

PVL STAPHYLOCOCCUS AUREUS OSTEOMYELITIS COMPLICATING SEPTIC ARTHRITIS IN A UK SOLDIER SERVING IN IRAQ

JG Penn-Barwell¹, S Finnikin², I Sargeant³, K Porter⁴

¹ST2 Trauma and Orthopaedics, West Midlands Deanery. ²FY2 West Midlands Deanery. ³Consultant Orthopaedic Surgeon, Royal Centre for Defence Medicine. ⁴Professor of Clinical Traumatology, all University Hospitals Birmingham, Selly Oak Hospital, Raddlebarn Road, Selly Oak, Birmingham B29 6JD, UK.

Abstract

Musculoskeletal infections caused by Panton-Valentine Leukocidin (PVL) secreting *Staphylococcus aureus* in children and adolescents have previously been reported. We report the first adult case in a 26 year-old British Army soldier who presented with a *S. aureus* septic arthritis. He was treated by surgical washout and antibiotics and discharged but was readmitted five months later with an ipsilateral femoral osteomyelitis requiring debridement. The causative *S. aureus* grown from tissue biopsy taken at time of surgery was found to encode the PVL gene. Whilst there is evidence that soldiers in Iraq have a greater rate of *S. aureus* colonisation on their skin, the proportion that encode the PVL gene is similar to that observed in the UK. Soldiers are however, subject to the known risk factors that increase vulnerability to PVL secreting *S. aureus* infection. Military clinicians need to be aware of PVL secreting *S. aureus* and have a low threshold for requesting specific testing in aggressive musculoskeletal *S. aureus* infections.

Introduction

Musculoskeletal infections caused by Panton-Valentine Leukocidin (PVL) secreting *Staphylococcus aureus* in children and adolescents have been previously reported [1,2]. We present the first case of a PVL secreting *S. aureus* musculoskeletal infection in an adult. The patient, a 26 year old male, developed femoral osteomyelitis as a consequence of an ipsilateral knee septic arthritis.

Case History

A 26 year old British Army soldier presented to the British Military Hospital in Iraq in May 2007 unable to weight-bear on his left leg. His left knee had become painful following an insect bite over the joint seven days earlier. On examination, he was febrile (37.8°C), the knee was mildly erythematous and pain prohibited movement of the joint. He had a white cell count (WCC) of $25.1 \times 10^9 \text{L}^{-1}$ and a C-reactive protein (CRP) assay of $12 \times 10^9 \text{gL}^{-1}$. He was taken to theatre for aspiration and limited open washout as no arthroscopes were available, and 10mls of pus were aspirated although microbiological examination demonstrated no micro-organisms. The patient was treated empirically with intravenous (IV) cefuroxime and metronidazole.

Two days after the washout, the patient was evacuated to the UK and admitted to Selly Oak Hospital, Birmingham. Blood cultures taken on admission grew a *S. aureus* which was highly sensitive to flucloxacillin and his antibiotics were changed accordingly. Two days after his arrival in the UK, he underwent an arthroscopic washout of his knee joint. On microbiology advice, he was treated with a further four week course of IV flucloxacillin, by the end of which, he had improved clinically and was discharged with a normal CRP and WCC, a total of five weeks from his initial presentation.

Five months after discharge, the patient's knee flexion was limited to 100°, despite physical therapy and undergoing a manipulation under anaesthetic. A magnetic resonance scan, in October 2007, revealed extensive osteomyelitis involving his femur from mid-diaphysis to distal metaphysis (Figure 1). The patient was readmitted and underwent a limited surgical debridement of the distal femur and IV flucloxacillin was recommenced. Tissue samples taken during this operation grew a strain of *S. aureus* with sensitivities identical to those of the organism grown in the previous blood cultures. Further testing revealed that the *S. aureus* strain encoded the PVL gene.



Figure 1. MRI scan revealing extensive osteomyelitis involving his femur from mid-diaphysis to distal metaphysis.

