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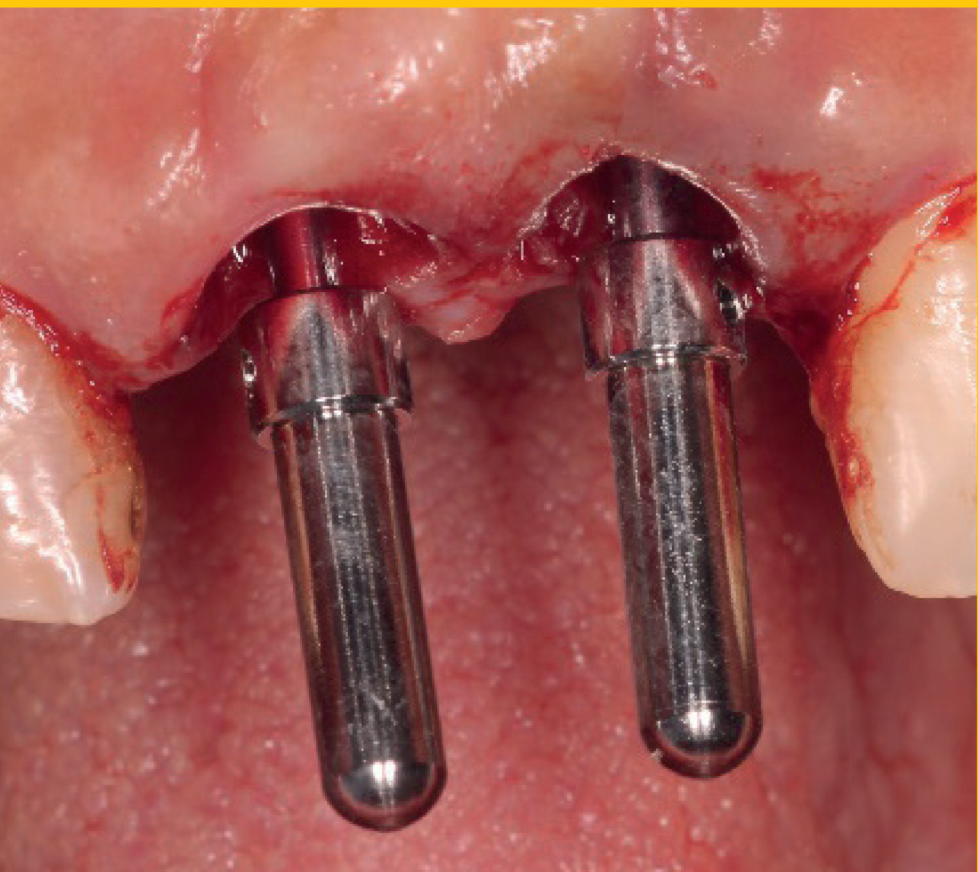

