

Changes in nasal flora after using povidone-iodine in nasal septoplasty surgery

Nazal septoplasti cerrahisinde povidon iyot kullanımından sonra nazal floradaki değişiklikler

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ABSTRACT

Objectives: This study aims to investigate the effect of povidone-iodine antiseptics on nasal flora prior to septoplasty surgery.

Patients and Methods: The study included a total of 44 patients (23 males, 21 females; mean age 36 years; range 18 to 71 years) with a diagnosis of nasal septal deviation who had undergone surgery. Preoperative nasal swab materials were taken by sterile cotton swabs from the region of the nasal cavity and skin of the nasal tip. Cultures from the same areas were taken 10 minutes after the application of 10% povidone-iodine.

Results: Five methicillin-sensitive *Staphylococcus aureus* (*S. aureus*), four *Staphylococcus epidermidis* (*S. epidermidis*), two methicillin-resistant *S. aureus*, and one diphtheroid species were revealed in nasal mucosa cultures before/after application of povidone-iodine. Six *S. epidermidis*, five methicillin-sensitive *S. aureus*, and one methicillin-resistant *S. aureus* were revealed in nasal tip skin before/after application of povidone-iodine.

Conclusion: In our study, we demonstrated that microbiological changes were harmonious, as noted in the literature. Application of antiseptic povidone-iodine did not decrease the microbiological population. Two patients (4%) had chemical conjunctivitis after surgery. Due to potential allergic and chemical side effects, we suggest to discuss the use of antiseptic solutions prior to closed technique septoplasty.

Keywords: Antiseptics; culture; nasal surgical procedures.

ÖZ

Amaç: Bu çalışmada septoplasti cerrahisinden önce povidon iyot antiseptisinin nazal flora üzerindeki etkisi araştırıldı.

Hastalar ve Yöntemler: Çalışmaya nazal septum deviasyonu tanısı olup cerrahi geçiren toplam 44 hasta (23 erkek, 21 kadın; ort. yaş 36 yıl; dağılım 18-71 yıl) dahil edildi. Ameliyat öncesi nazal sürüntü malzemeleri nazal kavite bölgesinden ve nazal uç derisinden steril pamuk uçlu çubuklarla alındı. Aynı alanlardan kültürler %10 povidon iyot uygulamasından 10 dakika sonra alındı.

Bulgular: Povidon iyot uygulamasından önce/sonra nazal mukoza kültürlerinde beş metisiline hassas *Staphylococcus aureus* (*S. aureus*), dört *Staphylococcus epidermidis* (*S. epidermidis*), iki metisiline dirençli *S. aureus* ve bir dipteroid türü gösterildi. Povidon iyot uygulamasından önce/sonra nazal uç derisinde altı *S. epidermidis*, beş metisiline hassas *S. aureus* ve bir metisiline dirençli *S. aureus* gösterildi.

Sonuç: Çalışmamızda mikrobiyolojik değişikliklerin literatürle uyumlu olduğu gösterildi. Antiseptik povidon iyot uygulaması mikrobiyolojik popülasyonu azaltmadı. İki hastada (%4) cerrahiden sonra kimyasal konjunktivit vardı. Olası alerjik ve kimyasal yan etkiler nedeniyle kapalı teknik septoplasti öncesi antiseptik solüsyon kullanımının tartışılması gerektiğini öneriyoruz.

Anahtar sözcükler: Antiseptikler; kültür; nazal cerrahi işlemler.

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Septoplasty is one of the most common surgeries in ear, nose and throat clinics. Following septoplasty, local and systemic infections may develop.^[1] Bacteremia may occur during surgeries with normal flora like nasal mucosa and nasal skin. This may not necessarily lead to a bacteremia infection in healthy individuals; however, sometimes, particularly in immunocompromised individuals, systemic complications such as endocarditis and toxic shock syndrome may develop.^[2,3]

In order to prevent possible infection after septoplasty surgery, different applications are performed in clinics. Using chemical antisepsis in preoperative surgical site is one method that is commonly used. Povidone-iodine is one of the chemicals used for the antisepsis issue. For this purpose, the nose region and surrounding area are cleaned using the chemical agent. At times, reactions in surrounding tissue such as the eyes may occur, as well as allergic reactions in the application area.

