

Inflammation and infection

Disseminated *E. coli* urinary tract infection resulting in septic arthritis of the glenohumeral joint

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ABSTRACT

An 89-year-old male with a background of metastatic transitional cell carcinoma presented acutely with new hydronephrosis and deranged renal function secondary to high pressure chronic urinary retention. A recent urine culture was positive for *Escherichia coli* (*E. coli*). Co-incidentally, the patient's primary presenting symptom was right shoulder pain following recent low velocity trauma. X-ray demonstrated air density within the glenohumeral joint, with Magnetic Resonance Imaging (MRI) confirming features of septic arthritis. Surgical debridement was undertaken with tissue microscopy and culture identifying the presence of *E. coli*, confirming the diagnosis of disseminated urinary tract infection.

1. Introduction

Urinary tract infections (UTI) are common within community and healthcare settings and can be classified into complicated and uncomplicated based on the presence of susceptibility factors and/or structural urinary tract abnormalities. The leading uro-pathogens are *Escherichia coli*, responsible for 80% of community cases. Periodically, UTI's can result in bacteraemia (urosepsis), leading to dissemination of infection to distant sites outside the urinary tract. The most recognised site for dissemination is the spine, with spondylodiscitis frequently resulting from haematogenous spread of gram negative pathogens from urine, amongst which *E. coli* is the most frequent, responsible for 7-33% of cases.¹

2. Case presentation

This article reports the case of an 89-year-old male with a complex urological history, who presented to the acute urology take with a septic glenohumeral joint secondary to an *E. coli* UTI. The patient had a background of recurrent high risk non-muscle invasive (G3 pT1) transitional cell carcinoma of the bladder, refractory to intravesical treatment with Mitomycin, Bacillus Calmette-Guérin (BCG) and Gemcitabine. Subsequent imaging demonstrated metastatic disease involving the liver and lung, prompting systemic treatment with atezolizumab, a PD-L1 antagonist used to treat locally advanced, or

metastatic urothelial carcinoma. A staging computed tomography (CT) scan following treatment demonstrated hydronephrosis and a distended bladder, which when combined with deteriorating renal function, was suggestive of high pressure chronic urinary retention (HPCR), necessitating an emergency urology referral. Further questioning revealed a short history of lower urinary tract symptoms (LUTS) with associated visible haematuria. A recent urine culture had also identified the presence of *E. coli*. Interestingly his most significant complaint was a recent history of low velocity trauma to the right shoulder with subsequent pain and swelling. Examination revealed a swollen, tender right shoulder with limited range of movement in all directions.

Urethral catheterisation resulted in an improvement in renal function and resolution of hydronephrosis on imaging, confirming the diagnosis of HPCR. The patient's shoulder complaints were then further investigated, including an X-ray (Fig. 1), which demonstrated abnormal air density within the glenohumeral joint and adjacent soft tissue. An orthopaedic consult was sought, following which an MRI shoulder was performed, demonstrating features of septic arthritis with an associated rotator cuff tear (Fig. 2).

The patient underwent debridement and washout of the right shoulder two days following admission, with a re-look 48 hours later. Pus and tissue specimens sent for microbiology assessment demonstrated the presence of *E. coli*, the same organism that had been identified on recent urine culture, indicating a likely disseminated UTI. The patient completed a course of Piperacillin/Tazobactam and continued

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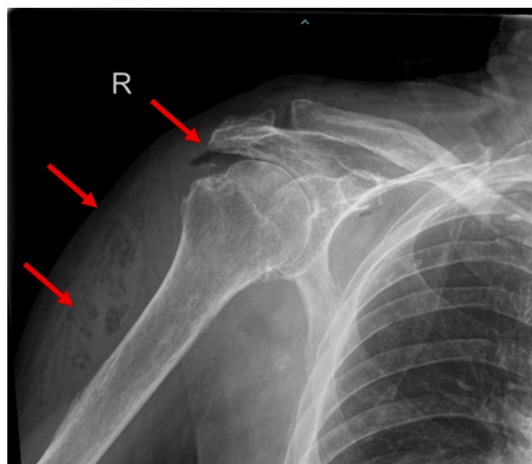


Fig. 1. X-ray of the right shoulder indicating air density within the glenohumeral joint and soft tissue (red arrows). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

