UNIVERSIDADE ESTADUAL DE CAMPINAS

FACULDADE DE ODONTOLOGIA DE PIRACICABA

CLAUDIO FERREIRA NÓIA

AVALIAÇÃO CLÍNICA E RADIOGRÁFICA PROSPECTIVA DE ALTERAÇÕES FUNCIONAIS EM PACIENTES SUBMETIDOS À REMOÇÃO DE ENXERTOS DE MENTO

Tese de doutorado apresentada à Faculdade de Odontologia de Piracicaba da UNICAMP para obtenção do título de Doutor em Clínica Odontológica, na Área de Cirurgia e Traumatologia Buco-Maxilo-Faciais.

Orientador: Prof. Dr. Márcio de Moraes.

Este exemplar corresponde à versão final da Tese/Dissertação defendida pelo aluno, e orientada pelo Prof. Dr. Márcio de Moraes.

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"Uma corrente é tão forte quanto o seu elo mais fraco".

Henry Ford

RESUMO

Os enxertos ósseos autógenos são atualmente tratamentos viáveis para aqueles pacientes com volume ósseo insuficiente e que desejam receber implantes osseointegráveis. Sendo assim, no presente trabalho buscou-se avaliar prospectivamente as alterações funcionais que ocorrem na área doadora de 30 pacientes submetidos à remoção de enxerto de mento, por meio de avaliação clínica e radiográfica, em um período de 12 meses. **CAPÍTULO I:** Através dos testes neurosensoriais de discriminação de dois pontos, toque estático leve, toque com tração direcional, teste da agulhada e discriminação térmica com estímulo frio e quente, avaliou-se a morbidade da região do mento após remoção de enxerto ósseo. Observou-se que 50% (15) dos pacientes apresentaram morbidade no primeiro mês após a cirurgia, sendo que após 12 meses os testes neurosensoriais não revelaram a persistência de morbidade. O toque estático leve revelou que os pacientes evoluíram de um quadro de sensibilidade diminuída para um quadro de sensibilidade normal após 12 meses. Deste modo, podemos concluir que a morbidade que ocorre após a remoção de enxerto de mento alcança resolutividade em 12 meses. **CAPÍTULO II:** Por meio de teste de vitalidade pulpar ao frio com solução spray refrigerante "Endo Ice", foi avaliada a sensibilidade pulpar de elementos mandibulares após remoção de enxerto ósseo de mento. Sendo assim, 68,82% (181) dos dentes avaliados não apresentaram perda de sensibilidade pulpar no período pós-operatório de um mês, sendo que ao final de 12 meses esse percentual elevou-se para 100% (263) da amostra. Diante disso, conclui-se que 68,82% dos elementos dentários da amostra não sofreram perda de vitalidade pulpar, e que no período de doze meses houve resolutividade dos casos perda de sensibilidade pulpar. **CAPÍTULO III:** Com o objetivo de avaliar a percepção dos pacientes quanto às alterações que ocorrem após a remoção de enxerto do mento, realizou-se uma análise subjetiva utilizando escala visual analógica (EVA) relacionada à sensibilidade, estética facial, alimentação, fonação

e movimentação do lábio inferior. Foi realizada também uma análise objetiva através do teste neurosensorial de toque estático leve. A análise subjetiva revelou que a sensibilidade evoluiu de um quadro de muita alteração para pouca alteração na região do mento ao final do estudo. Já a análise objetiva mostrou que ao final do estudo a sensibilidade encontrava-se normal. Desta forma concluímos que a análise subjetiva evidenciou resultado distinto da análise objetiva. **CAPÍTULO IV:** Através de telerradiografias de perfil realizadas no período pré-operatório, e pós-operatório imediato e tardio, avaliou-se o reparo ósseo após remoção de enxerto do mento. Para isso foram realizadas medições verticais (altura do enxerto) e horizontais (profundidade do enxerto) do defeito ósseo das telerradiografias. Logo após a remoção do enxerto observou-se um defeito vertical de 12.80 ± 1.99 mm e horizontal de 8.33 ± 1.77 mm. Após um ano houve uma diminuição de 32.8% no defeito vertical e 50.3% no defeito horizontal, levando-nos a concluir que o reparo do defeito ósseo foi próximo de 30-50% respectivamente.

Palavras-chave: Enxerto ósseo; Morbidade; Reparo ósseo.

ABSTRACT

The autogenous bone grafts are currently the treatments of choice for patients with insufficient bone volume and wish to receive dental implants. Therefore, this work evaluated alterations occurred in the donor area of 30 patients who undergoing chin bone harvesting by conducting clinical and radiographic assessments over a 12-month period. **CHAPTER I:** To evaluate morbidity in the mental region after bone graft removal the following neurosensory tests were used: two-point discrimination, static light touch, brush directional stroke, pin-prick and thermal discrimination of cold and warm. Therefore, 50% of the patients showed signs of morbidity in the first month after surgery but, after 12 months, it was no longer detectable by neurosensory testing. The static light touch test showed that, over the 12-month period, patients had progressed from a situation of diminished sensitivity to one of normal sensitivity. Accordingly, we conclude that morbidity occurring after chin bone harvesting disappears within 12 months. **CHAPTER II:** Pulp vitality testing was done using cotton swabs sprayed with Endo Ice refrigerant spray to evaluate pulpal sensitivity to cold of lower jaw teeth after chin bone harvesting. Therefore, 68,82% (181) of the teeth tested showed no loss of sensitivity at one month into the post operative period and by the end of the study that figure was up to 100% of the 263 teeth tested in the sample group. It was concluded that loss of pulpal sensitivity not affected 68,82% of the teeth tested and that within twelve months all pulpal sensitivity had been entirely restored**.** **CHAPTER III:** To evaluate patient's perceptions of the alterations that occur after chin bone harvesting, a Visual Analogue Scale (VAS) was used to investigate aspects of sensitivity, facial aesthetics, eating, speaking and lower lip movement. To make an objective analysis of sensitivity, the static light touch neurosensorial test was applied. Subjective analysis showed that sensitivity in the mental region evolved from a condition of considerable alteration initially, to one of little alteration by the end of the study. The objective analysis however showed sensitivity as

being back to normal by the end of the study. Thus conclude that there was a difference between the subjective and objective analysis results. **CHAPTER IV:** Lateral cephalograms of the region taken immediate, intermediate and late postoperative period were used to evaluate bone repair occurring after chin bone harvesting. Vertical and horizontal measurements were made of the resulting bone defect. Immediately after graft removal there was a vertical defect of 12.80 ± 1.99 mm and a horizontal defect of 8.33 ± 1.77 mm. After one year there was a reduction of 32.8% in the vertical defect and 50.3% in the horizontal defect leading us to conclude that 30- 50% of the bone defect had been repaired.

Key Words: Bone graft; Morbidity; Bone repair.

SUMÁRIO

INTRODUÇÃO

Quando o indivíduo perde um ou mais dentes, iniciam-se alterações que resultam em um desequilíbrio entre a formação e a reabsorção óssea no processo alveolar, culminando muitas vezes em atrofias alveolares, que resultam em defeitos em altura e/ou espessura nos maxilares e dificultam a realização de uma reabilitação com implantes dentários osseointegráveis (Mazzonetto, 2008; Nóia *et al.,* 2009).

Alguns fatores podem estar associados, ou até mesmo serem responsáveis pela ocorrência desses defeitos ósseos, e dentre esses fatores podemos destacar a doença periodontal, trauma, destruições patológicas e malformações (Misch, 1997; Garg *et al*., 1998; Weibull *et al*., 2009).

Para possibilitar uma adequada reabilitação dos rebordos alveolares que apresentam esses defeitos ósseos surgiram diferentes materiais que visam à reconstrução desses defeitos: 1- Osso autógeno: Comumente utilizado, e é composto de tecido retirado de uma área doadora e transferido para uma área receptora do próprio indivíduo; 2- Osso homógeno: É obtido de um indivíduo e transferido para outro da mesma espécie (banco de ossos); 3- Osso heterógeno: É retirado de uma espécie e transferido para outra (osso bovino liofilizado); 4- Materiais aloplásticos: São materiais sintéticos apropriadamente tratados (hidroxiapatita e fostato tricálcico) (Bränemark *et al*., 1975; Block *et al*., 1998; Montazem *et al*., 2000; Peterson *et al*., 2002; Chiapasco & Romeo, 2007; Gómez, 2008).

O uso do enxerto ósseo autógeno para tratamento de defeitos ósseos foi mostrado com sucesso em 1975, por Bränemark *et al*., e a partir disso, diversos outros autores também passaram a pesquisar e utilizar esse tipo de enxerto. Nos dias atuais, apesar de ainda gerarem controvérsias e discussões, a literatura

mostra que os melhores resultados clínicos são obtidos com a utilização desta modalidade de enxerto, sendo considerado o padrão ideal para a reabilitação de pacientes que sofreram reabsorção óssea extensa e que desejam instalar implantes, pois estes apresentam propriedades osteogênicas, osteoindutoras e osteocondutoras, além der ser considerado um procedimento com alta previsibilidade (Triplett & Schow, 1996; Misch, 1997; Garg *et al*., 1998; Montazem *et al*., 2000; Cranin *et al.,* 2001; Gapski *et al.,* 2001; Mazzonetto, 2008; Weibull *et al*., 2009; Nóia *et al.,* 2009; Mazzonetto *et al*., 2010).

Atualmente, embasado pela diversidade de estudos com acompanhamentos longitudinais a longo prazo com osso autógeno, é possível afirmar que as bases biológicas envolvidas no processo de incorporação desses enxertos são bastante conhecidas, e que os resultados com este tipo de reabilitação são altamente previsíveis (Triplett & Schow, 1996; Misch, 1997; Garg *et al*., 1998; Montazem *et al*., 2000; Cranin *et al.,* 2001; Gapski *et al.,* 2001; Kluppel, 2008; Mazzonetto, 2008; Chaves-Netto, 2009; Chaves-Netto, 2010).

No entanto, a maioria dos estudos relacionados aos enxertos autógenos está mais preocupada com o aspecto e com as características do enxerto propriamente dito, do que com os cuidados e as alterações que essa remoção do enxerto poderá causar na área doadora (Gapski *et al*., 2001), tanto em relação a questões estéticas quanto funcionais (Nóia, 2011).

Diante disso, faz-se necessário buscar maiores conhecimentos em relação às alterações que ocorrem na área doadora desses enxertos. Nesse sentido, o presente estudo se propõe a avaliar de forma prospectiva as alterações funcionais que ocorrem na região do mento após remoção de enxerto desta área, sendo abordado variáveis como a morbidade, sensibilidade pulpar, reparo ósseo e percepção dos pacientes através de Escala Visual Analógica (EVA).

