

# Nutritional evolution after alveolar bone grafting followed by oral nutritional supplementation

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## ABSTRACT

**Objective:** To evaluate the nutritional status of patients after alveolar bone grafting followed by oral nutritional supplementation (ONS) and to determine the need of ONS at home. **Setting:** Hospital for Rehabilitation of Craniofacial Anomalies at University of São Paulo, tertiary care. **Design:** A prospective study with nutritional evaluation at the day before surgery (M1) and at hospital discharge (M2) of all patients submitted to alveolar bone grafting from January to June 2006. The Frisancho criteria were used for nutritional classification. **Patients:** 240 patients, of both genders, taking homogeneous liquid diet without dairy, plus 2 hypercaloric-proteic ONS. **Results:** 62.5% were males and 37.5% were females ( $p = .19$ ), at the same age ( $p = .55$ ). The nutritional status was good for the majority of patients that was kept in the M2. At M1 there was a tendency to significance for males have more to nutritional risk ( $p = .056$ ) and less overweight ( $p = .082$ ) compared to females. From M1 to M2 the females did not show any significant differences, but the males presented more undernourishment ( $p = .008$ ) and less eutrophy ( $p = .006$ ). Males lost more weight and consequently needed more ONS at home. **Conclusions:** The nutritional intervention was helpful for eutrophy maintenance for most patients. Thus, due to the higher need of ONS at home and the higher tendency to undernourishment status for males, the nutritional protocol for this gender was modified, with higher concentration of the caloric-proteic diet density.

**Key words:** Nutritional status; dietary supplementation; alveolar bone grafting.

## INTRODUCTION

Secondary alveolar bone grafting (SABG) is used to rebuild the alveolar cleft, aiming at stabilizing the expansion of the jawbone, reduce the nose stenosis, and promote better face esthetics using bone tissue extracted from the iliac crest to fill the cleft.<sup>1</sup> By this surgical technique, the residual oral cleft at the alveolar process is closed by placement of autogenous cancellous bone.<sup>2</sup>

The first report of free bone grafting in a maxilla with cleft was assigned to Lexer in 1908 (apud Horswell and Henderson,<sup>3</sup>); since then, the surgical technique has been constantly changed and improved.<sup>2,4</sup>

Ideally, surgery should be performed before eruption of the canine at the cleft area, to allow satisfactory bone formation

and occurrence of subsequent tooth eruption though the grafted area, leading to additional physiological osteogenesis.<sup>4</sup>

The main objectives of SABG include mechanical stability of the maxillary complex, achievement of alveolar bone for eruption of the canine, orthodontic movement of adjacent teeth, closure of the persistent oronasal fistula, bone support to the teeth adjacent to the cleft, stabilization of the premaxilla, achievement of continuity of the entire alveolar crest, establishment of ideal alveolar morphology, and achievement of support to the alar base and nasolabial contour.<sup>4,5</sup>

The autogenous cancellous bone achieved from the iliac crest is considered the “gold standard”<sup>4</sup> because it presents a high amount and a larger population of osteoinductive cells and responds to the maxillary growth, orthodontic movement

and tooth eruption stimuli.<sup>6</sup> Other donor areas of autogenous bone for accomplishment of alveolar bone grafting described in the literature include the ribs, tibiae, calvarias, chin and mandible retro molar region.<sup>4,7,8</sup> The main advantages of utilization of iliac crest bone are the need of a second surgical site and the additional morbidity to the patient.

According to Margarido and Ferreira,<sup>9</sup> all surgical distress leads to an organic depression with increase in the nutritional needs that may lead to protein loss, undernourishment, infection and postoperative complications.

In the nutritional level, surgical intervention is characterized by a postoperative period with homogeneous liquid diet for 20 days, followed by 20 days with homogeneous pasty diet and the last 20 days with the same cooked foods, but in small pieces. It should be mentioned that dairy products are not offered during the first 5-7 days postoperatively.

The result of this sequence of interventions may expose the patients to risk of nutritional disturbances and dehydration, with complaints of pain, discomfort, anorexia and nausea, besides significant weight loss and poor healing.<sup>10</sup>

Peres *et al.*<sup>11</sup> evaluated the nutritional status of patients submitted to orthognathic surgery not receiving dietary supplement at 3 different moments (preoperative, at hospital discharge and 30 days after hospital discharge), concluding that the undernourishment stage occurred inside the hospital due to the association of insufficient ingestion and improper diet composition. Thus, they stated that, ideally, at these postoperative periods there should be a chemically defined feeding supplementing the usual diet, for effective and fast reestablishment of the anabolic stage, recovery of integrity of affected tissues and to avoid co-morbidities secondary to surgical manipulation.

