



MRSA colonisation in patients admitted with hip fracture : implications for prevention of surgical site infection

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In a prospective study we assessed 440 patients, sequentially admitted to the trauma unit with hip fracture. Of the 403 who had a swab on admission, 5.2% (21/403) were found to be colonised with MRSA. Fifty two percent of MRSA colonised patients were admitted from their own home, 29% from residential homes and 19% from nursing homes. MRSA colonisation was found in 3.6% of patients admitted from their own home, 10.9% of residential home patients, and 17.4% of nursing home patients.

A high proportion (80.9%) of colonised patients had been admitted to a hospital within the previous one year, and the high prevalence of previous hospitalisation among people from institutional care may explain the higher rates of MRSA carriage among these individuals.

When a patient gives a history of hospitalisation within the previous year, it is clearly sensible to consider the use of an agent such as teicoplanin for perioperative prophylaxis.

Key words : MRSA ; femoral neck fracture ; wound infection in hip fractures.

INTRODUCTION

The incidence and prevalence of methicillin resistant *Staphylococcus aureus* (MRSA) has increased worldwide since the late seventies (16), an issue that has been of increasing concern in the last five years (13).

It is well established that early detection and treatment of asymptomatic carriers contributes to the control of epidemic *Staphylococcus aureus* (2). MRSA can cause both asymptomatic colonisation and infection ranging from minor skin infection to major life-threatening infection (9). The normal sites of colonisation and carriage are the nose, throat, perineum, groin and axillae, but other sites such as broken skin, respiratory and urinary tract may also be colonised.

MRSA infection control has significant economic implications. It has a huge direct cost through

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increasing the length of inpatient stay, diagnostic tests, antibiotic treatment, isolation procedures and involvement of infection control staff. Indirect cost effects are also evident as this may lead to disruption of hospital activity due to ward closures and staff redeployment (1).

Over 70,000 hip fractures occur each year in the UK. The injury tends to affect the oldest and frailest in society, with the commonest age group affected being people aged 80-90, and a three-fold increase risk of this injury among people who are living in institutional care. Around 10% of patients die, and only half return to their pre-fracture levels of independence. Wound infections are one of the multifactorial problems that explain this poor outcome.

Previous studies have shown a high incidence of MRSA colonisation in patients living in residential and nursing homes. The aim of our study was to identify the incidence of MRSA colonisation in patients admitted to the hospital with hip fracture and to consider its implications for surgical site infection.

PATIENTS AND METHODS

We prospectively assessed 440 consecutive patients admitted with hip fracture to our trauma ward. Assessment included a record of age, sex, sub-type of fracture, pre-fracture residential status, presence of any wound, diabetes, ulcers, or pressure sores, and history of previous admission to hospitals in the last one year.

Swabs were taken from the nose, throat and perineum and also from any pressure sores and ulcers. Swabs were collected on admission to the trauma ward prior to surgery or antibiotic treatment. The majority of patients underwent surgery before the swab results were available.

The type of operative procedure was documented. The antibiotic protocol for patients with hip fractures in our hospital is cephadrine (1 g at induction and three further 500 mg doses at 6 hour intervals post operatively). Isolation procedures and treatment with nasal mupirocin (Bactroban) and chlorhexidine washes were commenced once MRSA colonisation was identified from swab results.

Clinical research fellows and specialist hip fracture nurses closely monitored the wound postoperatively until the time of discharge. The diagnosis of wound infection was based on the Centre for Disease Control (CDC)

National Nosocomial Infection Surveillance Definition (12). All hip fracture patients were followed up as outpatients at 4 months after fracture.

RESULTS

A total of 440 patients were prospectively assessed. Swabs were performed in 91.6% of patients : 37 (8.4%) who were not tested are excluded from the study. The average age in our study group was 81.2 years, with a male to female ratio of 2:5.

Of 440 patients admitted with hip fracture, 74.6% came from their own home, 13.6% from residential home, 5.7% from nursing home and 5.9% were transferred from other hospital setting (table I).

The incidence of MRSA colonisation in patients admitted with hip fracture was 5.2%. Of the MRSA colonised patients, 52.4% came from home, 28.5% from a residential home, and 19% from a nursing home. The commonest site of MRSA colonisation was the nose (61.9%), followed by multiple site colonisation (28.5%) and the groin (9.5%).