CAPÍTULO 1

Prospective clinical assessment of morbidity after chin bone harvesting

Abstract: Proposal: The aim of this prospective research was to assess soft tissue morbidity in the symphyseal region after bone harvesting. **Material and methods:** Thirty patients, average age 45, underwent symphyseal bone harvesting and were accompanied for a period of twelve months. Follow-up involved neurosensory testing of two-point discrimination, static light touch, brush directional stroke, pin-prick and thermal discrimination of cold and warm; the statistical analysis used the McNemar test and the Friedman test with p value <0.05. **Results:** The results showed that 50% (15) of patients had statistically significant postoperative morbidity in the first month after surgery (p<0.05); at six months went down to 23.3% (7) and at the end of the monitoring period (one year), the neurosensory tests revealed no persistent morbidity. The static light touch showed that patients evolved from a condition of reduced sensitivity (3) one month after the operation to a condition of normal sensitivity (1) by the end of the study period. **Conclusion:** All neurosensory tests revealed high morbidity in the first month with total resolution at one year of follow-up. It is essential that patients be fully informed regarding temporary sensitivity reduction.

Key words: Surgical complications; Neurosensory alteration; Osseous graft.

INTRODUCTION

The use of the symphyseal donor site for osseous graft reconstruction is a predictable technique with convenient surgical access and sufficient bone (quantity and quality)[1-3] . The embryological origin of this donor site has been

associated to rapid angiogenesis with volume and viability of the application maintained[4-5].

Various applications of chin bone graft have been reported in the surgical literature; it has been applied to orbital floor reconstruction[6], reconstruction of the alveolar cleft[7-8], and inlay/onlay reconstruction of the maxilla or mandible for implant insertion[9].

Most research related to the symphyseal donor site, addresses surgical technique and applications with little consideration for soft tissue management, suture technique or altered sensation of the chin[3,10], so that studies of those issues are required needed.

MATERIAL AND METHODS

The study sample comprised 30 patients, 22 women and 8 men, with ages ranging from 21 to 65 (average 45) all of whom needed to undergo the harvesting of a chin bone graft to be used in alveolar ridge augmentation preparatory to subsequent rehabilitation with implants. None of the selected patients had any medical history of trauma, surgery or alterations to sensitivity in the mental region. Two surgeons conducted the operations using standard surgical techniques.

Surgical procedure

The surgical procedure for graft harvesting involved a horizontal incision in the alveolar mucosa in the inter-canine region, 5 mm below the mucogingival line. Subsequently an incision was made through the mentalis muscles on each side and on down to the bone. After raising the muco-periosteal flap and locating the mental foramina, the osteotomy was carried out using a N° 702 cross-cut fissure burr under constant irrigation with 0.9% physiological saline solution. The

form of each graft block removed was determined by the reconstruction it was destined for but in every case a distance of at least 5 mm was maintained from the roots of the canine teeth, the mental nerves and the base of the mandible. The final removal of the graft block was achieved using chisels. Closure was carried out in two stages. The internal sutures consisted of three stitches using 3-0 suture catgut (Point Suture, Fortaleza-CE) and was designed to achieve precise repositioning of the mentalis muscles. A continuous suture using the same kind of catgut was used for closure of the mucosa. A microporous tape was then placed over the site to minimize edema and hematoma formation. The tape was removed 72hours later.

Evaluation of chin sensation

A single observer carried out the neurosensory tests in the preoperative and postoperative periods, including the first month after surgery, and the sixth and twelfth months. The chin area was divided into six zones (figure 1); each test was done three times for each zone in each period of evaluation; two negative responses from the patient indicated the existence of alterations.

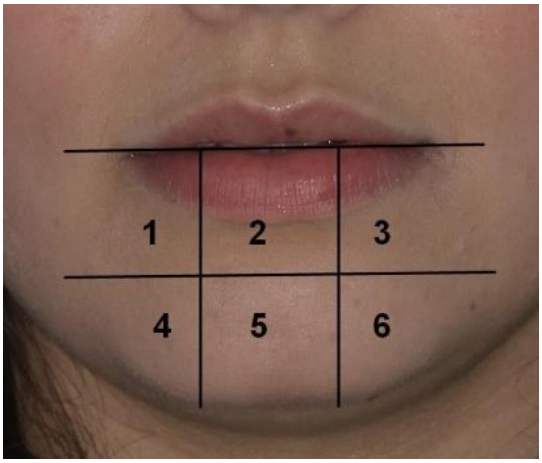

Figure 1: Sub-divisions of the chin region.

The neurosensory tests were:

Two-point discrimination (TPD): executed with a calipers with 10mm separating the two points; the patient recognized the presence of zero, one or two points (figure 2).

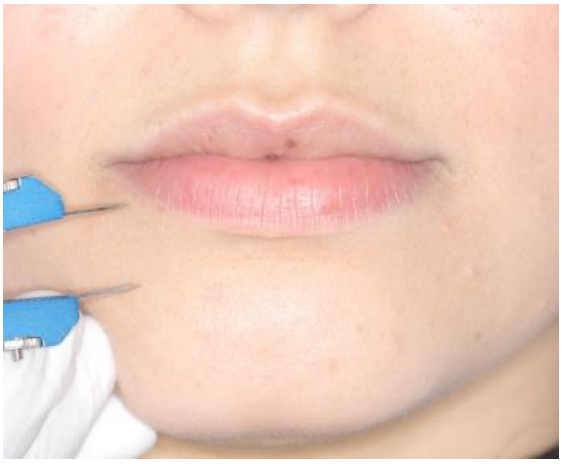

Figure 2: Two-point discrimination.

Static light touch (SLT): 6 nylon monofilaments (Semmes-Weinstein) were used, with same length but with differences in diameter and colors presented the following sequence of colors and bending forces: green (0.05g), blue (0.2g), violet (2.0g), dark red (4.0g), orange (10.0g) and silver red (300.0g). violet (2.0g), dark red (4.0g), orange 10.0g) and magenta (300.0g). The monofilaments were used in sequence beginning with the finest caliber (green) and gradually increasing the caliber until the lowest one for which the patient reported sensitivity was identified. The technique was to press the point of the filament against the patient's skin until it bent and then gently release the pressure and withdraw it (figure 3). The interpretation of the static light touch results was as follows: 1-Green: Normal sensitivity; 2-Blue: Slight loss of sensitivity (but within the range of normality); 3-Violet: Reduced sensitivity; 4-Dark red: Loss of sensitivity; 5-Orange: Loss of

sensitivity but still capable of feeling strong pressure and pain; 6-Magenta: Loss of sensitive to pressure and pain absence.

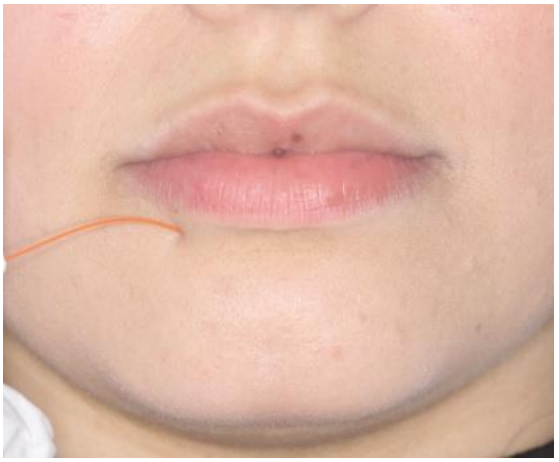

Figure 3: Static light touch.

Brush directional stroke (BDS): with a fine brush a left to right was made and then from right to left, on the soft tissue of the chin. The response was considered negative if the patient failed to identify the direction of the brush stroke (figure 4).

Figure 4: Brush directional stroke.

Pin-prick (PP): the cutaneous tissue of the chin was touched with the point of a 25x7mm needle. The response was considered negative if the patient failed to feel a sensation of slight pain (figure 5).

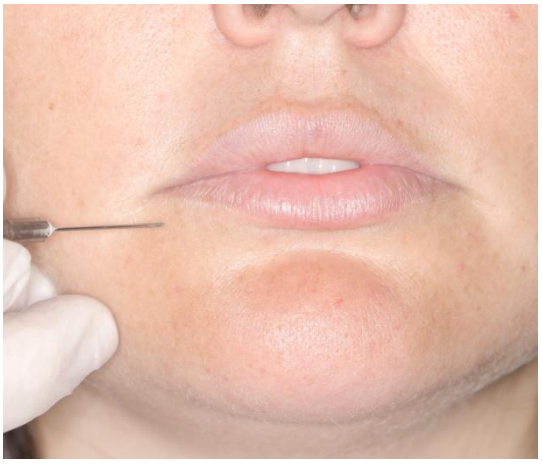

Figure 5: Pin-prick test.

Thermal cold discrimination (TCD): one end of a cotton bud was sprayed with a cooling spray preparation (Endo Ice, Curitiba, Brazil) creating a temperature effect of -50°C and was applied to the soft tissue of the chin. The response was considered negative if the patient failed to feel a sensation of cold (figure 6).

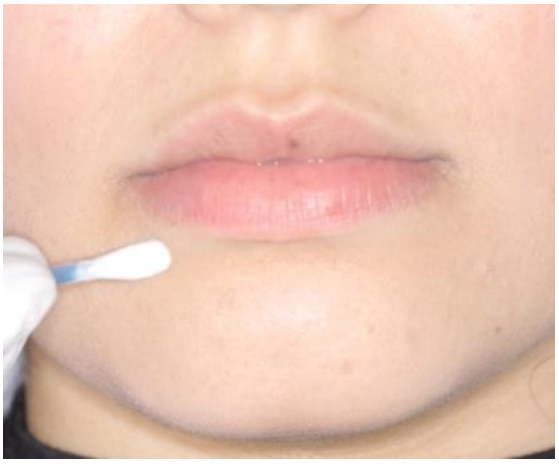

Figure 6: Cold thermal test.

Thermal warm discrimination (THD): a portion of dental impression compound (Kerr, Porto Alegre, Brazil) was heated and applied to the soft tissue of chin. The response was considered negative if the patient failed to feel a sensation of heat (figure 7).

