The Effect of Nasal Packing or Stenting on Oxidative Stress After Septoplasty

Septoplasti Sonrası Nazal Tamponlama ya da Stentlemenin Oksidatif Stres Üzerine Etkisi

Yüce İSLAMOĞLU[1], Aslıhan ENSARİ ŞİMSEK[2], Ahmet AKKOZ[2], Ebubekir Alper ÖZER[2], Mehmet Ali BABADEMEZ[2], Özcan EREL[3]

[1]Ataturk Training and Research Hospital, Department of Otorhinolaryngology, Head and Neck Surgery, Ankara
[2]Yildirim Beyazit University, Faculty of Medicine, Department of Otorhinolaryngology, Head and Neck Surgery, Ankara
[3]Yildirim Beyazit University Faculty of Medicine, Department of Clinical Biochemistry, Ankara

Abstract

Septal deviation cause hypoxia which may raise oxidative stress. Nasal packing after septoplasty operation may increase oxidative stress. Different types of nasal packing may effect oxidative stress. Our aim is to investigate effect of nasal packing and nasal stenting after septoplasty operation on oxidative stress and investigate effect of septoplasty operation on oxidative stress. Study is a prospective cohort study. Fifty-five individuals who has nasal septum deviation (NSD) one side total obstruction but no other diseases; ages 18-30; were included for this study. The NSD was diagnosed based on the presence of nasal obstruction complaint, anterior rhinoscopy and nasal endoscopy. Patients randomly divided in to two by the nasal packing type. In group 1 merocel, in group 2 Doyle Silicone Combo splint with airway was used. To investigate oxidative stress levels, preoperatively venous blood was taken. Nasal packing was removed second day of surgery and venous blood was taken just before removal. After 28 days of surgery to investigate effect of septoplasty on oxidative stress, venous sample was taken. We measured thiol/disulfide levels and ischemic modified albumin. For group 1 and 2 preoperative levels compare to nasal packing removal day levels there was significant difference for thiol levels (respectively, p=0.008, p=0.002). Exclude nasal packing type to investigate effect of septoplasty on oxidative stress; preoperative values of thiols compare to 28th day values were significant different (p<0.001). We found nasal packing or stenting type do not have different effect on oxidative stress. Both thiol levels decrease. Unlike the literature; septoplasty has bad effect on thiol levels which is the defensive for oxidation, then thiol levels increases as the time progresses.

Keywords: IMA, Nasal Packing, Oxidative Stress, Septoplasty

Öz

Septum deviasyonu hipoksiye sebep olabilir ve bu hipoksi oksidatif stresi artırabilir. Septoplasti sonrası nazal tampon kullanmı oksidatif stresi artırabilir. Farklı burun tamponları oksidatif stresi etkileyebilir. Bu çalışmada amacımız septoplasti sonrası kullanılan splint ve tamponun oksidatif stres üzerine etkisini araştırmak ve septoplasti ameliyatının oksidatif stres üzerine etkisini araştırmaktır. Prospektif kohort çalışma planlanmıştır. 18-30 yaş arası tek taraf total obstrüktif olmak şartı ile ek hastalığı olmayan elli beş hasta çalışmaya dahil edilmiştir. Deviasyona nazal tıkanıklık, anterior rinoskopi ve endoskopik muayene ile tanı konmuştur. Hastalar iki gruba ayrılmıştır. Grup 1'e merosel tampon; grup 2'ye doyle nazal splint kullanılmıştır. Oksidatif stres periferik kandan örnekleme yapılarak değerlendirilmiştir. Nazal tampon yada splint ikinci gün alınmış ve hemen arkasına venöz kan örneklemesi yapılmıştır. Ayrıca ameliyat sonrası 28'inci günde de venöz kan örneklemesi yapılmıştır. Thiol/disulfide değerleri ayrıca IMA değerleri çalışılmıştır. Grup 1 ve grup 2 de preoperatif değerler ile tamponların çıktığı gün arasındaki thiol değerleri arasında anlamlı fark bulunmuştur (p=0.008, p=0.002). Her iki grup preoperatif değerleri ile post operatif 28'inci gün thiol değerleri arasından anlamlı fark bulunmuştur. (p<0.001). Nazal tampon ya da stent kullanımı oksidatif stres thiol değerleri üzerine negatif etki yapmakla birlikte gruplar arasında anlamlı fark yoktur. Literatürün aksine septoplasti thiol değerleri üzerine olumsuz etki oluşturmaktadır sonrasında ise bu değer yükselmeye başlamaktadır.

