PONTIFÍCIA UNIVERSIDADE CATÓLICA DE MINAS GERAIS
Programa de Pós-graduação em Odontologia

Alysson Henrique Neves Ramos

ESTABILIDADE ÓSSEA MARGINAL EM IMPLANTES EXTRA CURTOS INSTALADOS EM MANDÍBULA ATRÓFICA POSTERIOR: estudo clinico retrospectivo

Belo Horizonte
2018

Alysson Henrique Neves Ramos

ESTABILIDADE ÓSSEA MARGINAL EM IMPLANTES EXTRA CURTOS INSTALADOS EM MANDÍBULA ATRÓFICA POSTERIOR: estudo clinico retrospectivo

Dissertação apresentada ao Programa de Pós-graduação em Odontologia da Pontifícia Universidade Católica de Minas Gerais, como requisito parcial para a obtenção do título de Mestre em Odontologia, Área de Concentração: Implantodontia.

Linha de pesquisa: Propriedades biomecânicas, físico-químicas e biocompatibilidade dos biomateriais e materiais odontológicos.

Orientador: Prof. Dr. Eduardo Nunes

Belo Horizonte
2018

FICHA CATALOGRÁFICA
Elaborada pela Biblioteca da Pontifícia Universidade Católica de Minas Gerais

Ramos, Alysson Henrique Neves
R175e Estabilidade óssea marginal em implantes extra curtos instalados em mandíbula atrófica posterior: estudo clinico retrospectivo / Alysson Henrique Neves Ramos. Belo Horizonte, 2018.
42 f.: il.

Orientador: Eduardo Nunes
Dissertação (Mestrado) – Pontifícia Universidade Católica de Minas Gerais. Programa de Pós-Graduação em Odontologia

1. Implantes dentários osseointegrados. 2. Reabsorção óssea. 3. Osseointegração. 4. Nervo Mandibular. 5. Parestesia. I. Nunes, Eduardo. II. Pontifícia Universidade Católica de Minas Gerais. Programa de Pós-Graduação em Odontologia. III. Título.

CDU: 616.314-089.843

Ficha catalográfica elaborada por Fernanda Paim Brito - CRB 6/2999

Alysson Henrique Neves Ramos

ESTABILIDADE ÓSSEA MARGINAL EM IMPLANTES EXTRA CURTOS INSTALADOS EM MANDÍBULA ATRÓFICA POSTERIOR: estudo clinico retrospectivo

Dissertação apresentada ao Programa de Pós-graduação em Odontologia da Pontifícia Universidade Católica de Minas Gerais, como requisito parcial para obtenção do título de Mestre em Odontologia. Área de Concentração: Implantodontia.

COMPOSIÇÃO DA BANCA EXAMINADORA:

1- Prof. Dr. Leandro Napier de Souza – UFMG
2- Prof. Dr. Elton Gonçalves Zenóbio – PUC Minas
3- Prof. Dr. Eduardo Nunes – PUC Minas

DATA DA APRESENTAÇÃO E DEFESA: 31 de agosto de 2018

A dissertação, nesta identificada, foi aprovada pela Banca Examinadora

Prof. Dr. Eduardo Nunes
Orientador

Prof. Dr. Rodrigo Villamarim Soares
Coordenador do Programa de Pós-graduação em Odontologia

AGRADECIMENTOS

Em mais um grande momento de minha vida, venho agradecer às pessoas e à Instituição que o fizeram possível. Assim sendo agradeço à minha amada esposa Cristiane Ramos, por sempre ter apoiado minhas decisões e ser minha grande incentivadora.

Agradeço às minhas filhas Manuella Ramos e Gabriella Ramos por terem compreendido a importância desse momento em minha vida, abdicando de momentos familiares para que eu ficasse estudando.

Agradeço a meus familiares que sempre me deram força da melhor forma possível.

Agradeço à Instituição PUC Minas, que me concedeu uma bolsa de estudo, assim sendo possível realizar mais um grande sonho de minha vida.

Agradeço a todos os professores envolvidos no Mestrado de Implantodontia, que dividiram suas experiências e conhecimentos com extremo afinco e profissionalismo.

Agradeço a meu orientador, Prof. Eduardo Nunes e ao Prof. Elton Zenóbio que desde o inicio não mediram esforços para me orientar.

E finalmente agradeço a Deus que colocaram todos em meu caminho, porque sem eles, com certeza, esse sonho não seria possível.

RESUMO

Implantes extra curtos representam uma opção de tratamento reabilitador para pacientes com grave reabsorção óssea, evitando-se assim diferentes cirurgias para regeneração óssea e maior morbidade ao paciente, assim como o aumento no custo e tempo de tratamento. O presente estudo clínico retrospectivo avaliou a estabilidade óssea marginal em implantes extras curtos em função mastigatória na mandíbula posterior. Por meio do levantamento de radiografias periapicais digitalizadas de 15 pacientes tratados com 10 implantes curtos (grupo controle), sendo maiores que 6 mm e menores que 10 mm de comprimento, e 13 implantes extra curtos, menores ou iguais a 6 mm de comprimento, foram selecionadas as regiões mesiais e distais de cada implante, a partir da crista óssea até à região paralela ao ápice e mensurados, utilizando o software Image J, imediatamente após instalação do implante (T1) e com mais de 1 ano (T2), a estabilidade da crista óssea. A “altura da crista óssea” foi estatisticamente menor em T2 que em T1, tanto para a crista óssea mesial quanto para a crista óssea distal, quando os implantes foram avaliados em conjunto ou quando os implantes curtos (grupo controle), foram avaliados separadamente. Quando os implantes extra curtos foram avaliados separadamente, não houve diferença estatisticamente significante entre T1 e T2, tanto para a crista óssea mesial quanto para a crista óssea distal. A estabilidade óssea marginal pode ser observada no grupo de implantes extra curtos no qual foram usados implantes de superfície tratada com corpo único (tissue level), cone morse e bone level com plataforma switching, considerando assim a estabilidade biológica e biomecânica referente a este item. Com esse resultado, pode-se afirmar que os implantes extra curtos, quando a estabilidade óssea marginal apresentar-se em mandíbula posterior, é uma opção de tratamento com prognóstico previsíveis, para pacientes com grave atrofia óssea vertical.

