Study of Microorganism Growth Pattern in Nasal Pack of Patients Visiting the Department of ENT, Head and Neck Surgery

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ABSTRACT

Background

Nasal packs are utilized nearly by otorhinolaryngologists for controlling epistaxis and post nasal procedures. Complications have been reported due to them; therefore the use of antibiotics is a common practice among otorhinolaryngologists.

Objective

To detect microbiological flora associated with nasal packing and find evidence to support the benefit of systemic antibiotics with it.

Method

A prospective, analytical study was conducted on 51 patients presenting to the Department of ENT, KUSMS from June to September 2015 who required nasal packing. Approval of the local Institutional review committee (IRC) was taken. The mid part of the pack was collected in a sterile bottle under aseptic technique and sent to microbiology department. Specimen collection, culture, identification tests were done according to the guidelines by American Society for Microbiology. Data were collected using the individual patient records and Microsoft Office Excel 2007. Statistical analysis was performed with SPSS 16.0.

Result

Among the 51 cultures; 33 (64.7%) were positive. In 18 (35.3%) cultures no organism was grown. Statistical analysis did not show significance between duration of pack kept with microbial growth (p=0.051) or the type of pack kept (p=0.212) .It showed significance with foul smell of the pack to the growth (p=<0.001).

Conclusion

Microbiological flora was associated with nasal pack. Antibiotic soaked nasal packs have lesser incidence of positive bacterial growth when compared with plain nasal packs. Nasal packs kept for less than 48 hours have lesser incidence of positive bacterial growth when compared with nasal packs kept for more than 48 hours. Therefore, administering systemic antibiotics in cases when we plan to keep the pack for longer duration is recommended.

KEY WORDS

Epistaxis, microbiology, nasal pack

INTRODUCTION

Nasal packing is the commonest mode of treating epistaxis, when initial treatment by pressure and cautery fails to stop the nasal bleeding.[1] Nasal packs are utilized nearly by all otorhinologists post septoplasty or septorhinoplasty procedures. Nasal packs prevent postoperative septal hematoma as well as provides nasal support.[2]

Serious complications such as toxic shock syndrome, staphylococcal endocarditis, meningitis and pseudomonas infections and cavernous sinus thrombosis have been reported due to nasal packs therefore the use of antibiotics is a common practice among otorhinolaryngogists for surgical procedures.[3-7] Local topical formulations of antibiotics have also been described after nasal procedures.[7,8]

A loose cotton or tape gauge soaked in paraffin, xylocaine or antibiotic ointment is the common things used for anterior nasal packing. Now a days sterile nasal tampon or bioresorbable and biofragmentable gelatin sponges are also used with the aim to give pressure and achieve hemostasis. Other methods to control bleeding are post nasal packing using tied ball gauge or Foley's catheter. Above all methods, commonest and easiest means remains the anterior nasal packing.[9]

The objective of the present study is to characterize the different microbiological flora associated with nasal packing and to find out if there is evidence to support any benefit of the use of systemic antibiotics with anterior nasal packing.

METHODS

A prospective, analytical study was conducted on 51 patients presenting to the Department of ENT, Dhulikhel Teaching Hospital, Kathmandu University School of Medical Sciences from June to September 2015.

After approval of the local institutional review committee (IRC), cases were evaluated by brief history taking and thorough clinical examination after informed consent. Patients with spontaneous epistaxis requiring anterior nasal packing were included in the study. Patients who were operated with the indications of septoplasty/ septorhinoplasty/nasal bone reduction or Functional Endoscopic Sinus Surgery (FESS) who requires nasal packing post surgery were included. Anterior nasal packs were either plain or antibiotic impregnated. Plain packs were prepared with tape gauge soaked in xylocaine or liquid paraffin with or without adrenaline. Antibiotic soaked packs were made with tapegauge soaked in xylocaine jelly with Framycitin or Neosporin ointment. Patients with epistaxis were packed only when primary measures fails like – cotton pack with xylometazoline with pinching of nose or chemical cautery is not possible due to bleeding and site is not seen. For short term packing to be kept for less than 24 hours; loose cotton packing with lignocaine with or without adrenaline was used. Whenever it was anticipated that pack had to remain for more than 24 hours then packing is done with antibiotic soaked tapegauge anterior nasal pack. In all post-operative cases; nasal packing was done with tapegauge soaked in antibiotic ointment. Also when bleeding could not be controlled by loose cotton anterior nasal pack, tapegauge packs were used. Packs were removed after 24-72 hours, depending upon the etiology and type of pack used. Before removing the nasal pack, external nose was cleaned with antiseptic solution to avoid any contamination. On removal of pack, condition of pack and any foul smelling discharge seen was noted. The mid part of the pack was then collected in a sterile bottle under aseptic technique.