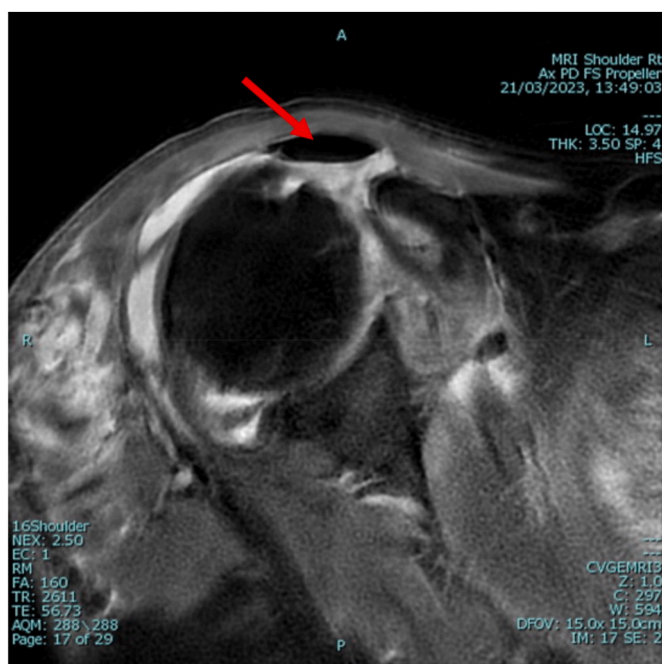


Fig. 2. Magnetic Resonance Imaging (MRI) of the right shoulder (Axial PD FD) with an air fluid level within the anterior aspect of the joint capsule (red arrow), with a high signal uptake on the lateral aspect indicating fluid collection. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

on a prolonged course of Amoxicillin in accordance with sensitivities and Microbiology advice. He went on to recover full function of the shoulder and was discharged to his usual place of residence.

3. Discussion

Despite being a rare but documented complication of UTI, there is a paucity of literature relating to septic arthritis secondary to disseminated UTI involving joints other than the spine. Ubhi and Cooke reported two cases of *S.aureus* UTI that resulted in septic arthritis of the ankle and knee respectively, with the same organism present on joint aspiration.² Both patients were found to have bladder outflow

obstruction secondary to benign prostatic enlargement, implicating this as a predisposing cause. Nair and Schoenemen reported a case of a 4-week-old infant with vesicoureteric reflux that was admitted due to *K. pneumoniae* urosepsis. On day six of admission the patient was no longer moving their right leg, with significant pain on passive movement. Radiographs revealed soft tissue swelling of the right hip, and subsequent joint aspiration demonstrated the presence of *K. pneumoniae*.³ As in these few cases, the patient reported here had multiple urinary tract abnormalities, including metastatic TCC of the bladder and a new diagnosis of HPCR. Furthermore, the patient possessed a number of risk factors that may have also predisposed him to both the initial UTI and its subsequent dissemination to the glenohumeral joint, including advanced age and recent immunotherapy, both of which alter immune system function.

Whilst dissemination of bacteria from a urinary source to the spinal infrastructure can be explained by vascular anatomy, the pathobiology of dissemination to a distant joint is more difficult to explain. Studies report that septic arthritis commonly occurs due to bacteraemia in 70% of cases in patients with pre-existing joint disease, with chronic synovitis and abnormal joint structure thought to provide optimal conditions for bacterial survival and growth. Other causes include trauma, through direct penetration to the joint, or haematogenous spread from a distant penetration.⁴ It is therefore possible that in the patient reported here the history of recent low velocity trauma to the shoulder at the time of *E. coli* bacteraemia secondary to a UTI may have enabled dissemination to the effected glenohumeral joint.

The patients' treatment was in keeping with the standard recommended by the British Society for Rheumatology and British Orthopaedic Association, which advises MRI along with joint aspiration for the diagnosis of septic arthritis, followed by empirical antibiotics and joint drainage through a closed needle or arthroscopic approach.⁵ In addition, he also underwent open surgical debridement due to the formation of a deltoid abscess.

4. Conclusion

Here we report a case of septic arthritis involving the glenohumeral joint secondary to a disseminated urinary tract infection in a complex urological patient. This illustrates that, although rare, a urinary source should be considered in all cases of septic arthritis, regardless of the causative organism, and similarly septic arthritis should be considered in all patients presenting with urinary tract infection and a painful joint.

Consent

The patient provided formal written consent for anonymised clinical information and imaging to be included in this manuscript.

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Declaration of competing interest

No conflicts of interest to declare.

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