Palavras-chave: Implantes curtos. Implantes extra curtos. Perda óssea marginal.

ABSTRACT

Extra short implants represent a rehabilitative treatment option for patients with severe bone resorption, thus avoiding different surgeries for bone regeneration and greater morbidity to the patient, as well as increasing in cost and time of treatment. The present clinical study retrospective research evaluated marginal bone stability in short extra implants in masticatory function in the posterior mandible. Through the digitalized periapical radiography of 15 patients treated with 10 implants (control group), being greater than 6mm and smaller than 10 mm of length, and 13 extra short implants less than or equal to 6 mm the mesial and distal regions of each implant, also from the bony crest to the parallel region of the apex and measured, using Image J software in order to allow this immediately after implant installation (T1) and within more than 1 year (T2), the stability of the bone crest. The “crest height bone” was statistically lower in T2 than in T1, both for the bone crest distal bone crest, when the implants were evaluated together or when short implants (control group) were evaluated separately. When the extra short implants were evaluated separately, there was no statistically significant difference between T1 and T2, for both the mesial bone crest and the distal bone crest. The marginal bone stability can be observed in the extra implant group in which single-body treated surface implants were used (tissue level), cone morse and bone level with platform switching, considering in this manner the biological and biomechanical stability related to this item. With this result, it can be said that the extra short implants, when the marginal bone stability to present in the posterior mandible, is an option of treatment with predictive prognosis for patients with severe atrophy vertical bone.

Keywords: Short implants. Extra short implants. Bone loss marginal.

SUMÁRIO

1 INTRODUÇÃO 13

2 OBJETIVOS 15
2.1 Objetivo geral 15
2.2 Objetivos específicos 15

3 MATERIAL E MÉTODOS 17
3.1 Desenhos do estudo 17
3.2 Populações de estudo 18
3.3 Critérios de elegibilidade 18
3.4 Critérios de inclusão 19

4 ARTIGO 21

5 CONSIDERAÇÕES FINAIS 39

REFERÊNCIAS 41

1 INTRODUÇÃO

A reabilitação oral com implantes dentários em pacientes com atrofia óssea grave em mandíbula posterior é um desafio na implantodontia. Assim, dentre as alternativas para tratamento dessa região, relatam-se a lateralização do nervo alveolar inferior (DURSUN et al., 2016; YOSHIMOTO et al., 2004), podendo ocorrer alterações sensitivas tais como hipostesia e parestesia (MARTINEZ-RODRIGUEZ et al., 2016), enxerto ósseo, distração osteogênica e divisão do rebordo ósseo, conforme relatado por Rodriguez e Eldibany (2013), em um estudo prospectivo, realizado em 143 pacientes com atrofia mandibular, sendo que, no caso de uma distração osteogênica, podem ocorrer fratura do segmento de transporte e defeito de formação óssea (MAZZONETTO et al., 2007).

Os procedimentos cirúrgicos de regeneração óssea para reabilitar o paciente com implantes, além de serem minuciosos, levam esses pacientes a um maior grau de morbidade, aumentando também o tempo de tratamento (ESPOSITO et al., 2008).

Conforme Galvão et al. (2011), os implantes curtos estão diretamente relacionado com uma técnica cirúrgica mais simples quando comparada a cirurgias de reconstrução óssea para fixação de implantes padrões, diminuindo assim, o tempo de tratamento.

Os implantes curtos possibilitam a reabilitação dentária em pacientes com reabsorção óssea avançada, onde a fixação de implantes regulares é inviável. Essa inviabilidade se dá porque o nervo alveolar inferior ou seio maxilar podem sofrer injúrias na fixação de implantes regulares (igual ou maior que 8,0 mm) quando o osso alveolar é deficiente. Considerando os aspectos biomecânicos e a perda óssea marginal dos implantes curtos comparados aos implantes de tamanho regulares, estudos mostram que não houve diferença significativa num período de 2 a 3 anos. Há, porém, uma falta de estudo clínico de longo prazo (HASAN et al., 2013).

Anitua, Piñas e Orive (2015) em um estudo retrospectivo entre 2001 e 2009, no qual foram usado 128 implantes, classificaram os implantes em extra curtos e curtos com medidas entre 5,5 a 8,5 mm.

Al-Johany et al. (2017) após um estudo retrospectivo de artigos científicos entre janeiro de 2004 à fevereiro de 2016, com palavras chaves “comprimento do implante dentário e diâmetro do implante dentário “classificaram os implantes extra

curtos em menores ou igual a 6 mm; curtos maior que 6 e menor que 10; regular maior ou igual a 10 mm e menor que 13 e finalmente os longos que são maiores ou igual a 13 mm.

Conforme relatado por Calvo-Guirado et al. (2016), implante extra curtos (4 mm de comprimento) é uma opção de tratamento em pacientes com reabsorções graves dos maxilares. Em seu estudo de caso foram selecionados 10 pacientes. Cada paciente recebeu 6 implantes na mandíbula, sendo 2 implantes anteriores (interforame) de 10 mm de altura e mais 4 implantes de 4 mm de altura na região posterior distribuídos bilateralmente. Assim verificaram também que a estabilidade e a perda óssea marginal foram semelhantes em ambos tamanhos dos implantes.

Monje et al. (2013) citaram em um estudo prospectivo de meta análise, que a sobrevida dos implantes curtos e extra curtos independe do diâmetro do implante e da relação coroa implante, assim como a macrogeometria e o tipo de prótese.

No contexto de avaliar a previsibilidade dos implantes extra curtos, segundo critério de agrupamento de Al-Johany et al. (2017), o presente estudo avaliou estabilidade óssea marginal em implantes desses implantes função no período de um ano em mandíbula posterior atrófica.