The majority (80.9%) of the colonised patients had been admitted to hospital at some time in the previous one year. Ninety percent of care home residents had been admitted to hospital in the last one year. The high rate of prior multiple hospital admissions in institutional care patients appeared to explain the high rate of MRSA carriage among this group (table II).

Prior hospital admission had a sensitivity of 81% for the identification of patients who were MRSA carriers. This is clearly a more effective approach that the targeting of admissions from institutional care – an approach that achieved only a sensitivity of 48% in identifying MRSA carriers. A combined approach – targeting patients who were either admitted from institutional care, or who had been an inpatient in the previous year successfully identified 85% of MRSA carriers.

There were no MRSA carriers in patients transferred from other hospitals ; however the number of patients in this group (24/403) was small. Nine patients (52%) of the colonised group underwent dynamic hip screw fixation, 11 patients (43%)

Table I. — Residential status of patients admitted with fractures of the neck of the femur

Pre-fracture residence	Total	MRSA colonised	Percentage colonised
Own Home	301	11	3.6
Residential Home	55	6	10.9
Nursing Home	23	4	17.4
Hospital	24	0	0
Total	403	21	5.2

Table II. — Previous hospital admission in the last one year – MRSA colonised patients

Pre-fracture Residence	Total Colonised	Previous Admission to Hospital in last 1 year	No prior Hospital admission
Home	11	8	3
Residential Home	6	5	1
Nursing Home	4	4	0
Hospital	0	0	0
Total	21	17	4

hemiarthroplasty and 1 patient (5%) AO cannulated screw fixation.

Three of the 21 patients (14.2%) colonised with MRSA developed postoperative wound infection during their hospital stay (table III). One was a superficial infection, which was treated with vancomycin, and the other two were deep infections, which required surgical debridement and antibiotic treatment. One of the patients with deep wound infection died during the hospital stay as a result of sepsis leading to respiratory failure.

Ten percent (2/21) of the MRSA colonised patients had persistent colonisation at discharge despite topical treatment with nasal mupirocin (Bactroban) and chlorhexidine wash.

DISCUSSION

The incidence of MRSA infection has been increasing both within the hospital and in the community. Previous studies of the nursing home population show an incidence of MRSA colonisation between 4.7-17% (4,7). From the all Wales surveillance of MRSA, Morgan *et al* reported 14.3% (248/1737) of MRSA isolates from residents of

nursing homes and institutions (13). The prevalence of MRSA carriage in a study from Belgium was 4.7% (14). This study also pointed out the cross-contamination of MRSA which happens in nursing home residents, that this was commoner in multi-bedded rooms, and when the room-mate was MRSA positive (14). Fluoroquinolones have been reported to be associated with MRSA through elimination of the commensal flora and colonisation by nosocomial pathogens including MRSA (5,8,17).

The European Antimicrobial Resistance Surveillance System (EARSS) report in 2004 suggested the prevalence of MRSA in blood isolates to be higher in southern and parts of western Europe and lower in northern Europe. MRSA prevalence seems to be increasing in many countries. Significant increases were found for Belgium, Germany, the Netherlands, Ireland, and the United Kingdom, whereas the proportion of MRSA decreased in Slovenia (15).

Our data represents patients admitted to the largest trauma centre in Wales which provides health services to a population of around 500,000 people. The incidence of MRSA colonisation in patients admitted with hip fracture in our study was 5.2%.

Table III. — Summary of the MRSA colonised patients

Patients	Age	Sex	Residential status	Type of Surgery	Previous Admissions	Site of Colonisation	Postop wound infection	Pre-discharge Screening
1	80	F	Home	Hemi	Yes	Throat	No	Cleared
2	60	F	Home	DHS	No	Perineum	Coag Neg Staph	Cleared
3	77	F	Home	DHS	Yes	Perineum	No	Cleared
4	84	F	RH	DHS	Yes	Nose	MRSA	Cleared
5	75	M	NH	DHS	Yes	Nose	No	Cleared
6	81	F	Home	Hemi	Yes	Nose	Coliforms, coag-ve, serratia marcea	Cleared
7	72	F	RH	DHS	Yes	Nose	No	Cleared
8	77	F	Home	Hemi	Yes	Nose	No	Cleared
9	81	F	Home	DHS	Yes	Nose	No	Cleared
10	88	F	RH	Hemi	No	Nose/perineum	No	Nose persistent
11	83	F	RH	Hemi	Yes	Nose	No	Cleared
12	69	M	Home	DHS	Yes	Nose	No	No swabs done
13	71	F	NH	DHS	Yes	Nose	No	Cleared
14	88	F	RH	Hemi	No	Nose/perineum	Coag - ve staph, Coryneform	Cleared
15	81	M	Home	Hemi	Yes	Nose/ Throat	No	Throat persistent
16	76	F	Home	Hemi	Yes	Nose	Coryneform	Cleared
17	80	F	NH	Hemi	Yes	Nose	No	Cleared
18	78	F	RH	DHS	Yes	Nose	No	Cleared
19	86	F	NH	DHS	Yes	Nose	No	Cleared
20	82	M	Home	AO Screws	No	Nose/perineum	MRSA	Cleared
21	83	M	Home	Hemi	No	Nose/perineum	MRSA	Cleared

