

## Administration of Oral Nutritional Supplements in Patients with Mandibular Fractures Treated with Intermaxillary Fixation

Bustamante Gustavo<sup>1</sup>, Cedeño Alejandro<sup>1</sup>, Peraza Arianny<sup>2</sup>,  
Castellano Jose<sup>3</sup>, Ramos Salomón<sup>2</sup> and Dueñas Greyner<sup>2\*</sup>

<sup>1</sup>D.D.S. Oral Surgeon, Oral Surgery Unit, Dentistry School, Universidad del Zulia and Aggregate Professor, Oral Surgery Post-graduated Program, Dentistry School, Universidad del Zulia, Venezuela

<sup>2</sup>D.D.S. Resident, Oral Surgery Post-graduated Program, School of Dentistry, Universidad del Zulia, Venezuela

<sup>3</sup>D.D.S., Aggregate Professor, Research Institute, Epidemiology Department, Dentistry School, Universidad del Zulia, Venezuela

\*Corresponding Author: Dueñas Greyner, D.D.S. Resident, Oral Surgery Post-graduated Program, School of Dentistry, Universidad del Zulia, Venezuela.

Received: April 16, 2022

Published: June 22, 2022

© All rights are reserved by Dueñas Greyner., et al.

### Abstract

**Introduction:** A significant number of polytrauma patients treated in emergency centers have maxillofacial trauma with mandibular fracture being the most frequent condition. The purpose of this study is to compare the nutritional status of patients with intermaxillary fixation fed with oral nutritional supplements and with a traditional liquid diet.

**Material and methods:** we made a retrospective study of patients with mandibular fractures treated with intermaxillary fixation in the Oral Surgery service of the University Hospital of Maracaibo - Venezuela during the 2015-2018 period, who were divided into a group with traditional liquid diet and oral nutritional support, and another group with a traditional liquid diet, to study the nutritional and anthropometric variations, through weight in kilograms, body mass index, hemoglobin, white blood cell count, absolute lymphocyte count and subjective global assessment at the start of the treatment and after 7, 15, 30 and 45 days.

**Results:** A significant difference between groups was observed. The group with traditional liquid diet and oral nutritional support presented less alteration in the values studied ( $p \leq 0.08$ ).

**Conclusion:** Oral nutritional supplements are of great importance as a nutritional source for patients with mandibular fractures treated only with intermaxillary fixation to avoid weight loss and decrease in body mass index with minimal alteration in metabolism, maintaining their initial nutritional status.

**Keywords:** Malnutrition; Mandibular Fracture; Diet; Intermaxillary Fixation; Oral Nutritional Supplements

### Introduction

Maxillofacial trauma represents one of the main public health problems in all countries. Assaults and automobile accidents have been described as the most common causes, regardless of socio-economic development; with mandibular fractures being the most frequent condition [1]. In the Oral Surgery Service of the

University Hospital of Maracaibo, the main cause of emergency care is for patients with facial trauma involving the mandible, requiring restoration of occlusal balance through closed and/or open reduction. Patients treated with intermaxillary fixation (IMF) show important changes in their diet, due to the impossibility of chewing for 6 weeks; therefore, a strictly liquid diet administered

orally must be followed, which can lead to a low-calorie and low-protein status, triggering decreased weight and body mass index (BMI), loss of positive nitrogen balance, as well as a decreased caloric, mineral and vitamin intake [2]. The objective of this study is to compare the nutritional status of patients with mandibular fractures treated by IMF fed with traditional liquid diet and oral nutritional support (TLD-ONS) and traditional liquid diet only (TLD) in the Oral Surgery Service of the University Hospital of Maracaibo during the period 2015-2018.

## Materials and Methods

### Inclusion criteria

The patients selected met the following criteria: (1) Clinical and radiographic diagnosis of favorable mandibular fractures, single or multiple, that needed the application of IMF as the only and definitive treatment, (2) adults without distinction of gender, physically and mentally fit to participate in the study.

### Study and design population

A retrospective study where the nutritional status of two groups of patients with IMF fed with TLD-ONS versus TLD was compared, using the data obtained regarding body mass index (BMI), weight in kilograms (Kg) and biochemical examinations. The patients were informed of the characteristics of their disease, risks and complications, the benefits of the treatment and the alternatives of the research, making a free decision on whether or not to participate in the study. The patients agreed to participate and signed an informed consent.