Local povidone-iodine is an agent with antiseptic properties.^[4] The effect of this agent on methicillin resistant *Staphylococcus aureus* (*S. aureus*) and other microorganisms has been well-documented.^[4] In this study, we aimed to investigate the effect of povidone-iodine antisepsis on nasal flora prior to septoplasty surgery.

PATIENTS AND METHODS

This study was planned prospectively and carried out at Yozgat Bozok University and Sakarya Akyazi State Hospital in the Microbiology/Otolaryngology Departments between October 2013 and October 2016. A total of 44 patients (23 males, 21 females; mean age 36 years; range 18 to 71 years) who had undergone surgery with a diagnosis of nasal septal deviation were included. All patients were operated on under general anesthesia and using closed technique septoplasty via hemitransfixion incision of the nasal vestibule mucosa.

Preoperative nasal swab materials were taken in the regions of the nasal cavity and from the skin of the nasal tip using sterile cotton swabs. Following application of

10% povidone-iodine to the nasal dorsum, vestibule mucosa and surgical area, a second round of cultures were taken from the same areas after 10 minutes. Both rounds of samples were examined in the clinical microbiology laboratory. Nasal cultures were planted into blood flattening plate^[12] and eosin methylene blue. Incubation was performed in an aerobic environment at 37 degrees for 24 to 48 hours. Once a diagnosis was established with reproducible results, identification and antibiograms were performed using the VITEK 2 compact device (bioMérieux, Marcy l'Etoile, France). Preoperative antibiotics were not given to patients. Patients were given antibiotics for five days following surgery (amoxicillin, clavulanic acid 1000 mg 2x1). Patients were monitored for complications and infection.

Exclusion criteria: Patients were questioned about general systemic diseases (diabetes mellitus, immune compromising diseases), and the use of antibiotics and chemotherapeutic drugs. Patients with additional systemic disease, those who had used antibiotics 15 days prior to surgery, and chronic sinusitis and allergic rhinitis patients with nasal pathology were excluded. The study protocol was approved by the Yozgat Bozok University Hospital Ethics Committee. A written informed consent was obtained from each patient. The study was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

Alpha-hemolytic streptococcus, non-hemolytic streptococcus, coagulase-negative staphylococcus and Neisseria species and Haemophilus species were produced more than any other dominant elements of flora in cultures from the nasal mucosa in all patients.

Reproduction of the pathogenic microorganisms did not occur before or after surgery in the nasal mucosa in 32 patients. Methicillin-sensitive *S. aureus* was revealed with polymicrobial flora in the nasal mucosa of five patients prior to application of povidone-iodine. *Staphylococcus epidermidis* (*S. epidermidis*), methicillin-resistant *S. aureus*, and diphtheroid species were revealed in the nasal mucosa of four and two patients,

Table 1
Number of microorganisms before and after application of povidone-iodine

	Pre-povidone-iodine application		Post-povidone-iodine application	
	Growth +	Growth -	Growth +	Growth -
Nasal skin from tip of nose	12	32	12	32
Nasal mucosa inside columella	11	33	11	33

Table 2					
Swab culture results					
	Pre-povidone-iodine application		n	%	Microorganism
	Growth +				
Nasal skin from tip of nose	12		6	13	<i>Staphylococcus epidermidis</i>
			5	11	Meticillin sensitive <i>Staphylococcus aureus</i>
			1	2	Meticillin resistant <i>Staphylococcus aureus</i>
Nasal mucosa from vestibule of nose	12		5	11	Meticillin sensitive <i>Staphylococcus aureus</i>
			4	9	<i>Staphylococcus epidermidis</i>
			2	4	Meticillin resistant <i>Staphylococcus aureus</i>
			1	2	<i>Diphtheroid suppurativa</i>

and one patient, respectively, prior to application of povidone-iodine. A total of 12 microorganisms were revealed prior to application of povidone-iodine (Table 1). All microorganisms persisted after application of povidone-iodine to the nasal mucosa and nasal skin.

Staphylococcus epidermidis, methicillin-sensitive *S. aureus*, and methicillin-resistant *S. aureus* were revealed in six and five patients, and one patient, respectively, on nasal tip skin prior to application of povidone-iodine. All microorganisms were revealed after application of povidone-iodine to the nasal mucosa and nasal skin (Table 2).