RH : residential home ; NH : nursing home ; Hemi : hemiarthroplasty ; DHS : Dynamic Hip Screw.

Traditionally MRSA was considered a hospital acquired organism, but recently there have been many reports of increased MRSA prevalence in the community. Our study looked at elderly patients admitted with hip fracture who came from the community, residential homes, nursing homes, or were transferred from other hospitals. Of the elderly patients admitted to our trauma ward, 74.6% came from their own home.

Zulian *et al* and Khan *et al* showed a correlation between previous hospital admission in the last six months and MRSA colonisation (10,20). Morgan *et al* reported that 70% (667/961) of the MRSA isolates had been hospitalised within the previous

year (13). Eighty one percent of the MRSA colonised patients in our study had previous multiple admissions to hospitals during the last one year.

Among those patients already colonised, it may be possible to identify some risk factors and thus prevent subsequent infection. Previous studies have shown that surgical wounds, pressure ulcers, ICU admission and intravenous catheters are the possible risk factors for developing MRSA infection in the colonised group (4). The reasons why some of the patients who are colonised with MRSA progress to wound infection and others do not are not known. Coello *et al* in their study on hospital patients colonised with MRSA showed that 11.1%

developed postoperative wound infection (3). In our study 14.2% of colonised patients developed postoperative MRSA wound infection.

Nasal carriers of MRSA are at significantly higher risk for surgical site infection. Previous studies have shown pre-operative intra-nasal mupirocin ointment in nasal carriers significantly reduces the postoperative infection rate (19). This may have a role in elective orthopaedic surgery, but is clearly not appropriate in the management of an emergency condition such as hip fracture, where outcome is dependent on prompt surgery. However, pre-operative screening for MRSA colonisation still proved a valuable tool to identify the colonised patients and thus helps in avoiding cross infection of others, and in choosing antibiotics if a surgical site infection developed.

With increasing prevalence of MRSA colonisation in the community, colonised patients admitted to the wards may cross colonise other patients, thereby increasing the number of asymptomatic MRSA carriers. Despite topical treatment and isolation procedures, 10% had persistent colonisation at discharge, and this is consistent with the results from previous studies (6).

In our study 14.2% of colonised patients developed postoperative MRSA wound infection. This justifies screening all hip fracture patient on admission to isolate the MRSA colonised patients and commence eradication therapy.

Cephadrine as prophylaxis has no activity against MRSA, and previous studies have shown that changes to antibiotic prophylaxis protocol reduce both the incidence of MRSA colonisation and rates of infection in surgical patients (11). However, MRSA screening results will not be available prior to surgery. Choice of perioperative prophylaxis must therefore be made on clinical grounds. MRSA colonisation rates are high in people admitted from care homes and in those with a history of admission to hospital in the previous year.

Prior hospital admission has a sensitivity of 81% for the identification of MRSA carriers. If patients living in care homes are added to those with a history of hospital admission in the previous year 85% of all MRSA carriers will be identified for teicoplanin prophylaxis.

Our rationale for using teicoplanin was based on the evidence available which suggests teicoplanin is as efficacious as vancomycin, but its superior tolerability, with the advantage of once daily bolus administration, intramuscular use and lack of requirement for routine serum monitoring gives it considerable potential for use in clinical practice (18).

When a patient gives a history of hospitalisation within the previous year, it is clearly sensible to consider the use of teicoplanin for preoperative prophylaxis. Many frail patients admitted from institutional care may be unable to recall or report such hospitalisation, and our results would suggest that a similar approach to antibiotic prophylaxis is justified in this situation.

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