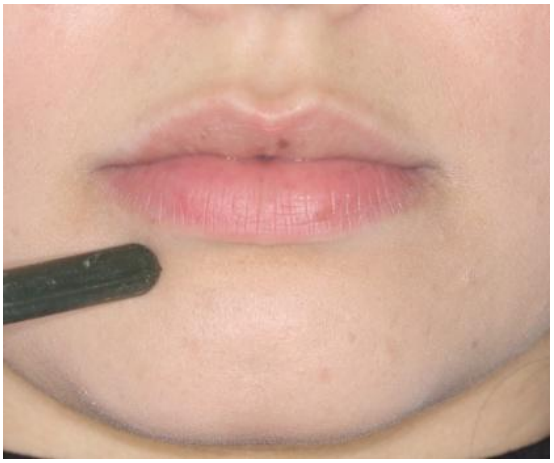

Figure 7: Warm thermal test.

Statistical analysis

First the average values for each test were calculated considering the values obtained for each of the sub-regions and each of the testing periods. Subsequently, McNemar's non-parametric test for two dependent variables was applied. In the case of the static light touch test, Friedman's non-parametric test was applied followed by non-parametric multiple comparisons of the ordinal dependent variables. In all the neurosensory tests the results were compared considering a significance level of 5%.

RESULTS

Tables 1 and 2 present the surgery-related morbidity results.

Table 1- Number and % of patients giving negative answers in the neurosensory testing (except in the static light touch test) for each period of testing and type of test.

MONTH	Neurosensory Tests				
	TPD	**BDS**	**PP**	**TCD**	**THD**
0	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
1	14(47.6%)*	12(40%)*	15(50%)*	10(33.3)*	11(36.6%)*
6	4(13.3%)	4(13.3%)	7(23.3%)*	2(6.6%)	1(3.3%)
12	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)

* differs from month 0 according to the McNemar test ($p \leq 0.05$).

Table 2- Median values for the static light touch test (minimum - maximum), for each period of testing.

MONTH	SLT
0	1 (1-1) A
1	3 (1-4) B
6	2 (1-3) A
12	1 (1-2) A

Medians followed by different letters in the vertical direction differ from one another according to the Friedman test and the nonparametric multiple comparison test ($p \leq 0.05$).

It can be observed that for the first evaluation on day 30 after surgery, all tests indicated neurosensory morbidity with statistical significance ($p<0.05$). In fact, the PP test showed the highest proportion of patients affected (50%, N=15) followed by the TPD (47.6%, N=14). Also in the testing at 30 days the static light touch test showed that all patients experienced some reduction of sensitivity in the chin region (3).

In the six-month evaluation, the PP test only presented 7 patients (23.3%) affected by surgical morbidity but showed that it were statistically significant ($p<0.05$). At the same time the static touch tests showed that patients had somewhat reduced sensitivity but already within a range that could be considered normal (2).

In the one year follow-up there were no neurosensory complications or observable morbidity and all patients had re-established their pre-operative status in terms of sensitivity.

DISCUSSION

The use of various neurosensory tests to obtain an objective evaluation of morbidity and thereby facilitate prognosis and treatment of any alterations to sensitivity occurring in the chin region has been widely described in the literature as a viable, easily performed procedure of proven clinical value. According to Akal *et al.,*[11] (2000) such tests aim to evaluate patient's subjective impressions by means of their responses to standardized testing mechanisms.

Most studies divide the neurosensory tests into two categories: mechanoceptive (two-point discrimination, static light touch, brush directional stroke) and nociceptive (pin-prick and thermal discrimination). They also consider that the two point discrimination test is designed to test for large, myelinated, slow adapting, A alpha sensory nerve fibers, while static light touch and brush directional stroke are also believed to selectively discriminate for large, myelinated, quickly adapting, A alpha sensory nerve fibers. The pin-prick is specific for small, myelinated, A delta and C sensory nerve fibers, while thermal discrimination is specific for small, myelinated and unmyelinated, A delta and C sensory nerve fibers[11-12]. The present study undertook all those tests thereby providing the results with a solid foundation in the literature and a good level of reliability.

The paresthesia related to chin bone harvesting probably resulted from neuropraxia of the incisive nerve or the end branches of the mental nerve and that is one of the major problems for patients after this type of surgery[13]. Furthermore, some researchers report that such complications can persist in up to a third of patients[14,15].

The result of our research showed a high rate of neurosensory alteration in the first month after surgery, with 50% of the sample group experiencing some degree of morbidity. Those figures, however, are low compared to the 80% of patients experiencing alterations reported by Clavero, Lundgren[16] (2003) for the same period of evaluation.

The analysis made for the period six months after surgery showed 23.3% persistence of morbidity for the pin prick test while for static light touch there was some persistence of reduced sensitivity but within limits that could be considered normal (2). Clavero, Lundgren[16] (2003) reported close to 50% of morbidity one year after surgery, involving a 30% reduction in sensitivity in comparison with preoperative levels. Twelve months after surgery, our research detected no signs of morbidity and those results are corroborated by the work of Joshi[17] (2004) who reported a 33% rate of neurosensory alteration shortly after surgery but the complete absence of alterations to sensitivity 12 months after surgery.

Even though the work of some authors confirms the result of this research[17,18] most of them show that the neurosensory alteration persists for longer than 12 months[3,11,13,16,19] . We believe that those differences can be associated to surgical technique, the amount of bone removed, the instruments used in the osteotomy (quality of the drills and refrigeration, for example) and the depth of osteotomy. All authors are unanimous, however, in stating that bone graft harvesting in the chin region is a viable procedure, in spite of the postoperative

morbidity it entails, and that patients must be enlightened and fully informed of the latter aspect.

CONCLUSION

The neurosensory tests revealed that bone graft harvesting in the chin region caused postoperative morbidity in 50% of the patients but disappeared unaided over a period of twelve months, which allows us to state that it is a viable and reliable procedure for the correction of alveolar ridges, but that patients must be fully informed of temporary postoperative losses of sensitivity.

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CAPÍTULO 2

Prospective clinical assessment of pulp sensitivity after chin bone harvesting

Abstract: Proposal: Evaluate tooth pulp sensitivity of mandibular teeth after chin bone harvesting. **Materials and methods:** 30 patients, average age 45, underwent chin bone harvesting and were accompanied for a period of twelve months. Over the period they were submitted to cold testing for pulp sensitivity using cotton swabs sprayed with Endo Ice refrigerant spray to produce a local temperature of -50º C; the statistical analysis used the McNemar test and the Friedman test with p value <0.05. **Results:** Results show that canine teeth are most susceptible to alterations. 68.82% (181) of the teeth tested showed no loss of tooth pulp sensitivity to cold 30 days after surgery (p<0.05), and at the end of the study that figure had risen to 100% (263) of all teeth included in the sample. **Conclusion:** Pulp sensitivity testing showed that 68.82% of teeth not loss of sensitivity and by twelve months after surgery all teeth had recuperated their pulp sensitivity to cold unaided.

Key words: Bone graft. Mandibular symphysis. Morbidity.

INTRODUCTION

The use of autogenous bone grafts for re-structuring atrophied alveolar crests prior to rehabilitation with dental implant placement has become a gold standard treatment. Several studies have shown that the mandibular symphysis is a suitable donor area for such graft material offering easy access and a good quantity bone tissue of a suitable quality[1-4]. The literature also reports that the ectomesenchymal and membranous origin of bone tissue removed from this region ensures early vascularization and the maintenance of its volume and viability

during the period of incorporation, all of which makes its use highly reliable with very successful results[5-8].

Currently the use of this particular donor area is indicated in cases of alveolar reconstruction involving extensions of up to four teeth, or sites involving one or two teeth that require gains in alveolar height and/or thickness. The literature also reports its use in the correction of alveolar-palatine clefts where special care is recommended to avoid any damage to permanent tooth buds[2,6,9].

Most studies on mandibular symphysis grafts focus on the volume of the bone graft itself rather than on the negative consequences that graft harvesting may cause to the donor region or the care that must be taken to avoid them[3,10]. Further studies are needed to accompany and evaluate such alterations.

Accordingly this prospective study sets out to evaluate the effects chin bone harvesting on the tooth pulp sensitivity of teeth in the region.

MATERIALS AND METHODS

The study sample comprised 30 patients, 22 women and 8 men, with an average age of 45 (ranging from 21 to 65), all of whom needed to undergo the harvesting of a chin bone graft to be used in alveolar ridge augmentation prior to rehabilitation with implant placement. Two surgeons conducted the operations using standard surgical techniques.

Surgical Procedure

The surgical procedure for graft harvesting involved a horizontal incision in the alveolar mucosa in the inter-canine region, 5 mm below the mucogingival line. Subsequently an incision was made through the mentalis muscles on each side and on down to the bone. After raising the muco-periosteal flap and locating the mental foramina, the osteotomy was carried out using a N° 702 cross-cut

fissure burr under constant irrigation with 0.9% physiological saline solution. The form of each graft block removed was determined by the reconstruction it was destined for but in every case a distance of at least 5 mm was maintained from the roots of the canine teeth, the mental nerves and the base of the mandible. The final removal of the graft block was achieved using chisels. Closure was carried out in two stages. The internal sutures consisted of three stitches using 3-0 suture catgut (Point Suture, Fortaleza-CE) and was designed to achieve precise repositioning of the mentalis muscles. A continuous suture using the same kind of catgut was used for closure of the mucosa. A microporous tape was then placed over the site to minimize edema and hematoma formation. The tape was removed 72h later.

Evaluation Method

Assessment of tooth pulp sensitivity in the mandibular teeth was done by the same person in the pre-operative period and in the post-operative period at one, six and twelve months. The information obtained was registered in clinical case sheets.

The teeth examined were the mandibular incisors (31, 32, 41, 42), canines (33, 43), and premolars (34, 35, 44 and 45), excluding any teeth that showed signs of periapical lesions, endodontic treatment, extensive caries, extensive restoration or prosthetic crowns.

At the stipulated moments the teeth were individually subjected to cold testing for tooth pulp sensitivity by touching them with the tip of a cotton swab soaked in 'Endo Ice' spray refrigerant producing a local temperature of –50º C and patients were asked to confirm whether they felt it or not (Figure 1).

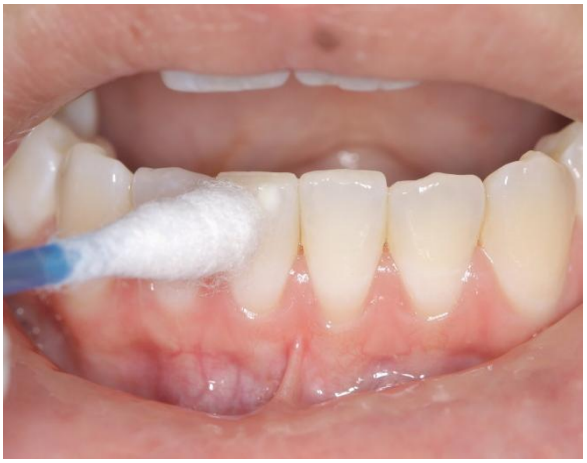

Figure 1: Conducting a tooth pulp sensitivity test.

