IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 7 Ver. 16 (July. 2018), PP 30-33
www.iosrjournals.org

Evaluation of Screening and Treatment for Nasal Carriage of Staphylococcus Aureus before Surgery to Prevent Postoperative Surgical Site Infection

Parthasarathy K*
Madha Medical College & RI Kovur,Chennai Tamil Nadu Dr.M.G.R. Medical University
**Corresponding Author: Parthasarathy K*

Abstract: *Health care associated infections have imposed a huge burden on present medical management. One of the commonest causes for surgical site infection is nasal carriage of Staphylococcus aureus. Decolonization of this organism from nasal and extra nasal sites may reduce the risk of Health care associated infections. A prospective study was conducted, in which all patients undergoing general surgery from January 2017 to December 2017were included. Preoperatively all patients were screened for nasal carriage of S.aureus by conventional culture method, cefoxitin disc and to detect (Methicillin-Resistant Staphylococcus aureus) MRSA and kit agglutination method to detect Mec A gene of MRSA. The (Surgical Site Infection) SSI was recorded based on the criteria of (Centers for Disease Control and Prevention) CDC guidelines. Screening was performed in 456 cases of these 122 (26.7%) cases had positive nasal swab for S.aureus. Among the positive screened patients 102 (83.6%) were identified as (Methicillin-sensitive Staphylococcus aureus) MSSA carriers and 20 (16.4%) cases were MRSA carriers. All the positive screened patients were treated with intranasal mupirocin application and chlorhexidine bath for 5 days. On postoperative follow up 8 (6.5%) cases developed SSI with S.aureus among carriers and 6 (1.8%) cases developed SSI with S.aureus among non carriers. In conclusion nasal carriers carry increased increase of development of S.aureus SSI compared to non carriers. These patients may benefit by proper preoperative treatment to eradicate nasal and extra nasal carriage.*

Date of Submission: 17-07-2018 Date of acceptance: 02-08-2018

I. Introduction

Health care associated infections have imposed a great burden in the management of post operative patients [1]. Surgical site infection are the 3rd most common health care associated infection and these infection increases the morbidity, mortality, increase length of hospitalisation, increase of the cost of health care [1,2,3]. S.aureus contributes to about 25% of HCAI and thereby causing postoperative complications and increasing the cost of hospitalisation [2].

Nasal carriage of S.aureus increases the risk of development of HCAI with the organism especially in post cardiac, orthopaedic, vascular surgeries and peritoneal dialysis cases [4,5,6,7]. Nasal carriers of S.aureus are 2-9 times at higher risk compared to non carriers for surgical site infection [8.9,10]. Preoperative screening for nasal carriage an treatment of the patients with nasal application of 2%Mupirocin calcium and chlorhexidine gluconate bath for extranal sites to decolonize the nasal and extra nasal carriage reduces the risk of SSI [11,12]. This reduces the risk of deep seated infection by 79% and superficial infection by 55% [13,14,15].

For this reason we conducted a prospective study to evaluate the nasal screening preoperatively in general surgery cases for carriage of Staphylococcus aureus and its relation with post operative SSI compared to non carriers.

II. Methodology:

This was a prospective study conducted in our tertiary care centre from January 2017 to December 2017 in general surgery department. The patients were screened for nasal carriage of Staphylococcus aureus in the department of Microbiology. The nasal swabs were obtained with the use of a dry sterile Dacron nasal swab and rotating each nostril for four times and then placed in a sterile tube containing 100µl sterile saline.

Then the swab was inoculated on to 5% Sheep blood agar plates and incubated at 37°C for 24 hours to isolate the organism. If no growth after 24 hours then the plates were incubated until 48 hours. After isolation of organism based on colony morphology, gram staining, coagulase test the organism was identified. Cefoxitin disc was used for screening of MRSA and kit method of latex agglitnation test was performed to determine presence of Mec A gene of MRSA [16,17,18].