Anahtar Kelimeler: IMA, Nazal Tamponlama, Oksidatif Stres, Septoplasti

Introduction

The septum of the nose is an important physiological and support structure which is formed anteriorly by the quadrangular cartilage and posteriorly by the vomer and perpendicular lamina of the ethmoid bone. The nasal septum divides the two halves of the nose into right and left nasal spaces. When this structures displaced to one side; this situation is called nasal septal deviation (NSD). NSD is a frequent disease. In the literature NSD is reported between 1-80% (1). NSD has important role in nasal obstruction, aesthetic appearance and increased nasal resistance (2-4).

The treatment of NSD is septoplasty operation (5,6). To prevent synechias, post-operative epistaxis and septal hematomas, also for stabilization of septal flaps; nasal packing has been using for a long time (7). Recent studies showed that nasal packing did not show benefit in reducing synechias, post-operative epistaxis or septal hematomas but increase post-operative infections. Because of this, instead of nasal packing nasal stents are increasingly being used. But old habits still are often used (8-11).

NSD results obstruction of nose which may cause to hypoxia. Cellular metabolism may change due to hypoxia which lead some cellular

	ORCID No
Yüce ISLAMOGLU	0000-0002-1294-7088
Aslihan ENSARİ ŞİMSEK	0000-0002-6875-4218
Ahmet AKKOZ	0000-0001-9267-9337
Ebubekir Alper ÖZER	0000-0001-6039-5049
Mehmet Ali BABADEMEZ	0000-0002-0020-6493
Özcan EREL	0000-0002-2996-3236

Başvuru Tarihi / Received: 21.07.2019
Kabul Tarihi / Accepted : 17.03.2020

Adres / Correspondence : Yüce İSLAMOĞLU
Ataturk Training and Research Hospital, Department of Otorhinolaryngology, Head and Neck Surgery, Ankara
e-posta / e-mail : yuceislamoglu@gmail.com

compartments to lose. This lost may improve release of free oxygen radicals. According to literature hypoxia/re-oxygenation circles increases production of free oxygen radicals. Patients who has NSD have exposed oxidative stress and the effect of septoplasty on this oxidative stress is favorable (12,13). Nasal packing which lead to nasal blockage and more post-operative infection than nasal stents may also bad influence on oxidative stress. Nasal stents which help patient to breathe after surgery may help to decrease oxidative stress. In a study which investigated the effect of nasal packing and suturing technique after septoplasty on oxidative stress found no difference between two techniques.

Aim of our study to investigate effect of nasal packing and nasal stenting on oxidative stress and investigate effect of septoplasty operation on oxidative stress. We measured thiol/disulfide levels and ischemic modified albumin. Our study is the first study which investigate ischemic modified albumin (IMA) as a marker of oxidative stress on NSD and septoplasty operation.

Material and Method

Study was conducted in our tertiary center. Approval of this study was obtained from ethical board (Yıldırım Beyazit University ethical board date 25.10.2017 no. 26379996/184). Fifty-five individuals who has NSD one side total obstruction but no other diseases; ages 18-30; were included for this study.The NSD was diagnosed based on the presence of nasal obstruction complaint, anterior rhinoscopy and nasal endoscopy (0˚ CKarl-Storz GmBH&Co, Tuttingen, Germany). Paranasal sinus tomograpy was performed to all patient to exclude other nasal pathologies. Patients with acute-chronic infectious diseases, with diabetes mellitus, obesity, cardiovascular disease, cerebrovascular disease, kidney disease, liver disease, acute or chronic systemic diseases such as malignency, using antioxidants, lipid lowering drugs or vitamins, smoker, alcohol user, history of local or systemic steroid use and other nasal pathologies diagnosis via paranasal tomography were excluded from this study (14,15).