Periapical radiographs were taken of those teeth for which no pulp sensitivity was registered during the six-month post operative testing to verify the existence of periapical lesions (Figure 2) and whenever that was confirmed the tooth was indicated for endodontic treatment.

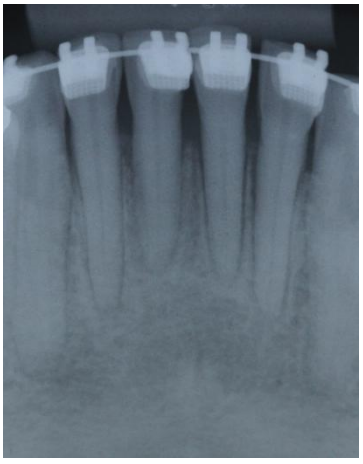

Figure 2: Lateral and central incisors with negative responses to pulp vitality testing six months after surgery. The periapical radiograph shows no evidence of periapical lesions. Twelve months after surgery the teeth showed positive tooth pulp sensitivity responses.

Statistical Method

For statistical analysis purposes, McNemar's non-parametric test for two dependent variables was applied and the results were compared considering a significance level of 5%.

RESULTS

The results obtained from cold testing for tooth pulp sensitivity carried out among the patients included in the sample are set out in tables 1, 2 and 3.

Table 1- Total numbers and percentages of teeth with positive tooth pulp sensitivity responses by period of testing.

Month	Total of teeth
0	263(100%)
1	181(68.82%)*
6	234(88.97)
12	263(100%)

* statistically significant difference from month 0 according to McNemar test ($p \leq 0.05$).

Table 2- Numbers of patients and percentages of teeth with positive tooth pulp sensitivity responses for teeth 31, 32, 33, 34 and 35, according to period of testing.

Month	Tooth (Number of patients)				
	31(n=30)	**32(n=28)**	**33(n=27)**	**34(n=25)**	**35(n=22)**
0	30(100%)	28(100%)	27(100%)	25(100%)	22(100%)
1	17(56.66%)*	14(50%)*	10(37.03%)*	25(100%)	22(100%)
6	27(90%)	24(85.71%)	17(62.96%)*	25(100%)	22(100%)
12	30(100%)	28(100%)	27(100%)	25(100%)	22(100%)

* statistically significant difference from month 0 according to McNemar test (p≤0.05).

Table 3- Numbers of patients and percentages of teeth with positive tooth pulp sensitivity responses for teeth 41, 42, 43, 44 e 45, according to period of testing.

Month	Tooth (Number of patients)				
	41(n=30)	**42(n=27)**	**43(n=27)**	**44(n=25)**	**45(n=22)**
0	30(100%)	27(100%)	27(100%)	25(100%)	22(100%)
1	19(63.33%)*	15(55%)*	12(44.44%)*	25(100%)	22(100%)
6	29(96.66%)	25(92.59%)	18(66.66%)*	25(100%)	22(100%)
12	30(100%)	27(100%)	27(100%)	25(100%)	22(100%)

* statistically significant difference from month 0 according to McNemar test (p≤0.05).

Postoperative testing at 30 days revealed statistically significant alterations to pulp sensitivity in the lower incisors (31- 56.66%; 32- 50%; 41- 63.33%; 42- 55%) and canines (33- 37.03%; 43- 44.44%) ($p<0.05$). At six months however statistically significant alterations only persisted in the canines (33- 62.96%; 43- 66.66%) ($p<0.05$).

Radiographic examinations of teeth that failed to respond to tooth pulp sensitivity testing six months after surgery showed that none of them showed any sign of periapical lesions and by the time the 12 month postoperative testing was conducted all the teeth in the sample patients responded positively to tooth pulp sensitivity tests (100%, N= 263).

DISCUSSION

The basic aim of dentistry is to restore the patient's chewing function, and aesthetic and phonetic normality, irrespective of the existence of any atrophy, disease or lesion in the stomagnathic system[11-12]. To that end, despite the possible introduction of some degree of morbidity, the re-structuring of atrophied alveolar crests using autogenous bone grafts prior to rehabilitation with dental implants has become an ideal standard treatment given the outstanding predictability and long-term success such grafts[1-3,13].

In this study, tooth pulp sensitivity testing conducted 30 days after surgery showed that 68.82% (181) of the teeth tested responded positively while 31.18% (82) failed to respond. At six-months into the postoperative period however 88.97% (234) of the teeth responded positively to the test and only 11.03% (29) continued to give no response. Testing 12 months after surgery showed that all the sample teeth (263) responded positively to tooth pulp sensitivity testing. These findings on alterations to pulp sensitivity subsequent to bone graft harvesting in this region are corroborated by the similar results obtained by Nkenke *et al*.,[14] (2001),

Joshi[15] (2004), Von Arx *et al.,*[4] (2005) and Sbordone *et al*.,[16] (2009). In all their studies it was shown that teeth with negative responses to pulp sensitivity testing caused by the surgical procedure tend to recover a positive response as the post-operative months go by. However none of the above mentioned authors report the recovery of a positive response by all the teeth tested as was the case in the final testing at twelve months in the present study. We believe that those differences can be associated to surgical technique, the amount of bone removed, the instruments used in the osteotomy (quality of the drills and refrigeration, for example) and the depth of osteotomy.

The canines were the only teeth to show persistent statistically significant alterations at the end of the six-month postoperative period. According to Hoppenreijs *et al*.,[9] (1992) and Nkenke *et al*.,[14] (2001) they are the teeth most affected by surgery in the mental region because their roots are so much longer than those of the incisors and they limit the dimensions of osteotomies carried out in the region. Studies conducted by Pommer *et al*.,[17] (2008) indicate that a distance of at least 08 mm from the apices of those teeth should be respected That limits the amount of bony tissue that can be removed and in many cases makes it unfeasible to harvest bone grafts from the region.

In this study, no loss of pulp sensitivity was registered for premolar teeth at any period of testing which leads us to conclude that they are unaffected by chin bone graft harvesting. Similarly, Joshi[15] (2004) reports no observable loss of pulp sensitivity for those teeth in a study conducted with 27 patients. On the other hand Nkenke *et al*.[14] (2001) demonstrated that first premolars may show negative pulp sensitivity after the removal of this type of bone graft. According to Von Arx *et al,.*[18] (2007), in the case of teeth that show no loss of sensitivity there is no significant reduction of blood flow to them stemming from the surgical intervention. All authors are unanimous, however, in stating that bone graft harvesting in the chin region is a viable procedure, in spite of the postoperative morbidity it entails, and that patients must be enlightened and fully informed of the latter aspect.

Loss of tooth pulp sensitivity is a major worry in harvesting bone grafts from the chin region but the findings of this study show that provided a distance of at least 5 mm from the apices of the canines is preserved then any loss of sensitivity is merely transitory and is naturally overcome over a period of twelve months. It is worth highlighting the importance of the periapical radiographic examinations made at the end of the six month postoperative period in the case of teeth that are not responding to the tooth pulp sensitivity test, to identify the possible need for conventional endodontic treatment teeth examined in that way and that show no lesions should be accompanied for a further six months to confirm that twelve months after surgery, normal sensitivity has been restored.

CONCLUSION

The tooth pulp sensitivity testing showed that bone graft harvesting from the mental region not caused a loss of sensitivity in 68.82% (181) of the teeth tested and that the canines were the most affected. With the passing of the postoperative months the percentage gradually increased and by twelve months after surgery all the teeth had recovered their pulp sensitivity unaided.

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CAPÍTULO 3

Evaluation of patient's perceptions of alterations after chin bone harvesting

Abstract: Proposal: The objective of this prospective study was to evaluate patient's perceptions of alterations occurring after chin bone harvesting. **Materials and methods:** 30 patients, average age 45, underwent chin bone harvesting and were accompanied over a period of twelve months. Subjective analyses were made using visual analogue scale (VAS) technique to investigate perceived alterations to sensitivity, facial aesthetics, eating, speaking, and lower lip movement. An objective analysis was done using the neurosensorial test static light touch. The statistical analysis was executed with Friedman test with p value <0.05 for both samples. **Results**: Subjective analysis revealed no alterations (1) to facial aesthetics, eating, speaking or lower lip movement, but sensitivity of the chin region went from a lot of alteration at the beginning of the postoperative period (5) to little at the end of the study (2). Results for the objective analysis showed normal sensitivity in the region after twelve months (1). **Conclusion:** The discrepancy between the subjective and objective analyses may be indicative of the limited capacity of the clinical test to register the patient's subjective impressions with precision.

Key words: Surgery; Bone graft; Morbidity.

INTRODUCTON

Autogenous bone grafts are now the most recommended treatment for patients desirous of undergoing rehabilitation with endosseous implants but who have regions with insufficient bone volume to support them, stemming from re-absorption of the alveolar ridge, periodontal disease, trauma, pathological destruction or malformation. The use of bone from the region of the mandibular symphysis to adapt such regions has been widely reported as a viable and reliable

procedure. The literature also emphasizes the ready accessibility of the region, the suitable quantity and quality of the bone tissue and its ectomesenchymal origin, which ensures early vascularization and the maintenance of volume and viability during the period of its incorporation[1-5].

The use of this particular donor area is indicated in cases of alveolar reconstruction involving extensions of up to four teeth, or sites involving one or two teeth that require gains in alveolar height and/or thickness. It can also be used in the correction of alveolar-palatine clefts where special care must be taken not to damage the tooth buds of permanent teeth[2,5-6].

Most studies on mandibular symphysis grafts focus on the volume and conditions of the bone graft itself rather than on procedures to take care of the soft tissues involved in the donor area or the alterations to them it may cause[3,7],. Thus studies are needed to accompany the alterations to soft tissues after the bone graft material has been harvested from this particular donor area.

Accordingly this prospective study undertook an evaluation of the patient's perceptions of the alterations occurring after chin bone harvesting.

MATERIALS AND METHODS

30 patients made up the study sample, 22 women and 8 men, with an average age of 45 (ranging from 21 to 65 years old), all of whom required the harvesting of chin bone grafts to be used in alveolar ridge augmentation preparatory to rehabilitation with implants. None of the patients had any background of trauma, previous surgery or alterations to sensitivity in the chin region. Two surgeons conducted the operations using standard surgical procedures.