An additional four week course of IV flucloxacillin was completed, prior to further surgery, in order to suppress any active

Corresponding Author: Surg Lt Cdr Jowan G Penn-Barwell
MRCs RN, c/o Trauma Coordinator, Selly Oak Hospital,
Raddlebarn Road, Selly Oak, Birmingham B29 6JD
Tel: 07810 867555 Email: Jowan@doctors.net.uk

infection. Thereafter the patient returned to theatre for more radical debridement of his distal femur and the wound was left open. Following three weeks of topical negative pressure therapy with continued flucloxacillin cover, his wound was closed with a Gastrocnemius muscle flap and split-skin graft. On microbiology advice, he was discharged on oral flucloxacillin and rifampicin which he continued for six months after discharge.

At twelve month follow-up from discharge, his range of knee movement was -5° to 100° and he was able to weight bear without pain. However, impact activity caused medial knee pain. The patient remains in a reduced military medical category. His WCC and CRP remain normal. At no stage did he demonstrate signs of toxemia or systemic manifestations of infection.

Discussion

Panton-Valentine Leucocidin is an exoprotein that was first isolated in 1932 [3]. It is highly toxic to mononuclear and polymorphonuclear immune cells. This toxicity to immune cells typically makes PVL secreting *S. aureus* infections more virulent than other strains [4]. Like non-secreting strains, PVL-secreting *S. aureus* is normally associated with soft tissue infections, however, these tend to be much more aggressive due to the increased virulence and may be complicated by invasive infections including necrotising haemorrhagic pneumonia. It is estimated that approximately 2% of *S. aureus* encode the PVL gene [5,6].

This case is unusual in a several respects. It is a rare case of adult septic arthritis, that after clinical resolution has gone on to develop into osteomyelitis and a PVL secreting *S. aureus* causing musculoskeletal infection distinct from the more common presentation of sepsis and multi-organ involvement is also uncommon.

The *S. aureus* cultures from the patient's initial presentation were not screened for PVL. However, it is reasonable to speculate that the PVL secreting strain of *S. aureus* found at the time of the second presentation, with identical sensitivity profile, was the causative organism in both episodes. Whilst it not standard practise to test all clinical samples of *S. aureus* for PVL exotoxin as in this case, the authors would recommend that in instances where a *S. aureus* infection is behaving aggressively or involving distant sites, especially the lungs, then strain-typing for PVL secretion should be considered. Confirmation of PVL secreting status allows the clinician to anticipate an atypically progression of the infection, particular resistance to irradiation and potential devastating sepsis or secondary infections.

This is the second case of PVL-secreting related infection in the military, the first being that of a Royal Marine recruit who died from sepsis caused by a PVL secreting *S. aureus* in 2004 [7] and this raises several issues of concern for the military clinician. Firstly, are military personnel more susceptible to PVL-secreting *S. aureus*? Risk factors for PVL-secreting strains cited by the Health Protection Agency [8] include close contact, crowding, cleanliness, cuts and other compromised skin integrity. Whilst

on operations or in training, service personnel may be exposed to some if not all of these risk factors and the HPA document specifically cites military training camps as high risk areas. Secondly, are military personnel in Iraq at a relatively greater risk of contracting a PVL secreting rather than a typical *S. aureus* infection? This question was investigated by a 2007 study which reported that, within the Latvian army, rates of *S. aureus* colonisation were significantly higher in soldiers deployed in Iraq than in those stationed in Latvia [9]. The proportion of PVL secreting *S. aureus*, however, was similar to that described elsewhere. This finding suggests that whilst soldiers deployed in Iraq may have higher rates of *S. aureus* colonisation, there is no increased relative risk that these bacteria will encode the PVL gene.

Conclusion

This case describes a new presentation of the PVL secreting strain of *S. aureus*. Military doctors care for a population at increased risk of PVL secreting *S. aureus* infection. Therefore, an awareness of this strain of *S. aureus* and a low threshold for requesting specific testing in highly aggressive musculoskeletal *S. aureus* infections are paramount.

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