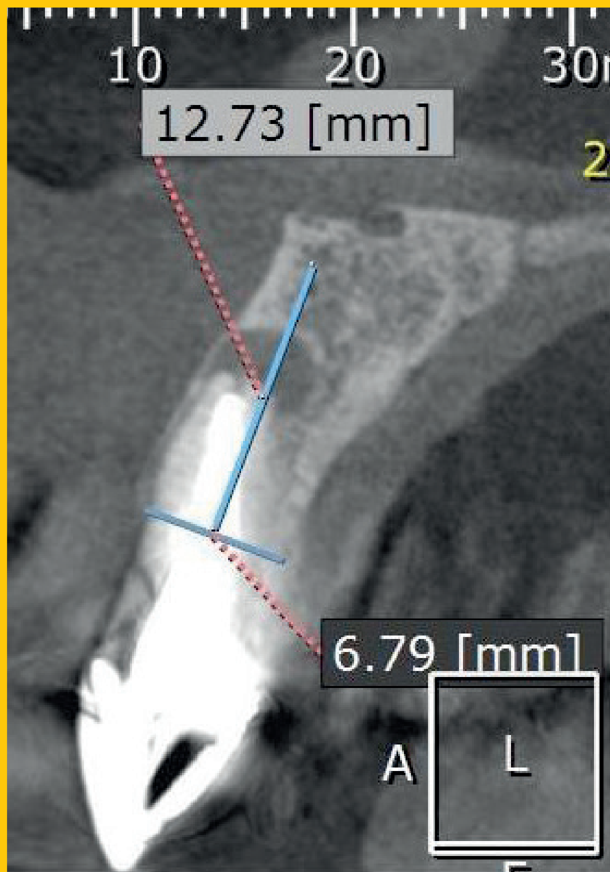

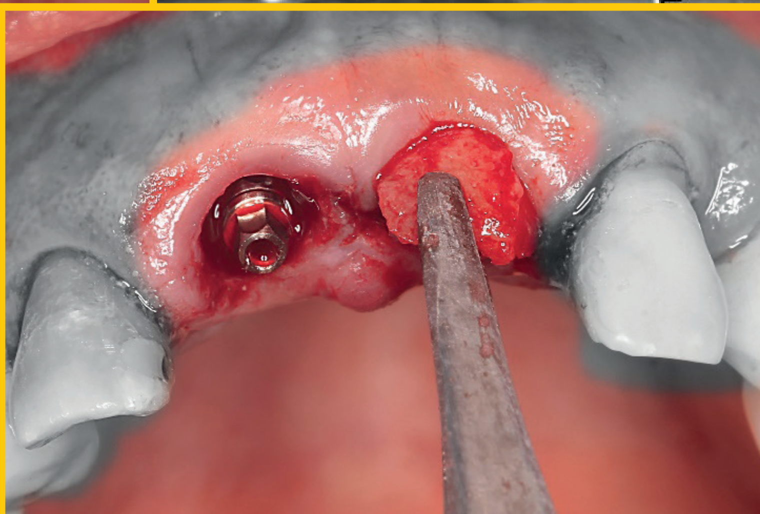

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In atrophic edentulous maxillae, should we regenerate or use residual bone?

In the world, there are 500 million of completely edentulous people. Edentulism has a significant impact on quality of life: esthetic concerns due to alteration of the vertical dimension and facial profile, decreased masticatory efficiency, temporomandibular joint dysfunction and problems associated with the use of removable complete prostheses, such as stomatitis, angular cheilitis, oral candidiasis, ulcers and hyperplasia.[1,2] Edentulism has repercussions in social life and day-to-day activities. Edentulous patients may feel embarrassed when talking, smiling or eating in front of other people, and this can lead to social isolation and subsequent loneliness.[3]

The best solution for patients with complete edentulism is rehabilitation with prostheses supported on implants. Improved oral health and quality of life can be seen in edentulous patients with atrophied maxillae after implant treatment with an immediate loading protocol.[4] It is frequent that edentulous patients present severe bone atrophy. In these cases we should ask ourselves whether we need to regenerate before placing the implants or if can use the residual pristine bone. Therefore, we must establish whether it is better to place an implant with or without bone grafting.

A problem of regenerative procedures is bone graft resorption. Volumetric measurements of the grafts evidence progressive and unavoidable bone resorption of almost all the grafted bone in the maxilla and mandible. In a study with a number of years of follow-up, after vertical and horizontal alveolar ridge augmentation of atrophic maxillae and mandibles with autogenous crest block bone grafts, very high percentages of bone graft resorption were found.[5] The use of anatomical buttresses is an alternative that overcomes the higher morbidity and higher treatment fees of regenerative procedures, as well as the longer postoperative periods for delivery of the definitive restorations. Flying buttresses are external discharge elements used in Gothic architecture in the form of a half arch. Buttresses collect the pressure at the start of the vault and transmit it to another buttress attached to the wall of a lateral nave. They were first used in 1180 in the construction of the central nave of the Notre Dame of Paris to reinforce its vault. In orofacial structures, buttresses are areas of dense bone that form a protective frame and dissipate forces around the craniofacial cavities: fronto-maxillary buttress, pterygomaxillary buttress, zygomatic buttress, palatal cortical bone and nasopalatine duct (an additional area of residual bone).[6–8]

A study that compared conventional dental implants placed in augmented atrophic maxillae and the placement of implants in buttresses found a greater loss of implants in the augmentation group.[9] It also found that the mean period for functional restoration was 1 week in the buttresses group and more than 1 year in the augmented patients.[9]

Prof. Miguel Peñarrocha Diago
Editor-in-Chief

Editorial note: A list of references is available from the publisher.

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Evaluation of primary stability and early healing of 2 implant macrodesigns placed in the posterior maxilla: A split-mouth prospective randomized controlled clinical study

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Abstract

Objective
The aim of this study was to evaluate the clinical behavior of 2 implants of different macrodesigns placed in low-density bone at the moment of insertion and during bone healing.

