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Original Article

Evaluation of changes in paraclinical indexes due to intermaxillary fixation

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Abstract

Introduction: One of the treatment techniques for mandibular and midface fractures is intermaxillary fixation (IMF), but treatment with IMF interferes with normal nutrition, and malnutrition can affect the result of the treatment and patient's recovery.

Methods: Paraclinical factors including lipid profile and protein profile indexes which are diagnostic for malnutrition were evaluated in this study to point out how treatment with IMF changes these indexes. In this study, 60 patients were treated with 4 weeks of IMF, the lipid profile and protein profile indexes for these patients were measured before and after the treatment.

Results: The albumin (Alb) decreased during this period, but a slight increase was shown in the hemoglobin (Hb) level. All lipid profile indexes such as low-density lipoprotein (LDL), high-density lipoprotein (HDL), triglyceride (TG), and total cholesterol (TC) decreased during this period but not statistically significant.

Conclusion: Treatment with IMF could cause a malnutrition situation although not severe, which makes using nutrition supplements considerable in these cases.

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Introduction

Maxillofacial injuries have a high incidence in traumas. According to the statistics of developed countries falling and insult are the main cause of mandibular and facial fractures while in developing countries the most common reason still is motor vehicle accidents.[1-4] In maxillofacial traumas, mandible and maxilla are usually affected. Different treatment plans can be considered for mandibular or midface fractures. One of the treatment options is close reduction via intermaxillary fixation (IMF). In this technique, the occlusion is obtained, and the jaws are maintained in the same relation so that the fracture segments could union in their correct positions.[1,5,6] Although it's a very popular technique, but we should keep in mind that sometimes treatment with IMF can cause some complications such as malunion, nonunion, malnutrition, gum, and periodontal inflammation.[7-10]

IMF interferes with the patient's normal diet. Lots of studies have shown the role of nutrition in the body's healing process.[11-16] It is understandable to consider a relation between IMF, nutrition condition and healing process. There are some studies showing that

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how IMF affects body weight, body mass index (BMI) and other nutrition indexes.[17-20] IMF is even used as a technique to treat extreme obesity.[21-25] Malnutrition comes with different signs and symptoms such as losing more than 10% of body weight, neurologic changes, changes in skin, volume change of subcutaneous fat, hair loss, reduction of serum protein and lipid factors, losing muscle mass and etc. In this study, we evaluated the effects of IMF on paraclinical factors like protein profile and lipid profile which are markers for malnutrition condition, so further thoughts can be given to prevent malnutrition by using different supplements. Because nutrition habits are different in every region and society, it is mandatory to evaluate the effects of close reduction on people in each region to find the best way to face it.

Methods

According to other similar studies and their results 60 patients were analyzed who had received treatment in Imam Reza Educational-Medical Center of Tabriz University of Medical Sciences, Iran. All the chosen patients were aged 15-50 years and had a BMI of 18-30 kg/m^2. For unifying the group of patients, we included only the patients whom undergone 4 weeks of IMF and excluded patients who had any systemic problems such as diabetes, kidney or heart diseases.

Blood sample was obtained from all patients before treatment and lipid profile factors [total cholesterol (TC), low-density lipoprotein (LDL), high-density lipoprotein (HDL), triglyceride (TG)] and protein profile factors [hemoglobin (Hb), albumin (Alb)] were measured at the main central lab of the hospital. All patients got a mandibular or midface fracture which needed treatment. Then all patients were treated with a 4 weeks period of IMF. None of the patients received any supplements during the treatment period. After 4 weeks, a blood sample was obtained again, and all the measurements were redone.

All stages of the study were verified by Ethical Committee of Tabriz University of Medical Sciences which was in accordance with Declaration of Helsinki.

Statistical analysis was performed by SPSS software for Windows (version 16, SPSS Inc., Chicago, IL, USA). Quantitative data were presented as mean ± standard deviation (SD) while qualitative data were demonstrated as frequency and percent (%). In order to statistical analysis, collected data were studied using descriptive statistical methods, the mean difference t-test for independent groups. $P < 0.050$ was statistically considered significant in all steps.

Results

A total of 60 patients were included in this study (36 male and 24 female) with an age average of 28 years. In this study, for evaluating the protein profile, two indexes were measured, Alb of the serum and Hb. Alb's average before the treatment was 4.58 g/dl among the patients and had a range of 3.6-5.9 g/dl, which reduced significantly 0.27 g/dl during the treatment and got to 4.31 g/dl by the end of the treatment ($P = 0.006$). According to Alb index, only one patient had mild malnutrition problem at first but after the IMF period, five patients Alb level were in this category.