This pack was then sent to the microbiologist at the earliest. Culture was done over Blood agar, Mac Conkey agar and Chocolate agar. The colonies were then processed for microbiological study of identification and antibiotic sensitivity using appropriate antibiotic disc. Specimen collection, culture, identification tests were done according to the guidelines given by American Society for Microbiology. The antibiotic sensitivity test of the pathogens isolated from the clinical specimen against different antibiotics was done using Mueller Hinton Agar (MHA) (Oxoid, United Kingdom) by the standard disk diffusion technique of Modified Kirby-Bauer method as recommended by Clinical and Laboratory Standards Institute (CLSI).[10,11]

Our hospital guidelines were adhered to and antibiotics (*Ampicillin*) were prescribed only when the anterior packs were in situ for more than 24 hours. All patients underwent a thorough clinical examination including rigid nasal endoscopy to detect signs of infection. The patients were informed to contact us immediately if they encountered any unusual changes after discharge from the hospital, e.g. fever, nasal discharge, facial pain or headache, which could be suggestive of an infection. We reviewed this group of 51 patients in our department a week after discharge from hospital.

Excluded cases were nasal packing in epistaxis due to nasal tumors or bleeding diathesis and undergoing nasal surgeries for nasal tumors, malignancies; unable to follow up for a week and who refused admission.

The data were tabulated and analyzed using SPSS version 16.0 and Statistical tests like Pearson's chi square test were performed. Significance of tests were set at $p < 0.05$.

RESULTS

Among the total 51 patients, minimum age was 12 years and maximum was 75 years with an age range of 63 years. The mean age ± SD was 41.9 ± 15.86. There were 23 females (45.1%) and 28 (54.9%) males. Among the patients with nasal packs; 32(62.7%) cases were of epistaxis and the remaining 19 (37.3%) cases were post operative cases. Nasal packing for post operative cases were done in one case of septal hematoma, seven cases post septoplasty,

two cases of nasal bone fracture reduction and nine cases post Functional Endoscopic Sinus surgery. Almost all cases (98%) were packed by anterior nasal packing and in only one case (2%) anterior plus posterior nasal packing had to be done to control epistaxis.

The duration of the pack kept inside the nasal cavity was less than 48 hours in 20(39.2%) cases and >48 hours in 31(60.8%) cases. 23(45.1%) of the pack was plain tape gauze with xylocaine or liquid paraffin with or without adrenaline packing; whereas 28(60.8%) of the packs were antibiotic *Framycitin* or *Neomycin* soaked. After removing the pack, foul smell was present in 24(47.1%) cases and absent in 27(52.9%) cases.

On bacteriological culture, out of 51 cultures done 33(64.7%) were positive. In 18(35.3%) cultures no organism was grown. Among them six cases (11.8%) grew *Staphylococcus aureus.* In 12 cases (23.5%) *Coagulase Negative Staphylococcus epidermidis* was found. *Pseudomonas aeruginosa* was seen in 8(15.7%) cases and *Escherichia coli* was seen in 4(7.8%) cases. *Enterococcus, Methicillin resistant Staphylococcus aureus (MRSA)* and *Methicillin resistant coagulase negative Staphylococcus* were seen in one case (2%) each. (Table 1)

Table 1. Result of culture

Culture Report	No./Total No. (Percentage)
Staphylococcus aureus	6/51 (11.8%)
Coagulase Negative Staph epidermidis	12/51 (23.5%)
Pseudomonas	8/51 (15.7%)
Escherichia coli	4/51 (7.8%)
Enterobacter	1/51 (2%)
Methicillin Resistant Staphylococcus aureus	1/51 (2%)
Methicillin Resistant coagulase negative Staphylococci	1/51 (2%)
No Growth	18/51 (35.3%)

