

Influence of General Anesthetics at Periodontium of Pediatric Patients

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Abstract

Purpose: The selection of general anesthetic beyond surgical indications significantly affects the periodontal status of child patients undergoing surgical interventions. The different characteristics of sevoflurane compared to propofol are the elements that are taken for study with the aim of the obvious clinical findings in the periodontal status of the patients included in the study. The selection of evaluative periodontal indices, depending on clinical sensitivity, is another goal of this study.

Materials and methods: After the verbal consent received from the parents, the study was applied to the measurement of the amount of saliva of child patients and to the evaluation of the gingival status in 14 child patients, without age limitations, who underwent the planned surgical treatment protocol. Saliva production values were recorded in the patients before and after the surgical intervention, divided depending on the type of anesthetic applied. Period status was assessed by means of the PMA index, before and after the surgical intervention.

Results: The increase in the amount of saliva produced was evidenced by the difference of 0.36 ml, the difference in average values of saliva production, measured in a time interval of 5 minutes. More than half of the patients, depending on the values, are referred to as patients with production in normal values of saliva, and the rest vary in the ratio of 1:5 in terms of hypo and hyper - production of salivary flow. The PMA index showed values of deterioration of periodontal status in children undergoing anesthesia with propofol.

Conclusions: According to the assessment with the PMA index, it can be seen that sevoflurane affects the deterioration of the health of the marginal gingiva with a value of 1, while propofol has the same effect. In contrast, before and after surgery, it can be seen that the attached gingiva is more sensitive to the aggravation of the pathology. This can probably be explained by the effects at the level of the blood circulation system, for the interdental papilla.

Keywords: Sevoflurane; Propofol; Saliva production; PMA index.

Introduction

According to a study by Kubo S. et al, intravenous anesthesia with propofol, if compared to inhaled anesthesia, sevoflurane, also used for procedural sedation, provides a slower release and less agitation [1]. It is preferred as a general anesthetic for due to the rapid induction and duration of adequate anesthesia, this is sufficient for surgical intervention. Acceptable cardiovascular characteristics are other important data of this anesthetic

when compared with other anesthetics. Despite all, it is still said that sevoflurane is not the ideal anesthetic, as it is classified for possible nephrotoxic effects. Since sevoflurane affects the formation of fluoride ions, it may show nephrotoxicity, but from the literature there is no data on kidney damage. The recovery period is shorter, patients leave the hospital faster. Due to the antiemetic properties of propofol, nausea and vomiting appear less, but as a drug it is metabolized in the liver [2].

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Sevoflurane increases the respiratory frequency, decreases the hepatic blood flow, with the aim of being removed from the organism where it has been applied, through exhalation. Breathing frequencies and dosages of this general anesthetic are influenced by the fact of high solubility and evaporation capacity, since the shorter the exposure time, the faster the patient returns to the initial state.

Sevoflurane is in the center of the ranking based on the level of metabolism of anesthetics, 2 levels higher is halothane, the level is descending [4]. As post-surgery effects, hepatotoxicity and kidney damage can be mentioned, depending on the way of elimination. Hepatotoxicity has as a risk factor the female sex, increasing age, genetic predisposition to obesity [3-9]. Propofol is metabolized in the liver, significantly induces nausea and vomiting. Sevoflurane reduces the mucociliary effect, thus increasing the possibility of postoperative respiratory infections.

Materials and methods

Increased saliva production is a characteristic finding supported by literature sources about sevoflurane [5]. As a general anesthetic, sevoflurane is very well tolerated by patients due to the fact that it does not irritate the respiratory tract [6]. It is a soluble anesthetic with a rapid onset of action and rapid renewal, providing high control for adequate anesthesia and rapid recovery of the patient due to its solubility [7].

This study is oriented around finding the clinical effect of this general anesthetic on the increase of saliva and as a consequence the effect of this same anesthetic on the periodontal health of child patients undergoing various surgical procedures under general anesthetic. To make this effect more sensitive in numbers, the study evaluates two groups of patients: those undergoing surgical interventions under the effect of sevoflurane and those undergoing anesthesia with propofol. The PMA index was chosen as an element to evaluate the periodontal status, since with this index the health of the periodontal tissues in different locations, at the level of the marginal gingiva, the attached gingiva and the fixed gingiva, can be evaluated simultaneously [8]. The initial processing of these data was carried out in 2017. In this return about this topic, as authors and co-authors we try to show the data in a different form and way, more tangible in the expression of the results that show quite well the purpose of this study. The starting point for this method of analysis was taken from the study conducted on the laparoscopic treatment of gastroesophageal reflux, period 2009-2013 [10]. One of the classifications of patients in this study was the classification based on the general anesthetic applied, where it is emphasized that the two anesthetics selected are the most useful in cases of pediatric surgical interventions.

The indication to lighten up the night before the surgical procedure with the aim of eliminating different diets and nutrients as influencing salivary flow variances, were plus elements with a positive effect, not conditions of our study, in the procedure of measuring the amount of saliva. This procedure was performed according to the standard protocols for measuring saliva production, during which the patient is asked to bend the head forward and place the ears inside the funnel that collects whatever comes out of the oral cavity, to orient it to the collection tubes [10]. This is a simple invasive technique to be performed with minimal cooperation from the patient [11].