After the results were obtained the positive screened patients were instructed to do intranasal application of 2% Mupiriocin calcium ointment twice daily and undiluted Chlorhexidine gluconate bath for 5 days including the day of surgery to decolonize the nasal and extra nasal carriage of the organism. On the day of surgery the patients were given preoperative antibiotics according to their carrier state. Injection Cefuroxime were given to non carriers of S.aureus and Inj.Teicoplanin were given to carriers of S.aureus one hour before the incision.

Patients were followed up postoperatively in the surgical OPD for development of SSI which were defined according to CDC criteria for SSI [19]. Postoperatively the SSI cases were treated according to culture and sensitivity reports obtained.

III. Result:

Out of 456 cases included in the study 122 (26.7%) cases were screened positive for nasal carriage of S.aureus and 334 (73.2%) cases were negative for nasal carriage.

Table 1: Incidence of Nasal carriers of Staphylococcus aureus

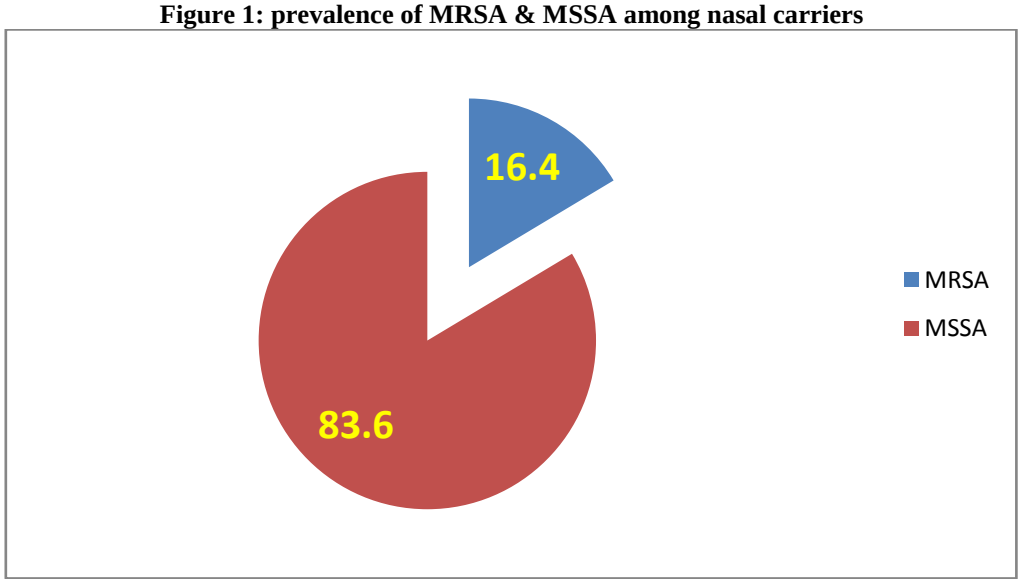
S.no	Patient group	Number	Percentage
1	Screened positive for S.aureus	122	26.7%
2	Screened negative for S.aureus	334	73.2%

Among the 122 positive screened cases 102 (83.6%) were MSSA nasal carriers and 20 (16.4%) were identified as MRSA carriers.