Surgical Procedure

The surgical procedure to harvest the graft involved a horizontal incision in the alveolar mucosa in the inter-canine region, 5 mm below the mucogingival line. Subsequently an incision was made through the mental muscles on each side and on down to the bone. After raising the muco-periosteal flap and locating the mental foramens the osteotomy was carried out using a N° 702 cross-cut fissure burr. The form of each graft block removed was determined by the reconstruction it was destined for but in every case a distance of at least 5 mm was maintained from the roots of the canine teeth, the mental nerves and the base of the mandible. The final separation and removal of the graft block was achieved using chisels. Synthesis was carried out in two planes. The internal sutures consisted of three points using 3-0 suture catgut (Point Suture, Fortaleza-CE) designed to achieve the precise repositioning of the mental muscles. The synthesis of the mucosa was done by a continuous suture using the same kind of catgut. A microporous tape was then placed in the region to minimize edema and haematoma formation. The tape was removed 72hours later.

Evaluation Method

Subjective evaluation of patient perception was done using Visual Analogue Scale testing –VAS. Objective evaluation of morbidity in the soft tissues in the chin region was done using the static light touch neurosensorial test. All VAS testing was done by the same person in the preoperative period and then again at one month, six months and twelve months after surgery. All static light touch testing was also done by a single person, at the same intervals of time. All the collected information was transferred to a clinical case-sheet.

Subjective Evaluation –VAS

A horizontal line, 10 cm long, was the scale and patients were asked to mark an X on the line indicating their perception of the extent of alterations in the

chin region after surgery. The left extremity of the line corresponded to 'no alteration' and the right to 'a lot of alteration'. The individual variables evaluated in this way were sensibility (SEN), facial aesthetics (FAE), eating (EAT), speaking (SPK) and lower lip movement (LLM).

To analyze the results, the line was divided up into 2 cm-long sections corresponding to the following perceptions: section 1: no alteration; section 2: a little alteration; section 3: a reasonable amount of alteration; section 4: a enough alteration; and section 5: a lot of alteration.

Objective Evaluation- static light touch test

For the purpose of this test the chin region was divided into 6 sub-regions. 6 Semmes-Weinstein nylon monofilaments (Sorri-Bauru, Bauru, São Paulo, Brazil) of equal length but different colors and diameters were used. The colors and associated bending forces were as follows: green (0.05g), blue (0.2g), violet (2.0g), dark red (4.0g), orange 10.0g) and magenta (300.0g). The monofilaments were used in sequence beginning with the finest caliber (green) and gradually increasing the caliber until the lowest one for which the patient reported sensitivity was identified. The technique was to press the point of the filament against the patient's skin until it bent and then gently release the pressure and withdraw it (Figure 1).

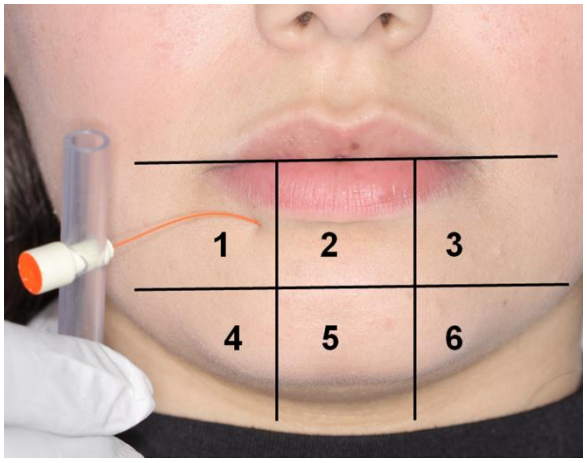

Figure 1: Static light touch test.

The interpretation of the static light touch results was as follows: 1-Green: Normal sensitivity; 2-Blue: Slight loss of sensitivity (but within the range of normality); 3-Violet: Reduced sensitivity; 4-Dark red: Loss of sensitivity; 5-Orange: Loss of sensitivity but still capable of feeling strong pressure and pain; 6-Magenta: Loss of sensitive to pressure and pain absence.

Statistical Method

First the mean values for the static light touch test were calculated considering all sub-regions of the chin and each period of evaluation. Later the data obtained from this test and the VAS tests were analyzed using the Friedman non parametric test for multiple comparisons. The significance level was determined as 5%.

RESULTS

An analysis of the results of the subjective VAS tests shows that most patients reported a lot of alteration in sensitivity in the chin region during the first month after surgery (5), but by the six-month evaluation the alterations had decreased (3). The evaluation made 12 months after surgery shows that patients showed little loss of sensitivity (2) but that the loss was statistically significant ($p<0.05$). In regard to facial aesthetics, speech and lower lip movement, patients reported no alterations (1) at the end of the study (Table 1).

Table 1- Medians for VAS results (minimum – maximum), according to each variable and each period of evaluation.

MONTH	VAS				
	SEN	**FAE**	**EAT**	**SPK**	**LLM**
0	1 (1-1) A	1 (1-1) A	1 (1-1) A	1 (1-1) A	1 (1-1) A
1	5 (2-5) B	2 (1-3) B	1 (1-3) A	1 (1-3) A	2 (1-4) B
6	3 (1-5) B	1 (1-2) A	1 (1-3) A	1 (1-2) A	1 (1-3) A
12	2 (1-5) B	1 (1-1) A	1 (1-2) A	1 (1-1) A	1 (1-2) A

Medians followed by different letters in the vertical columns differ from one another in the Friedmen non parametric multiple comparisons test ($p \leq 0.05$).

The objective assessment carried out using the static light touch test showed a loss of sensitivity in the mental region during the first month after surgery (3) ($p<0.05$), but sensitivity had improved by end of the six-month post-operative period (2). In the evaluation made 12 months after surgery, sensitivity of the chin region had returned to normal levels (1) (Table 2).

Table 2- Medians for the Static light touch results (minimum - maximum), taking the average of the sub-regions of the chin, according each of the periods.

MONTH	Static light touch
0	1 (1-1) A
1	3 (1-4) B
6	2 (1-3) A
12	1 (1-2) A

Medians followed by different letters in the vertical column differ from one another in the Friedmen non parametric multiple comparisons test ($p \leq 0.05$).

DISCUSSION

Dental implant rehabilitation seeks to restore: patient's ability to mastigate, oral comfort, facial aesthetics and speech normality, irrespective of the existence of any atrophy, disease or lesions to the stomatognathic system [8-9]. Biomaterials like autogenous, heterogenous and homogenous bone have been used to restore atrophied alveolar crests in preparation for installing dental implants. Although some controversy and discussion still persist, studies have shown that the use of autogenous bone gives the best clinical results, making the long term success of rehabilitation more reliable[1-3,6]. Most of the patients undergoing this type of grafting procedure experience some post-operational morbidity but it is transitory and considered to be acceptable[2-4,10].

This study the subjective evaluation using VAS technique showed that facial aesthetics, eating, speech and lower lip movements were little affected by the harvesting of chin bone grafts (2). Sensitivity in the region, however, showed a lot of alteration (5), but, as the postoperative period progressed, the situation steadily improved and by the end of the study most of the patients reported relatively little alteration (2). Similar results have been reported by Raghoebar *et al.*,[11] (2001), Mazzonetto *et al.*,[12] (2004), Booij et al.,[10] (2005) and Weibull *et al.*,[3] (2009) all of whom assessed subjective impressions of patients undergoing this type of bone graft surgery and also observed that most patients reported alterations in sensitivity. The authors noted that patient's daily routines were unaffected, and that most of them had a positive opinion of the surgery and would readily submit to it again, should it prove necessary.

According to Ghali & Epker,[13] (1989) and Akal *et al.*[14], (2000), the static light touch test is designed to make an objective assessment of morbidity and assist in the treatment and prognosis of any alterations occurring after chin bone harvesting. It is considered a reliable clinical test given the standardization of all the procedures involved.

The objective evaluation made in this study using static light touch test showed that patient's experienced morbidity in the post-operative period gradually evolving from a situation of diminished sensitivity (3) to one of normality by the end of the study (1). Morbidity associated to this type of procedure is reported in the literature as a common occurrence, and, in a study conducted by Joshi,[15] (2004), it was reported in 33% of the patients. Because of that, Raghoebar *et al.,*[11] (2001), Joshi,[15] (2004), Von Arx *et al.,*4 (2005) and Dik *et al*.,[5] (2010) all declare that it is of fundamental importance to fully inform patients about the loss of sensitivity associated to bone graft surgery.

A comparison of the data obtained from subjective analysis and that obtained from the objective analysis shows discrepancies. While the subjective analysis shows that at the end of the study period some patients still reported alteration to sensitivity in the chin region, the objective analysis showed sensitivity in the region as being normal for all patients at the end of the same period. Raghoebar *et al*.,[11] (2001) and Weibull *et al*.[3] (2009) also made the comparison between subjective results and objective results obtained with patients submitted to chin bone harvesting and their results were similar to the results obtained by the authors of the present study. A possible explanation for the discrepancy in the results may be the limited sensitivity of the neurosensorial test to detect the patients' subjective impressions with the necessary precision, which is in disagreement with the reports of Ghali & Epker,[13] (1989) e Akal *et al.,*[14] (2000).

CONCLUSION

Subjective analysis using the VAS method revealed that there was persistent alteration to sensitivity in the mental region at the end of the 12-month study period whereas objective assessment using static light touch testing showed sensitivity as being normal. That may be indicative of limited sensitivity of the latter test to register the patient's subjective impressions with precision.

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CAPÍTULO 4

Estudio radiográfico prospectivo de la reparación ósea posterior a la remoción ósea de mentón

RESUMEN: Proposición: El objetivo de esta investigación fue establecer la existencia de la reparación ósea en el defecto creado en sínfisis debido al retiro de hueso. **Material y métodos:** Treinta pacientes (22 mujeres, 8 hombres) de entre 21 y 65 años fueron operados para retirar hueso de mentón que fue posteriormente aplicado en reconstrucción ósea alveolar; las cirugías fueron realizadas por dos cirujanos maxilofaciales y los pacientes fueron evaluados con telerradiografías en la etapa preoperatoria, postoperatoria inmediata (PIn) y postoperatoria tardía (PTar), donde se realizaron medidas horizontales (profundidad del injerto) y verticales (altura del injerto) del defecto óseo; los valores fueron estudiados con la prueba *t* de Student con valor de $p<0,05$. **Resultados:** Luego del retiro óseo se observó un defecto vertical promedio de 12.80 ± 1.99 mm y horizontal de 8.33 ± 1.77 mm; luego de 1 año, se obtuvo una disminución de 32,8% (8.60 ± 1.92) en el sentido vertical y 50,3% (4.14 ± 1.21) horizontal, presentando significancia estadística ($p<0,05$) en relación al Pin. **Conclusión:** Se concluye que existe reparación ósea del defecto originado en sínfisis siendo próximo al 30-50% del defecto vertical y horizontal, respectivamente, en la evaluación de un año posterior a la cirugía.