The selection of the PMA index was made on the basis of ease of evaluation and application. The extent of periodontal

disease and its severity is estimated with numbers according to the location in the marginal, fixed or papillary gingiva, with the logic of increasing the number after the corresponding letter, thus indicating the severity of the pathology [3].

Results

The collected data were reorganized in the tables below, where Table 1 shows the results collected respectively for the patients who underwent anesthesia with fentanyl-sevoflurane and fentanyl-propofol on the amount of saliva produced. Table 2 shows the results collected respectively for patients who underwent anesthesia with fentanyl-propofol and fentanyl-propofol on fluctuations in the PMA index.

Table 1: Results collected for patients who underwent anesthesia with fentanyl-sevoflurane and fentanyl-propofol on the amount of saliva produced.

Quantity of saliva	Before surgery	After surgery	The difference
Sevoflurane	1.75 ml në 5 minuta	2.1 ml për 5 minuta	0.35 ml për 5 min
Propofol	2.1 ml në 5 minuta	1.9 ml në 5 minura	-0.2 ml për 5 min
Average	1.9 ml për 5 min	2 ml për 5 min	

Table 2: Collected results, respectively for patients who underwent anesthesia with fentanyl-propofol and fentanyl-propofol on fluctuations in the PMA index.

Index of PMA	Before surgery	After surgery	The difference
Sevoflurane	P1M1A1	P1M2A1	P0M1A0
Propofol	P2M2A1	P2M3A1	P0M1A0
The difference	P1M1A0	P1M1A1	P1M0A1

Regarding the normal values of the salivary flow (0.3-0.4 ml/min) it was taken as the limits to predetermine the pathologies of hypo and hypersalivation, respectively below the value of 0.2 is hyposalivation above the value of 0.4 hypersalivation. Based on these data, Table 3 presents the combined data about salivary flow and healthy or sick status assessed by the PMA index, for patients who underwent surgery under sevoflurane anesthesia. While Table 4 presents the combined data about salivary flow and healthy or unhealthy status assessed by the PMA index, for patients who underwent surgery under propofol anesthesia.

Table 3: This table presents the combined data about salivary flow and healthy or unhealthy status assessed by the PMA index, for patients who underwent surgery under sevoflurane anesthesia.

Analyzed patients	Normal salivary flow - %	Hyposalivation - %	Hypersalivation - %
Healthy	1 – 7%		
Not Healthy	1 – 7%	1 – 7%	4 – 29%
Total	14%	7%	29%

Table 4: This table presents the combined data about salivary flow and healthy or sick status assessed by the PMA index, for patients who underwent surgery under propofol anesthesia.

Analyzed patients	Normal salivary flow - %	Hyposalivation - %	Hypersalivation - %
Healthy	1 – 7%		
Not Healthy	1 – 7%	2 – 14%	3 – 21%
Total	14%	14%	21%

Discussion

The selection of the general anesthetic is mainly based on the duration of the surgical intervention, based mainly on the expected side effects and on the possible complications, if any, for the systemic pathologies to which the patient is referred [10].

The side effect of sevoflurane that drew attention to this topic is the increase in salivary fluid. This effect was also confirmed by the data we collected, since the difference between the average values, in ml for 5 minutes, is 0.36 ml [8]. This figure shows a double increase in the value of normal saliva production, measured per minute. While for the anesthetic propofol, there were no increases in the average values of the collected amount of saliva, in fact, there were cases that were presented with a significant reduction.

Propofol reduced the amount of saliva produced after surgery, while sevoflurane increased it. Although the differences are apparently small, the time during which these values were measured is only 5 minutes, leaving the possibility to be reflected in the 24-hour effect of this anesthetic, the difference of 0.1 ml in 5 minutes before and after surgery is a significant value. Sevoflurane is an inhaled anesthetic while propofol is intravenous. This data leads to changes in the application protocol and the duration and renewal of the patient [11]. The characteristics of inhaled sevoflurane are evaluated in relation to the surgical procedure that will be performed in relation to the time that lasts from post-surgery to extubation in relation to post-surgical pain and the time of exit from anesthesia.

If analyzed for the PMA index, it can be seen that sevoflurane affects the deterioration of marginal gingival health with a value of 1, while propofol has the same effect. In the difference between before and after surgery, it can be seen that the attached gingiva is more sensitive to the aggravation of the pathology. This can probably be explained by the effects at the level of the blood circulation system, for the interdental papilla [8].

If the data is analyzed about normal flow, hypo or hypersalivation, it can be seen that only 14% of the patients included in the study are classified as healthy patients and this is equally divided in the group of patients who underwent anesthesia with sevoflurane or propofol (random allocation). Hyposalivation occurs in 31% of cases and hypersalivation in 50% of cases are data that are associated with 86% of patients with periodontal disease.

Conclusions

According to the assessment with the PMA index, it can be seen that sevoflurane affects the deterioration of the health of the marginal gingiva with a value of 1, while propofol has the same effect. In the difference in values before and after surgery, it can be seen that the attached gingiva is more vulnerable to the aggravation of the pathology. This can probably be explained by the effects at the level of the blood circulation system, for the interdental papilla.

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