On antibiogram, *Staphylococcus* aureus was highly susceptible to *Ciprofloxacin* four (66.6%), *Cefotaxime* six (50), *Amikacin* seven (66.6%) and *Norfloxacin* two (33.3%), *Erythromycin* two (33.3%), and moderately sensitive to *Gentamycin* four (66.6%), Cephalexin three (50%). *Coagulase Negative Staphylococcus* was highly sensitive (100%) to *Cefazoline, Chloramphenicol, Ciprofloxacin, Cloxacillin, Gentamycin, Vancomycin* and were resistant to *Erythromycin* and *Penicillin*. *Pseudomonas aeruginosa* was highly resistant to *Amoxycillin, Tetracycline, Ceftriaxone, Cefixime, Gentamycin, Norfloxacin, Ciprofloxacin. Amoxycillin,* Tetracycline in all cases (100%) but sensitive to Colistin in 100%, Imepenam in four cases (50%). *Escherechia coli* was highly sensitive to *Ceftriaxone* (100%), *Cefuroxime* (100%), *Ciprofloxacin* (100%), *Gentamycin* (50%), and *Norfloxacin* (50%) cases, partially sensitive to Tetracycline (50%) and resistant to *Amoxycillin* (100%), *Ampicillin* (100%) and *Cefalexin* (50%). Enterobactor was highly sensitive to *Cefazolin, Norfloxacin, Cefuroxime, Ciprofloxacin, Gentamycin, Tetracycline*; partially sensitive to *Ampicillin* and resistant to *Amoxicillin. MRSA* was highly sensitive to *Ciprofloxacin, Cefazolin, Chloramphenicol, Gentamycin, and Vancomycin*; partially sensitive to *Erythromycin* and resistant to *Cloxacillin* and *Penicillin. Methicillin* Resistant *Coagulase Negative Staphylococcus* was highly sensitive to *Chloramphenicol* and *Vancomycin,* partially sensitive to *Erythromycin* and resistant to *Gentamycin, Ampicillin, Cloxacillin, Cefazolin, Ciprofloxacin,* and *Penicillin G.*

Table 2 shows the correlations between foul smell and other variables such as growth of organism, duration of pack and type of packing used. Pearsons Chi- square test proves significant result when analyzing the foul smell with growth of organism which was p value of 0.0002. Statistically significant result was not seen with type of the pack used (p=0.095) and with duration of the pack kept (p= 0.250).

Table 2. Analysis of foul smell

	Foul smell		P-value
	Present	Absent	
Culture Report			
Positive growth	22 (66.7%)	11 (33.3%)	0.0002*
Negative growth	2 (11.1%)	16 (88.9%)	
Type of Gauze			
Plain gauze	14 (60.9%)	9 (39.1%)	0.0950
Antibiotic soaked gauze	10 (35.7%)	18 (64.3%)	
Duration of Pack			
<48 hrs	7 (35%)	13 (65%)	0.25
>48 hrs	17 (54.8%)	14 (45.2%)	

*Suggests significant test result (significance of p value is set to <0.05)

Table 3 shows the correlations between growth of organism to variables like type of pack used and duration of pack kept. Pearsons Chi-square test done to analyze growth with duration of pack kept showed p=0.13; and to type of packing kept showed p=0.25.

Table 2. Analysis of bacterial growth

	Bacterial growth		p value
	Positive	Negative	
Type of Gauze Packing			
Plain gauze	17 (73.9%)	6 (26.1%)	0.25
Antibiotic soaked gauze	16 (57.1%)	12 (42.9%)	
Duration of Pack			
< 48 hrs	10 (50%)	10 (50%)	0.13
> 48 hrs	23 (74.2%)	8 (25.8%)	

DISCUSSION

Anterior nasal packing , though simplest and commonest method of combating epistaxis is linked with a number of problems ranging from discomfort, local infection,

bacteremia, septic shock, airway obstruction to life threatening complications such as-toxic shock syndrome, staphylococcal endocarditis, meningitis, pseudomonas infections and cavernous sinus thrombosis.[3-9]

