

Decolonization of orthopedic surgical team *S. aureus* carriers: impact on surgical-site infections

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Abstract

Background Orthopedic surgical-site infection (SSI), mostly due to *S. aureus*, is recognized as a major adverse event. This research aims to verify the usefulness of surgical team decolonization in order to reduce the risk of surgical-site infection.

Materials and methods We performed swabs of both nares and oropharynx to identify *S. aureus* carriers among orthopedic team members who consented to cooperate with the study. Carriers were treated with local application of mupirocin ointment.

Results Retrospective study of 1,000 consecutive patients operated before surgical team decolonization showed 6% SSIs. Of the 300 cases considered after decolonization, none developed SSI.

Conclusions Though we are aware that more data need to be collected, this work might be relevant for the introduction of a new preventive protocol.

Keywords Surgical-site infections · *S. aureus* · Prevention · Orthopedic surgery

Introduction

Surgical-site infections (SSIs) are a major adverse event for patients and their surgeons. Orthopedic SSIs cause

substantial morbidity, prolonging hospital stay by a median of 2 weeks, doubling rehospitalization rates, and more than tripling overall healthcare costs [1]. *Staphylococcus aureus* is the most important pathogen after surgical procedures, and its nasal carriage is the main risk factor for SSI caused by *S. aureus* [2], since carriers are two to nine times more likely to acquire *S. aureus* SSIs than noncarriers [3]. The mean carriage rate in the general population is 37.2% [3]. Several studies have been conducted on nasal decolonization in patients undergoing orthopedic surgery by using perioperative intranasal mupirocin [4, 5], an attractive prevention strategy, being a safe and simple method to eradicate nasal colonization. Preoperative patient decolonization significantly decreases incidence of *S. aureus* SSIs [4, 5]. Nevertheless, no experience is documented regarding surgical team screening for *S. aureus* carriers and the use of perioperative mupirocin for decolonization in order to extend the prophylaxis against *S. aureus* orthopedic SSIs. Therefore, the focus of this study is the role of the surgical team as a possible risk factor for SSI and to suggest a suitable and comprehensive protocol for prevention.

Materials and methods

In order to establish the frequency of *S. aureus* nasal carriers among orthopedic surgical team members operating within 2 m from the surgical site, we performed swabs of both nares and oropharynx on 75 workers of the operating theater (orthopedic surgeons, anesthesiologists and nurses) who provided informed consent to be enrolled in the study.

Each collection swab was streaked onto *S. aureus*-selective mannitol salt agar plates, incubated for 24 h at 37°C, and examined for growth.

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According to swab results, carriers were treated with daily nasal application of mupirocin ointment (Glaxo) for 5 days. The treatment was repeated 6 months later. Results of mupirocin treatment were checked 3 months after treatment by repeating swabs of both nares and oropharynx.

SSIs in both pre- and posttreatment groups were diagnosed through wound swab and cultural examination in presence of altered clinical and biohumoral parameters.

Results

Thirty out of 75 (40%) swabs resulted positive for presence of *S. aureus*.

Susceptibility testing on the isolated bacteria indicated that, while none of the carriers was mupirocin resistant, 23/30 produced β -lactamase (therefore being penicillin resistant) and 5/30 were oxacillin resistant (Fig. 1).

Despite mupirocin application, one surgeon appeared positive 3 months after treatment, and was therefore excluded from the study.

In a second step of this study we compared the rate of *S. aureus* SSIs in two series of patients operated before (1,000 patients, retrospective analysis) and after (300 patients) decolonization of surgical teams.

All 75 team members, both carriers and noncarriers, had to be considered because of the variable composition of the surgical teams. Retrospective study on 1,000 consecutive patients operated before nasal decolonization of the

surgical team showed 6% SSIs. Of the 300 cases considered after nasal decolonization, none developed SSI ($p = 0.439$ Kruskal–Wallis test).

Operations were distributed as presented in Table 1. The two considered groups are equivalent.

Discussion

This preliminary study shows for the first time how a prophylactic intervention on the surgical team can decrease the SSI rate. Though we are aware that various problems still have to be solved (such as intermittent carriers and possible false negatives, the duration of decolonization efficacy and the appearance of resistance to treatment) and that more data need to be collected to reinforce statistical analysis, we consider this prophylactic approach to be promising and worth being introduced into daily surgical practice.

In accordance with published statistics [3], our work confirms the presence of 40% *S. aureus* carriers in surgical teams, thus emphasizing the importance of decolonization treatment not only for patients but—probably even more strikingly—for health workers in the operating theater. According to the CDC Guideline for Prevention of SSI, healthcare organizations have to implement policies to prevent transmission of microorganisms from personnel to patients [6]. This work might be relevant for the development of preventive protocols and guidelines for the introduction of this kind of prophylaxis to reduce SSIs.

Fig. 1 Percentage of *S. aureus* carriers in the screened population of orthopedic surgical team members (a) and antibiotic resistance in the isolated bacterial colonies (b)

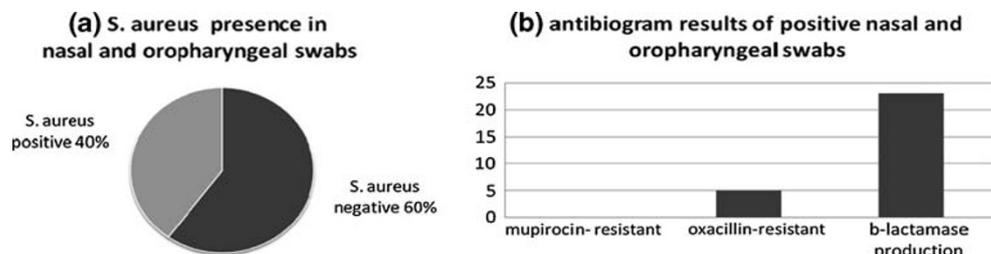


Table 1 Distribution of operations within the two considered groups

	Pretreatment		Posttreatment	
	Number	Percentage (%)	Number	Percentage (%)
Hip-knee prosthesis	40	4	13	4.3
Shoulder-knee arthroscopy	515	51.5	167	55.7
Foot surgery	69	6.9	26	8.7
Hand surgery	210	21	67	22.3
Anterior cruciate ligament reconstruction	61	6.1	20	6.7
Other	105	10.5	7	2.3
Total	1,000		300	

Values are expressed as approximate number and as percentage. Groups are equivalent in composition

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Conflict of interest statement The authors declare that they have no conflict of interest related to the publication of this article.

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