The study was carried out on patients who attended the Oral Surgery Service at the University Hospital of Maracaibo – Venezuela, presenting mandibular fractures that merited IMF as the only and definitive treatment. A total of 30 patients underwent the placement of Erich arches and wires for the IMF under local anesthesia, for a period of 6 weeks. Even though open reduction internal fixation (ORIF) is the gold standard for the management of the vast majority of fractures in the maxillofacial complex, in some cases the availability of the necessary material to manage such conditions is not at hand due to several socioeconomic factors. Thus, oral and maxillofacial surgeons need to be able to resolve cases using other alternatives such as IMF. This is a key point to explain the management protocol applied in this study.

After applying rigorous random sampling, each patient was given a number and 15 of them were selected through a statistical software, creating 2 groups of 15 patients each: study group followed TLD-ONS and control group followed TLD. BMI, weight in kilograms, hemoglobin, leukocytes and basal glycemia were measured prior to the procedure and at the 7<sup>th</sup>, 15<sup>th</sup>, 30<sup>th</sup> and 45<sup>th</sup> postoperative day.

This study was approved by the ethics committee of the University Hospital of Maracaibo according to the Helsinki declaration.

### Measurements

From the anthropometric point of view, weight and height were obtained to subsequently calculate the initial BMI. From the biochemical point of view, an initial hemoglobin examination, white blood cell count (WBCC), absolute lymphocyte count (ALC) and glycemia were obtained. Subjective diagnostic methods were also used by performing the subjective global assessment (SGA) to categorize the patient's nutritional status.

Although all cases were managed on an outpatient basis, they were treated with a multidisciplinary approach, including the department of Nutrition and Dietetics, which established an adequate nutritional regime for each patient, which consisted of the balanced administration of proteins, carbohydrates and lipids, processed from a solid to liquid state; even though nutritional requirements are individual for each patient, a minimum of 1,5g of protein per Kg as well as 20-30 cal per Kg was managed as standard. The study group also received an ONS through the use of a nutritional supplement (ENSURE®) for a 6-week period. This supplement is a combination of macro and micro nutrients (28 vitamins and minerals, proteins, fiber, carbohydrates and fatty acids), with a high-calorie formula. Every 100g of the supplement's powder provides 428kcal and every portion of 230ml provides 230kcal.

### Statistical analysis

The information collected in the investigation was subjected to statistical treatment. The data base was managed using Microsoft Excel and a T distribution analysis for 2 groups was applied, using the program IBM SPSS Statistics, 22<sup>nd</sup> version. The authors established the level of statistical relevance with a safety margin of 92%, which represents a P value  $\leq 0,08$ . For the quantitative

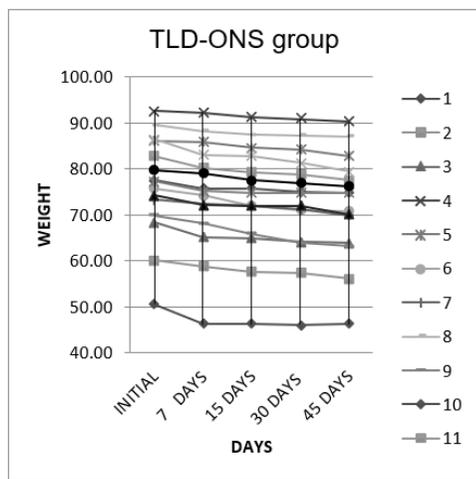
analysis, several tables were elaborated in order to interpret the information and present the final results.

**Results**

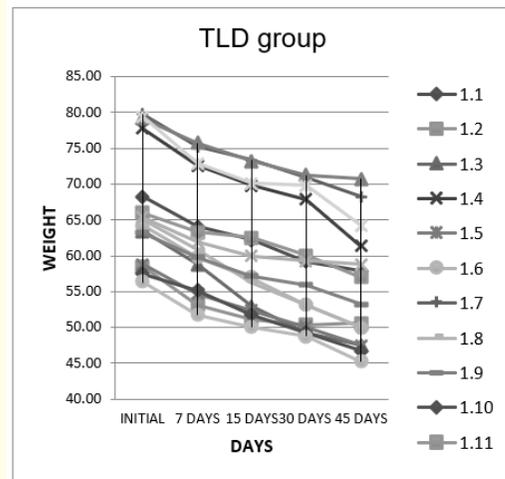
From the 30 patients included, 9 were female (30%) and 21 male (70%). According to the age group, 6 patients were between 11 and 20 years, 13 patients between 21 and 30 years, 8 patients between 31 and 40 years, 2 patients between 41 to 50 years and 1 patient was located in the age group from 51 to 60 years.