2 OBJETIVOS

2.1 Objetivo geral

O objetivo desse estudo foi o de avaliar a estabilidade óssea marginal em implantes extras curtos instalados na região posterior da mandíbula.

2.2 Objetivos específicos

a) determinar o número de pacientes com implantes, tratados na PUC Minas por meio de implantes curtos e extra curtos em mandíbula posterior;
b) mensurar a estabilidade ou perda óssea marginal de implantes curtos e extra curtos instalados na região posterior da mandíbula.

3 MATERIAL E MÉTODOS

Este estudo clínico observacional retrospectivo foi realizado no período de 2014 a 2018 no Departamento de Odontologia da Pontifícia Universidade Católica de Minas Gerais. As radiografias foram selecionadas no banco de dados do Mestrado Profissional de Implantodontia da PUC Minas.

A população de estudo, foi composta por 15 pacientes adultos de ambos os gêneros, com um total de 23 implantes curtos (grupo controle) e extra curtos instalados em região posterior de mandíbula há pelo menos um ano em função

3.1 Desenhos do estudo

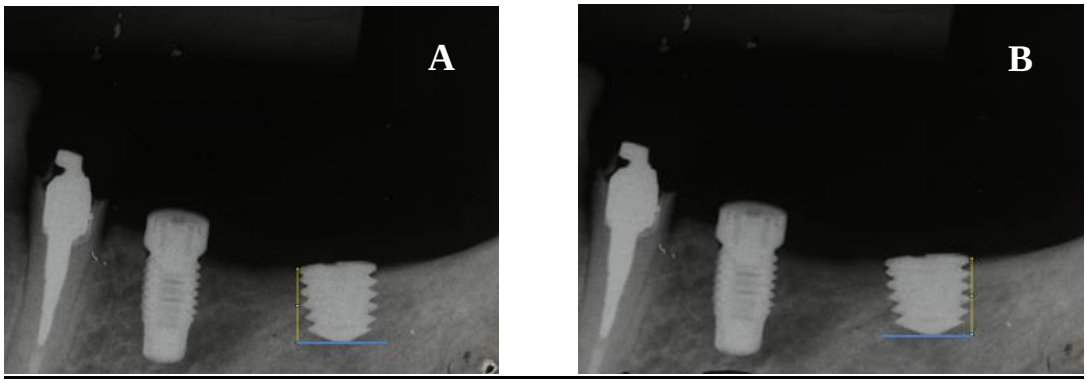
O critério de seleção da amostra foi o de edentulismo parcial em região posterior de mandíbula apresentando atrofia do rebordo alveolar, caracterizada por altura óssea disponível menor ou igual a 8,0 mm medida do rebordo ao nervo alveolar inferior, com implantes curtos e extra curtos segundo Al-Johany et al. (2017), com período mínimo de 1 ano em função mastigatória.

Foram selecionadas as regiões mesiais e distais de cada implante, a partir da crista óssea até à região paralela ao ápice do implante (Figs. 1 e 2).

As aferições dos das referidas cristas tiverem como referência para calibração o tamanho original dos implantes.

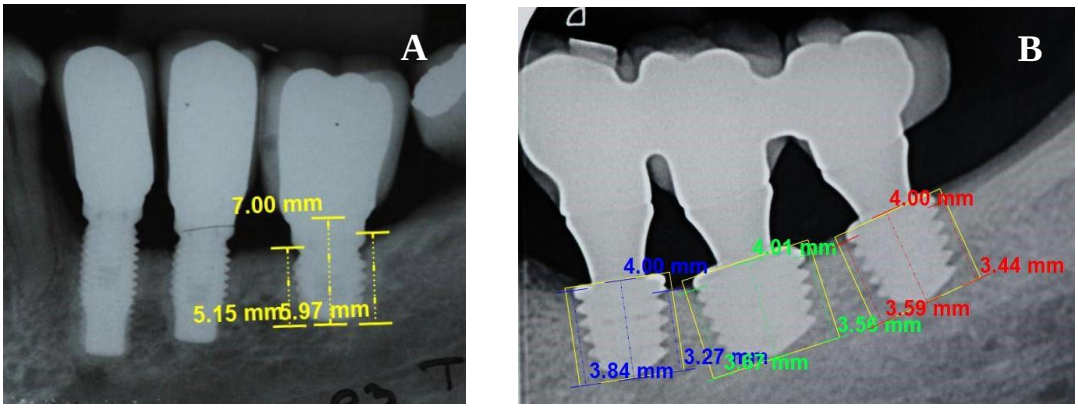
Para a análise, bem como tabulação dos dados, foi utilizado o software Image J (National Institutes of Health, Bethesda, Maryland, USA) (AIMETTI et al., 2015).

Figura 1: A) aferição da altura óssea na região mesial do implante sem prótese; B) aferição da altura óssea na região distal do implante sem prótese.



Fonte: Imagem obtida do arquivo do Curso de Mestrado Profissional em Implantodontia da PUC Minas

Figura 2: A e B) aferições das alturas ósseas mesiais e distais dos implantes, tendo como referencia a altura original dos implantes.



Fonte: Imagem obtida do arquivo do Curso de Mestrado Profissional em Implantodontia da PUC Minas

3.2 Populações de estudo

A população de estudo foi a 15 de pacientes adultos de ambos os gêneros, com um total de 23 implantes curtos e/ou extra curtos instalados em região posterior de mandíbula há pelo menos um ano.

3.3 Critérios de elegibilidade

Os pacientes foram selecionados conforme os critérios a seguir.

3.4 Critérios de inclusão

a) pacientes que possuíam edentulismo parcial, com implantes curtos e extra curtos instalados em região posterior de mandíbula;
b) radiografias periapicais inicial e um ano após a instalação dos implantes, constantes nos arquivos de ficha clínica;
c) pacientes sem alteração sistêmica que interfiram no processo de osseointegração e remodelamento ósseo;
d) não tabagistas.