Patients randomly divided into two by the nasal packing type.In group 1 merocel (Merocel® Standart Nasal Dressing, 8 cm, without airway, Medtronic Xomed), in group 2 Doyle Silicone Combo splint with airway (Boston medical products; MA, USA) was used. All patients operated by same surgeon viastandart septoplasty operation under general anesthesia which Cottle was defined in 1948 (16). No complication was occured.

Laboratory procedures: Blood specimens were collected after 12-h over night fasting. These were then immediately centrifuged for 10 min at 1500 rpm for plasma and serum separation. Serum specimens were stored at 80˚C until all samples had been collected. Thiol/ disulphide haemostasis parameters were subsequently studied in the specimens. All parameters were studied from the same specimen. Thiol/disulfide levels were measured using the method described by Erel (17). IMA was measured from the same blood specimens. The data obtained were determined as total thiol, native thiol, disulphide and IMA levels.

Thiol/disulfide measurement: The serum levels of total oxidant status were measured using the TOS Kit (Rel Assay Diagnostics, Ankara, Turkey). The serum levels of total antioxidant status were measured using the TAS Kit (Rel Assay Diagnostics, Ankara, Turkey). For OSI calculation, the unit for TAS (millimole of Trolox equivalent per liter) was converted to micromole of Trolox equivalent per liter, and the OSI value was calculated as OSI = (TOS, 1 mol/L) / (TAC, 1 mol Trolox equivalent/L/100) (17).

IMA measurement: Bar-Or et al. method's by was used for IMA measurement. The test called albumin cobalt binding (ACB) test is based on that ischemia-induced structural change in albumin is measured with spectrophotometric measurement of the unbound cobalt after addition of cobalt. The principle of the method is briefly as follows: serum IMA concentration is measured by spectrophotometric measurement of the unbound cobalt at 470 nm using dithiothreitol (DTT) after addition of a known amount of cobalt to the serum sample. Since IMA concentrations are not standard, they were given as absorbance unit (ABSU) (18). All patients provided their written informed consents and volunteer to study.

Statistical analysis: All statistical analyses were performed usingSPSS (Statistical Package for Social Sciences) for Windows 21.0 (SPSS Inc., Chicago, Illinois, USA) program. Unless otherwise stated, results were expressed as mean ± SD. Fisher's Exact Test was used to compare the categorical variables. Independent sample t-test was used for comparisons between the two subject groups, and also the paired test for comparisons preop and post op values. $P<0.05$ was considered statistically significant.

Results

There was no significant difference in age, sex disturbance and body mass index compare the groups. There was no significant difference between two groupsin terms of native thiol, disulfid, IMA levels preoperatively (respectively, p=0.292, p=0.059, p=0.373) (Table 1). There was no significant diffence between two groups at the day of nasal packing or nasal stent removal for native thiol, disulfid and IMA levels (respectively, p=0.070,

p=0.150, p=0.625) (Table 1). There was no significant diffence between two groups at the 28th day for native thiol, disulfid and IMA levels (respectively, p=0.561, p=0.441, p=0.242) (Table 1).

For group 1 preoperative levels compare to nasal packing removal day levels there was significant difference for thiol levels (p=0.008), there was no significant difference between disulfid (p=0.646) and IMA (0.106).

Table 1. Comparison of preoperative, postoperative 2nd and 28th day measures of groups

	Group 1 n=25	Group 2 n=30	p★
Pre-op values (µmol/L)			
Native thiol	524.8±43.06	512.77±40.74	0.292
Disulfide	20.56±7.30	25.71±12.18	0.059
Total thiol	565.9±38.62	564.1±46.86	0.881
Disulfide/native thiol	0.03±0.01	0.05±0.02	**0.035**
IMA	77.20±5.38	81.05±10.69	0.373
Post-op 2nd day (µmol/L)			
Native thiol	491.5±50.51	449.7±102.8	0.070
Disulfide	21.91±12.14	28.81±20.86	0.150
Total thiol	535.3±59.70	507.39±82.58	0.163
Disulfide/native thiol	0.04±0.23	0.08±0.12	0.112
IMA	78.73±7.77	77.02±15.82	0.625
Post-op 28th day (µmol/L)			
Native thiol	489.9±43.99	496.8±43.32	0.561
Disulfide	26.50±14.22	24.08±8.66	0.441
Total thiol	542.9±40.80	544.9±49.53	0.867
Disulfide/native thiol	0.05±0.03	0.04±0.01	0.274
IMA	77.12±7.10	81.49±18.58	0.242

★Student t test; IMA: ischemic modified albumin

For group 2 preoperative levels compare to nasal packing removal day levels there was significant difference for thiol levels (p=0.002), there was no significant difference between disulfid (p=0.305) and IMA (0.333).