Palabras clave: Sitios donante intraoral; Injerto óseo; Reparación ósea.

Abstract: Proposal: The aim of this research was to establish the presence of bone repair into osseous defect caused by removal of bone. **Materials and methods:** Thirty patient (22 female, 8 male), range 21 to 65 year old were submitted to surgery for chin bone harvest and alveolar reconstruction: the surgery were executed by two maxillofacial surgeons and the patient were evaluated with lateral radiography in the preoperatory stage, early postoperatory and late postoperatory; were realized horizontal and vertical measures of bone defect; the

dates were analyzed with a Student t test with a value of $p<0.05$. **Results:** After of bone harvest was observed a vertical defect of 12.80 ± 1.99 mm and horizontal defect of 8.33 ± 1.77 mm; after one year, the defect decreased to 32.8% (8.60 ± 1.92) in vertical evaluation and 50.3% (4.14 ± 1.21) in the horizontal evaluation, with a statistical significance ($p<0.05$) related to early postoperatory stage. **Conclusion:** We conclude that exist a bone repair of mandibular symphysis defect being close to 30-50% in a one year follow-up.

Key words: Intraoral donor; Bone graft; Bone repair.

INTRODUCCIÓN

La reconstrucción ósea previo a la instalación de implantes óseointegrados es una técnica debidamente documentada con altas tazas de éxito (Deatherage 2010). Del punto de vista biológico, la mejor opción reconstructiva está en el hueso autógeno (Deatherage, Olate et al. 2007), existiendo algunas opciones intraorales que pueden ser utilizadas para retirar el hueso necesario; de entre ellos, la rama de mandíbula (Verdugo et al. 2009) y la sínfisis mandibular (Montazem et al. 2000) han sido popularizados por su capacidad de entregar amplias cantidades que permiten injertar en sitios que requieren instalación de implantes o reparar fisuras alveolares.

La sínfisis y parasínfisis mandibular ha sido utilizada por su capacidad de aportar hueso cortical y esponjoso y por el rápido acceso quirúrgico que presenta (Hoppenreijs et al. 1992), siendo aplicada en diferentes condiciones clínicas (Sindet-Pedersen & Enemark 1988, Precious & Smith 1992). Anatómicamente, esta región presenta estructuras importantes a considerar como los forámenes mentales con su paquete vascular y nervioso mental, músculos mentales y raíces dentarias (Montazem et al.), lo que justifica buena parte de las complicaciones y secuelas de esta cirugía. De esta forma, se ha identificado

complicaciones postoperatorias como la parestesia regional, lesiones a rices dentarias, ptosis de labio, alteraciones en el contorno facial, entre otras (Raghoebar et al. 2001, Sbordone et al. 2009), que exigen del cirujano un amplio conocimiento de la técnica y de las condicionantes anatómicas del sector.

A pesar de todo, uno de los elementos poco estudiados hasta ahora es la reparación ósea que existe en el defecto creado en la sínfisis. Cuando se retira el hueso necesario, permanece un defecto en sínfisis que posteriormente debe repararse; de esta forma, el objetivo de esta investigación es identificar la reparación ósea existente en sínfisis mandibular luego de retirar un bloque óseo para reconstrucción alveolar.

MATERIAL Y MÉTODOS

Fueron estudiados 30 pacientes (22 mujeres y 8 hombres) sometidos a remoción de hueso de mentón para cirugía de aumento de hueso alveolar con objetivo de instalar implantes óseointegrados; la edad media de los pacientes fue de 45 años (rango entre 21 y 65 años). Estos pacientes no tenían historia de trauma o cirugías en la región del mentón. Esta investigación fue aprobada por el comité de ética de la Facultad de Odontología de la Universidad Estadual de Campinas con el número 040/2009.

Procedimiento quirúrgico

Las cirugías fueron realizadas por dos cirujanos. El acceso quirúrgico consistió de una incisión (hoja 15 en bisturí frio) realizada 5mm inferior a la línea mucogingival iniciando en el sector derecho, inferior al canino ipsilateral y finalizó a nivel del canino del lado izquierdo; posteriormente fue realizada la incisión de los músculos mentales en la misma dirección hasta llegar a periostio, momento en el que fue rebatido un colgajo de espesor total con descolamiento total hasta la región del margen basilar de sínfisis. A continuación fueron observados los

forámenes mentales del lado izquierdo y del lado derecho y fue establecido el límites de la osteotomía 5mm inferior al ápice de los dientes inferiores, 5mm superior al margen basilar de mandíbula y 5mm hacia medial de ambos forámenes. La osteotomía fue realizada con fresa tronco cónica Nº 702 montada en pieza de mano, bajo constante irrigación de suero fisiológico al 0,9%. La longitud y magnitud de la osteotomía fue establecida en base a la necesidad de la reconstrucción; la remoción final del injerto fue realizada con cinceles curvos y rectos de. La síntesis fue realizada con tres puntos de sutura de tipo cat-gut cromado 3-0 (Point Suture, Fortaleza-CE), cuidando de mantener la adecuada reposición muscular. La síntesis de mucosa fue realizada mediante sutura continua con el uso de la misma sutura cat-gut 3-0. Posterior a la sutura fue instalado en región de mentón una cinta adhesiva con el objetivo de limitar el hematoma y edema presente; la cinta fue retirada a las 72h de realizado el procedimiento.

Método de evaluación de imagen

Fueron realizados estudios con telerradiografía en la etapa preoperatoria (Pop), postoperatoria inmediata (PIn) (30 días postquirúrgico) y postoperatoria tardía (PTar) (12 meses postquirúrgico). Las imágenes radiográficas fueron captadas por el mismo operador y en el mismo equipo radiográfico. La telerradiografía inicial fue la base de las comparaciones radiográficas posteriores con la que se identificó el contorno óseo y de tejido blando (figura 1).

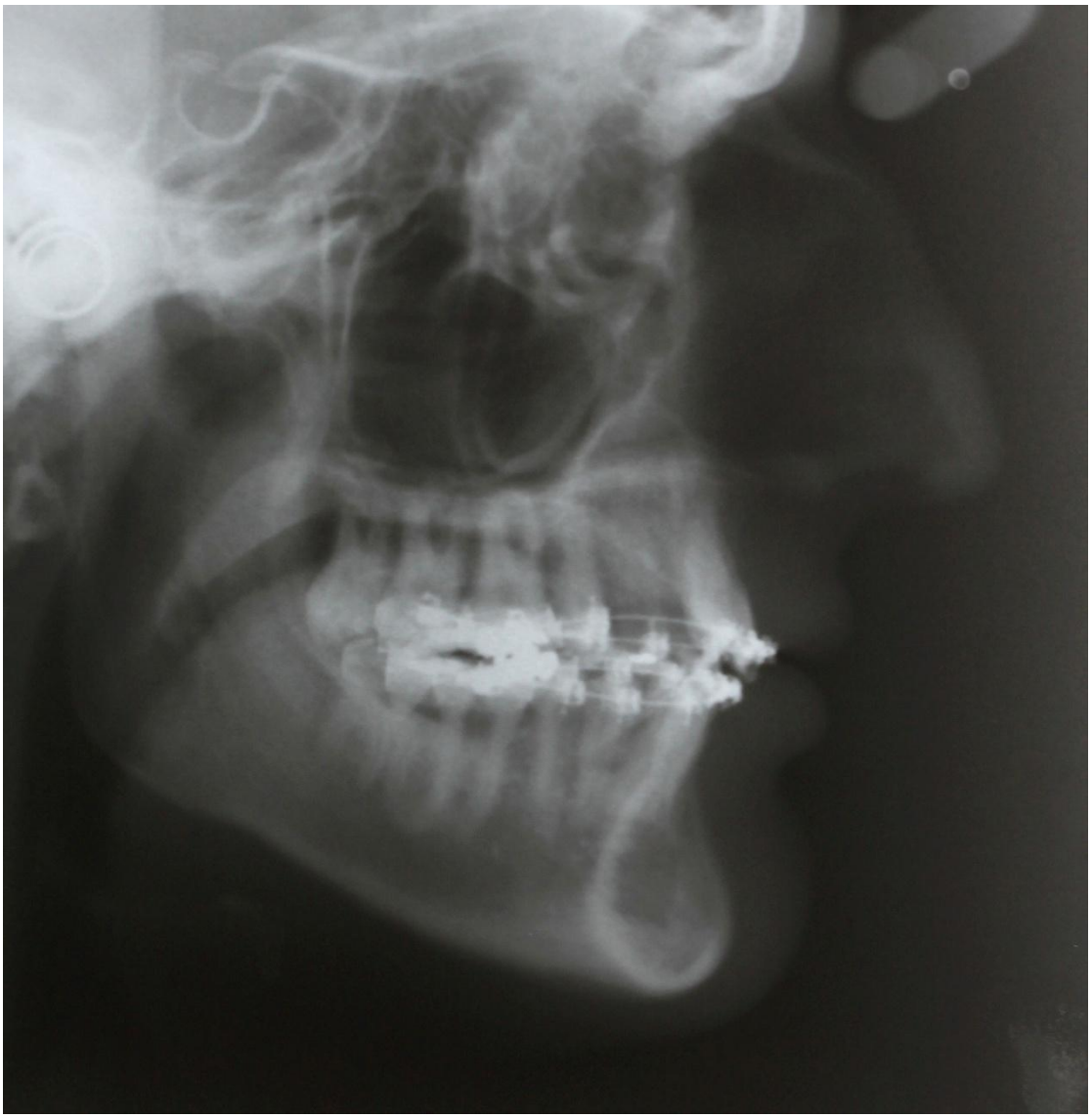

Figura 1: Imagen radiográfica preoperatoria utilizada para realizar la evaluación inicial.

Las medidas realizadas en la radiografía PIn y PTar fueron:

Vertical: distancia existente entre el margen supero-anterior del defecto óseo y el margen ínfero-anterior del mismo (medición en línea recta; corresponde a la altura del injerto) (figura 2).