4 ARTIGO

Marginal bone stability in extra-short implants installed in posterior atrophic mandible: retrospective clinical study

Artigo a ser submetido à publicação no periódico **The International Journal of Oral & Maxillofacial Implants (Qualis A2).**

Normas para submissão de artigos podem ser visualizadas no endereço eletrônico: https://jomi.quintessenz.de/jomi/downloads/authorguidelines_jomi.pdf

Marginal bone stability in extra-short implants installed in posterior atrophic mandible: retrospective clinical study

Alysson Henrique Neves Ramos[1], Alyssa Sales dos Santos[1], Elton Gonçalves Zenóbio[2], Martinho Campolina Rebello Horta[2], Eduardo Nunes[2]

[1] Postgraduate Program in Dentistry, Pontifical Catholic University of Minas Gerais, Belo Horizonte, Minas Gerais, Brazil

[2] Adjunct Professor IV, Department of Dentistry, Pontifical Catholic University of Minas Gerais, Belo Horizonte, Minas Gerais, Brazil

Correspondence to: Dr. Eduardo Nunes. Department of Dentistry. Pontifical Catholic University of Minas Gerais. Dom José Gaspar Avenue, 500 / Building 46 - Eucharistic Heart. CEP 30.535-901. Belo Horizonte / MG,. Brazil.

Phone: + 55 31 3319-4414 - Fax: + 55 31 3319-4415

Email: edununes38@terra.com.br

ABSTRACT

Introduction: Extra short implants represent a rehabilitative treatment option for patients with severe bone resorption, thus avoiding different surgeries for bone regeneration and greater morbidity to the patient, as well as the increase in cost and time of treatment. **Objective:** The present retrospective clinical study evaluated the marginal bone stability in short implants and short extras in masticatory function in the posterior mandible. **Materials and Methods:** Through the digitized periapical radiographs of 15 patients treated with 10 short implants being larger than 6 mm and smaller than 10 mm in length and 13 extra short implants smaller or equal to 6 mm in length, the mesial and distal regions of each implant, from the bone crest to the region parallel to the apex and measured, using Image J software, immediately after implant installation (T1) and with more than 01 year (T2), stability of the bone crest. **Results:** Bone crest height was statistically lower in T2 than in T1 for both the mesial bone crest and the distal bone crest when the implants were evaluated together or when the short implants were evaluated separately. When the extra short implants were evaluated separately, there was no statistically significant difference between T1 and T2, for both the mesial bone crest and the distal bone crest. **Conclusion:** The marginal bone stability can be observed in the group of extra short implants have been used in which surface treated with single body implants (tissue level), cone morse and bone level with switching platform , thus considering the biological and biomechanical stability related to this item. With this result, it can be stated that extra short implants, when marginal bone stability presents in the posterior mandible, is a predictable prognosis treatment option for patients with severe vertical bone atrophy.

Key words: Short implants. Extra short implants. Marginal bone loss.

INTRODUCTION

Dental rehabilitation with dental implants in patients with severe bone atrophy in the posterior mandible is a complex part of implant dentistry. Thus, techniques to circumvent this situation, such as the inferior alveolar nerve lateralization may occur sensory changes such as hypoesthesia and paresthesia[1], bone graft, distraction osteogenesis and in this case, there may be fracture of the transport segment and defect bone formation[2] and division of the bony ridge[3,4], as reported by Rodriguez and Eldibany[5]. These surgical procedures of bone regeneration, besides being meticulous, lead these patients to a higher degree of morbidity, also increasing the cost and time of treatment.[6]

According to Galvão et al.[7], short implants are directly related to a simpler surgical technique when compared to bone reconstruction surgeries for fixation of regular implants, thus reducing treatment time.

Considering the bio mechanical aspects and the marginal bone loss of the short implants compared to the regular implants, studies report that there was no significant difference in a period of 2 to 3 years. However, there is a shortage of studies in this area.[8]

Anitua, Piñas and Orive[9], in a retrospective study between 2001 and 2009, with 128 implants, classified the implants as extra short and short, measuring between 5.5 and 8.5 mm.

Al-Johany et al.[10] after a systematic review between January 2004 and February 2016, classified the extra short implants as less than or equal to 6 mm; shorter than 6 and less than 10; regular length greater than or equal to 10 mm and less than 13 and longer ones equal to or greater than 13 mm.

As reported by Calvo-Guirado et al.[11], extra short implants (4 mm in length) is a treatment option in patients with severe resorptions of the jaws. In a case series of 10 patients, they found that stability and marginal bone loss were similar in both implant sizes.

Monje et al.[12] in a meta-analysis study, reported that the survival of the short and extra short implants is independent of the diameter of the implant and the relation crown implant, as well as the macro geometry and the type of prosthesis.

In order to add more information about extra short implants in the posterior mandible, the present study evaluated the marginal bone stability of these implants over a year in the posterior atrophic mandible.

MATERIALS AND METHODS

This retrospective observational clinical study was conducted in the period of 2014 to 2018 in the Department of Dentistry of the Pontifical Catholic University of Minas Gerais. The patients were selected in the database of the Professional Masters of Implantology of PUC Minas and they were assured the right of non-identification and privacy according to the consent form and patient information contained in the medical record. This study was approved by the Research Ethics Committee.

The criterion for selection of the sample was partial edentulism in the posterior region of the mandible presenting atrophy of the alveolar ridge, characterized by available bone height less than or equal to 8.0 mm measured from the ridge to the inferior alveolar nerve with short and extra short implants already installed, with at least 12 months of treatment.

In original periapical radiographs the mesial and distal bone height in millimeters around the implant platform was measured.

For the analysis, as well as data tabulation, Image J (National Institutes of Health, Bethesda, Maryland, USA).[13,14]

For measuring, the mesial and distal regions of each implant were selected from the bone crest to the region parallel to the apex of the implant (Figs. 1 and 2).