According to the anatomical location of the fractures, they were classified into: 6 patients with symphysis fractures, 3 patients with parasymphysis fractures, 8 patients with mandibular body fractures, 3 patients with mandibular angle fractures, 3 patients with fractures at the mandibular ramus and 7 patients at the condyle level.

Regarding weight loss in Kg, an initial measurement was performed at 7 days, 15 days, 30 days and 45 days of the patients in the TLD-ONS group (Graph 1) and in the TLD group (Graph 2). A slight decrease in weight was observed in IMF patients in the TLD-ONS group, with an average total weight loss of 4 Kg vs. 11.58 Kg in the TLD group, showing a marked loss of weight in the group treated with IMF and TLD ( $p \leq 0.08$ ).

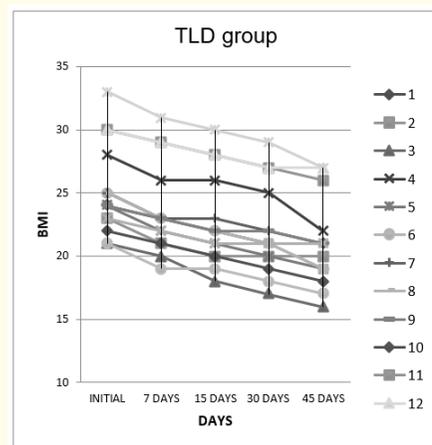


**Graph 1:** Weight measurements in kilograms of patients with mandibular fractures treated with IMF, fed with TLD and ONS.

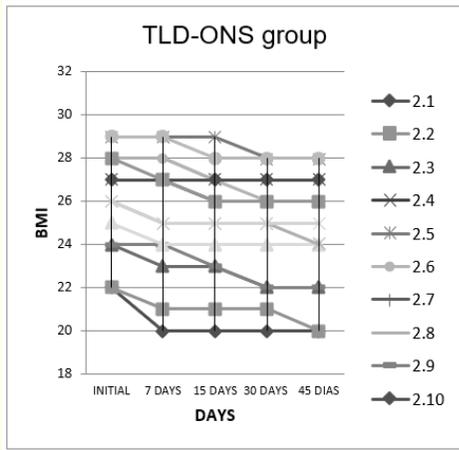


**Graph 2:** Weight measurements in kilograms of the 15 patients with mandibular fractures treated with IMF, fed with TLD.

On the other hand, in the BMI measured at baseline and at day 7, 15, 30, and 45 in the 30 patients in the respective groups, a clear downward trend was observed in all patients as the IMF was performed, with a clearly higher decrease in the TLD group (Graph 3) with an average loss of 4.2 kg/m<sup>2</sup> vs 1.3 kg/m<sup>2</sup> in the patients of the TLD-ONS group (Graph 4). All the patients remained in a normal BMI range, except for 2 patients with mild malnutrition with values of 18 and 17, and one patient with a value of 16 at the end of the treatment in the TLD group ( $p \leq 0.1$ ).



**Graph 3:** BMI of patients with mandibular fractures treated with IMF, fed with TLD.



**Graph 4:** BMI of patients with mandibular fractures treated with IMF, fed with TLD and ONS.

Baseline hemoglobin level of the 30 patients was measured, with a mean value of 13.28 g/dl for the TLD-ONS group and 13.21

g/dl for the TLD group. A significant decrease in the final mean hemoglobin on day 45 for the TLD group with 11.31 g/dl was observed, compared to a mean value of 12.84 g/dl in the TLD-ONS group. ( $p: \leq 0.1$ ) Likewise, the initial values of WBCC were evaluated in both groups, with an average of 7.307 leukocytes/mm<sup>3</sup> in the TLD-ONS group and 7.717 leukocytes/mm<sup>3</sup> in the TLD group. At the end of the IMF treatment, a greater decrease in the WBCC average of 5.396 leukocytes/mm<sup>3</sup> in the TLD group vs 6.307 leukocytes/mm<sup>3</sup> in the TLD-ONS group was observed. The ALC was also evaluated, with an average of 3129 lymphocytes/mm<sup>3</sup> in the TLD-ONS group and 3345 lymphocytes/mm<sup>3</sup> in the TLD group, obtaining a decrease in the ALC average of 2015 lymphocytes/mm<sup>3</sup> in the TLD group, compared to 2695 lymphocytes/mm<sup>3</sup> in the TLD-ONS group ( $p: \leq 0.08$ ). On the other hand, there were no significant differences between the values of glycemia levels in both groups: 72, 66 mg/dl in the TLD-ONS group vs 67,8 mg/dl in the TLD group (Table 1).