The average of Hb before the treatment was 13.12 mg/dl which increased during the IMF period about 0.22 mg/dl and reached 13.34 mg/dl ($P = 0.150$). The mean of TC of patients at the start point of the study was 154.67 mg/dl which ended up 152.15 mg/dl after the 4 weeks of IMF period ($P = 0.420$).

The HDL of the serum of the patients before the treatment had a range of 30-378 mg/dl with a mean of 53.13 mg/dl. After the IMF period, the mean decreased about 1.31 mg/dl and reached 51.82 ($P = 0.630$). The average of LDL was 85.4 mg/dl, which also decreased during the IMF period about 1.30 mg/dl and reached 84.10 mg/dl 82 ($P = 0.340$).

The last index of lipid profile which was evaluated was TG, the average of it decreased

about 6.24 mg/dl (TG) during the IMF period (P = 0.100). The changes of lipid profile indexes in this study were not statistically significant (Table 1).

Table 1. The mean of this study's measurements

Variable	Before IMF (mean)	After IMF (mean)	P
Albomin (g/dl)	4.58	4.31	0.006
Hb (mg/dl)	13.12	13.34	0.150
TC (mg/dl)	154.67	152.15	0.420
HDL (mg/dl)	53.13	51.82	0.630
LDL (mg/dl)	85.40	84.10	0.340
TG (mg/dl)	102.98	96.74	0.100

Alb: Albomin; Hb: Hemoglobin; TC: Total cholesterol; HDL: High-density lipoprotein; LDL: Low-density lipoprotein; TG: Triglyceride; IMF: Intermaxillary fixation

Discussion

In this study, the effects of IMF on biochemical indexes of the patients were evaluated. Alb is one of the body's important proteins, as mentioned before in this study, it faced a reduction of 0.27 mg/dl during the IMF period. Alb is a long term index for malnutrition, it has a half-life of 20 days, so short term changes don't affect it. The IMF period in the current study was 28 days, so Alb was a suitable index to show the patients' nutrition condition.[26] At the beginning of the study, only one patient had Alb at a mild malnutrition level, but after the IMF period five patients got this condition. There was a significant decrease in patients Alb level due to IMF although this reduction was not severe, but it showed the insufficient nourishment condition, which was not a surprise due to the occluded jaws and the inability to intake normal diet of the patients. There wasn't any similar study to evaluate this protein index for malnutrition in IMF period to be compared.

Hb was the other protein index that was evaluated in this study. As mentioned, before the mean of this index showed an increase of 0.22 mg/dl (P = 0.150) although this change seems strange according to the reduction pattern of the body's protein and lipid mass during the malnutrition condition, but it's justifiable. During the IMF period, the patient's mouth is occluded tightly so breathing through the mouth is greatly affected. According to different studies,[27-31] 8-53% of population has mouth breathing, and it supplies up to 70% of the oxygenation in some cases. Because all of our patients have encountered trauma to their faces, their nasal breathing may be affected due to it. Hence, the affected mouth and nasal breathing would create some deal of hypoxia which the body increases the Hb level as a counteraction, like when it's seen in heavy smokers and mountain climbers.[32] We can conclude that the increase in Hb is a physiologic reaction due to its role in oxygenation and not the nutrition condition.

In this study, 4 index of lipid profile is evaluated, and as mentioned before all indexes (TC, HDL, LDL, TG) faced a smooth decrease after the IMF period, although the decrease detected in this study were not statistically significant, but they have the same pattern as was shown for weight, BMI and skinfold thickness after IMF in similar studies.[19-21,23]

Conclusion

We could show according to patients' protein and lipid indexes treatment with IMF can result in malnutrition conditions although not severe. As mentioned before, good nutrition is the key for better and faster recovery, so when close reduction techniques are used as the treatment plan in maxillofacial region, a supplemental nutrition planning is very thoughtful thing to do.

Because there are a variety of nutrition habits in different regions we recommend that similar studies should be done in every region with their nutrition habits and with the use of different supplements to find out the best nutrition plan in each region to avoid malnutrition in patients.

Conflict of Interests

Authors have no conflict of interest.

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