ORIGINAL RESEARCH PAPER
Volume-8 | Issue-10 | October - 2019 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ROLE OF FREE RADICALS AND NO IN NASAL POLYPS

ENT

Pokuru Sivakumar Assistant Professor, Department of ENT, Department of Biochemistry and Central laboratory Head, Sri Lakshmi Narayana Institute of Medical Sciences, Affiliated to Bharath University, Pondicherry- 605 502, India

Prabhakar Reddy. E* Professor, Department of Biochemistry and Central laboratory Head, Sri Lakshmi Narayana Institute of Medical Sciences, Affiliated to Bharath University, Pondicherry-605 502, India *Corresponding Author

ABSTRACT

Many diseases are linked to damage from reactive oxygen species that occurs from an imbalance between reactive oxygen species and antioxidants, a condition called oxidative stress. Nasal polyposis is considered to be an inflammatory condition in nasal and paranasal sinus cavities and its aetiology is still unclear.The blood NO,antioxidant VitaminS and enzymes levels were found to be decreased, and MDA, levels as an oxidant increased significantly in the patient group with polyposis when compared with the control group, and there was a negative correlation between oxidative stress and antioxidants.Our Results are oxidative stress and blood antioxidants in the patients with polyposis were significantly different compared with the control group. The blood antioxidant levels decreased, and MDA levels,as an oxidant, increased significantly in the patient group with polyposis when compared with the control group. The current study demonstrates that there is strong evidence related to oxidative stress in the pathogenesis of nasal polyposis, and antioxidants can have a preventive role in free radical mediated damage in nasal polyposis.

KEYWORDS

Free radicals, Reactive Oxygen species,oxidative stress, antioxidants,nasal polyp.

INTRODUCTION:

Oxidative stress (OS) is the term used to describe the conditions produced by reactive oxygen species (ROS) that are highly reactive molecules, produced by the human body, having harmful and pathogenic effects. Human body, at the same time, is equipped with antioxidant systems, which eliminate the harmful effects of ROS, preventing or reducing the damage caused by oxidation. In essence, in OS there is a disturbance of oxidants/antioxidants balance in favour of oxidants. The imbalance between oxidants and antioxidants leads to cell injury, cell daeath, underlying tissue damage and chronic inflammation development (1).OS and ROS are inherent in human metabolism. ROS are essential in the maintenance of normal cellular function. At low concentrations they can act as cellular and intracellular signalling molecules that facilitate normal biological processes. The excess of ROS due to the cceleration in their production or a deficiency in the antioxidant defence system attacks important macromolecules, leading to cell damage and homeostatic disruption. Targets of ROS include all kinds of molecules in the body: carbohydrates, lipids, nucleic acids and proteins (1-3).

Nasal polyposis is considered an inflammatory condition in nasal and paranasal sinus cavities and is frequently encountered in otolaryngology clinics. Despite the prevalence and the recognition of this condition for 3,000 years, its etiology has remained unclear. Therefore, many pathogenic theories have been proposed to explain the etiology of nasal polyps. These theories include adenoma and fibroma theories, glandular cyst theory, mucosal exudates theories, blockade theory, glandular hyperplasia theory, gland new formation theory, ion transport theory,periphlebitis and perilymphangitis theory, cystic dilatation of the excretory duct and vessel obstruction theory,necrotizing ethmoiditis theory, and many others (4-6). However ,multiple factors may be involved in polyp formation,but the exact etiology of nasal polyposis is still unknown. Most studies in the literature deal with inflammatory mechanisms occurring in the lamina propria of nasal polyposis, but few data are available concerning epithelium changes and their relationship with free-radical damage.

It has recently been demonstrated that free–radicalmediated lipid peroxidation (as malondialdehydethiobarbituric acid [MDA] levels) was increased both in blood and in polyp tissue, whereas there were no data regarding antioxidants and the relationship between antioxidants and free–radical-induced lipid peroxidation. Previous studies suggested that progressive epithelium injury in polyp tissues is caused by peroxynitrite. In addition to the toxic effect, this reaction might reduce the concentration of nitric oxide, thereby decreasing its bioavailability (14). The aim of this study was to investigate the role of malondialdehyde, superoxide dismutase, Vitamin A, E, C and nitric oxide in nasal polyposis by comparing their concentrations in samples from nasal polyposis.