Variables	TLD + ONS group		TLD group		P value
	Initial	Final	Initial	Final	
Weight loss	78,15 ± 8,88	74,1 ± 9,35	66,75 ± 8,60	55,11 ± 8,41	$P \leq 0.08$
BMI	26,13 ± 2,29	24,8 ± 2,70	25,5 ± 3,45	20,9 ± 3,39	$P \leq 0.1$
Hemoglobin	13,28 ± 0,94	12,84 ± 0,82	13,21 ± 1,10	11,30 ± 0,94	$P \leq 0.1$
ALC	3128,66 ± 619,23	2694,8 ± 476,76	3345 ± 649,80	2014 ± 424,51	$P \leq 0.08$
Glycemia	85,13 ± 15,01	72,66 ± 6,54	91,13 ± 18,39	67,8 ± 10,29	$P \leq 0.08$

**Table 1:** Average of the study variables for patients with mandible fractures treated with IMF, fed with TLD + ONS and TLD. N (Total N = 30). Data (Mean ± Standard deviation) BMI: Body mass index ALC: Absolute Lymphocyte Count

Finally, the SGA results were obtained at the end of the treatment from the patients in both groups, where it was shown that 14 patients in the TLD group were located in the severely malnourished range and 1 in the moderately malnourished range. Of the TLD-ONS group patients, 8 were located in the well-nourished range and 7 in the moderately malnourished range.

**Discussion**

Morris., *et al.* [3] reviewed the epidemiology and patterns associated with mandibular injuries for a period of 17 years, where the average age of patients was 38 years. Likewise, there was an evident majority regarding the distribution according to gender, being more frequent in males (83.27%). The aforementioned

study, despite representing a larger population, coincides with our study. However, regarding the fracture pattern, a higher prevalence of the mandibular angle was described in 27% of the cases; contrasting with our study where the most frequent location was the mandibular body with 26.6%.

Weight loss is one of the major adverse effects in patients treated with IMF, which may compromise adequate healing. Under this concept, Christensen., *et al.* [4] in a retrospective study of 439 patients with mandibular fractures, measured the changes in body weight associated with the treatment of mandibular fractures, where a loss of 5% of body weight was evidenced in all cases after 7 weeks of treatment.

The TLD in IMF patients usually has low energy content and a range of nutrients that does not compensate for the proteolysis process that occurs in response to trauma, which translates into weight loss. Bobamuratuva, *et al.* [5] conducted a systematic review to analyze the nutritional status in patients with mandibular fractures or orthognathic surgery, where they described that the prescription of ONS, even before the procedure, prevents postoperative complications and reduces healing time.

Similarly, Kondo, *et al.* [6] studied the effectiveness of the ONS team intervention for the management of patients during the IMF period, where they found that weight loss was significantly less prominent in patients with ONS compared to those without support. In the sample evaluated in this work, a behavior similar to that reported by the aforementioned studies was observed, where it was possible to determine significant weight loss from the start of the IMF in the group of patients fed TLD, compared to the group with TLD-ONS.

Yazdani, *et al.* [2] assessed 60 patients treated with IMF for 4 weeks, where an average loss of 2.64 kg was evidenced, the highest weight loss observed was 5 kg in one patient. Regarding BMI, 18 patients were previously categorized as obese, 3 with mild malnutrition and one with severe malnutrition, the rest within normal values. After the treatment period, 6 patients presented mild malnutrition and 2 presented moderate malnutrition. The initial average BMI was 23.11, decreasing 0.58 until reaching 22.53 at the end of the treatment. In the results found in our study, a clear decrease in BMI levels could be observed in both study groups, being greater in the group undergoing TLD; similarly, suboptimal levels of BMI were found only in this group.

Kondo, *et al.* [6] also assessed serum albumin, C-reactive protein and hemoglobin levels, finding initial Hb values on average of 14.19 g/dl vs. 13.83 g/dl at the end of the treatment. In the same way, Yazdani, *et al.* [7] measured albumin and hemoglobin levels and found an increase of 0.22 mg/dl in the 4 weeks of IMF. They associated it with a physiological reaction due to the role of Hb during oxygenation, and not a nutritional condition. In our study, a clear difference was evident between the initial and final values of Hb between the patients of the TLD group and the TLD-ONS group, finding lower values associated with the group of IMF with TLD, which may be related to iron deficiency, vitamin B12 and folic acid due to decreased nutritional requirements without supplements.