The raw area or dehiscence in mucosa causes toxins and bacteria to get absorbed into the circulation resulting in fatal bacteremia or septicemia. Nasal passage is a bacterial reservoir for Staphylococcus aureus. Slavin AS et al. identified the organism in 23% of healthy adult nose. Study by Kaygusuz I et al. shows 35.5% harboured *Staphylococcus aureus*, 10% had *Streptococcus spp* and his smear cultures obtained from nasal pack demonstrated 39.3% of *Staphylococcus aureus* and 2.7% had Streptococci. He also reported bacteremia in 16.9% of his nasal packs.[2,12] According to Slavin et al. and Kaygusuz et al. if we accept the fact that the nasal passage is a reservoir for bacteria; we cannot deny the intensity of this microbiological transfer.[2,12] If the bacteria can reach the circulation via mucosal capillaries during procedures like upper and lower gastrointestinal system endoscopies, nasotracheal intubations, tonsillectomies, dental and urological procedures, it may also pass through the nasal trauma or incisions into the blood stream.[2,12]

In the present study, 11.8% cases with bacteriemia grew Staphylococcus which is less comparable to study by Abhay Gupta where 70% of cultures grew *Staphylococcus aureus*.[9] This is well above the carrier rate of *Staphylococcus aureus* (30-50%) and carries higher potential for causing Toxic shock syndrome (TSS).[9] TSS is caused by toxin produced by *Staphylococcus aureus* which is a normal commensal in nasal cavities. This organism in presence of pack and blood may proliferate and produce more toxins. The study also indicates that in the presence of favorable environment, patients with *Staphylococcus aureus* had high risk of development of toxic shock syndrome. Hull HF et al. reports Toxic shock syndrome (TSS) related to nasal packing.[6] Similarly one case of TSS has been reported by Aeumjaturapat S et al. after antero –posterior packing for epistaxis.[13]

Topic use of antibiotics result in changes to the normal nasal flora, which is considered by many authors as a protective factor, favoring growth of grampositive germs.[7] The use of a topical antistaphylococcal antibiotic ointment on the packing materials has been recommended by Kucik and Clenney.[14] In our series, 23.5% of the packs grew Gram negative bacilli. Alteration of such naso- bacterial flora by antibiotics is well established. Johnson et al. in 1972 had cultured Gram negative bacilli in 45% of his hospitalized patients receiving antibiotics.[15] Although *Staphylococcus aureus* colonizes the nasal mucosa; the risk of bacteremia is reported to be low after septoplasty operations.[16] However, nasal septal surgery is categorized as a clean contaminated operation and is accepted to carry an infection risk of 8% Cruse et al.[17]

The first study about the prophylactic use of antibiotics in surgical procedures was conducted in 1938.[18] Since then several management regimes have been proposed. The main reason for many otolaryngologists to administer antibiotics is the fear of infection, medico legal issues and incidental reports of these serious complications but practice is variable.[7] TC Biggs et al. from University Hospital Southampton NHS Foundation Trust (UHSFT- ENT) suggests that antibiotics use should be used sparingly for patients with nasal packs. He suggests using systemic antibiotics in epistaxis patients with post nasal packing.[19] Microbiological study was conducted in University of Pittsburgh School of Medicine (1989) where twenty patients were randomized and placebo controlled study was done in posterior nasal packing. Antibiotic impregnated gauze packing were employed in all patients. No infective complications were noted in either group.[20]

Another randomized trial demonstrated a significant less growth of microbes including Staphylococcus aureus with the use of packing containing antibiotics.[8] Unfortunately, no randomized controlled trials evaluating the effect of antibiotics containing packing on outcomes following epistaxis packs could be identified.

The limitation of our study is the sample size. The small numbers are due to limiting inclusion of patients to only those with full data sets. Nevertheless, the study does provide some supporting evidence stating that microorganisms will tend to grow with nasal packs and so they should be hospitalized, looked for complications and antibiotics be prescribed if suspected of infection.

CONCLUSION

Microbiological flora was associated with nasal pack. Antibiotic soaked nasal packs have lesser incidence of positive bacterial growth when compared with plain nasal packs. Nasal packs kept for less than 48 hours have lesser incidence of positive bacterial growth when compared with nasal packs kept for more than 48 hours. Therefore, administering systemic antibiotics in cases when we plan to keep the pack for longer duration is recommended.

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