition provided the organism is susceptible. Metastatic infection and prostatic abscess may occur after the patient has been discharged from hospital.[7] It is not surprising that none of the isolates were Extended spectrum beta-lactamase (ESBL) producers in the case reports. ESBL producing *Klebsiella pneumoniae* strains are rare in community acquired infections. Virulent factors such as rmpA and magA which are associated with hypermucoviscosity phenotypes of *Klebsiella pneumoniae* may offer new insights into the pathogenesis of *Klebsiella pneumoniae* PLA. Hypermucoviscosity phenotypes were more commonly associated with *Klebsiella pneumoniae* causing PLA whereas non-hypermucoviscosity *Klebsiella pneumoniae* were more commonly seen in nosocomial bacteraemias.[16] Hypermucoviscocity is also linked with a specific serotype K1 of *Klebsiella pneumoniae*. The discovery of magA, rmpA and serotype K1 related to the virulence of *K. pneumoniae* may also aid in the management of *K. pneumoniae* liver abscess in the future.[6]

Conclusion

Pyogenic liver abscess is a potentially life threatening infection traditionally managed by open surgical drainage. With the advancement in interventional radiology over the last two decades it has become easier to diagnose and treat patients effectively. Liver abscess causing *K. pneumoniae* are now emerging pathogen with