The final population obtained for the study was 15 of adult patients of both genders 6 men and 9 women aged 55 to 78 years, non-smokers, with partial edentulism, without systemic alterations that interfere in the process of osseointegration and bone remodeling , totaling 23 short and extra short implants installed in the mandible posterior region, withinitial periapical radiographs (T1) and control radiographs after a minimum period of 12 months (T2) after insertion of the implant, in the records of PUC Minas.

The data were initially submitted to the D'Agostino & Pearson normality test, which demonstrated its normal distribution.

The paired t-test was then used to evaluate the existence of differences in the variable "bone crest height" between T1 and T2. The implants were evaluated together or separately (short and extra short). The analyzes were performed independently for the mesial bony crest and for the distal bony crest.

The level of significance was set at 5%. Analyzes were performed using the GraphPad software Prism 6.05 (GraphPad Software, San Diego, California, USA).

RESULTS

Bone crest height was statistically lower in T2 than in T1 for both the mesial bone crest and the distal bone crest when the implants were evaluated together and when the short implants were evaluated separately ($p < 0.05$ Table 1).

When extra-short implants were evaluated separately, there was no statistically significant difference between T1 and T2, for both the mesial bone crest and the distal bone crest ($p > 0.05$; Table 1).

DISCUSSION

The present study selected short implants (control group) of 7 mm and 8 mm and extra short implants of 4 mm, 5 mm and 6 mm according to the classification of Monje et al.[12] and Al-Johany et al.[10], where extra short implants performed better marginal bone stability than short implants .

Annibali et al.[15] concluded in a systematic review in which 6193 implants were used in 3848 patients with atrophic maxillaries, that the oral rehabilitation supported by short implants in these types of jaws seems to be a good treatment option. However, the authors considered the 10.00 mm and 9.00 implants also as short, in which they totaled more than 75% of the implants evaluated. A low rate of extra short implants was also verified in the study of Anitua, Piñas and Orive[9], in which of the 128 implants reported, only 9 implants were extra short or 7% of the total implants. In the present study[13], extra short implants were evaluated, 57% of the total, according to the classification of Monje et al.[10] and Al- Johany et al.[8], and it is important to note that other authors consider implants larger than 8 mm as standard implants.[16]

Herrmann et al.[17] who reported a success rate of 78.2% for short implants, in this case 7 mm in length, attributes this low success value to the length of the implants. This study did not take into account the surface of the implants or the type of connection. The present study evaluated the type of connection, which verified that in the group of extra short implants Tissue level , switching platform, cone morse, there was no significant difference between T2 and T1 no that touches the surface of the implants, all were treated.

A low success rate was also reported by Weng et al.[18] in which they used external fittings and machined surfaces, citing that 60% of the implants lost were implants classified as short, less than 10 mm, and that the cumulative success rate, 06 years, of the short implants were significantly lower than all other long implants.

This low success rate may be closely related to the type of implant treatment surface and the type of connection.[19] In this study, all selected implants have rough surfaces, internal and external connections. The group of extra-short implants with a single body (tissue level), cone morse and bone switchig platform level with the peri-implant bone crest change was not significant unlike the group where short implants also showed bone implants level of external connections with straight platform. Thus one of the reasons for the success of the short implants can be attributed to the surface characteristics of the implants and the type of connection.

Studies have been carried out in order to know the surface properties of implants with treated surfaces. Rough surfaces (eg SLActive, TiUnite) have achieved better results.[20,21] Several studies have also been carried out on the types of connections. Hermann et al.[22] have reported that implants of external connections lose 1.5 mm to 2.00 mm ofperimplant crest just after the creation of an implant-abutment interface, before even putting it into function. Cochran et al.[23] the

mentioned bone implants Reduced level have a much lower platform bone loss, between 0.34 mm and 0.38 mm as compared to bone implants level of straight connections. A critical factor for the loss of perimplantar bone crestwill be the amount of inflammation present, given the type of connection, so the ideal would be not to have any inflammation at the perimplant crest , that is, that no opportunity is given for bacterial contamination. In this path the single body implants (one piece or tissue level) show exactly this conformation, eliminating from the perimplant crest the implant-abutment interface avoiding the loss of the ridge.[19] In the group of extra short implants it can be observed a stability of the perimplantar ridge because they have the characteristic to move away from the implant interface pillar of the bone crest, because they are of internal connections or external connection of platform switching.

Blanes et al.[24] suggested that the disproportion between crown implant could induce poor bio mechanics impacting the loss of the periimplantar bone crest leading to an early implant loss. However, Anitua , Piñas and Orive[9] in a retrospective study conducted in Spain in Edward Anitua Institute between 2001 and 2009, which were used short extra short implants 128 (between 5.5 mm and 8.5 mm) measuring change in bone crest these implants have concluded that there were no significant relationships between bone loss and implant crown ratio of the short and extra short implants, which was also verified in the present study, since all implants in function had a disproportion between crown and implant>1:1 with no significance in the group of extra short implants, which has an implant crown disproportion even greater than 2:1.

Bordin et al.[25] described in a laboratory study performed with 63 extra-short implants of 5 mm in length with different diameters being: 4.0 mm, 5.0 mm and 6.00

mm, such as were fixed in acrylic resin leaving the platform level of this resin and that they were loaded with identical cemented prostheses, that there was no significant difference in the failure of these implants, all of which were tested until the pillar failure or until the maximum load of 900 N, also verified in the present study of the implants in function, in which in a statistical analysis of the group of extra short implants the alteration of the perimplantar bone crest was not significant. This fact was also demonstrated by Pierrisnard et al.[26] in a finite element study that evaluated the bone stress around the implant, concluding that stress was located at the level of the implant neck, and that in addition to cervical 3 mm, the intensity of bone stress was low. The peak of stress was evidenced in the first implant thread and although the stress in the cortical portion was virtually constant.

