ИММУНОЛОГИЯ И МИКРОБИОЛОГИЯ

EVELUATION OF PREOPERATIVE NASOPHARYNGEAL COLONISATION OF STAPHYLOCOCCUS AUREUS IN ORTHOPAEDIC IMPLANT SURGERY

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Abstract. Staphylococcus aureus (S. aureus) is an independent risk factor for orthopaedic surgical site infection (SSI). There is a strong epidemiologic association between nasopharyngeal carriage of S. aureus and development of S. aureus SSIs. Carriers are two to nine times more likely to acquire S. aureus SSIs than noncarriers . *Staphylococcus* colonizing nasal or pharyngeal sites can become virulent and cause severe infections. In this study, We retrospectively studed both pharyngeal and nasal colonisation of St.aureus in 59 outpatients who visited TSMU the first university clinic traumatology department for screening purposes before orthopedic implant surgery. One swab was taken from the nostrils which was rotated gently in both nostrils, and one swab was taken from the pharynx by sweeping both tonsils. Specimens were inoculated onto manitol-salt and 5% sheep blood agar palate, which were incubated for 20 to 28 hours at 35°C to 37°C. After 24 hours negative plates were incubated for an additional 24 hours. The absolute S. aureus carriage was 25.42%, as 15 out of the 59 patients had S. aureus in the nose. 2 patients had SA both in the throat and nose. 1 patient had Candida albicans in the throat swab. Screening does not yielded positive nasal cultures MRSA . Thus, the nasal carrier rate was marginally significantly higher than that in the pharynx. We also eveluated antibiotic susceptibility test results which showed resistance to erythromycin, tetracycline,clindamycin and clarithromycine.

Keywords: Staphylococcus aureus, antibiotics, screening, implant, surgery.

Introduction:

Staphylococcus aureus is among the most common causes of surgical site infection (SSI) in orthopaedic patients (1). The association between Staphylococcus aureus (SA) nasal colonization and infection was first reported in 1931 (2). Since then, it has been well established that development of SSI involving SA is associated with preoperative nasal colonization with the organism (2,3,4). Nasal colonization with SA was the most powerful independent risk factor for SSI after cardiothoracic surgery (5), and in another study of patients undergoing orthopaedic surgery with prosthetic implants, nasal colonization with SA was the most important independent risk factor for development of a SSI. Carriers of SA were nine times more likely to have an SSI develop versus noncarriers (95% confidence interval, 1.7–45.5) (6). The Centers for Disease Control and Prevention (CDC) describes preoperative nasal colonization with SA as a risk factor for SSI (7).

Methicillin-resistant Staphylococcus aureus (MRSA) in the community is believed to add to the burden of SA colonization, and its prevalence is increasing (8). Furthermore, Ellis et al. reported a 3.1-fold risk (95% confidence interval, 1.5–6.5) for acquiring MRSA infection in MRSA carriers compared with noncarriers (9). It is unknown how these data can be applied to a preoperative orthopaedic surgery population and whether MRSA colonization status should play a role in perioperative antibiotic selection and empiric treatment regimens(10-11*).* Staphylococcus aureus is the most important cause of orthopaedic infection worldwide. Despite the known association between preoperative colonization with SA and SSI, little is known about the epidemiology of the nasal carriage in an orthopaedic surgery population(12). Nasal colonization can cause opportunistic and sometimes life-threatening infections such as surgical site infections or other infections in non-surgical patients that increase morbidity, mortality as well as healthcare costs(13). Up to 30% of the human population are asymptomatically and permanently colonized with nasal Staphylococcus aureus. To successfully colonize human nares, S. aureus needs to establish solid interactions with human nasal epithelial cells and overcome host defense mechanisms(14).

The aim of our study was to determine the prevalence of asymptomatic nasopharyngeal colonization with SA, including MRSA, among healthy preoperative orthopaedic implant surgery outpatients at TSMU the First University clinic.

Material and Methods: We performed a retrospective study of 59 outpatients who visited TSMU the first university clinic traumatology department in 2019 for screening purposes two to 4 weeks before orthopaedic implant surgery. The presence of MSSA and MRSA, was determined by microbiological analysis of nasopharyngeal exudate and antimicrobial susceptibility was determined. We collected both pharyngeal and nasal exudates . One swab was taken from the nostrils which was rotated gently in both nostrils, and one swab was taken from the pharynx by sweeping both tonsils. The protocol consisted of preoperative screening for S. aureus nasal carriage and, in carriers, preoperative use of intranasal mupirocin with chlorhexidine body wash. Specimens were inoculated onto manitol-salt and 5% sheep blood agar palate, which were incubated for 20 to 28 hours at 35°C to 37°C. After 24 hours negative plates were incubated for an additional 24 hours. The colonies present on either medium at 48 hours were verified as S. aureus by Gram's stain and coagulase testing

(Pastorex staph, BioRad). Approximately a week before surgery, patients with nasal cultures positive for MSSA or MRSA were educated about the rationale for the decolonization protocol, which was initiated in the outpatient setting. We plated both swabs directly on selective media for SA select medium(Bio-Rad)) and MRSA (ChromID MRSA; Bio-Rad)). Antibiotic susceptibility testing was performed according to the European Committee on Antimicrobial SusceptibilityTesting guidelines released in 2019 , using the Kirby-Bauer disk-diffusion method. From isolated colonies on selective medium for SA (ChromID S.aureus, Bio-Rad) and MRSA (ChromID MRSA, Bio-Rad). The inoculum 0.5 MacFarland was streaked into Muller Hinton agar plates (Bi0-Rad). We placed the antibiotic disks (Bio-Rad, France) . The plates were then incubated at 37°C for 18 h and the following day the inhibition zone diameters were measured using an electronic caliper for maximum precision of the measurement. For the quality control of the Muller Hinton agar plates and antibiotic disks, we used the Kirby-Bauer method with the Culti-Loops SA control strains ATCC 25923 (Thermo Fisher Scientific)

Results: The absolute S. aureus carriage was 25.42%, as 15 out of the 59 patients had S. aureus in the nose. 2 patients had SA both in the throat and nose. 1 patient had Candida albicans in the throat swab. Screening does not yielded positive nasal cultures MRSA . Thus, the nasal carrier rate was marginally significantly higher than that in the pharynx. We also eveluated antibiotic susceptibility test results which showed resistance to erythromycin, tetracycline,clindamycin and clarithromycine.

Conclusion: The overall prevalence of S.aureus nasal carriage varies different countries is reported 30% .Our data is close to the studies(25,42%). Being a carrier is an independent risk factor for orthopaedic surgical site infection (SSI) . We therefore hypothesized use of a decolonization protocol would lower the SSI. The antibiotic resistance pattern of SA strains demonstrated a high resistance of St.aureus probably driven by antibiotic use. Resistance to erythromycin, tetracycline, clindamycin and clarithromycin was high and consequently, these drugs are not recommended for the empirical therapy of S. aureus infections. S. aureus is a pathogen with constantly changing trends in resistance and epidemiology, and thus requires constant bacteriological monitoring in healthcare facilities.

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