Compare to preoperative levels and 28 day levels of group 1 there was significant difference for thiol levels (p<0.001), there was no significant difference between disulfid (p=0.052) and IMA (0.939).

Levels of thiols slightly increasedcompare to day of packing removal but this increase was not significant (p=0.907). Compare to preoperative levels and 28 day levels of group 2 there was no significant difference between for thiol (p=0.095), disulfid (p=0.532) and IMA (0.442).

Exclude nasal packing type to investigate effect of septoplasty on oxidative stress; preoperative values of thiols compare to 28th day values was significant different (p<0.001). Disulfid and IMA values was not significant different (respectively p=0.179, p=0.437).

Discussion

Hypoxia as a result of NSD effects oxidative stress mechanism in organism. As a result, the thiol/ disulphide balance changes. Studies showed NSD has negative effect on the thiol/disulfide balance (12,13).

Ekici et al. found increased thiols levels and reduced disulfide levels after septoplasty. They stated that septoplasty decreased oxidative stress after correction of NSD. But authors did not mention about severity of deviation which could affect the oxidative stress. In our study to balance severity of deviation patients who has one side total obstruction of nose with no other diseases especially OSAS and obesity were included (12,19).

Also to our knowledge this study is the first study which ischemic modified albumin (IMA) was investigated on septoplasty operation and on nasal packing types. This marker is a relatively new for ischemia and oxidative stress. According to studies NSD effect oxidative stress circle and may effect IMA levels (20). Packing or stenting did not affect IMA levels also septoplasty did not affect IMA levels. IMA seems not a good oxidant-antioxidant marker for nasal surgeries.

Kazkayasi et al. compared oxidative stress marker levels malondialdehyde (MDA), sulfhydryl (SH), and nitric oxide (NO) on the nasal packing and nasal septal suturing after septoplasty and found no significant difference between two groups. They explain that nasal septal suturing after septoplasty did not have a negative effect on the oxidant–antioxidant metabolism (10). Alkan et al. studied nasal packing before and after septoplasty on oxidative parameters. They found that regional high

oxidative stress occurs after septoplasty operation but no systemically biochemical effect occurs (21).

In our study unlike the literature we found that nasal packing and nasal stenting lower the thiol levels significantly both in two groups. Thiols has a critical role in preventing the formation of any oxidative stress situation in cells and the levels of thiols was decreased. Disulfide levels increased at the day of packing or stenting removal but this was not significant.

At the 28th day there was no significant difference between two groups for thiol, disulfide or IMA levels but thiol levels started to increase. This increase was significant in group 1 ($p<0.05$) but not in group 2. We assume that this change may be because of the full obstruction of the packing group. They exposed more hypoxia and improve after removal was better.

To investigate effect of septoplasty on oxidative stress we exclude nasal packing type and compare preoperative values of all patients to 28th day values. We found that thiol level was significantly decrease ($p<0.05$). Disulfide and IMA levels were not significant different. Unlike the literature we found septoplasty has bad effect on thiol levels which is defensive for oxidation. Ekici et al found increased thiols levels and reduced disulfide levels after septoplasty. They investigated oxidative stress markers after 3 months of surgery (12). We investigated markers after 28 day of surgery and found decreased thiol levels. But compare to second day values there was a slightly increase in thiol levels.

Antioxidant level decreases early period of surgery and then started to increase as the time progresses. After 3 months this increase shows significant difference. With the help of our study we understand the graph of antioxidant level status from preoperative time to 3-month period. Thiol levels first decrease than increase as the time progresses.

As a result, we found nasal packing or stenting has bad effect on oxidative stress but type of packing or stenting has no difference.

Postoperative 28th day septoplasty has bad effect on thiol levels. Thiol levels first decrease after the operation then starts to increase in the light of this information and early literature we understand the graph of thiol change after septoplasty.

