

THE IMPACT OF MRSA ON WOUND HEALING

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Methicillin-resistant *Staphylococcus aureus* (MRSA) infections have been on the rise and in the news. This article looks behind the headlines to find out what exactly MRSA is, how dangerous it is and discusses the best way to treat wounds that have become infected with this difficult-to-treat bacteria.

Methicillin-resistant *Staphylococcus aureus* (MRSA) is often isolated from patient wounds, both in the hospital and community setting. The impact of MRSA on wounds varies from patient to patient and is dependent on a number of factors. Healthcare professionals must have an understanding of these factors, as well as a basic understanding of what MRSA is, in order to provide the most appropriate patient care.

What is MRSA?

All living creatures, including humans, are hosts to a variety of bacteria, known as normal body flora. Most of the time these bacteria are harmless or may even be beneficial because they prevent more pathogenic (harmful) organisms from causing disease (Wilson, 2001). Normal flora are harmless in their usual habitat, but may cause disease if transferred to different parts of the body where it is unnatural for them to live (Wilson, 2001). *S. aureus* is an example of normal body bacteria and is found in up

to 30% of healthy individuals (McCulloch and Finn, 2000), harmlessly colonising a variety of body sites such as the nose, axillae and groin (Royal College of Nursing, 2000). However, if transferred from these body sites where they live harmlessly, to vulnerable areas such as open wounds, *S. aureus* has the ability to cause opportunistic infection. Some strains of *S. aureus* have developed resistance to a range of commonly used antibiotics, such as penicillin, and these strains are known as MRSA. Both methicillin-sensitive *S. aureus* (MSSA) and MRSA cause similar infections, ranging from minor infections of the skin to more serious infections such as septicaemia, pneumonia and major wound infection (Boyce, 2001). However, treating MRSA infection poses a greater challenge due to the limited range of effective antibiotics that are available.

Wound colonisation or infection?

To understand the factors that determine MRSA wound

colonisation and infection, it is important to first consider what colonisation and infection are. Wound colonisation is defined as the presence of multiplying bacteria in a wound, but with no immune response from the patient (Ayton, 1985). This definition indicates that wound colonisation is the harmless presence of bacteria in a wound. In contrast, wound infection is defined as the presence of multiplying bacteria that overwhelm the patient's immune system, resulting in associated tissue damage (Kingsley, 2001). Both of these are discussed in more detail on p.132–42.

A variety of factors determine whether a wound remains harmlessly colonised or succumbs to infection. Some of the most important factors include individual vulnerability to infection (immunity) and the size and location of the wound, balanced against the number of micro-organisms present and their virulence factor (the ability or power to cause disease) (Emmerson, 1998).

Vulnerability factors include age with the elderly being more prone to MRSA infection as they have a reduced immune response, and underlying disease such as diabetes or cardiovascular disease and malnutrition, all of which affect the wound healing process (Infection Control Nurses Association [ICNA], 2003). In terms of wound size, the larger the wound the greater the surface space for bacteria to enter and multiply, potentially leading to a wound infection. The virulence factor of MRSA or its ability to cause disease may also be significant if the bacteria gain entry into vulnerable body sites, such as large open wounds, invasive devices or the bloodstream. In these situations the bacteria may cause opportunistic infection in vulnerable patients (ICNA, 2003).

MRSA may have a significant impact on the vulnerable patient's overall health and well-being, including causing delayed wound healing. If a patient develops a deep wound infection around a prosthetic hip joint following hip replacement surgery, it may be necessary to remove the prosthesis or even amputate the affected limb. Similarly, a wound from an emergency laparotomy which becomes infected with MRSA and dehisces (spontaneously breaks down) may become life-threatening. Serious complications are more likely with MRSA as the infection may not be readily treated due to the limited range of effective antibiotics available.

In contrast, in patients who are less acutely ill and susceptible



Figure 1. A wound infected with MRSA following coronary artery bypass graft surgery.

to infection, superficial MRSA wound colonisation may occur without undue complications or delayed wound healing. In general, the majority of wounds in which MRSA is found are colonised rather than infected (Wilson and Richardson, 1996). However, within the wound infection continuum harmless colonisation may predispose to heavier colonisation, known as critical colonisation, or even infection if the patient's immune defences are compromised. Both critical colonisation and infection will result in delayed wound healing (Kingsley, 2001).

