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MRSA – 'bug-bear' of a surgical practice: reducing the incidence of MRSA surgical site infections

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ABSTRACT

Adverse publicity (the 'superbug') has demonstrated that the problem of MRSA (methicillin-resistant *Staphylococcus aureus*) is prevalent in many of the country's most prestigious hospitals. The results of the mandatory UK Department of Health (DH) surveillance for early surgical site infections in orthopaedic surgery (SSIS) have been published recently for the period April 2004 to March 2005 when 41,242 operations were studied (<http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsStatistic> 28 October 2005). Infection rates were generally and gratifyingly low but 48% of surgical site infections were caused by *Staph. aureus* and of those 68% were MRSA. The following article will discuss the aetiology and prevention of MRSA surgical site infection.

KEYWORDS

MRSA – Surgical infections – Orthopaedics – *Staphylococcus aureus*

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The UK Department of Health (DH) has monitored and published MRSA (methicillin-resistant *Staphylococcus aureus*) bacteraemia rates for NHS Trusts since 2001. These have been used as performance management indicators from 2003. Reduction of MRSA bacteraemia rates by 60% until 2007/8 has become part of the Core Standard 4 in *Standards for Better Health Care*,[1] upon which the new assessment by the Health Commission is based. This performance marker is influenced by nosocomial causes for MRSA bacteraemias such as infections of invasive medical devices (intravenous lines, urethral catheters, vascular grafts, ventilator associated pneumonias, *etc.*) or opportunistic infections in debilitated patients (aspiration pneumonia, arthritis, osteomyelitis).[2,3] Interestingly, surgical site infections other than sternal wound infections rarely lead to MRSA bacteraemias and, thus, this performance marker actually ignores the true postoperative infection rate.

MRSA is an opportunistic pathogen, which requires in many cases a foreign body such as a suture to invade tissues. Experiments in the 1950s showed that inoculation of *Staph. aureus* into the skin of healthy human volunteers did not cause an infection unless the inoculum exceeded one million organisms or a foreign body such as a suture was present.[4] Staphylococci cling to foreign bodies by specialised adhesins and form a biofilm which provides a niche hiding them from antibiotic access. Thus, infections of prosthetic devices cannot be controlled by antimicrobial therapy; therefore, they inevitably require surgical removal.

Prevention of infection is of prime importance, with the realisation that MRSA spreads by direct physical contact, is not airborne and is also transmitted by indirect contact with towels, clothes, *etc.* Surgical patients are at risk of infection if they are colonised with MRSA or if MRSA is inoculated into their surgical wound by contaminated hands or instruments including dressing scissors. Simple measures such as alcohol hand decontamination have poor compliance in the current NHS culture. This can only be changed by good role models of surgical consultants and senior hospital staff and appropriate 'policing' by senior nurses; much the same as in the respected strict protocols already observed in operating theatres.

The incidence of surgical site infection increases with the ASA status of the patient, the length of the surgical procedure and the type of operation wound relating to the likelihood of micro-organisms being present at the time of surgery.[5] In the UK, NICE is developing evidence-based guidelines for the prevention of surgical site infections. The American Healthcare Infection Control Practices Advisory Committee issued guidelines in 1999 on prevention[6] and recently the British Society for Antimicrobial Chemotherapy has produced guidelines for the prevention of postoperative MRSA infections,[7] which are incorporated into a new DH publication *Saving Lives*.[8] The following interventions have been recommended:

Pre-operative

- MRSA screening for all patients who are undergoing implant, cardiothoracic or neurosurgery, because the consequences of infections are disastrous for implants and neurosurgery. Sternal infections are very common after thoracotomies. Patients who are found to be MRSA carriers on pre-operative screening before implant surgery should be offered MRSA decontamination with nasal mupirocin and antiseptic skin washes.[7] Randomised controlled trials have demonstrated that pre-operative MRSA decolonisation reduces the staphylococcal postoperative infection rate by 50%.[9]
- For pre-operative hair removal, the use of a disposable clipper device instead of a razor is recommended and should be performed in theatre.[6] Several studies have demonstrated a lower infection risk compared with shaving the evening before the operation.

Peri-operative

- Antibiotic prophylaxis with a glycopeptide (*e.g.* teicoplanin) in implant and contaminated surgery in known MRSA carriers.[7]
- Maintaining glucose levels < 11 mg/l in diabetic patients.[6,8]
- Maintaining a body temperature above 36°C in the peri-operative period.[6,8]
- Closed suction drains through separate incisions appear to reduce the infection risk, but timing of the drain removal is important. Bacterial colonisation increases with the duration that the drain is left in place.[6]

Postoperative

- Covering the incision wound with a sterile dressing for 24–48 h.[6]
- The American College of Surgeons have recommended the use of sterile gloves and equipment when changing dressings.[6]

MRSA has become the 'bug-bear' of modern surgical practice. Rapid throughput of patients through hospitals should have resolved the problem but it has not. Inadequate provision of screening and lack of appropriate prophylaxis has allowed the problem to increase. The geographical layout of wards is a problem allowing close contact. It is of interest that it is uncommon for there to be an MRSA infection in an independent hospital where patients are nursed in individual rooms; albeit there may be a different case-mix of patients undergoing surgery not conducive to MRSA, *i.e.* shorter elective procedures, fitter patients (lower ASA grades). The physical isolation of MRSA-positive patients has not yet been shown consistently to be an effective intervention in the UK. Though ring fencing of elective orthopaedic beds reduced the postoperative MRSA infection rate significantly,[10] isolation of MRSA-positive patients in ITU failed to reduce cross-infection.[11]

MRSA infection can be fatal but, in the majority, it may be preventable. The surgical and medical team have a responsibility to eradicate this scourge of contemporary surgery together with the management of hospitals and Trusts and indeed their whole workforce.

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