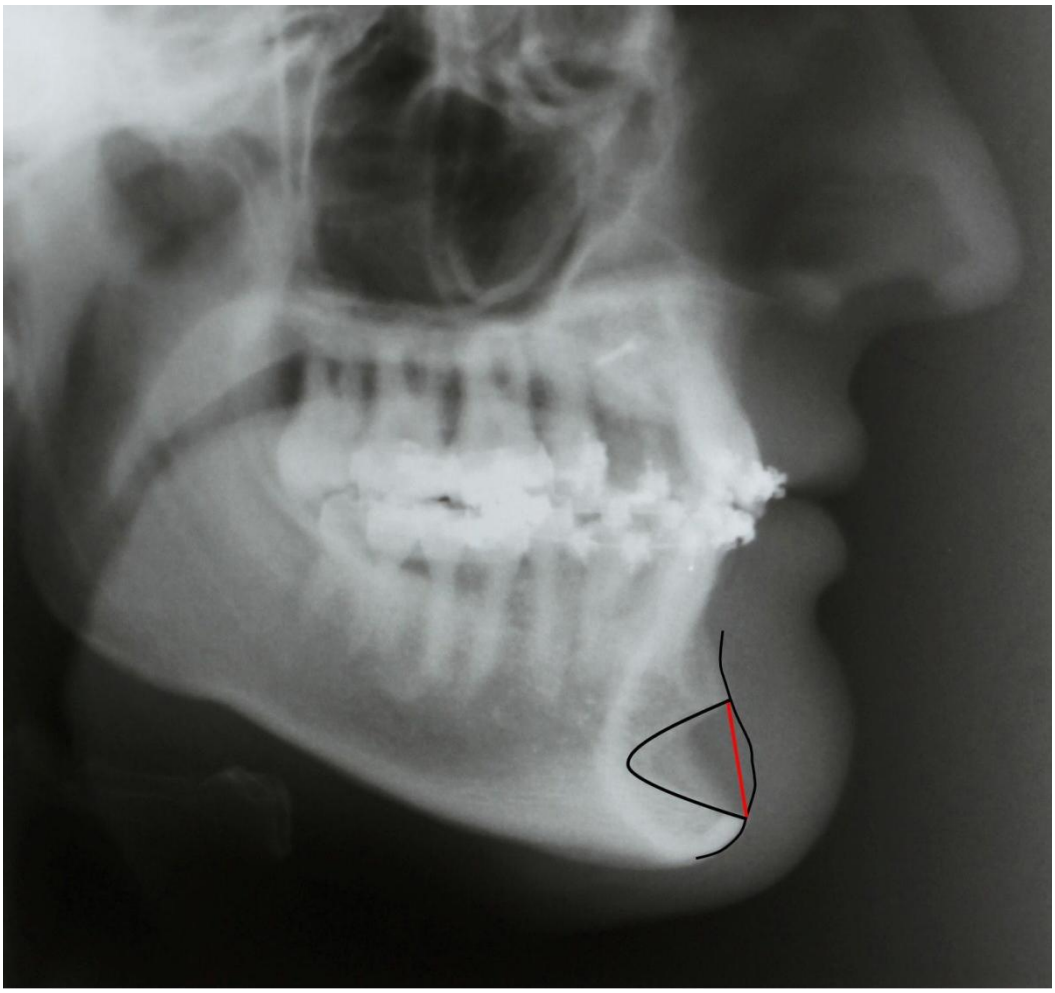

Figura 2: Dirección de la medida vertical entre los puntos ya señalados en el Pin (Línea roja).

Horizontal: distancia existente entre el punto más posterior del defecto óseo y la intersección con la línea del contorno óseo (la telerradiografía inicial sirvió de base para la determinación de esta línea; corresponde a la profundidad del injerto) (figura 3).

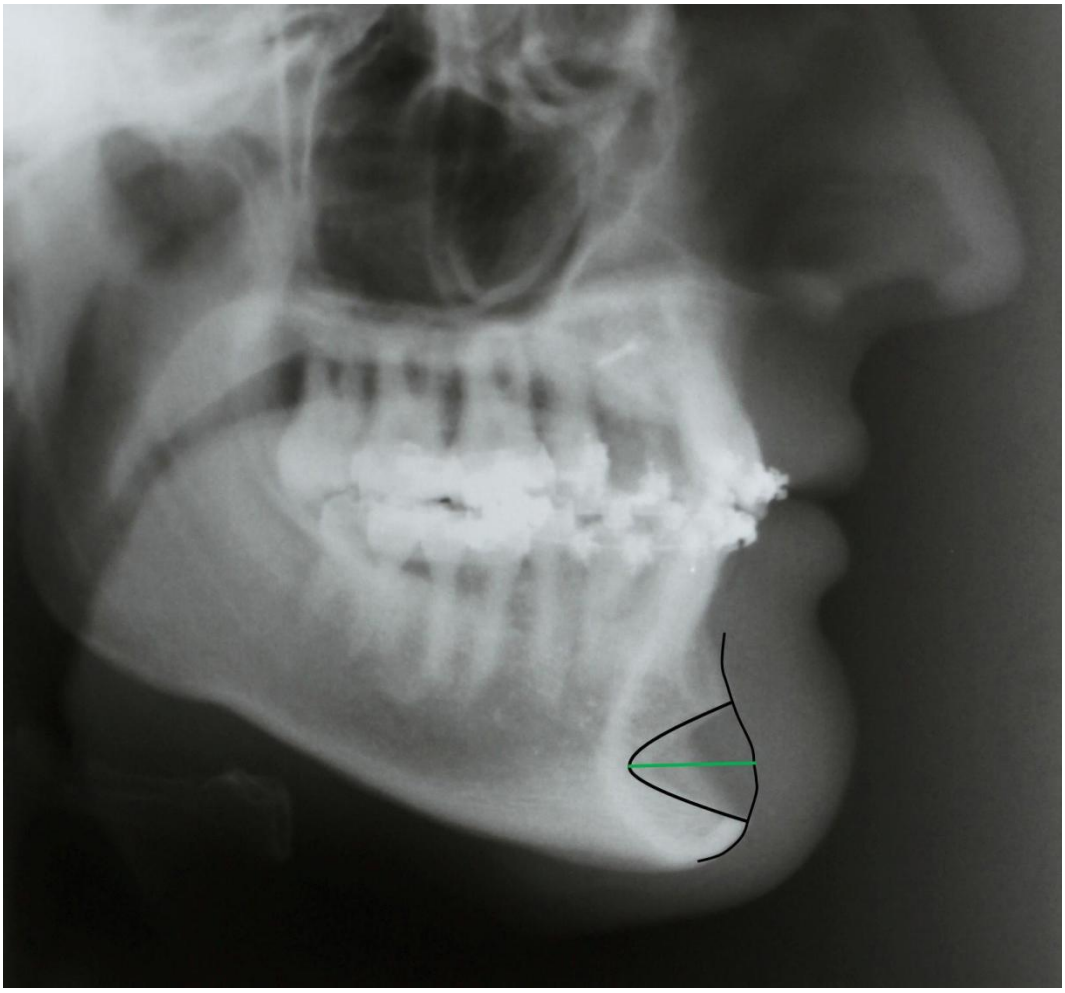

Figura 3: Dirección de la medida horizontal entre la zona más posterior del defecto y la intersección con la línea del contorno óseo (Línea verde).

Las mediaciones fueron realizadas por un solo operador, utilizando papel de acetato de 0,07mm y lápiz de grafito de 0,5mm; cada medida fue realizada tres veces con una semana de diferencia entre cada medición y fue considerado como valor final el valor promedio de las mediciones realizadas.

Método estadístico

Inicialmente, los datos fueron manejados con el test de Léveme y el test de Kolmogorov-Smirnov donde se observó que la muestra era paramétrica; posteriormente se aplicó el test *t* de Student con un nivel de significancia de 5% para establecer significancia estadística.

RESULTADOS

Al analizar el tamaño inicial del defecto óseo se observó en el periodo PIn presentaba una altura media de 12,8± 1.99 mm y una distancia anteroposterior de 8.33 ± 1.77 mm (tabla 1).

Tabla I: Tamaño del defecto óseo creado a partir de la remoción de hueso desde la sínfisis mandibular en los 30 sujetos de muestra (según evaluación en la etapa postoperatoria inmediata).

Paciente	Género	Edad	Defecto Vertical (mm)	Defecto Horizontal (mm)
1	F	40	10	6
2	F	45	13	8
3	M	21	15	10
4	F	34	12	9
5	F	42	14	7
6	F	55	13	8
7	M	51	15	10
8	M	60	10	10
9	F	48	14	13
10	F	41	16	8

11	F	65	10	8
12	M	54	13	9
13	F	45	10	6
14	F	48	15	8
15	F	56	13	10
16	M	35	15	9
17	M	39	14	10
18	F	30	13	9
19	F	42	10	7
20	F	49	10	6
21	F	52	15	6
22	M	50	12	6
23	M	62	12	10
24	F	43	16	9
25	F	57	13	11
26	F	33	10	6
27	F	47	12	8
28	F	28	13	8
29	F	40	15	9
30	F	38	11	6
Promedio		45	12.80	8.33
DE		10.5	1.99	1.77

DE= Desviación Estándar.

En el periodo PTar presentaba una altura de 8.80 ± 1.92 mm presentando una diferencia de aproximadamente 4mm, siendo estadísticamente significativo (p<0,05) con el PIn. El defecto medido en el sentido horizontal en el PIn fue de 8.33 ± 1.77 mientras que en el PTar presentaba 4.17 ± 1.21 mm, demostrando una disminución de aproximadamente 4mm, presentando una diferencia significativa (p<0,05) en relación al PIn (tabla 2, figura 2 y 3).

Tabla II: Distribución de la disminución del defecto óseo creado en la muestra de 30 sujetos.

Defeito	**PIn (*X*±DE)**	**PTar (*X*±DE)**	**% Reparación**
Vertical	12.80 ± 1.99	8.60 ± 1.92*	32,8%
Horizontal	8.33 ± 1.77	4.14 ± 1.21*	50,3%

Difiere del PIn según el test *t* de Student (p<0,05).