It is important to regularly assess the patient and their wound for signs and symptoms of infection to determine whether a wound is colonised or infected. This includes gauging the patient's level of pain and regularly inspecting the wound to detect any changes within the wound site. Kingsley

(2001) recommends observing wounds at all dressing changes for signs of change. Accurate documentation and communication with other healthcare staff involved in the patient's care are vital to this process.

Treating MRSA-infected wounds

The need for antibiotic treatment for MRSA-positive wounds (Figure 1) should be determined by clinically assessing the patient and their wound to determine whether the wound is colonised or infected by the micro-organisms. Antibiotic therapy will be indicated where clinical signs and symptoms of infection are evident. Systemic antibiotics such as vancomycin or teicoplanin should be prescribed according to microbiology laboratory results. Findings will indicate which antibiotics may be used to treat the infection (known

as antibiotic sensitivities) (Joint Working Party on MRSA of the British Society for Antimicrobial Chemotherapy [BSAC], Hospital Infection Society [HIS] and the ICNA, 2006). Where wounds are only colonised or have superficial local infection present, topical antiseptics such as silver or iodine, may be used. Antibiotic therapy is generally not required or prescribed for wound colonisation alone, due to the added problem of selecting for more resistant micro-organisms.

In addition to systemic antibiotics, topical antibiotic ointments, such as mupirocin (0.5%) ointment, have in the past been recommended for routine use on infected or colonised small skin lesions but not for large raw areas such as burn wounds (Working Party of the British Society for Antimicrobial Chemotherapy, HIS and ICNA, 1998). However, more recent guidance indicates that widespread use of topical mupirocin on wounds is likely to result in increased mupirocin resistance and should only be used in conjunction with systemic antibiotics when clinically indicated for an active wound infection (Joint Working Party on MRSA of the BSAC, HIS and ICNA, 2006). The rationale behind limiting the routine use of topical mupirocin is to reduce the risk of increased antibiotic resistance. For this reason routine use of topical mupirocin on wounds is no longer advocated.

However, local infection control teams in conjunction with tissue viability specialists may

still advise the use of topical mupirocin along with systemic antibiotics for individual patients with specific wound management needs, such as delayed wound healing due to MRSA infection or heavy colonisation, and, if such advice is given, it should be followed. In situations where topical mupirocin ointment is necessary, its use should be restricted to

The single most important infection control precaution is thorough hand hygiene (ICNA, 2003). For MRSA specifically, good hand hygiene is vital as it is primarily spread from person to person, often via healthcare workers' hands (Phillips and Young, 1995).

7–10 days and a repeat course should preferably be avoided in order to limit the potential for increased antibiotic resistance (Joint Working Party BSAC, HIS and ICNA, 1998).

Selecting a suitable dressing

Choosing a suitable dressing for any wound, including those colonised or infected with MRSA, should be determined by the type of wound a patient has in line with the principles of asepsis and moist wound healing (Phillips and Young, 1995). It is important to select a wound management product most suited to the wound type, and which is able to manage the wound's bioburden so that healing is achieved as quickly as possible. For patients with MRSA, encouraging rapid

wound healing will help lower the risk of MRSA infection both for the individual patient and other vulnerable patients who are at risk of cross-infection. It is thought that occlusive dressings, such as hydrocolloids, are better at containing micro-organisms and therefore lower the risk of cross-infection to other patients (Bowler et al, 1999). Antiseptic dressings, for example, those impregnated with silver or iodine, may be helpful for wounds infected or heavily colonised with MRSA (White et al, 2001) and their use should be considered if appropriate for the wound type.

Infection control

Patients with MRSA pose a risk of cross-infection to other vulnerable individuals (Joint Working Party BSAC, HIS and ICNA, 1998). It must be remembered that for many patients their MRSA status is unknown, as routine screening is generally not undertaken or is practical. It is therefore important to employ standard infection control precautions with all patients at all times). These include hand hygiene, appropriate use of personal protective clothing, correct management of waste and laundry, dealing with body fluid spillages carefully and correctly, safe handling and disposal of sharps and maintaining a high standard of environmental cleanliness, all equipment.