No local or systemic infection was observed during the postoperative period. Two patients had advanced hyperemia of the conjunctiva. Patients were consulted to the ophthalmology department, diagnosed with chemical conjunctivitis, and treated with saline lavage therapy for two days, which resulted in recovery.

DISCUSSION

The entrance of the nose and nasal cavity suffers from bacterial colonization from the moment we are born. In a study, nasal cultures from the skin of a newborn found 39% normal flora, 22% sterile cultures, 23% Gram-positive pathogenic cocci, and 16% Gram-negative enteric cocci. Cultures taken from nasal mucosa were derived as 39% *S. epidermidis*, 11% *S. aureus*, and 8% *Escherichia coli*.^[5]

Septoplasty surgery is characterized as a clean-contaminated surgery.^[6] Two most common complications following surgery are bleeding and infection. Infection following surgery may be local or systemic, e.g., meningitis or osteomyelitis.^[7] There are numerous methods for avoiding postoperative infections in the pre- and postoperative period. Cleaning the

surgical area is one such preoperative prevention method. Numerous chemicals can be used for this purpose.

Studies regarding bacterial colonization in the nasal cavity state that 40% of healthy individuals' nasal vestibule is colonized by *S. aureus*. *S. epidermidis* may also be observed in healthy adults' nasal skin and vestibules.^[8] In healthy children, *Streptococcus pneumoniae*, *Streptococcus pyogenes*, *Haemophilus influenzae*, and *Moraxella catarrhalis* are more commonly observed than in adults.^[9]

Research exists regarding colonization of the ostiomeatal complex and middle meatus. In one study, 50% coagulase negative staphylococcus, 12% *S. aureus*, and 12% *Corynebacterium* were isolated from endoscopically-taken ostiomeatal complex cultures.^[10] Chronic infections such as chronic sinusitis can completely change the microbiology of the paranasal sinus region. Maxillary sinus microbiology has shown that the sinus is not sterile.^[11] Chronic infections can also lead to microbiological changes in the sinuses.^[12] Adults with chronic sinusitis were excluded from our study.

Almost every stage of surgery is important, due to the different colonizing microorganisms in the nasal cavity following nasal surgery. Colonization of microorganisms both in the nasal cavity and nasal tampons, which are used following surgery, may increase infection risks.

Chronic mucosal inflammation, allergic rhinitis, and long-term factors such as the use of a decongestant increase staphylococci colonization in the nose.^[8] Some studies have shown the temporary development of bacteremia during septoplasty.^[13,14] Nasal staphylococcus is located in normal flora. Traumatization of nasal mucosa via surgical processes may be a factor in facilitating the development of transient bacteremia, which may lead to systemic infections such as pericarditis and

endocarditis.^[1] According to the literature, colonization of staphylococcus on nasal skin and nasal mucosa ranges from 15-25% and 25-35%, respectively.^[15] Our study results were compatible with the literature in this context. Our rates for colonization on nasal skin and nasal vestibule mucosa were 27% and 25%, respectively.

Researches have examined the impact of septoplasty surgery on nasal flora^[16,17] and shown that changes in nasal flora do not create statistically significant differences.

Preoperative, postasepsis, and antisepsis practices vary between clinics. Pre- and postoperative use of antibiotics are disputed in the literature.^[18,19] The type of surgery and tampons used may change the application of antibiotics postoperatively. Studies have shown that the preoperative use of antibiotics may increase staphylococcal colonization in the nasal mucosa.^[20] Bacteremia may also arise during surgery.^[21]

The purpose of using preoperative povidone-iodine is to reduce the population of microorganisms; however, recolonization may occur during surgery following application of the antiseptic agent.

A limitation of our study was that we evaluated only bacteria as an agent that may cause infections, while viral agents may also colonize and lead to infection postoperatively. Therefore, further studies are required to reveal any additional viral pathogens. Moreover, biopsy of nasal skin and mucosa may provide further information about all microorganisms in the region; however, this is not possible for ethical reasons. Another weakness of the study was the number of included patients, which may have been too many for the purpose of this research. Finally, the study may also be conducted using other local antiseptic solutions.

In conclusion, our study on the effect of povidone-iodine antisepsis on nasal flora prior to septoplasty surgery demonstrated microbiological changes consistent with the literature. The application of antiseptic povidone-iodine did not decrease the microbiological population in our study. Furthermore, some patients had chemical conjunctivitis following surgery. Due to the potential for allergic and chemical side effects, we discussed the use of antiseptic solutions prior to the advent of closed technique septoplasty surgery. Further studies using a wide range of local antiseptics are necessary to confirm and expand on these findings among a larger cohort of patients.