Monje et al.[12] cit plow in a prospective meta-analysis, also corroborated by Pommer et al.[27] In a meta-analysis of prospective observational studies, that the survival of short and extra short implants depend m diameter of the implant and implant crown relationship, as acrogeometria am, surface treatment , and type of connection. The present study with treated surface implants shows that in the group of extra short implants, which had internal connections and platform switching, they obtained a superior result of perimplantosseous stability than the short implants they had in their group, internal connections and those of external connections with straight platforms thus having a significant impact on the success of the implant.

The results of the present study confirm the studies where the report that extra short implants are predictive prognostic treatment options for patients with mandibular atrophy. However, for a better predictability the extra short implants, they should have treated surface[21], single body (tissue level) or bone level , since these configurations reduce the risk of loss of the perimplant crest , thus reducing the risk

of loss even, since it is an implant with measures between 4 mm and 8 mm in length, which can be verified in Cochran's study et al.[23], suggesting that in places where there is vertical bone resorption the single-piece or reduced-platform implants are indicated, since in implants with straight connections there will be a loss of 1.5 mm to 2 mm of support. Sasada and Cochran[19] have also reported that single-body implants are indicated for the posterior mandibular region, where bone quantity is generally limited, thus avoiding a loss of support of 2 mm which would be 25% in the case of an 8 mm implant.

Marginal bone stability can be observed in the group of extra short implants in which single-body treated surface implants (tissue level), cone morse and bone level with reduced platform, thus considering the biological and bio mechanical stability related to this s it ass corroborating the results of the present study of the extra short implants

CONCLUSION

The short and extra short implants are predictive prognostic treatment options for patients with vertical bone atrophy with regard to marginal ridge stability can be observed in the group of extra short implants in which single body treated surface implants (tissue level), cone morse and bone level with reduced platform, and considering the biological stability and bio mechanics related to this way.

REFERENCES

1. Martínez-Rodríguez N, Barona-Dorado C, Cortes-Breton Brinkmann J, Martín-Ares M, Leco-Berrocal MI, Prados-Frutos JC, et al. Implant survival and complications in cases of inferior alveolar nerve lateralization and atrophied mandibles with 5-year follow-up. Int J Oral Maxillofac Surg. 2016 Jul;45(7):858-63.
2. Mazzonetto R, Allais M, Maurette PE, Moreira RW. A retrospective study of the potential complications during alveolar distraction osteogenesis in 55 patients. Int J Oral Maxillofac Surg. 2007 Jan;36(1):6-10.
3. Yoshimoto M, König B Jr, Allegrini S Jr, de Carvalho Lopes C, Carbonari MJ, Liberti EA, et al. Bone healing after the inferior alveolar nerve lateralization: a histologic study in rabbits (Oryctolagus cuniculus). J Oral Maxillofac Surg. 2004 Sep;62(9 Suppl 2):131-5.
4. Dursun E, Keceli HG, Uysal S, Güngör H, Muhtarogullari M, Tözüm TF. Management of limited vertical bone height in the posterior mandible: short dental implants versus nerve lateralization with standard length implants. J Craniofac Surg. 2016 May;27(3):578-85.
5. Rodriguez JG, Eldibany RM. Vertical splitting of the mandibular body as an alternative to inferior alveolar nerve lateralization. Int J Oral Maxillofac Surg. 2013 Sep;42(9):1060-6.
6. Esposito M, Grusovin MG, Kwan S, Worthington HV, Coulthard P. Interventions for replacing missing teeth: horizontal and vertical bone augmentation techniques for dental implant treatment. Cochrane Database Syst Rev. 2008 Jul 16;(3):CD003607.

7. Galvão FFSA, Almeida-Júnior AA, Faria-Júnior NB, Caldas SGFR, Reis JMSNR, Margonar R. Previsibilidade de implantes curtos: revisão de literatura. RSBO (online). 2011 Jan-Mar;8(1):81-8.
8. Hasan I, Bourauel C, Mundt T, Heinemann F. Biomechanics and load resistance of short dental implants: a review of the literature. ISRN Dent. 2013;2013: 424592.
9. Anitua E, Piñas L, Orive G. Retrospective study of short and extra-short implants placed in posterior regions: influence of crown-to-implant ratio on marginal bone loss. Clin Implant Dent Relat Res. 2015 Feb;17(1):102-10.
10. Al-Johany SS, Al Amri MD, Alsaeed S, Alalola B. Dental implant length and diameter: a proposed classification scheme. J Prosthodont. 2017 Apr;26(3):252-60.
11. Calvo-Guirado JL, López Torres JA, Dard M, Javed F, Pérez-Albacete Martínez C, Maté Sánchez de Val JE. Evaluation of extrashort 4-mm implants in mandibular edentulous patients with reduced bone height in comparison with standard implants: a 12-month results. Clin Oral Implants Res. 2016 Jul;27(7):867-74.
12. Monje A, Fu JH, Chan HL, Suarez F, Galindo-Moreno P, Catena A, et al. Do implant length and width matter for short dental implants (<10mm)? A meta-analysis of prospective studies. J Periodontol. 2013 Dec;84(12):1783-91.
13. Aimetti M, Ferrarotti F, Mariani GM, Ghelardoni C, Romano F. Soft tissue and crestal bone changes around implants with platform-switched abutments placed nonsubmerged at subcrestal position: a 2-year clinical and radiographic evaluation. Int J Oral Maxillofac Implants. 2015 Nov-Dec;30(6):1369-77.