MATERIAL AND METHODS:

In the present study, 50 patients were included, with a mean age of 39 (range 15–74) years. Thirteen were female, and 27 were male. The patient group consisted of 31 patients (mean age of 41 years) with nasal polyposis who were selected for polypectomy procedure, and the control group consisted of 19 patients (mean age of 30 years) with septal deviation who were selected for septoplasty and inferior turbinate procedure. Informed consent was obtained from all the patients, and the study was approved by the Institutional ethical committee of SLIMS Medical college and Hospital. None of the patients had allergy, acute infection, systemic disease, or history of drug and supplement intake. None of the patients with polyposis had received systemic or topical steroids for at least 4 weeks before polyp tissue sampling. Tissue samples were obtained freshly during surgeries. The blood samples were stored at-50°C. Levels of the following antioxidants were measured from the sera of the participants in the study and the control group: NO,Vitamin A, E and C. Plasma levels of SOD were also measured. As a peroxidation product, the levels of the MDA combination were measured from the plasma.

Statistical analyses were analyzed with use of Mann-Whitney *U* test. Spearman's rank correlation coefficient analysis was used to investigate the relationship between two quantitative variables. All statistical analyses were performed using SPSS 11.5 for Windows (SPSS Inc., Chicago, IL). Data are presented as mean ± SD.A significance level (*P* value) of 1% was considered statistically different unless otherwise stated.

RESULTS:

Table. 1: Control and Patient group Oxidants ,antioxidants and NO levels.

DISCUSSION:

Exposure to oxidants, whether endogenous or exogenous,can initiate free-radical-mediated reactions and lead to oxidative stress. Antioxidant systems help to defend the body against free radicals and oxidative stress but might become overwhelmed during periods of chronic oxidative stress. There is a crucial balance between protection against free radicals and their generation. The reduction oxidation state of the cell is a consequence of the balance between levels of reactive oxygen species and endogenous enzymes such as catalase, SOD, GSHPX, and thiol buffers, in particular GSH and thioredoxin. Owing to its critical role in mediating cell growth and antimicrobial function, decreased nitric oxide levels have been implicated in the pathogenesis

of nasal polyposis. and it is found that the nasal epithelial cells of allergic patients produced greater levels of nitric oxide as a result of concomitant expression of different nitric oxide isoforms.

The effect of nitric oxide in inflammation conditions such as allergy.Inflammatory mechanisms occurring in the lamina propria of nasal polyposis can explain the effect of nitric oxide. In the present study, lower nitric oxide concentrations were found in the group of patients with nasal polyposis compared with the control group. Nitric oxide radical (NO), a highly reactive and diffusible FR, is implicated in the regulation of various physiological and pathological events. These data indicate that the nasal polyp environment is characterized by abnormalities in nitric oxide metabolism that might predispose to altered regulation of tissue growth and infection, or that nasal polyposis affects nitric oxide metabolism. Further studies are needed to understand the growth mechanism of nasal polyps. NO has multiple effects on tissues. At sinonasal level, NO plays a dual role – it increases ciliary beat frequency through intracellular signalling pathways and diffuses into the mucus,where it fights against bacteria and viruses as part of the innate immune response (7-9). It is clear from the present study that there are abnormalities in lipid peroxidation and antioxidant enzymes in patients with nasal polyposis. Multiple factors may be involved in polyp formation, but the precise aetiology of nasal polyposis is still unknown. A relationship between nasal polyposis and antioxidants has been demonstrated, but the role of antioxidants in nasal polyposis and their effects on nasal polyposis progress are still unclear.