Table 2: prevalence of MRSA & MSSA among nasal carriers

S.no	Patient group	Number	Percentage
1	MSSA	102	83.6%
2	MRSA	20	16.4%

Figure 1: prevalence of MRSA & MSSA among nasal carriers

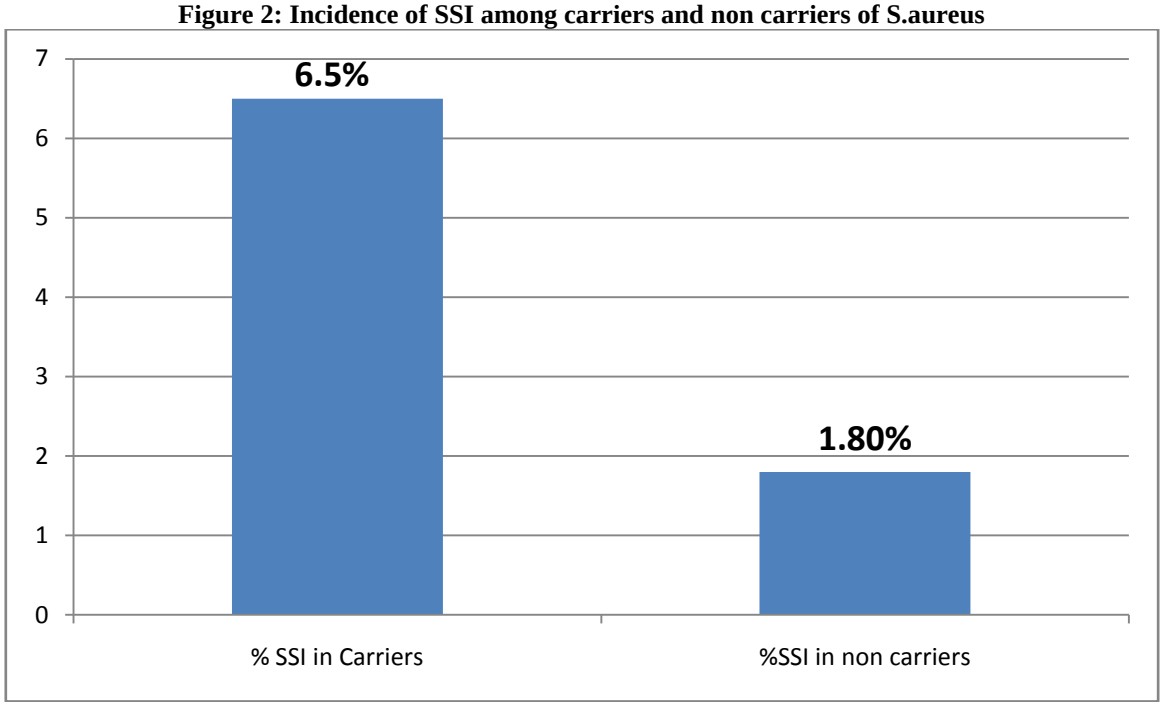


Postoperatively the patients were followed in Surgical OPD and checked for SSI in both carriers and non carriers. Among the 456 cases included in the study 8 out of 122 (6.5%) cases of carriers and 6 out of 334 (1.8%) cases of non carriers developed surgical site infection during the follow up period with S.aureus. Other organisms were also isolated but were not included in the scope of study.

Table 3: Incidence of SSI with S.aureus in nasal carrier screened group

S.no	Patient group	Number of cases with SSI	Percentage
1	Nasal carriers	8/122	6.5%
2	Nasal non carriers	6/334	1.8%

Figure 2: Incidence of SSI among carriers and non carriers of S.aureus



IV. Discussion:

The causes for SSI are multi factorial including patient related factor, surgical factors. One of the most common and important organism causing SSI is S.aureus [20,21]. Among the general population approximately 30% are colonized with S.aureus nasally and extranasally which is a significant factor for developing SSI [22,23,24,25]. Hence it is important to decolonize the carriers preoperatively to reduce the risk of SSI. This can be done effectively by screening all the preoperative patients for nasal carriage of S.aureus and decolonization of these positive screened cases preoperatively with a combination of intranasal application of 2%mupirocin ointment and chlorhxidine bath for 5 days [26,27]. This combination is well established in many trials and well tolerated by the patients.

The objective of this study was to evaluate the significance of preoperative screening for nasal carriage of S.aureus and its postoperative complication of causing SSI among carriers and non carriers with that microorganism.

In our study preoperative screening revealed 26.7% cases with nasal carriage of S.aureus which approximately correlates with previous reported studies [27,28,29,30,31]. This study shows that there is significant risk associated with nasal carriage of S.aureus and development of SSI postoperatively than the non carrier state. The patients screened positive for carrier state were given inj.Teicoplanin intra operatively one hour before incision [32,33].

Our study had certain boundaries; conventional methods were used to determine MRSA instead of molecular method which would have been a more sensitive method, patient compliance of decolonization was not checked which would have caused the SSI even after decolonization. The screening was not repeated after 5 days to check for efficacy of decolonization. Further studies will be done to consider these limitations.

V. Conclusion:

The data obtained in our study indicates that pre operative screening and decolonization of MRSA and MSSA carriers for patients who undergo elective surgery by using Mupirocin, Chlorhexidine and intravenous Teicoplanin will help in reduction of postoperative incidence of SSI.