14. Bratu E, Mihali S, Shapira L, Bratu DC, Wang HL. Crestal bone remodeling around implants placed using a short drilling protocol. Int J Oral Maxillofac Implants. 2015 Mar-Apr;30(2):435-40.
15. Annibali S, Cristalli MP, Dell'Aquila D, Bignozzi I, La Monaca G, Pilloni A. Short dental implants. A systematic review. J Dent Res. 2012 Jan;91(1):25-32.
16. Nielsen HB, Schou S, Isidor F, Christensen AE, Starch-Jensen T. Short implants (≤8mm) compared to standard length implants (>8mm) in conjunction with maxillary sinus floor augmentation: a systematic review and meta-analysis. Int J Oral Maxillofac Surg. 2018 Jul 3. pii: S0901-5027(18)30182-6.
17. Herrmann I, Lekholm U, Holm S, Kultje C. Evaluation of patient and implant characteristics as potential prognostic factors for oral implant failures. Int J Oral Maxillofac Implants. 2005 Mar-Apr;20(2):220-30.
18. Weng D, Jacobson Z, Tarnow D, Hürzeler MB, Faehn O, Sanavi F, et al. A prospective multicenter clinical trial of 3i machined-surface implants: results after 6 years of follow-up. Int J Oral Maxillofac Implants. 2003 May-Jun;18(3):417-23.
19. Sasada Y, Cochran DL. Implant-abutment connections: a review of biologic consequences and peri-implantitis implications. Int J Oral Maxillofac Implants. 2017 Nov/Dec;32(6):1296-307.
20. Van Assche N, Michels S, Quirynen M, Naert I. Extra short dental implants supporting an overdenture in the edentulous maxilla: a proof of concept. Clin Oral Implants Res. 2012 May;23(5):567-76.
21. Kim SY, Ku JK, Kim HS, Yun PY, Kim YK. A retrospective clinical study of single short implants (less than 8 mm) in posterior edentulous áreas. J Adv Prosthodont. 2018 Jun;10(3):191-6.

22. Hermann JS, Cochran DL, Nummikoski PV, Buser D. Crestal bone changes around titanium implants. A radiographic evaluation of unloaded nonsubmerged and submerged implants in the canine mandible. J Periodontol. 1997 Nov;68(11):1117-30.
23. Cochran DL, Bosshardt DD, Grize L, Higginbottom FL, Jones AA, Jung RE, et al. Bone response to loaded implants with non-matching implant-abutment diameters in the canine mandible. J Periodontol. 2009 Apr;80(4):609-17.
24. Blanes RJ, Bernard JP, Blanes ZM, Belser UC. A 10-year prospective study of ITI dental implants placed in the posterior region. I: Clinical and radiographic results. Clin Oral Implants Res. 2007 Dec;18(6):699-706.
25. Bordin D, Bergamo ETP, Bonfante EA, Fardin VP, Coelho PG. Influence of platform diameter in the reliability and failure mode of extra-short dental implants. J Mech Behav Biomed Mater. 2018 Jan;77:470-4.
26. Pierrisnard L, Renouard F, Renault P, Barquins M. Influence of implant length and bicortical anchorage on implant stress distribution. Clin Implant Dent Relat Res. 2003;5(4):254-62.
27. Pommer B, Frantal S, Willer J, Posch M, Watzek G, Tepper G. Impact of dental implant length on early failure rates: a meta-analysis of observational studies. J Clin Periodontol. 2011 Sep;38(9):856-63.

SUBTITLE

Table 1 Mean and standard deviation of the variable "height of the bone crest" and its comparison between T1 and T2 in mm.

Figure 1 A) The bone height injury in the mesial region of the implant without prosthesis; **B)** measurement of the bone height in the distal region of the implant without prosthesis.

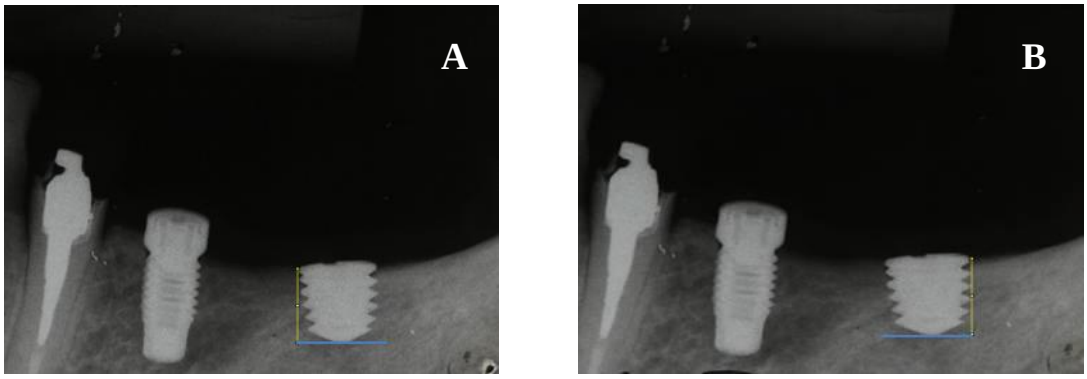
Figure 2 A and B) A heights of bony heights mesial and distal implants, with reference to the original height of the implants.

Table 1

Implants	Christian	T1		T2		Mean differences (T2-T1)	Value of p^1
		Average	DP	Average	DP		
Agrupads	Mesial	5.067	1.39	4.532	1.087	-0.535	<0,05
	Distal	5.108	1.50	4.546	1.263	-0.562	<0,05
Short	Mesial	5.922	1.46	5.013	0.968	-0.909	<0,05
	Distal	6.106	1.34	5.159	1.178	-0.947	<0,05
Extra short	Mesial	4.410	0.93	4.162	1.060	-0.248	n.s.
	Distal	4.341	1.13	4.075	1.153	-0.266	n.s.