Ethics Committee Approval: Yıldırım Beyazit University Ethics Committee Permission was obtained with the letter dated 25.10.2017 and numbered 26379996/184.

References

1. Roblin DG, Eccles R. What, if any, is the value of septal surgery? Clin Otolaryngol. 2002;27:77–80.
2. Hsia JC. Camacho M. Capasso R. Snoring exclusively during nasal breathing: a newly described respiratory pattern during sleep. Sleep Breath. 2014;18(1):159–64.
3. Grymer LF. Melsen B. The morphology of the nasal septum in identical twins. Laryngoscope. 1989;99(1):642-6.
4. Ahn JC, Kim JW, Lee CH, Rhee CS. Prevalence and risk factors of chronic rhinosinusitus, allergic rhinitis, and nasal septal deviation: Results of the Korean National Health and Nutrition Survey 2008-2012. JAMA Otolaryngol Head Neck Surg. 2016;142(2):162-7.
5. Stewart MG, Smith TL, Weaver EM, et al. Outcomes after nasal septoplasty: results from the nasal obstruction septoplasty effectiveness (NOSE) study. Otolaryngol Head Neck Surg. 2004;130(3):283–90.
6. Bhattacharyya N. Ambulatory sinus and nasal surgery in the US: demographics and perioperative outcomes. Laryngoscope. 2010;120(3):635–8.
7. Samad I, Stevens HE, Maloney A. The efficacy of nasal septal surgery. J Otolaryngol. 1992;21:88-91.
8. Weber R, Keerl R, Hochapfel F, Draf W, Toffel PH. Packing in endonasal surgery. Am J Otolaryngol. 2001;22:306-20.
9. Nunez DA, Martin FW. An evaluation of post-operative packing in nasal septal surgery. Clin Otolaryngol Allied Sci. 1991;16:549-50.
10. Kazkayası M, Dincer C, Sezikli H, Arıkan OK, Caglayan O. The effect of suturing technique and nasal packing on oxidative stress in septoplasty operations Kulak Burun Bogaz Ihtis Derg. 2008;18(1):35-9.
11. Weber RK. Nasal packing and stenting. GMS Current Topics in Otorhinolaryngology - Head and Neck Surgery. 2009;8:1-16.
12. Ekinci A, Karataş D, Yetiş A, Demir E, Ozcan M. The effects of septoplasty surgery on serum oxidative stress levels Eur Arch Otorhinolaryngol. 2017;274(7):2799-802.
13. Ekinci A, Karataş D, Yetiş A, Demir E, Ozcan M. Serum oxidative stress levels in patients with nasal septal deviation. Turk Arch Otorhinolaryngol. 2017;55: 125-8.
14. Bozdemir K, Sezgin A, Akkoz A, Erel O, Korkmaz MH. Thiol-disulphide homeostasis in chronic sinusitis without polyposis.Tr-ENT. 2018;28(2):66-70.
15. Simsek E, Erel O, Bicer CK, Carlıoglu A. A novel method for determining the relation between nasal polyposis and oxidative stress: the thiol/disulphide homeostasis. Acta Otolaryngol. 2016;136(11):1180-3.
16. Cottle MH, Loring RM. Surgery of the nasal septum; new operative procedures and indications. Ann Otol Rhinol Laryngol. 1948;57(3):705-13.
17. Erel O, Neselioglu S. A novel and automated assay for thiol/disulphide homeostasis. Clin Biochem. 2014;47:326-32.
18. Bar-Or D, Lau E, Winkler JV. A novel assay for cobalt albumin binding and its potential as a marker for myocardial ischemia-a preliminary report. J Emerg Med. 2000;19(4): 311–5.
19. Min HJ, Kim KS. Comment on "The effect of septoplasty surgery on serum oxidative stress levels". Eur Arch Otorhinolaryngol. 2018;275(2):645-6.
20. Dogru M, Akoglu H, Kilinckaya MF, Ulfer G. Ischemia-modified albumin levels in children with asthma: a pilot study. Arch Argent Pediatr. 2018;116(4):522-8.
21. Alkan Z, Yigit O, Acıoglu E, Araz Server E, Uzun H, Civelek S. The effect of nasal packing on oxidative stress in septoplasty. Operation Turk Arch Otolaryngol. 2013;51:20-2.