Other investigators advocated the utilization of dietary supplements as Ensure®, Enrich®, Sustacal®, Nutrements®, Citrotene® and Meritene® after maxillomandibular surgeries.<sup>8,12</sup>

Recently, Peres *et al.* investigated patients submitted to orthognathic surgery and verified that the introduction of dietary supplements reverted the protein-energy undernourishment induced by surgery, keeping the good nutritional status until removal of intermaxillary fixation.<sup>13</sup> This study was conducted on 11 adult patients submitted to orthognathic surgery kept with maxillomandibular fixation for 40 days with a liquid and homogeneous diet, restricted to milk in the first days. Feeding was fractionated and complemented with hypercaloric and hyperproteic nutritional supplements, which offered 40 to 45 calories per kilogram a day and 1.2 to 1.5 grams of protein per kilogram a day. Besides, the balance of vitamin and mineral salts together with the high protein-caloric density are necessary for maintenance of the nutritional status, quick catabolic status reversion and efficient healing.

This highlights the importance and need to supplement the feeding of these patients, as also advised by Olejko and Fonseca, who used oral dietary supplements at a 50% level of

the estimated caloric needs, observing positive nitrogen balance and maintenance of body weight.<sup>12</sup>

Besides that, the literature recognized the importance of adequate nutritional status in the clinical evolution of hospitalized patients, aiming at preventing postoperative complications.<sup>11,13,14,16</sup> Therefore, evaluation of the nutritional status is fundamental at the beginning, upon admission to the hospital, and periodically thereafter until discharge and/or home care.

Thus, the aim of this study was to evaluate the nutritional status of patients after alveolar bone grafting followed by ONS and to determine the need of ONS at home.

## PATIENTS AND METHODS

The design of this study was prospective and, the study protocol was revised and approved by the Institutional Review Board of the Hospital for Rehabilitation of Craniofacial Anomalies at University of São Paulo (HRAC-USP) and the participants received both written and verbal information about the nature of the study. All patients gave written consent before entry into the study.

The sample comprised all patients submitted to alveolar bone grafting, of both genders, attending the HRAC-USP from January to June 2006.

After the surgical procedure, during hospitalization, all patients cannot chew or bit, so they received standardized diet with homogeneous liquid foods, composed of vegetables, cereals and meat soups, fruit juices and hypercaloric- proteic dietary supplements (2 units of 200ml per day). Dairy products were allowed only after hospital discharge.

The composition of the ONS was: caloric distribution of 13 to 17% of proteins, 30 to 35% of lipids and 45 to 55% of carbohydrates; caloric density of 1.5 calorie per milliliter; proteins with high biological value; osmolality not higher than 500mOsm/l; no gluten or lactose; homogeneous, tasteful, with varied flavors; no need, preferentially, of previous manipulation for modification of flavor. Commercial brands included Ensure Plus HN®, Nutridrink® and Resource Plus®.

In this procedure, SABG, the catabolic status observed during the postoperative period is not different from that observed in other surgical conditions.<sup>16</sup> Thus, offering was standardized at 40 to 45 Cal/Kg/day and 1.2 to 1.5 g P/Kg/day, with adequate amounts of vitamin and mineral. Besides that, specifically after surgery, the importance of vitamins A and C and iron for healing should be highlighted.<sup>13,17</sup> Nutritionists, nurses and psychologists stimulated the patients to eat all standardized foods and meals.

The anthropometrical nutritional status was analyzed by weight and height measurements, compared to the age, at the preoperative day (M1) and at hospital discharge (M2). Analysis followed the criteria of Frisancho<sup>18</sup> for nutritional classification as described below, and is based on data of the National Center for Health Statistics (CDC):<sup>19</sup>

Eutrophy (E) – normal nutritional status for age and gender, i.e. measurements at the 10 to 90 percentiles

Nutritional Risk (NR) – measurements between 5 and 10 percentiles.

Undernourishment (UD) – measurements < 5 percentiles.

Overweight (OW) – measurements between 90 and 97 percentiles.

Obesity (OB) – measurements > 97 percentiles.

All patients losing more than 10% of the acceptable weight received home ONS for 10 days for free. The mean weight loss was monitored.

The ONS protocol was based on weight loss during hospital admission, as follows: for 5-9.9% weight loss, 200ml of hypercaloric and hyperproteic supplement a day, for 10 days; for 10-14.9% weight loss, 400ml of supplement a day, for 10 days, and for 15% weight loss, 600ml of supplement a day, for 10 days.

Statistical analyses were performed using the SigmaStat software for Windows, and included the nonparametric Man-Whitney test for hospital stay, age and weight loss, and the chi-square test (Yates corrected or McNemar) for proportions. A value of  $p < 0.05$  was considered significant, and a tendency for significance when  $0.05 < p < 0.10$ .

## RESULTS AND DISCUSSION

There were no significant differences for age (0.552), gender (0.186) and hospital stay ( $p = 0.552$ ) for the 240 patients in the study (Table 1).

Hypercaloric and hyperproteic diet supplements have been offered at the postoperative period in several studies in the literature, aiming at preventing complications and assuring

the efficacy of surgical treatment.<sup>8,11,12,20,21,22</sup> No previous study has used this type of oral supplementation diet after alveolar bone graft surgery, which emphasizes the importance of this study.