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REFERENCES

1. Ketcham AS, Han JK. Complications and management of septoplasty. *Otolaryngol Clin North Am* 2010;43:897-904.
2. de Vries N, van der Baan S. Toxic shock syndrome after nasal surgery: is prevention possible? A case report and review of the literature. *Rhinology* 1989;27:125-8.
3. Leonard DW, Thompson DH. Unusual septoplasty complication: *Streptococcus viridans* endocarditis. *Ear Nose Throat J* 1998;77:827-30.
4. Durani P, Leaper D. Povidone-iodine: use in hand disinfection, skin preparation and antiseptic irrigation. *Int Wound J* 2008;5:376-87.
5. Ostfeld E, Segal J, Segal A, Bogokovski B. Bacterial colonization of the nose and external ear canal in newborn infants. *Isr J Med Sci* 1983;19:1046-9.
6. Rechtweg JS, Paolini RV, Belmont MJ, Wax MK. Postoperative antibiotic use of septoplasty: a survey of practice habits of the membership of the American Rhinologic Society. *Am J Rhinol* 2001;15:315-20.
7. Rettinger G, Kirsche H. Complications in septoplasty. *Facial Plast Surg* 2006;22:289-97.
8. Dyas AC, Eden PJ, Eastwood D, Bentley S, Burdon DW, Alexander-Williams J, et al. Sources of staphylococcal wound sepsis in surgical patients. *J Hosp Infect* 1982;3:345-50.
9. Klossek JM, Dubreuil L, Richet H, Richet B, Sedallian A, Beutter P. Bacteriology of the adult middle meatus. *J Laryngol Otol* 1996;110:847-9.
10. Aral M, Keles E, Kaygusuz I. The microbiology of ethmoid and maxillary sinuses in patients with chronic sinusitis. *Am J Otolaryngol* 2003;24:163-8.
11. Jiang RS, Liang KL, Jang JW, Hsu CY. Bacteriology of endoscopically normal maxillary sinuses. *J Laryngol Otol* 1999;113:825-8.
12. Jiang RS, Lin JF, Hsu CY. Correlation between bacteriology of the middle meatus and ethmoid sinus in chronic sinusitis. *J Laryngol Otol* 2002;116:443-6.
13. Okur E, Yildirim I, Aral M, Ciragil P, Kiliç MA, Gul M. Bacteremia during open septorhinoplasty. *Am J Rhinol* 2006;20:36-9.
14. Silk KL, Ali MB, Cohen BJ, Summersgill JT, Raff MJ. Absence of bacteremia during nasal septoplasty. *Arch Otolaryngol Head Neck Surg* 1991;117:54-5.
15. Henning C, Hillborgh U, Lindvall K, Marqvardsen O, Sellers J, Wählin S, et al. Comparison of *Staphylococcus aureus* carriage and skin infection rates in hospital and office employees. *J Hyg (Lond)* 1979;83:437-44.
16. Eviatar E, Kessler A, Segal S, Vaiman M, Kalmovich LM. Effects of septoplasty on the nasal flora. *Am J Rhinol* 2006;20:40-2.
17. Apuhan T, Koçoğlu E, Yıldırım YS, Şimşek T, Kazaz H, Gök Ü. Effects of septoplasty on nasal and oropharyngeal microbial flora. *Afr J Microbiol Res* 2011;5:4583-7.
18. Georgiou I, Farber N, Mendes D, Winkler E.

- The role of antibiotics in rhinoplasty and septoplasty: a literature review. *Rhinology* 2008;46:267-70.
19. Meyers AD. Prophylactic antibiotics in nasal surgery. *Arch Otolaryngol Head Neck Surg* 1990;116:1125-6.
 20. Karaman E, Alimoglu Y, Aygun G, Kilic E, Yagiz C. Effect of septoplasty and per-operative antibiotic prophylaxis on nasal flora. *B-ENT* 2012;8:13-9.
 21. Kaygusuz I, Kizirgil A, Karlidağ T, Yalçın S, Keles E, Yakupoğullari Y, et al. Bacteriemia in septoplasty and septorhinoplasty surgery. *Rhinology* 2003;41:76-9.