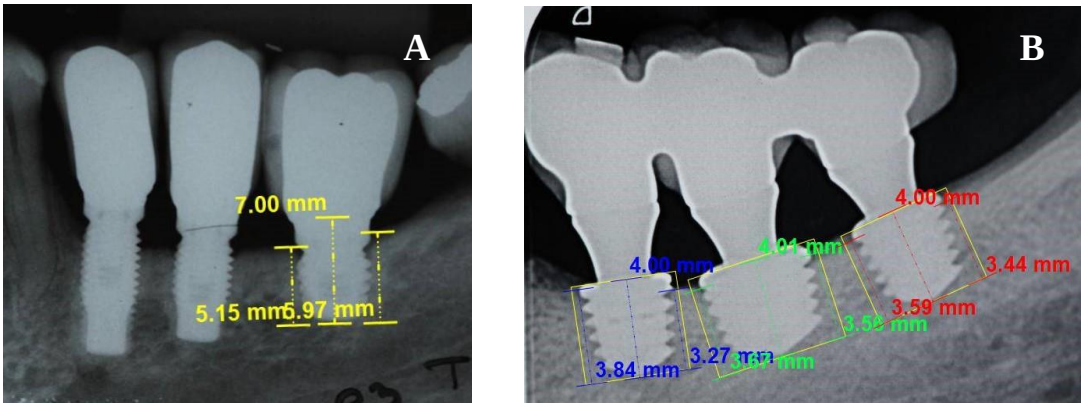
[1] P-value obtained by paired t-test: T2 vs T1
NS = Non-significant (p>0.05)

Figure 1



Source: Image obtained from the archive of the Professional Masters Course in Implant Dentistry of PUC Minas.

Figure 2



Source: Image obtained from the archive of the Professional Masters Course in Implant Dentistry of PUC Minas.

5 CONSIDERAÇÕES FINAIS

Pacientes com atrofia óssea mandibulares que necessitam de reabilitação com implantes, podem precisar de cirurgias mais invasivas para reconstruir o tecido ósseo e posterior fixação de implantes regulares. Com isso ocorre um aumento do tempo de tratamento, custo mais elevado e maior morbidade para o paciente. Assim os implantes extra curtos e curtos são indicados para pacientes com atrofia óssea, evitando-se assim cirurgias mais invasivas, diminuição do tempo e custo do tratamento. Porem esses implantes devem ser criteriosamente escolhidos para se ter uma melhor previsibilidade.

No presente trabalho, através do levantamento de radiografias periapicais digitalizadas de 13 pacientes tratados com 10 implantes curtos e 13 extra curtos, foram selecionadas as regiões mesiais e distais de cada implante, a partir da crista óssea até à região paralela ao ápice e mensurado, utilizando o software Image J, imediatamente (T1) e em um período de um ano (T2), o nível de perda óssea.

A “altura da crista óssea” foi estatisticamente menor em T2 que em T1, tanto para a crista óssea mesial quanto para a crista óssea distal, quando os implantes foram avaliados em conjunto ou quando os implantes curtos foram avaliados separadamente. Quando os implantes extra curtos foram avaliados separadamente, não houve diferença estatisticamente significante entre T1 e T2, tanto para a crista óssea mesial quanto para a crista óssea distal.

Os implantes curtos e extra curtos são opções de tratamento com prognóstico previsíveis, para pacientes com atrofia mandibular. Para uma melhor previsibilidade os implantes curtos e extra curtos, deveriam ter superfície tratada e corpo único, já que essas configurações diminuem o risco de perda da crista perimplantar.

REFERÊNCIAS

AIMETTI, M. et al. Soft tissue and crestal bone changes around implants with platform-switched abutments placed nonsubmerged at subcrestal position: a 2-year clinical and radiographic evaluation. **The International Journal of Oral & Maxillofacial Implants,** v.30, n.6, p. 1369-1377, Nov./Dec. 2015.

AL-JOHANY, S.S. et al. Dental implant length and diameter: a proposed classification scheme. **Journal of Prosthodontics,** v.26, n.3, p. 252-260, Apr. 2017.

ANITUA, E.; PIÑAS, L.; ORIVE, G. Retrospective study of short and extra-short implants placed in posterior regions: influence of crown-to-implant ratio on marginal bone loss. **Clinical Implant Dentistry and Related Research,** v.17, n.1, p. 102-110, Feb. 2015.

CALVO-GUIRADO, J.L. et al. Evaluation of extrashort 4-mm implants in mandibular edentulous patients with reduced bone height in comparison with standard implants: a 12-month results. **Clinical Oral Implants Research,** v.27, n.7, p. 867-874, July 2016.

DURSUN, E. et al. Management of limited vertical bone height in the posterior mandible: short dental implants versus nerve lateralization with standard length implants. **The Journal of Craniofacial Surgery,** v.27, n.3, p. 578-585, May 2016.

ESPOSITO, M. et al. Interventions for replacing missing teeth: horizontal and vertical bone augmentation techniques for dental implant treatment. **Cochrane Database of Systematic Reviews,** v.4, n.CD003607, June 2009.

GALVÃO, F.F.S.A. et al. Previsibilidade de implantes curtos: revisão de literatura. **Revista Sul-Brasileira de Odontologia,** v.8, n.1, p. 81-88, jan./mar. 2011.

HASAN, I. et al. Biomechanics and load resistance of short dental implants: a review of the literature. **International Scholarly Research Notices Dentistry (online),** v.2013, n.424592, p. 1-5, Apr. 2013.

MARTÍNEZ-RODRÍGUEZ, N. et al. Implant survival and complications in cases of inferior alveolar nerve lateralization and atrophied mandibles with 5-year follow-up. **International Journal of Oral and Maxillofacial Surgery,** v.45, n.7, p. 858-863, July 2016.

MAZZONETTO, R. et al. A retrospective study of the potential complications during alveolar distraction osteogenesis in 55 patients. **International Journal of Oral and Maxillofacial Surgery,** v.36, n.1, p. 6-10, Jan. 2007.

MONJE, A. et al. Do implant length and width matter for short dental implants (<10mm)? A meta-analysis of prospective studies. **Journal of Periodontology,** v.84, n.12, p. 1783-1791, Dec. 2013.

RODRIGUEZ, J.G., ELDIBANY, R.M. Vertical splitting of the mandibular body as an alternative to inferior alveolar nerve lateralization. **International Journal of Oral and Maxillofacial Surgery,** v.42, n.9, p. 1060-1066, Sept. 2013.

YOSHIMOTO, M. et al. Bone healing after the inferior alveolar nerve lateralization: a histologic study in rabbits (Oryctolagus cuniculus). **Journal of Oral and Maxillofacial Surgery,** v.62, 9 Suppl.2, p. 131-135, Sept. 2004.