The nutritional status was good for the majority of patients that was kept in the M2. However, despite all diet care, since M1, there was a tendency to significance for higher nutritional risks and lesser overweight for males, which was maintained until M2, with larger overweight for females (Table 2).

When the nutritional status was compared for the same gender between the study moments, it was observed that males showed a significant reduction in eutrophy ( $p = 0.006$ ) and increase in undernourishment ( $p = 0.008$ ). No significant differences in nutritional status were observed for the females (Table 2).

These data, as well as the greater weight loss in males ( $< 0.001$ ), reinforce the need for more home ONS ( $p < 0.05$ ) for this gender (Table 1). There could be insufficient caloric-proteic storages to revert the metabolic distress, in which, according to Cerra *et al.*,<sup>23</sup> to permit the hepatic synthesis of acute phase proteins and other metabolic losses.<sup>23</sup>

Chidylo and Chidylo mentioned that *"the success or failure of surgery may depend on the patient's nutritional competence to allow maximum response of immune defense mechanisms, both against infection and for healing"*.<sup>24</sup>

The same was explained by Heymsfield and Casper<sup>21</sup> and Kendall *et al.*<sup>22</sup>, who described the importance of diet in the nutritional status and consequently to the good postoperative evolution with prevention of complications.

Having in mind that injury and surgical trauma are associated with metabolic responses leading to substrate

Table 1. Sample characterization

	N (%)	Age (years)	Weight loss (kg)	Hospital Stay (days)	Home ONS
		Md (range)	Md (range)	Md (range)	N (%)
Male	150 (62.5)	13.0 (8-27)	1.4 (-2.1 - 5.7)	5 (3- 8)	24 (16.0)
Female	90 (37.5)	12.5 (8-31)	1.0 (-1.8 - 4.4)	5 (3-15)	10 (11.1)
p	0.186	0.552	< 0.001	0.552	<0.05

Table 2. Anthropometric evaluation of the nutritional status.

	Males					Females					p
	E	NR	UD	OW	OB	E	NR	UD	OW	OB	
M1 (%)	74.6	8.7	12.7	3.3	0.7	74.5	2.2	11.1	10.0	2.2	0.056
M2 (%)	69.3	10.0	18.7	1.3	0.7	72.2	7.8	11.1	6.7	2.2	0.082
p	0.006	0.628	0.008	0.248	>0.10	0.724	0.131	0.480	0.248	>0.10	

E = eutrophy; NR = nutritional risk; UD = undernourishment; OW = overweight; OB = obesity

Table 3. Prevalence of undernourishment among patients upon admission, and loss weight during this study compared with other hospital conditions

Studies	% Undernourishment upon admission				Weight loss > 10%		
	N	Males	Females	Total	%		
					Males	Females	TOTAL
Present study	240	12.7	11.1	12.1	1.3	0.0	0.8
Vlaming et al., 2001	692	16.5	17.2	16.8	17.5	16.0	10.0
McWhirter and Pennington, 1994	500	-	-	40.0			(n=12) 3.1kg
					% undernourishment after hospital stay (days)		
Waitzberg et al., 2001	4.000	-	-	48,1	2	3-7	8-15
					33.2	44.5	51.2

mobilization, negative nitrogen balance and characteristic changes in muscle and plasma amino acids, we assume that the metabolic support and anabolic stimulation were well supplied for most patients in this study.<sup>25,26</sup>

Besides these observations, the prevalence of undernourishment among these patients upon admission and the loss weight during the study were smaller than observed in other studies on hospitalized patients.<sup>27,28</sup> Such studies were conducted on hospitalized patients in clinical and/or surgical treatment and without oral anomalies; however, many of them had an acute condition that imposed nutritional risk, whereas in this study the patients were submitted to a totally elective procedure. The undernourishment rate in the present study was even lower compared to Brazilian hospitalized patients.<sup>29</sup> (Table 3).

Thus, the importance of evaluation of the nutritional status during the hospitalization period was clear, in order to observe the insufficient food ingestion and high weight loss and to correct them through organic reposition of the nutrient storages.<sup>29,30</sup>

Considering previous reports in the literature, the increased undernourishment among males and their higher home ONS need, the dietary and anthropometrics protocols after alveolar bone grafting were modified, with increase in caloric-proteic diet density in more than 380 calories and 12.5 grams of protein per day and inclusion of measurements of tricipital skinfold thickness and arm circumference, aiming at having, in a near future, further information about the muscle and fat organic reserves.

## CONCLUSIONS

The dietary intervention was efficient for maintenance of eutrophy for most patients. However, the increase in undernourishment among males and their higher home ONS need emphasize the need of optimization of dietary requirements for this gender. Thus, the dietary and anthropometrics protocols after alveolar bone grafting were changed, with increase in caloric-proteic diet density and inclusion of

measurements of tricipital skin fold thickness and arm circumference. More studies of this kind are necessary to verify the consistency of the gender differences here observed.

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Recebido: 12/12/2008

Aceito: 03/03/2009

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