

## Methicillin resistant *Staphylococcus aureus* (MRSA) pin tract infections: an increasing problem in external fixation

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### Abstract

In a retrospective review of 117 patients who had external fixation applied in 1998, pin tract infection was found in 36 (31%). The infection rate for the tibia, the most common site of external fixation, was 36%. Of the 36 cases, 22 were grade I, one grade II and 13 grade III infections. External fixation was discontinued in 61% of those infected. Cultures from the infected pin sites were taken in only 14 cases. Of these, 6 had mixed growth and all the remaining 8 cultures grew methicillin resistant *Staphylococcus aureus*. These findings suggest that pin tract infection is still a problem in the use of external fixation, and the development of methicillin resistant *S. aureus* is likely to add to this problem. Microbiological investigations of the infected pin sites must be mandatory in all cases of pin tract infection and the antibiotic policy of all the units needs to be reviewed to overcome this problem.

**Keywords:** external fixation; pin tract infection; methicillin resistant *Staphylococcus aureus*

### Introduction

Pin tract infection is the commonest complication in external fixation and was the predominant reason for its unpopularity when it was first introduced. However, with proper care during its application and pin site hygiene, the infection rate has fallen. When infection occurs, it usually responds to treatment with antibiotics, rest and elevation and increased pin site care (Nepola, 1996). A retrospective study was carried out to investigate the incidence of pin tract infection, its outcome and the types of organisms responsible for the infection.

### Materials and Methods

All the patients treated with external fixation in 1998 in Hospital Kuala Lumpur were included in the study. A total of 135 patients were identified from the "External Fixators Logbook" in the General Operating and the Accident and Emergency Operating Theatre. The case notes of 18 patients were missing, leaving data available on 117 patients. Of the external fixators used, 92 were Stuhler Heiss, 16 small AO or Martini, 7 AO and 2 others. The Stuhler Heiss and AO external fixators were mainly used for the tibia and the size of the Schanz screws were 5.0 mm. The small AO and Martini were used for the radius and ulna and the screw

sizes were 2.5mm and 3.0 mm. The Schanz screws were made from stainless steel.

The number of cases of pin tract infection, grade of pin tract infection, type of pathogen cultured from the pin sites, management and the outcome of pin tract infections were analysed.

Pin tract infection was made clinically, based on the patient's case notes, and graded with the aid of radiographs according to Nepola (1996). In Grade I infection there is inordinate amount of free flowing serous or seropurulent drainage. In Grade II infection there is superficial cellulitis characterised by a halo of cutaneous erythema extending from the pin site. In Grade III there is deep infection characterised by infection along the entire pin tract and associated with purulent drainage, swelling and cellulitis. Radiographically, very slight radiolucencies is noted in the entry side cortex of the half pin fixation. In Grade IV, there is osteomyelitis with clinical loosening of implants accompanied by infection and radiographic evidence of bone infection.

### Results

Of the 117 patients, 108 were males and 9 females. Their ages ranged from 14 to 73 years (mean 30.4 years) with the commonest age group being 21-30 years

(39%). 80% of the fractures resulted from motor vehicle accidents. The grades of 79 open fractures were known. In 38 cases, the fractures were either closed or the grade of open fracture not stated in the records. The open fractures were classified into Grade I, II and III (Gustillo & Anderson, 1976). The Grade III fractures were further subclassified into IIIa, IIIb and IIIc (Gustillo *et al.*, 1984). Of the known open fractures, 10 were Grade I, 24 Grade II, 19 Grade IIIa, 21 Grade IIIb and 5 Grade IIIc. External fixation was applied to 88 tibiae, 21 radius/ulna, 5 femur, 2 pelvis and one humerus.

Pin tract infection was found in 36 cases. Of these, 22 were Grade I, one Grade II, 13 Grade III, and 0 Grade IV infections. 27 had a single episode infection, 7 two episodes and 2 more than two episodes. Infection involved the tibia in 32 cases, femur in 2 cases and radius/ulna in 2 cases.

All patients were given antibiotics before and after external fixation, the type and duration being variable. The commonest antibiotics given were cefoperazone, cloxacillin, cefuroxime and gentamicin. 43% received a single course (65% cefoperazone) and 57% were given combinations of antibiotics. Taking a  $p$  value of  $< 0.05$  as significant, single or combination therapy did not significantly affect the rate of pin tract infection using chi-square analysis ( $p = 0.188$ ).

Cultures from the infected pin sites were taken in only 14 cases. Of these, 6 had mixed growth but the exact types of the organisms were not reported. Of the remaining 8 cultures, all grew methicillin resistant *Staphylococcus aureus* (MRSA).

The infection was treated with antibiotics and improved pin site hygiene with more frequent povidone dressings in 10 cases. In 4 cases, the infected pins were removed and fresh pins were inserted away from the infected sites. In 22 cases, external fixation was completely removed and the fracture treated by cast immobilisation. None of the patients developed osteomyelitis from the pin tract infection.

## Discussion

The overall rate of pin tract infection (31%) in this study is less than that (40%) reported by Masbah & Ali Noor (1990). This, however, fails to take into account the distribution of the sites for external fixation. In this study, the infection rate of the tibia was 36% of the cases whilst in the latter study, it was 25%. This suggests that pin tract infection remains an unsolved problem with the use of external fixation in Malaysia, as the rates are still very much higher than the 17%,

17%, and 29% reported by Cannon *et al.* (1985), Clifford *et al.* (1987), and Edwards *et al.* (1998) respectively. In this study, 61% of the infection resulted in discontinuation of the external fixation. This rate is considerably higher than the 25% reported by Masbah & Ali Noor (1990), 0% by Cannon *et al.* (1985), and 25% by Clifford *et al.* (1987). Although this is likely to be partly due to the large number of grade III infections, the distrust of the surgeons for external fixation may also play a role, resulting in immediate removal with the first signs of trouble rather than considering treatment of the infection first.

Another finding of great concern from this study is the role of MRSA as the causative pathogen in pin tract infections. Whilst *Staphylococcus aureus* was noted as the commonest pathogen in other studies (Dellinger *et al.*, 1988; Marsh *et al.*, 1995), none had reported on methicillin resistance. There is concern as only 14 of the 36 cases of pin tract infection had cultures taken from the infected pin sites. The taking of cultures from infected pin sites should be mandatory in all cases of pin tract infection, as part of the proper management of the infection. No firm conclusions can be made in this study, as 61% of the cases did not have cultures taken from the pin sites. In this study, the most commonly prescribed antibiotics for the treatment of pin tract infection were cloxacillin or a broad-spectrum cephalosporin. Based on the findings, this empirical treatment would appear to be inadequate. This may have contributed to the high rate of discontinuation of the external fixation as the primary means of treatment for the fractures. The low culture rate carried out also did not allow us to analyse the relationship between the types and duration of antibiotics and the incidence of MRSA pin tract infections.

In conclusion, pin tract infection remains a major problem in external fixation of fractures in Malaysia. The emergence of MRSA infections may complicate the problem and antibiotic use needs to be reviewed.

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