

Pyonephrosis by *Prevotella disiens* and *Escherichia coli* coinfection and secondary peritonitis in an obstructive uropathy patient: A case report and review of the literature

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ABSTRACT

Pyonephrosis is an uncommon condition that is associated with suppurative destruction of the renal parenchyma. Upper urinary tract obstruction by renal stones plays an important role in its aetiology. The majority of pyonephrosis is reported to be caused by aerobic bacteria but the role of anaerobes, especially black-pigmented gram-negative anaerobes, namely, *Prevotella* and *Porphyromonas* in renal infections, remain poorly defined. In view of the rarity of the event, a case of pyonephrosis by *Prevotella disiens* and *Escherichia coli* coinfection complicated by secondary peritonitis in an obstructive uropathy patient is hereby presented. An attempt is being made to review the literature on the infective aetiologies of renal abscess with special reference to anaerobes.

Keywords: Anaerobes, *Prevotella disiens*, pyonephrosis, secondary peritonitis

Introduction

Anaerobes are a common cause of endogenous infections causing serious life-threatening infections including the urinary tract infections (UTI).^[1] Pyonephrosis is a collection of pus in the renal pelvis mostly as a result of obstructive uropathy by urolithiasis.^[2] Delay in diagnosis and treatment may result in parenchymal damage and renal failure. Rarely, generalised peritonitis can result from a rupture of the pyonephrotic kidney in the neglected cases.^[3,4]

The majority of suppurative bacterial infections of the urinary tract are caused by gram-negative aerobic or facultative anaerobic bacilli. The incidence and significance of anaerobic infections especially by *Prevotella-Porphyromonas* in renal infections are poorly

studied. The role of anaerobic bacteria is often overlooked because of unavailability of adequate methods for the isolation and identification and their fastidious nature of growth. It is important to keep anaerobic aetiologies in mind by the clinicians in such life-threatening conditions for optimising the patient's management.

Therefore, we are hereby, presenting a very rare case of pyonephrosis leading to secondary bacterial peritonitis caused by pigmented anaerobic bacteria (*Prevotella disiens*) along with aerobic (*E. coli*) bacteria in an obstructive uropathy patient. An attempt has been made to review the literature on the infective aetiologies of the renal abscess with special reference to anaerobes.

Clinical Case

A known case of bilateral renal staghorn calculus with bilateral obstructive uropathy came with a slipped right percutaneous

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Received: 18-10-2019

Revised: 19-12-2019

Accepted: 27-12-2019

Published: 28-02-2020

Access this article online

Quick Response Code:



Website:
www.jfmipc.com

DOI:
10.4103/jfmipc.jfmipc_907_19

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How to cite this article: Nema S, Brahmachari S. Pyonephrosis by *Prevotella disiens* and *Escherichia coli* coinfection and secondary peritonitis in an obstructive uropathy patient: A case report and review of the literature. J Family Med Prim Care 2020;9:1263-5.

nephrostomy tube and fever after 1 month of bilateral percutaneous nephrostomy. After changing the right side tube, the purulent fluid was sent to the laboratory for aerobic bacterial culture and sensitivity. Empirically, faropenem was prescribed and the patient was discharged with advice to follow-up after 3 days with culture and sensitivity report but he did not return.

After 18–24 h of aerobic incubation on 5% sheep blood agar and Mac-Conkey agar, growth of *E. coli* was found, which was susceptible to tobramycin, gentamycin, chloramphenicol, imipenem, meropenem and doripenem. Suspecting an anaerobic aetiology in such cases, the sample was simultaneously processed for anaerobic culture. It was inoculated on anaerobic blood agar in GasPak jar. After 72 h of anaerobic incubation, black-pigmented colonies were grown which were presumed to be of black-pigmented *Prevotella-Porphyrromonas* group [Figure 1]. The isolate was confirmed as *Prevotella disiens* by automated VITEK-2 system (BioMerieux, France). The report of both aerobic and anaerobic infection was conveyed to the clinicians.

