Impact of Septoplasty on Oxidative DNA Damage Levels in Patients with Marked Nasal Septal Deviation

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Abstract

Objectives: Nasal septal deviation (NSD) is a common dilemma which cause nasal obstruction. Septoplasty is usually accomplished to solve nasal obstruction in patients with NSD. NSD is related strongly with hypoxia. Hypoxic conditions increase oxidative DNA damage in cells.

This study aimed to investigate the effect of septoplasty on the level of antioxidant agents in patients with marked NSD.

Methods: Sixty-one patients who submitted to septoplasty were involved in our prospective investigation.

Results: The difference between the pre- and postoperative levels of MDA and 8-OHdG/106 dG was statistically significant.

Conclusions: Septoplasty is an elective surgery performed to prevent the decrease in quality of life due to nasal obstruction and frequent respiratory tract infections in patients with NSD. As seen in this study, septoplasty is an urgent surgery that should be performed urgently to prevent DNA damage in patients with NSD.

Key Words: nasal septal deviation, septoplasty, 8-OHdG, DNA oxidation, lipid peroxidation, oxidative stress.

Introduction

Nasal obstruction is an usual ailment of subjects applying to otorhinolaryngologists and the leading argument of nasal obstruction is nasal septal deviation (NSD) [1]. Almost 50% of the respiratory tract obstruction originates at the nasal area [2]. Respiratory tract obstruction may be increased in case of nasal obstruction due to NSD.

There are many studies that shown the nasal obstructions could result to chronic hypoxia [3, 4]. Chronic hypoxia causes the reactive oxygen species (ROS) [5]. ROS are extremely reactive particles that interact with nucleic acids, lipids, and proteins and are regarded to have an improved DNA oxidation, giving rise to cytotoxic tissue destruction. Lipid peroxidation induced by ROS concludes in many unsteady, disintegrated mixtures, with the most significant one being malondialdehyde (MDA), an adequate declarative of lipid peroxidation [6]. But then, ROS are intimately conjoined with DNA rupture and infrastructure alteration [7]. For this intention, the utilisation of any marker of DNA oxidation, such as 8-hydroxy-2'-deoxyguanosine [8], to measure oxidative stress is of implication [8]. It is well constituted that oxidative stress is correlated with hypoxia [9, 10]. Although antioxidant degrees were higher in subjects with hypoxia than subjects with normoxia. There is no study, as far as we are interested, about the effect of septoplasty on antioxidant condition in patients with major NSD. We accomplished this survey to sustain whether there is a relation between NSD and serum MDA and leukocyte 8-OHdG degrees before and after septoplasty.

Materials and methods

Sixty-one patients (34 male, age range being 21–46 years) who submitted to septoplasty for major NSD between May 2015 and April 2017 at the otorhinolaryngology branch of 2nd stage hospital were involved in our investigation. The patients with noticed NSD were identified by anterior rhinoscopy and nasal endoscopy (Karl Storz, Germany). Then nasal apetures, nasopharynx, oropharynx and larynx were assessed by a flexible fiberoptic endoscope (Karl Storz 11001RD1, Germany). The other dilemmas engendering upper respiratory tract blockage such as nasal polyposis, adenoid vegetation and hypertrophied tonsils were eliminated from this survey. All subjects had major NSD and no chronic diseases such as diabetes mellitus, hypertension. In preoperative interval and 3
months after septoplasty, the blood specimens were gathered (2 mL serum for MDA assessment, 3 mL whole blood for 8-OHdG/dG measurement). All samples were preserved at -80°C up to test time.

DNA isolation from leukocytes was assembled by the procedure of Miller and coworkers [11]. Agilent 1100 modular pattern was used to assess the high-pressure liquid chromatographic analysis (Phenomenex, CA) (12). Serum MDA analysis was validated by Khoshsorur et al using fluorescence detector (13). IBM SPSS 18.0 was used for statistical

analysis. Sample T-test was used, and P < 0.05 was regarded statistically meaningful.

Results

Excessive bleeding was seen in two patients and septal perforation was seen in one patient. The difference between the pre- and postoperative levels of MDA and 8-OHdG/106 dG was statistically significant (P < 0.05), and it is shown in Supplementary Table 1.

|                      | %95 CI of Means | %95 CI of Means |
|----------------------|-----------------|-----------------|
|                      | MDA (µM) Mean ±SD | Low | High | 8-OHdG/106 dG Mean ± SD | Low | High |
| Before Operative Period | 11.30± 2.19 * | 10.14 | 12.46 | 2.19± 0.98 * | 2.07 | 2.31 |
| Post Operative Period   | 5.42± 1.87 * | 4.38 | 6.04 | 0.53± 0.39 * | 0.41 | 0.65 |

Supplementary Table 1: The Comparison of Pre- and Postoperative MDA and 8-OHdG/106 dG Levels of the Patients With NSD

Discussion

Nasal septal deviation is a common complaint of patients presenting to ear nose throat clinics. It may be ignored sometimes but it is a very important nasal disease, because of its probable complications such as pulmonary hypertension, cor pulmonale and alveolar hypoventilation [15-17]. It should be kept in mind for differential diagnosis of chronic hypoxia [17]. Previous studies have shown that chronic hypoxia is associated with many oxidative stress problems [18]. Nasal obstruction is one of the causes of hypoxia, mechanisms such as oxidative stress commonly seen in hypoxic patients must be considered in patients with NSD. The present study was planned to investigate the effect of septoplasty, used for NSD therapy, on oxidative damage.

Since in hypoxia is maintained, an increased ROS production is inevitable [19, 20]. ROS are produced in all aerobic cells. However, if an overproduction occurs and it becomes over antioxidant capacity, biomolecules such as DNA, lipids, proteins, and carbohydrates are oxidized, resulting in damage caused by this oxidative stress [21]. ROS produce lipid hydroperoxides affecting polyunsaturated fatty acids. The breakdown of these hydroperoxides yields aldehyde groups, of which the most important is MDA. It is a marker as a DNA oxidation [22]. Several methods may be used for MDA determination, with the common one being spectrophotometric method based on the colored complex with electrochemical detector (13). IBM SPSS 18.0 was used for statistical

Septoplasty is an elective surgery performed to prevent the decrease in quality of life due to nasal obstruction and frequent respiratory tract infections in patients with NSD. As seen in this study, septoplasty is an urgent surgery that should be performed urgently to prevent DNA damage in patients with NSD.

There is no study about impact of septoplasty on oxidative damage in NSD patients. Our results show that the preoperative MDA levels are higher than those in postoperative period (P < 0.01), which exhibits that septoplasty decreases lipid peroxidation. Similarly, that the preoperative 8-OHdG levels are higher than those in postoperative period (P < 0.01) can be considered as lowering effect of septoplasty on the DNA oxidative damage due to ROS. As a result, septoplasty decreases both DNA oxidation and lipid peroxidation as well. But new studies with larger case numbers are needed to confirm this result and explain the pathophysiology.

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