References:

[1]. Hall M, Lawrence L. Ambulatory surgery in the United States, 1996. Advance data from vital and health statistics. No. 300. Hyattsville, Md.: National Center for Health Statistics, 1998. (DHHS publication no. (PHS) (98-1250.)

[2]. Emori TG, Gaynes RP. An overview of nosocomial infections, including the role of the microbiology laboratory. Clin Microbiol Rev 1993;6:428- 42.

[3]. Boyce JM, Potter-Bynoe G, Dziobek L. Hospital reimbursement patterns among patients with surgical wound infections following open heart surgery. Infect Control Hosp Epidemiol 1990;11:89-93.

[4]. van Rijen M, Bonten M, Wenzel R, Kluytmans J (2008) Mupirocin ointment for preventing Staphylococcus aureus infections in nasal carriers. Cochrane database of systematic reviews: CD006216.

[5]. Kluytmans JA, Mouton JW, Ijzerman EP, Vandenbroucke-Grauls CM, Maat AW, et al. (1995) Nasal carriage of Staphylococcus aureus as a major risk factor for wound infections after cardiac surgery. The Journal of infectious diseases 171: 216–219.

[6]. Luzar MA, Coles GA, Faller B, Slingeneyer A, Dah GD, et al. (1990) Staphylococcus aureus nasal carriage and infection in patients on continuous ambulatory peritoneal dialysis. The New England journal of medicine 322: 505–509.

[7]. Nouwen J, Schouten J, Schneebergen P, Snijders S, Maaskant J, et al. (2006) Staphylococcus aureus carriage patterns and the risk of infections associated with continuous peritoneal dialysis. Journal of clinical microbiology 44: 2233–2236.

[8]. Perl TM, Golub JE. New approaches to reduce *Staphylococcus aureus* nosocomial infection rates: treating *S. aureus* nasal carriage. Ann Pharmacother 1998;32:S7-S16.

[9]. Kluytmans J, van Belkum A, Verbrugh H. Nasal carriage of *Staphylococcus aureus:* epidemiology, underlying mechanisms, and associated risks. Clin Microbiol Rev 1997;10:505-20.

[10]. Wenzel RP, Perl TM. The significance of nasal carriage of *Staphylococcus aureus* and the incidence of postoperative wound infection. J Hosp Infect 1995;31:13-24.

[11]. Bode LG, Kluytmans JA, Wertheim HF, Bogaers D, Vandenbroucke-Grauls CM, et al. (2010) Preventing surgical-site infections in nasal carriers of Staphylococcus aureus. The New England journal of medicine 362: 9–17.

[12]. Kaiser AB, Kernodle DS, Barg NL, Petracek MR. Influence of preoperative showers on staphylococcal skin colonization: a comparative trial of antiseptic skin cleansers. Ann Thorac Surg 1988;45:35-8.

[13]. Wassenberg MW, de Wit GA, Bonten MJ (2011) Cost-effectiveness of preoperative screening and eradication of Staphylococcus aureus carriage. PloSone 6: e14815.

[14]. Perl TM, Cullen JJ, Wenzel RP, et al. Intranasal mupirocin to prevent postop-erative *Staphylococcus aureus* infections. N Engl J Med 2002;346:1871-7.

[15]. 14.Kalmeijer MD, Coertjens H, van Nieuwland- Bollen PM, et al. Surgical site infections in orthopedic surgery: the effect of mupirocin nasal ointment in a doubleblind, randomized, placebo-controlled study. Clin Infect Dis 2002;35:353-8.

[16]. Spencer DH, Sellenriek P, Burnham CA (2011) Validation and implementation of the GeneXpert MRSA/SA blood culture assay in a pediatric setting. American journal of clinical pathology 136: 690–694.