After 15 days, the patient presented in emergency with septicemic shock due to pyoperitoneum. Imaging revealed bilateral staghorn calculus with bilateral percutaneous nephrostomy tube *in situ*. Left hydronephrotic kidney had a very thin cortex and the right kidney showed features of pyonephrosis with right retroperitoneal and moderate intraperitoneal free fluid collection with internal echoes. To optimise the patient, image-guided drains were inserted in peritoneal cavity, right pelvic and right perinephric region. More than 2 L of pus was drained. As per the previous culture report, parenteral meropenem and metronidazole were started after sending samples for both aerobic and anaerobic culture and sensitivity. *P. disiens* and *E. coli* with same susceptibility pattern were isolated from the drain fluids this time as well. Despite multidisciplinary intensive management, the patient's condition deteriorated and patient's relatives took him home against medical advice.



Figure 1: Black-pigmented colonies of *Prevotella disiens* on anaerobic blood agar along with colonies of *E. coli*

Discussion

The majority of pyonephrosis is caused by aerobic bacteria such as *E. coli*, *Klebsiella*, *Proteus*, *Pseudomonas* and gram-positive bacteria such as *Enterococcus*, *S. aureus*, *Streptococcus spp.* and so on.^[5,6] The clinical significance of the obligate anaerobes has received little attention in UTI as the rate of detection is only 0.8%–1.3%.^[7,8] In suppurative infections such as pyonephrosis, probably aerobic organisms consume the available oxygen for their own growth and create ideal conditions for anaerobic growth.

In the past reports of anaerobic UTI, *Bacteroides fragilis* was the most common anaerobe obtained.^[1,2] The role of black-pigmented *Prevotella-Porphyrromonas* in pyonephrosis is not well-defined. Brook studied ten cases of the perinephric abscess and reported isolation of *Prevotella melaninogenica* in only one case.^[9] In a case of pyonephrosis in a 2-month-old infant, Tao *et al.*^[2] detected polymicrobial infection by *Prevotella melaninogenica*, *S. anginosus* and *Gardnerella vaginalis* by metagenomic shotgun sequencing.

To our knowledge, renal abscess caused by *P. disiens* has not been reported yet. The infection by *Prevotella-Porphyrromonas* is reported to be mostly mixed with aerobic infection owing to microbial synergy.^[10] A similar finding was observed in the present case. Mechanism of microbial synergy may be due to the lowering of oxidation-reduction potentials in host tissues, protection from phagocytosis, production of capsule and production of β lactamases and various other virulence factors by pigmented anaerobes.^[10]

Pyelonephritis is one of the most serious forms of UTI which can progress to a renal abscess, pyonephrosis, septic shock or rarely intraperitoneal rupture of a pyonephrotic kidney. Management of such a life-threatening condition includes immediate surgical drainage along with initial empiric antibiotics to optimise the patient for further definitive management of underlying pathology by culture-specific antibiotics covering aerobes and anaerobes and pyelolithotomy or nephrectomy.^[4,6] The presented case was also managed on the same principles.

The role of anaerobes in urosepsis is often overlooked leading to clinical failures due to inadequate therapy against these organisms. Routine anaerobic culture is yet not practised in pyonephrosis because of the inconsistent use of adequate methods for the isolation of anaerobic bacteria. In the present case as well, the anaerobic pathogen would have been missed if specimen was not processed for anaerobic culture. Treatment of anaerobic infection is complicated by their slow growth, polymicrobial nature and by the growing resistance of anaerobic bacteria to antimicrobials.^[11] Patients of pyonephrosis receive broad-spectrum antibiotics empirically many times before pus is surgically drained hence, they are more prone to acquiring drug resistance. Also some antimicrobials have a limited range of activities such as metronidazole is active against only anaerobes but aminoglycosides and the quinolones are mostly effective only

against Enterobacteriaceae. In the last few decades, the need for testing of anaerobic isolates has been increasingly recognised and the testing methodologies used have been standardised. Timely reporting of such isolates would be clinically useful in therapeutic decisions.

Conclusions

It is suggested that cultures for anaerobic organisms be performed together with aerobic cultures in patients with pyonephrosis associated with urinary obstruction. Moreover, with the increasing frequency of antibiotic resistance among uropathogens while choosing antimicrobials for the mixed infections, their aerobic and anaerobic antibacterial spectrum should be taken into consideration. In addition, timely surgical interventions to drain the pus and decrease the sepsis are also equally important. Delay of the institution of such therapy may increase the rate of local as well as systemic complications in pyonephrosis cases.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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