

# Interventional non-RCT study on the efficacy of Mupirocin versus Neomycin in the eradication of nasal carriers of *Staphylococcus aureus* in theatre staff

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## ABSTRACT

**Aim:** Nasal carriage of *Staphylococcus aureus* plays a pivotal role in the spread of nosocomial infections even in tertiary care centers. We decided to detect nasal carriage of *S. aureus* in our institution and eradicate it with local application of Mupirocin/Neomycin and to compare their efficiency. **Materials and Methods:** The study was conducted over a period of 12 months among 50 surgical theatre staff. In all, two nasal swabs were taken from each person at an interval of one week. Alternate nasal carriers identified were given Mupirocin/Neomycin for application in the anterior nares. A third swab was taken seven days after treatment. **Observations and Result:** Out of the fifty persons, 16 tested positive for *S. aureus* (32%). Out of the 16, two were Methicillin resistant *Staphylococcus aureus* (MRSA). All repeat swabs were negative after treatment with Mupirocin. However, 4% were not cured after treatment with Neomycin. Since the sample size is too small, an elaborate study should be conducted to include theatre staff of all speciality and this can confirm the promising role of Neomycin, as the percentage of resistance in this study appears negligible.

**Key words:** Carrier, Neomycin, Mupirocin

## INTRODUCTION

*Staphylococcus aureus* is recognized as an important pathogen in human disease and is the most common cause of nosocomial infections. About 10-30% of healthy persons carry staphylococci in the nose, about 10% in the perineum, about 5% in the vagina and also on the hair.<sup>[1]</sup> The cocci shed by the patients and carriers contaminate fomites such as handkerchieves, bed linen and blankets and may persist on them for days or weeks. Staphylococcal infection may be transmitted through direct contact or fomites. The link between *S. aureus* nasal carriage and the development of subsequent *S. aureus* infection has been established in patients on hemodialysis, on continuous ambulatory peritoneal dialysis and those undergoing surgery.<sup>[2]</sup>

*Staphylococcus aureus* carriage plays a key role in the epidemiology and pathogenesis of infection. The main ecological niche of *S. aureus* is the anterior nares. Elimination of carriage appears

to be an attractive prevention strategy among patients at risk. Hence, regular screening of carriers is required for the prevention of nosocomial infection. Nasal ointments, sprays and oral antibiotics have variable efficacy and their frequent use results in antimicrobial resistance among *S. aureus* strains. Of the commonly used agents, Mupirocin ointment has been proved to be 97% effective in reducing *S. aureus* nasal carriage. Since Mupirocin is costly, a comparative study with Neomycin was done to detect efficacy of both, in eradicating nasal carriage of *S. aureus* among theatre staff, thereby reducing surgical site infections.<sup>[3,4]</sup>

### Aim

1. To detect and eradicate nasal carriers of *S. aureus* in theatre staff.
2. To compare the efficacy of Mupirocin and Neomycin in eradicating nasal carriage of *S. aureus* in the theatre staff as measured by the culture of nasal carriers.

## MATERIALS AND METHODS

This study was done among 50 theatre staff of surgical theaters in Government Medical College Hospital,

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Thiruvananthapuram for a period of 12 months. Theatre staff included surgeons, anaesthetists, nursing staff, nursing attenders, medical and nursing students posted in the theatre. Theatre staff who had active nasal infection and those who did not give consent were excluded from the study.

Sterile cotton swabs moistened with sterile normal saline were used to collect specimens from anterior nares. One sterile swab was inserted into each nostril until resistance was met, rotated 5 times and taken out of the nose. Separate swabs were used for right and left nostril. The swabs were transported to the laboratory and processed immediately.

Swabs were inoculated on blood agar, MacConkey agar and Mannitol salt agar and incubated at 37°C for 24 hours. Gram smear was also taken. *S. aureus* was identified using standard methods.

Nasal carriers were defined when two nasal swabs taken at an interval of one week was positive. Alternate nasal carriers identified were told to apply Mupirocin or Neomycin ointment twice daily for seven days which was given free of cost. Another swab was taken seven days after the treatment.