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Table 1

Summary of infection control precautions needed for patients with MRSA*

- ▶ Source isolate the patient, preferably in a single room based upon a risk assessment
- ▶ Thorough hand decontamination using liquid soap and running water or alcohol hand rub (on visibly clean hands) before and after clinical contact with the patient and before leaving the source isolation room
- ▶ Appropriate use of disposable gloves and a plastic apron, for instance when delivering direct patient care, undertaking wound dressings and handling blood or body fluids. Remove gloves and apron inside the source isolation room and discard as clinical waste. Decontaminate hands following glove and apron removal
- ▶ Observe correct segregation and disposal of waste, according to local policies. For instance, contaminated wound dressings should be discarded as clinical/hazardous waste
- ▶ Use dedicated or disposable equipment for the affected patient whenever possible. Ensure adequate decontamination of reusable equipment that cannot be dedicated to the infected patient, to reduce the risk of cross-contamination
- ▶ Correct segregation and laundering of contaminated or infected laundry. Laundry used for patients with MRSA should be regarded as infectious and bagged as such according to local policies

*Joint Working Party on MRSA of the British Society for Antimicrobial Chemotherapy, the Hospital Infection Society and the Infection Control Nurses Association, 2006

as it is primarily spread from person to person, often via healthcare workers' hands (Phillips and Young, 1995). Teare et al (2001) also indicate that staff who dress wounds containing MRSA have an 80% chance of carrying the organisms on their hands for up to three hours afterwards. Staff must decontaminate their hands before and after all clinical contact with patients, even when gloves have been worn. Failure to do so is likely to result in cross-infection from one patient to another, which may result in serious infection, such as septicaemia or major wound infection.

In addition to standard infection control precautions for patients in the acute hospital setting who are confirmed to have MRSA, source isolation precautions

should be instituted (Joint Working Party on MRSA of the BSAC, HIS and ICNA, 2006). *Table 1* provides a summary of the necessary source isolation precautions. Many of these precautions will apply within the community setting, however, the need for single room nursing should be assessed according

to cross-infection risk. For instance, the risk of cross-infection may be significant in a nursing home and necessitates isolating the patient. In this situation the individual with MRSA should not share a room for sleeping purposes with others in the nursing home who have open wounds or invasive devices, but they may still use communal areas of the home (Department of Health, 1996). However, for a patient in his/her own home, isolation is unnecessary.

MRSA skin eradication therapy

MRSA skin eradication therapy provides another important means by which to control the spread of the infection. The aim of skin eradication is to eliminate MRSA or at least suppress the number of organisms on a patient to reduce the risk of infection in both the individual and other susceptible patients. This is particularly important for patients found positive for MRSA in a wound site, as it is likely that the surrounding skin will be contaminated with

Table 2

MRSA skin eradication

Treatment

- Antiseptic body wash, such as triclosan or 4% chlorhexidine
- Antiseptic hair wash, such as triclosan or 4% chlorhexidine
- Antiseptic nasal ointment, such as mupirocin
- Antiseptic dusting powder for groin and axillae, such as hexachlorophane powder

Frequency

- Use once daily when bathing or showering for 5–7 days. Should be used undiluted onto moistened skin for maximum effectiveness. Rinse afterwards
- Use twice during the skin eradication protocol
- Use three times daily for 5–7 days
- Use twice daily for 5–7 days

MRSA. Skin eradication should be administered according to local infection control policies, but will often involve using an antiseptic body wash and shampoo, nasal ointment and dusting powder for groin and axillae as indicated in *Table 2*. Unless contraindicated, the full skin eradication protocol is generally prescribed, regardless of which or how many body sites initially contained MRSA. This is because MRSA can re-colonise from one body site to another.

Communication

Patients with MRSA in their wound site, whether colonised or infected, are likely to experience heightened anxiety, which is not surprising considering the media coverage of MRSA infection (Hamour et al, 2003). Healthcare workers must be aware of this increased anxiety and provide patients with accurate information, seeking specialist guidance from local infection control teams as necessary. Any information provided must be within the boundaries of one's own scope of knowledge.

Conclusion

The impact of MRSA on wounds is variable from one patient to another. Therefore, the care and management of patients with MRSA in their wound will also vary from patient to patient. It is crucial for healthcare professionals to understand this diversity to ensure that holistic care is given while maintaining the safety of other vulnerable patients to whom MRSA may pose a risk of cross-infection. **WE**

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