However, prolonged exposure to pollutants results in increased levels of H_2O_2, IL-8 and mucin production. Therefore, the effort to reduce air pollutants (particulate matter) may lead to the decrease in H_2O_2, proinflammatory cytokine IL-8 and the production of mucin, preventing the installation of the OS in the sinonasal epithelium (10). Hypochlorous acid (HOCl), a non-radical derived from oxygen, is formed as a result of the action of myeloperoxidase in the sinonasal tissues. HOCl has the ability to damage the underlying tissues. Ozone, a non-radical derived from oxygen, directly increases the level of FR and DNA synthesis. Cytokines released by effector cells of innate immunity due to exposure to ozone as well as cyclooxygenase and lipoxygenase activity facilitate the elevation of Free Radicals (6-10). Levels of the oxidant malondialdehyde were significantly higher in the nasal polyposis group compared with the control group, whereas levels of the antioxidants, superoxide dismutase and nitric oxide were significantly lower in the nasal polyposis group compared with the control group and concentrations of superoxide dismutase, malondialdehyde and nitric oxide in patients with nasal polyposis are significantly different compared with those for individuals in a control group without nasal polyposis.

CONCLUSION:

Present study demonstrates that oxidative stress in blood antioxidants in the patients with polyposis were significantly different compared with the control group. The blood antioxidants vitamins and enzymes levels decreased, and MDA levels, as an oxidant, increased significantly in the patient group with polyposis when compared with the control group. The present study demonstrates that there is strong evidence related to oxidative stress in the pathogenesis of nasal polyposis, and antioxidants may have a preventive role in free radical mediated damage in nasal polyposis. For further research is needed to determine the effects of antioxidants in treating nasal polyposis by preventing free radical-mediated tissue damage.

Table. 1: Control and Patient group antioxidants and preroxidation product Serum levels.

Parameters	Control Group	Patient group
Vitamin. A	0.442±0.4	0.312±0.1
Vitamin E	29.12±0.9	16.3±1.74
Vitamin C	69.93±0.8	51.13±3.81
SOD	1693.6±69	1492.8±175.3
MDA	6.36±4.75	14.92±3.83
NO	0.988 ±0.471	0.452 ±0.454

REFERENCES:

1. Holecek V, Rokyta R, Slipka J. Free radicals in nasal and paranasal diseases. In:Miller J, Le Prell CG, Rybak L, editors. Free radicals in ENT pathology. Humana Press; 2015, p.479–92.
2. Egea J, Fabregat I, Frapart YM, Ghezzi P, Görlach A, Kietzmann T, et al. Corrigendum to "European contribution to the study of ROS: A summary of the findings and prospects for the future from the COST action BM1203 (EUROS)" [Redox Biol. 13 (2017) 94–162]. Redox Biol. 2018;14:694–6.
3. Birben E, Sahiner UM, Sackesen C, Erzurum S, Kalayci O. Oxidative stress and antioxidant defense. World Allergy Organ J. 2012;5(1):9–19. DOI: 10.1097/WOX.0b013e3182439613. Epub 2012 Jan 13.
4 Tos M, Mogensen C. Pathogenesis of nasal polyps. Int Rhinol 1977;15:87–95.
5. Tos M. The pathogenic theories on formation of nasal polyps.Am J Rhinol 1990;4:305–312.
6. Drake-Lee AB. The pathogenesis of nasal polyps. In: Settipane GA, Lund VJ, Bernstein JM, Tos M, eds. Nasal Polyp: Epidemiology, Pathogenesis and Treatment. Rhode Island: Ocean Side Publications, 1997;17–64.
7. Holecek V, Rokyta R, Slipka J. Free radicals in nasal and paranasal diseases. In:Miller J, Le Prell CG, Rybak L, editors. Free radicals in ENT pathology. Humana Press; 2015, p.479–92.
8. Carey RM, Workman AD, Chen B, Adappa ND, Palmer JN, Kennedy DW, et al. Staphylococcus aureus triggers nitric oxide production in human upper airway epithelium. Int Forum Allergy Rhinol. 2015;5(9):808–13.
9. Tamashiro E, Banks CA, Cohen NA. New Areas for Investigation: Nitric Oxide. In: Önerci TM, Ferguson BJ, editors. Nasal Polyposis: Pathogenesis, Medical and Surgical Treatment. Springer-Verlag Berlin Heidelberg; 2010, p.175-83.
10. Cho DY, Le W, Bravo DT, Hwang PH, Illek B, Fischer H, et al. Air pollutants cause release of hydrogen peroxide and interleukin-8 in a human primary nasal tissue culture model. Int Forum Allergy Rhinol. 2014;4(12):966–71.