Regarding the leukocyte count values, Antila, *et al.* [8] carried out a study where they measured the effects of IMF on leukocytes, lymphocytes, serum trace elements and nutritional status in 17 patients with maxillofacial surgery and observed that the values of zinc and polymorphonuclear cells serum levels were not affected, although leukocytes and specifically lymphocytes did have significant decreases. In our research, a notable decrease in WBCC in the group with TLD was found, at the expense of lymphocytes, compared to the group treated with TLD-ONS, which is closely related to severe weight loss as a result of inadequate and insufficient intake.

On the other hand, Yuanfang, *et al.* [9], in a study carried out with 40 patients, obtained statistically significant differences in body weight, BMI, and peripheral lymphocyte count in the control group when compared to the experimental group at the end of the treatment. They concluded that in patients with IMF due to mandibular fractures, the administration of oral nutritional supplements can help maintain nutritional status and decrease postoperative complications. Likewise, Kendell, *et al.* [10] in a study conducted in patients with IMF and ONS administration concluded that the addition of a high-calorie supplement orally in the daily diet regimen helped maintain nutritional levels at values similar to those before the IMF, which resulted in better results in maintaining body weight and protein. This coincides with the data obtained through the SGA in our study, where patients with TLD-ONS presented better anthropometric measurements and serum values, compared with patients undergoing TLD.

Glycemia levels in this study did not suffer important differences among the 30 patients included. This value is not significant when evaluating major nutritional changes in the medium term (45 days), given that the average lifespan of blood glucose is short and its values might be affected by factors other than nutritional, especially in short periods of time.

Although several studies have used similar methods to compare a specific group of variables, we were not able to find throughout the literature studies that brought together all the values monitored in our work. With the results of this research, it was shown that the administration of ONS represents an important benefit for the patient undergoing IMF since it considerably reduces biochemical and anthropometric alterations, making patients' recovery period more efficient.

## Conclusion

The integration of a multidisciplinary team, including a nutrition specialist, is essential for a better prognosis. Likewise, it is advisable to carry out a protocol for requesting laboratory examinations and measurement of anthropometric values before and during the IMF, to evaluate the results and control them through ONS, helping the healing process of patients, always taking into consideration the possible differences among populations associated with idiosyncrasy, feeding, education and socio-economic status. The results of this study could be also applied in patients undergoing surgical procedures that warrant the administration of a postoperative liquid diet, such as tumor resections or orthognathic surgeries.

## Bibliography

1. Tucker, *et al.* "Characterization and Management of Mandibular Fractures Lessons Learned from Iraq and Afghanistan". *Atlas of the Oral and Maxillofacial Surgery Clinics of North America* 21.1 (2013): 61-68.
2. Yazdani J., *et al.* "Evaluation of changes in anthropometric indexes due to intermaxillary fixation following facial fractures". *Journal of Dental Research Dental Clinics Dental Prospects* 10.4 (2016): 247-250.
3. Morris., *et al.* "Mandibular fractures: an analysis of the epidemiology and patterns of injury in 4,143 fractures". *Journal of Oral and Maxillofacial Surgery* 73.5 (2015): 951.
4. Christensen BJ., *et al.* "How Much Weight Loss Can Be Expected after Treating Mandibular Fractures?". *Journal of Oral and Maxillofacial Surgery* 77.4 (2019): 777-782.
5. Bobamuratova DT., *et al.* "Nutrition of Patients with Jaw Fracture and After Orthognatik Surgery, Review of the Literature". *Journal of Dental Health, Oral Disorders and Therapy* 6.2 (2018): 1-7.
6. Kondo K., *et al.* "Nutritional Support Team Intervention for Patients with Mandibular Fracture Treated by Intermaxillary Fixation". *Journal of Trauma and Treatment* 6 (2017): 402.
7. Yazdani J., *et al.* "Evaluation of changes in paraclinical indexes due to intermaxillary fixation". *Journal of Analytical Research in Clinical Medicine* 3.3 (2015): 138-142.
8. Antila H., *et al.* "The effect of intermaxillary fixation on leukocyte, zinc, serum trace elements and nutritional status of patients undergoing maxillofacial surgery". *Clinical Nutrition* 12.4 (2003): 223-229.
9. Yuanfang L., *et al.* "Diet intervention in patients after fixation of jaw fracture". *Journal of Nursing Science* 16 (2006).
10. Kendell B., *et al.* "Postoperative nutritional supplementation for the orthognatic surgery patient". *Journal of Oral and Maxillofacial Surgery* 40.4 (1982): 205-213.