[17]. Laurent C, Bogaerts P, Schoevaerdts D, Denis O, Deplano A, et al. (2010) Evaluation of the Xpert MRSA assay for rapid detection of methicillin-resistant Staphylococcus aureus from nares swabs of geriatric hospitalized patients and failure to detect a specific SCCmec type IV variant. European journal of clinical microbiology & infectious diseases : official publication of the European Society of Clinical Microbiology 29: 995–1002. 18. Parta M, Goebel M, Matloobi M, Stager C, Musher DM (2009) Identification of methicillin-resistant or methicillin-susceptible Staphylococcus aureus in blood cultures and wound swabs by GeneXpert. Journal of clinical microbiology 47: 1609–1610.

[18]. Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG (1992) CDC definitions of nosocomial surgical site infections, 1992: a modification of CDC definitions of surgical wound infections. Infection control and hospital epidemiology : the official journal of the Society of Hospital Epidemiologists of America 13: 606–608.

[19]. Peel TN, Buising KL, Choong PF. Diagnosis and management of prosthetic joint infection. *Curr Opin Infect Dis* 2012; 25(6): 670-676.

[20]. Fry DE. The continued challenge of *Staphylococcus aureus* in the surgical patient. *Am Surg* 2013; 79(1): 1-10.

[21]. Perl TM, Golub JE. New approaches to reduce *Staphylococcus aureus* nosocomial infection rates: treating *S. aureus* nasal carriage. *Ann Pharmacother* 1998; 32: S7–16.

[22]. Kluytmans J, van Belkum A, Verbrugh H. Nasal carriage of *Staphylococcus aureus*: epidemiology, underlying mechanisms, and associated risks. *Clin Microbiol Rev* 1997; 10: 505–520.

[23]. Wenzel RP, Perl TM. The significance of nasal carriage of *Staphylococcus aureus* and the incidence of postoperative wound infection. *J Hosp Infect* 1995; 31: 13–24

[24]. Kalmeijer MD, van Nieuwland-Bollen E, Bogaers-Hofman D, de Baere GA. Nasal carriage of *Staphylococcus aureus* is a major risk factor for surgical-site infections in orthopedic surgery. *Infect Control Hosp Epidemiol* 2000; 21: 319–323.

[25]. Kallen AJ, Wilson CT, Larson RJ. Perioperative intranasal mupirocin for the prevention of surgical-site infections: systematic review of the literature and meta-analysis. *Infect Control Hosp Epidemiol* 2005; 26: 916–922.

[26]. Kluytmans JA, Wertheim HF. Nasal carriage of *Staphylococcus aureus* and prevention of nosocomial infections. *Infection* 2005; 33: 3–8.

[27]. Kim DH, Spencer M, Davidson SM, *et al.* Institutional prescreening for detection and eradication of methicillin-resistant *Staphylococcus aureus* in patients undergoing elective orthopaedic surgery. *J Bone Joint Surg Am* 2010; 92: 1820–1826.

[28]. Rao N, Cannella B, Crossett LS, Yates AJ Jr, McGough R 3rd. A preoperative decolonization protocol for *Staphylococcus aureus* prevents orthopaedic infections. *Clin Orthop Relat Res* 2008; 466(6): 1343-1348.

[29]. Rao N, Cannella BA, Crossett LS, Yates AJ Jr, McGough RL 3rd, Hamilton CW. Preoperative screening/decolonization for *Staphylococcus aureus* to prevent orthopedic surgical site infection: prospective cohort study with 2-year follow-up. *J Arthroplasty* 2011; 26(8): 1501-1507.

[30]. Perl TM. Prevention of *Staphylococcus aureus* infections among surgical patients: beyond traditional perioperative prophylaxis. *Surgery* 2003; 134(5 Suppl): S10-S17.

[31]. Crawford T, Rodvold KA, Solomkin JS. Vancomycin for surgical prophylaxis? *Clin Infect Dis* 2012; 54: 1474-1479.

[32]. Kanj WW, Flynn JM, Spiegel DA, Dormans JP, Baldwin KD. Vancomycin prophylaxis of surgical site infection in clean orthopedic surgery. *Orthopedics* 2013; 36(2): 138-146.

Parthasarathy K " Evaluation Of Screening And Treatment For Nasal Carriage Of Staphylococcus Aureus Before Surgery To Prevent Postoperative Surgical Site Infection."IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 7, 2018, pp 30-33.