## RESULTS

A total of 50 pairs of nasal swabs were collected from 10 male staff and 40 female staff. Of these, 16 (32% of theatre staff) were positive and found colonized with *S. aureus* [Table 1].

The maximum number of carriers were in the age group of 41-50 years (35%) [Table 2].

Out of the 16 positives, 2 (12.5%) were MRSA.

Among the isolates, all the 16 strains showed resistance to Penicillin, 12 (85%) were sensitive to 1<sup>st</sup> generation cephalosporin and Gentamicin, 14 (87.5%) sensitive to Oxacillin. Only 8 (50%) were sensitive to Erythromycin [Table 3]. All strains were sensitive to Amikacin, Rifampicin, Clindamycin and Linezolid. In all, two strains were resistant to Cefoxitin and were identified as Methicillin resistant *S. aureus* (MRSA).

Nasal swab for *S. aureus* was positive in 16 (32%) theatre staff. In all, eight were treated with Mupirocin ointment thrice daily and remaining eight were treated with Neomycin ointment twice daily for seven days.

Repeat nasal swabs were taken seven days after stopping the local antibiotics.

**Table 1: Theater staff distribution among culture positives**

Theater staff category	Number of Positive	Percentage
Staff nurse	5	31.2
Nursing assistants	3	18.8
Grade II nursing assistants	6	37.5
Head nurse	1	6.2
Doctors	1	6.2
Total	16	100

*S. aureus* were isolated from 5 male and 11 female staff

**Table 2: Shows age groups distribution of culture positives**

Age in years	No. of positives	Percentage
21-30	5/14	35.7
31-40	3/10	30
41-50	7/21	35
>51	1/5	20

**Table 3: Antibiotic sensitivity pattern**

Antimicrobial agent	MSSA (total no. 14)		MRSA (total No. 2)	
	No. sensitive	Percentage	No. sensitive	Percentage
Penicillin (10 IU)	0	0	0	0
Gentamicin (10µg)	12	85	0	0
1 <sup>st</sup> generation cephalosporin (30 µg)	12	85	0	0
Erythromycin (15 µg)	7	50	0	0
Cefoxitin (30 µg)	14	100	0	0
Amikacin (30 µg)	14	100	2	100
Rifampicin (5 µg)	14	100	2	100
Clindamycin (2 µg)	14	100	2	100
Vancomycin (30 µg)	14	100	2	100
Linezolid (30 µg)	14	100	2	100

MSSA: Methicillin sensitive staphylococcus aureus

Among the Neomycin group two (25%) were not cured with the local application of Neomycin (repeat swab taken after seven days was positive for *S. aureus*). They were given Mupirocin ointment for seven days. Repeat swabs were negative after Mupirocin treatment.

The MRSA carriers were treated with Mupirocin and the organisms were completely eradicated.

In this study, grade II nursing assistants were the major nasal carriers accounting for 6 (37.5%), followed by five (31.2%) staff nurses, three (18.8%) grade I nursing assistants 3 (18.8%), then one head nurse (6.2%), and one doctor (6.2%) among doctors including staff and post graduates were 1 (6.2%) while there were no nasal carriers among students. Hence nursing staff had more prevalence than clinical staff.

## DISCUSSION

According to Perl, Mupirocin ointment has been shown

to be 97% effective in reducing *S. aureus* nasal carriage. In our study we obtained 100% efficacy for Mupirocin.<sup>[5]</sup> We also found that Mupirocin is more effective than Neomycin sulphate for the elimination of *S. aureus* nasal colonization. They were directed to attend duties with standard surgical mask to prevent the spread of infection to others.

All the theatre staff were educated about universal precautions and the benefit of thorough hand washing. They were strictly advised about the continuous use of surgical mask in the theatre.

## RECOMMENDATIONS

1. Practice universal precautions and always cover the nose with the surgical mask.
2. Wash hands with soap and water or chlorhexidine.
3. Educate the theatre staff about the importance of eradicating nasal carriage of *S. aureus* and thus decrease surgical site infection.
4. Mupirocin nasal application thrice daily for 7 days can control nasal carriers of *S. aureus*.

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