Effect Of Antioxidants On Oxidative Indices Formation During Anaesthesia

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Citation

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Abstract

Objective: To assess the effect of antioxidants on oxidative indices formation during anaesthesia.
Methods: The present study was carried out on 300 patients of ASA grade I and II; planned for elective surgery. Patients were divided into three groups: Group I-Patients were given no antioxidant (Control group; n=100), Group II-Patients were given antioxidant (Vitamin E 400 mg/day; n=100) started one week prior to surgery, Group III-Patients were given antioxidant (Vitamin C 500 mg/day; n=100), started one week prior to surgery.
Results: The mean age of the patients in all groups were similar (Group-I=33.3±12.5, Group-II=35.71±9.35, Group-III=35.10±12.21). Most of the patients among all the groups were male sex. The catalase activity significantly ($p<0.0001$) decreased from pre-operative (1.27±0.37) to preoperative (0.67±0.15) and increased at post-operative (2.34±0.29) among the patients of Group-I, II and III. The level of LPO was significantly ($p<0.0001$) increased from preoperative (40.61±4.92) to preoperative (71.19±14.48) and decreased at post-operative (33.32±13.12) period. Almost similar observation was found in Group-II and Group-III. A significant ($p<0.01$) higher level of LPO was found in Group-I (33.32±13.12) than Group-III (21.14±5.35). A significant decrease was observed in the catalase activity from pre-operative (Group-I=1.36±0.08, Group-II=1.30±0.24, Group-III=1.18±0.72) to preoperative (Group-I=0.53±0.04, Group-II=0.56±0.10, Group-III=0.36±0.07) and increase at post-operative (Group-I=2.12±0.10, Group-II=2.46±0.28, Group-III=2.19±0.14) period in all the groups.
Conclusion: The findings of this study reveal that preoperative antioxidant e.g. Vitamin E and C seems to be beneficial in protecting the free radical tissue damage during anaesthesia.

INTRODUCTION

Antioxidants are complex and diverse group of molecules that protect key biological sites from oxidative damage. They usually act by removing or inactivating chemical intermediates that produce the ultimate oxidant. Disturbance between the production of reactive oxygen species such as superoxide, hydrogen peroxide, hypochlorus acid, peroxyl radicals and antioxidant defense against them produce oxidative stress which amplifies tissue damage by releasing oxidative forms of reactive radicals. The body has a number of defense mechanisms to deal with oxidative stress within different cellular compartments and superimposed on these are gene regulated defenses. These mechanisms can form primary and secondary levels of defenses against reactive radicals such as an enzyme system, small molecules (Antioxidant and Scavengers), miscellaneous proteins, DNA repair enzymes.

Despite improvements in surgical techniques, anaesthesia, is associated with oxidative stress1. Oxidative stress is a disturbance in the balance between the formation of oxidizing species (reactive oxygen species and other radicals) and their effective removal by protective antioxidants (AOX). Overwhelming radicals generated in the bloodstream and tissues can induce oxidative damage, representing by lipid peroxidation, to the cell membranes, lipoproteins, proteins, and deoxyribonucleic acid2. The peroxidation of membrane phospholipids generates malondialdehyde (MDA)

MATERIALS AND METHODS

The present study was carried out on 300 patients of ASA grade I and II; planned for elective surgery. The study included patients of either sex, age group between 15 to 55 years and with duration of surgery of 1

RESULTS

The mean age of the patients in all groups were similar (Group-I=33.3

DISCUSSION

Free radicals are characterized by enhanced biological activity and potentiality to damage cellular structures with enzyme activity resulting in cell function. General anesthesia is accomplished with aid to large number of drugs having different physiochemical properties and affecting directly or indirectly the process of peroxide oxidation of lipids in the body10. The hepatic origin of these free radicals was confirmed by the studies on isolated perfused livers where addition of halothane to the perfusate resulted in biliary elimination of the same PBN-trapped radical adducts11. In our study, preoperative mean catalase level of H2O2 decomposed in Group I, II and III which decreased preoperatively and increased postoperatively. The decrease and increase was statistically significant. Durak et al (1996)12 in their study of antioxidant effect of ?-tocopherol (Vitamin E) considered that prophylactic administration of antioxidants such as ?-tocopherol might be beneficial in suppressing the destructive effect of free radical oxygen in cells. The role of trace elements and Vitamin E was also established by Berger (1995)6.

In the present study, the decrease in catalase level increased significantly in spinal anaesthesia from general anaesthesia and thus, we could said that preoperative antioxidant therapy was beneficial in protecting the tissue from free radical injury produced during anaesthesia and Vitamin E was more potent antioxidant than Vitamin C (ascorbic acid). It was reported that ascorbic acid wasa potent antioxidant, it could act as a proxidant by promoting iron catalysed reactions13.

In the present study, the level of LPO was significantly increased from preoperative to preoperative and decreased at post-operative period. Almost similar observation was found in Group-II and Group-III. A significant higher level of LPO was found in Group-I than Group-III. It is generally believed that barbiturates can protect normal tissue from damage induced by cerebral hypoxia probably through inhibition of lipid peroxidation (LPO). In vitro study, thiopental could scavenge superoxide (O2) radicals while spontaneously generated hydroxyl radicals (OH), subsequently resulted in membrane lipid perooxidation. This formation of OH may damage cell membrane lipids14. In our study, comparing postoperative and preoperative LPO levels, non-significant difference in fall in Group I and Group III was observed. Fall in group II was significantly higher in spinal anaesthesia then general anaesthesia. Fall in LPO was the highest in Group I of general anaesthesia and Group III of spinal anaesthesia. However, the oxy radicals injury product is lipid peroxide (LPO) or MDA is one of the final product of free radical chain reaction during lipid peroxidation15 . Lipid peroxation is a complex process with abstraction of hydrogen atom from a PUFA by a reactive or free radical chain mechanism followed by a complex sequence of propagative reactions16.

CONCLUSION

The findings of this study reveal that preoperative antioxidant e.g. Vitamin E and C seems to be beneficial in protecting the free radical tissue damage during anaesthesia.

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