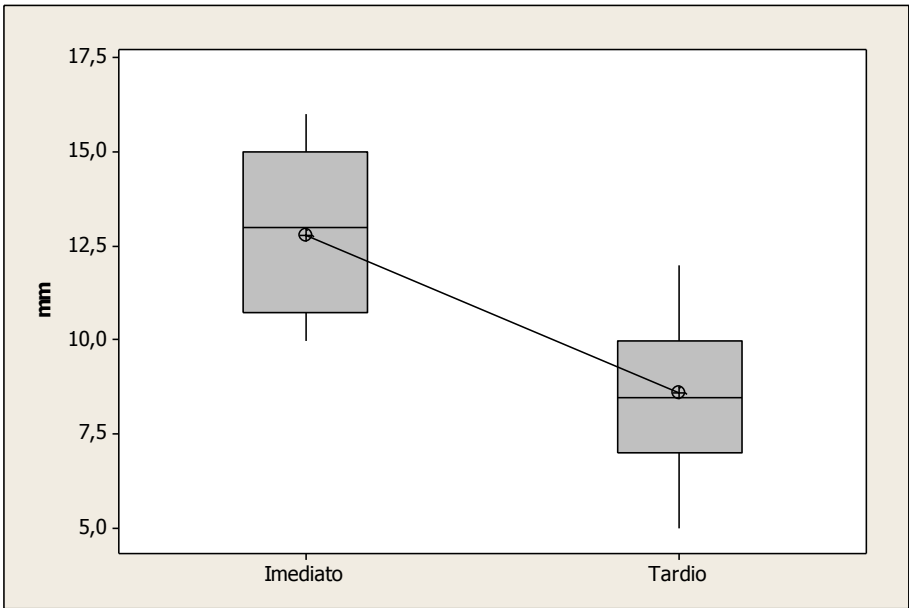

Figura 2: Comparación de los valores obtenidos en la medición vertical para el defecto en sínfisis en el PIn y el PTar.

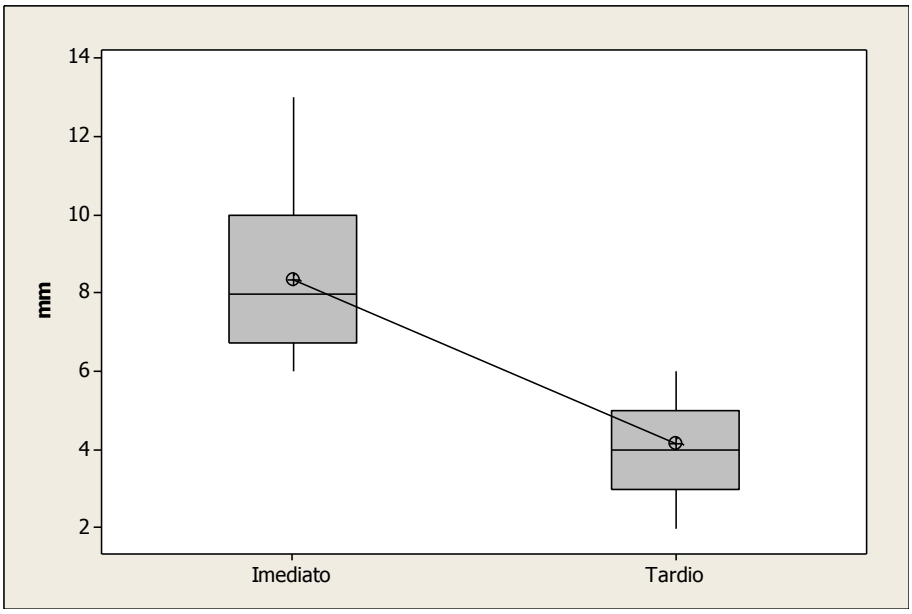

Figura 3: Comparación de los valores obtenidos en la medición horizontal de los defectos en sínfisis en el PIn y PTar.

DISCUSIÓN

La reconstrucción ósea alveolar es reconocida como una técnica segura, eficaz, previsible y funcional (Olate et. al. 2008). Los sitios donantes intraorales han determinado la posibilidad de realizar los procedimientos con anestesia local, lo cual optimiza los tiempos y disminuye los costos económicos del tratamiento (Olate et al. 2007b).

La morbilidad del retiro óseo de mentón ha sido documentada en diferentes publicaciones destacando la parestesia postoperatoria y las alteraciones de tejido blando tanto de mentón como de labio (Raghoebar et al., Sbordone et al. 2009). Los autores de la presente investigación creen que una causa probable para ocasionar estas alteraciones puede ser el tamaño del defecto óseo creado al momento del retiro óseo; si bien la sola osteotomía del sector puede generar los fenómenos de parestesia y alteraciones dentarias (Hoppenreijs et al.), la

profundidad del defecto puede generar un disturbio importante en la reposición muscular de los músculos mentales.

La cantidad de hueso retirado de sínfisis puede ser variada y alcanzar valores cercanos a 20.9 X 9.9 X 6.9mm (en promedio) para retiro de bloques, lo que implica una importante cantidad de hueso disponible para reconstrucción (Montazem et al. 2000); de esta forma, la reparación del defecto creado puede ser altamente compleja dado el tamaño de la cavidad que permanece en la sínfisis mandibular.

La literatura es escasa en relación a trabajo para evaluar la reparación de hueso después de la remoción de injerto de mentón, y algunos estudios sólo informaron que existe un defecto óseo evidente en la zona del mentón, pero no presentan datos y análisis estadísticos para confirmar estos resultados (Weibull *et al*,. 2009). En consecuencia, este estudio trata de determinar el potencial para la reparación ósea después de un período de doce meses, con la presentacion de datos y análisis estadísticos.

Sin embargo, el trabajo publicado por Dik et al. (2010) señalo que la velocidad de reparación ósea en el defecto generado por el retiro óseo de sínfisis fue asociada directamente con la edad del paciente, siendo esta investigación realizada en individuos adolescentes y jóvenes. También señalaron que, después de un año de seguimiento, la reparación del sector fue cercana al 86% del defecto original observándose también un aumento estadísticamente significativo del tejido blando de mentón. La presente investigación trato pacientes cuya edad media estaba en 45 años, donde se observó una disminución del defecto vertical de 32,8% (aproximadamente 4mm) y del defecto horizontal de 50,3% (aproximadamente 4mm) en un año de seguimiento. Ihan Hren & Milajavec (2008) señalaron similares conclusiones respecto de la influencia de la edad del paciente y la reparación ósea, siendo menor en sujetos de mayor edad.

CONCLUSIÓN

La reparación ósea del defecto originado en sínfisis fue próximo al 30-50% del defecto vertical y horizontal, respectivamente, en la evaluación de un año posterior a la cirugía y que otros estudios deben llevarse a cabo.

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CONCLUSÃO

No presente estudo, de acordo com a metodologia empregada pode-se concluir que:

1- Tanto a morbidade quanto as alterações na sensibilidade pulpar alcançaram resolutividade em todos os casos no período de 12 meses, sendo essencial esclarecer os pacientes quanto a essas alterações transitórias.

2- A distinção de resultados obtidos através da comparação da análise subjetiva com a objetiva pode ser considerada um indicativo da sensibilidade limitada do teste clínico em registrar de forma precisa as impressões subjetivas dos pacientes.

3- O reparo do defeito ósseo criado com a remoção de enxerto de mento foi de 30-50% do defeito horizontal e vertical, respectivamente, um ano após a cirurgia.

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APÊNDICE

Universidade Estadual de Campinas

Faculdade de Odontologia de Piracicaba

Paciente: _____ Prontuário:_____

Período de avaliação: Imediato ( ) Mês 1 ( ) Mês 6 ( ) Mês 12 ( )

Data da Avaliação: ___/___/___ Data da Cirurgia ___/___/___

Testes Neurosensoriais

Discriminação de dois pontos			Toque estático leve						
1.	sim	não	1.	1	2	3	4	5	6
2.	sim	não	2.	1	2	3	4	5	6
3.	sim	não	3.	1	2	3	4	5	6
4.	sim	não	4.	1	2	3	4	5	6
5.	sim	não	5.	1	2	3	4	5	6
6.	sim	não	6.	1	2	3	4	5	6

Toque com tração direcional

1. sim não
2. sim não
3. sim não
4. sim não
5. sim não
6. sim não

Teste da agulhada

1. sim não
2. sim não
3. sim não
4 sim não
5. sim não
6. sim não

Discriminação térmica ao frio

1. sim não
2. sim não
3. sim não
4. sim não
5. sim não
6. sim não

Discriminação térmica ao quente

1. sim não
2. sim não
3. sim não
4 sim não
5. sim não
6. sim não

<u>Teste de sensibilidade pulpar</u>

45( ) 44( ) 43( ) 42( ) 41( ) 31( ) 32( ) 33( ) 34( ) 35( )

Escala Visual Analógica

1. Em relação à sensibilidade, quanta alteração você notou na área operada?

Nenhuma alteração Muita alteração

2. O quanto você notou de alteração na sua estética facial após a cirurgia?

Nenhuma alteração Muita alteração

O quanto à cirurgia alterou nas suas atividades diárias como:

3. Alimentação

Nenhuma Alteração Muita Alteração

4. Fonação

Nenhuma Alteração Muita Alteração

5. Movimentação do lábio inferior

Nenhuma Alteração Muita Alteração

Estudo Radiográfico (Telerradiografias de perfil)

Defeito vertical _____

Defeito horizontal _____

ANEXO

COMITÊ DE ÉTICA EM PESQUISA

FACULDADE DE ODONTOLOGIA DE PIRACICABA

UNIVERSIDADE ESTADUAL DE CAMPINAS

CERTIFICADO

O Comitê de Ética em Pesquisa da FOP-UNICAMP certifica que o projeto de pesquisa **"Avaliação clínica e radiográfica prospectiva de alterações funcionais e estéticas em pacientes submetidos à remoção de enxertos de mento"**, protocolo nº 040/2009, dos pesquisadores Claudio Ferreira Nóia e Renato Mazzonetto, satisfaz as exigências do Conselho Nacional de Saúde - Ministério da Saúde para as pesquisas em seres humanos e foi aprovado por este comitê em 06/05/2009.

The Ethics Committee in Research of the School of Dentistry of Piracicaba - State University of Campinas, certify that the project **"A Prospective clinic and radiographic evaluation of functional and esthetics alterations of the chin after bone harvesting"**, register number 040/2009, of Claudio Ferreira Nóia and Renato Mazzonetto, comply with the recommendations of the National Health Council - Ministry of Health of Brazil for research in human subjects and therefore was approved by this committee at .

Prof. Dr. Pablo Agustin Vargas
Secretário
CEP/FOP/UNICAMP

Prof. Dr. Jacks Jorge Junior
Coordenador
CEP/FOP/UNICAMP

Nota: O título do protocolo aparece como fornecido pelos pesquisadores, sem qualquer edição.

Notice: The title of the project appears as provided by the authors, without editing.