Materials and methods
In this split-mouth prospective randomized controlled clinical study, 60 Avinent dental implants (Avinent Implant System) were placed in the posterior maxillae of 30 patients. Each patient received 1 tapered implant with a wide thread (OCEAN) and 1 cylindrical implant with a narrow thread (CORAL). Primary stability was evaluated at baseline by measuring the insertion torque applied and registering the implant stability quotient (ISQ). Periimplant crestal bone loss was evaluated from intraoral radiographs taken at 1 and 4 months after implant placement. Lastly, ISQ was registered after 4 months.

Results
At baseline, both insertion torque and ISQ values were significantly higher for tapered implants ($P = 0.008$). There was less periimplant crestal bone loss at 1 and 4 months with tapered implants with a wide thread (0.43 ± 0.27 mm and 0.59 ± 0.31 mm, respectively) than with cylindrical implants with a narrow thread (0.73 ± 0.28 mm and 0.95 ± 0.43 mm, respectively), and the differences at both evaluation times were significant ($P < 0.001$ and $P = 0.001$, respectively). The ISQ values at 4 months were higher for tapered implants with a wide thread, and the difference was significant ($P = 0.014$).

Conclusion
Although both implant macrodesigns can be placed in low-density bone, tapered implants with a wide thread appear to produce better results in terms of insertion torque, ISQ and crestal bone loss 4 months after placement.

Keywords: Dental implant macrodesign; tapered implant; cylindrical implant; low-density bone; thread.

Introduction

Bone density and especially cortical thickness are important factors in achieving adequate primary stability and a successful clinical outcome when placing dental implants.[1] Primary stability is defined as the absence of movement after the intraosseous insertion of the implant.[2] Different types of bone in the jaws have been clinically classified in various ways according to structural characteristics related to the proportion of cortical to trabecular bone. The most commonly used classification is that of Lekholm and Zarb,[3] according to which type I is the most densely compacted bone type, and type IV the most trabeculated, with lower density and thinner cortical bone, which is generally considered less suitable for supporting dental implants.[4] Nevertheless, none of the classification systems take the bone's biological capacity into account.[5]

In recent years, various quantitative methods for assessing primary stability have been introduced. These can be used to monitor implant stability repeatedly over time.[6] Resonance frequency analysis (RFA) consists of applying a bending load that imitates clinical implant loading and its direction. This provides information about the rigidity of the bone-to-implant union, and the result is registered as a parameter known as the implant stability quotient (ISQ). ISQ values range from 1 (low stability) to 100 (maximum stability).[7] Alternatively, insertion torque is a direct measure of the bone's cutting resistance during implant insertion surgery.[8] But insertion torque is a mechanical parameter that can be influenced by the surgical procedure, implant design and bone quality.

The success of an implant depends largely on its primary stability, as mechanical stability provides a basis for osseointegration.[9] Bone density and quality, surgical technique, primary stability and, of course, the implant's geometry are all important factors in achieving implant osseointegration.[9, 2, 10]

Implant design and shape have undergone various modifications over the years, aimed at increasing the contact between implant surface and bone, and increasing primary and secondary stability.[11, 12] An adequate macrodesign must balance compression and traction forces and minimize shear forces,[12] to maintain micromovement at a level below 50–150 µm during the healing period.[13] A tapered shape provides the implant with a good basis for primary stability, as it allows the gradual expansion of the bone and minimizes stress at its interface with the surrounding bone.[10] It has been shown clinically that implants with a tapered design present better stability in areas with lower bone density.[14, 15] The pitch and shape of the thread also influence primary stability, stress and initial bone-to-implant contact.[16] According to some studies, a reduced pitch improves surface contact with bone, reduces the distribution of stress and improves primary stability in low-density bone.[17, 18]

Thus, the aim of this split-mouth prospective randomized controlled study was to evaluate the clinical behavior of 2 implants of different macrodesigns at the moment of insertion in the low-density bone of the posterior upper jaw and during bone healing.

Methods and materials

Recruitment and patient characteristics

The study protocol was approved by the University of Murcia's ethics committee (Spain) (1933/2018) and was carried out between June 2018 and December 2018 at the university's dental clinic. Subjects were treated according to guidelines established by the Declaration of Helsiki for medical research involving human subjects. All the subjects provided their informed consent to participate. The entire protocol (clinical, surgical and radiographic) was carried out by a single clinician.

The inclusion criteria were as follows: aged over 18 years; total edentulism in the maxilla necessitating bilateral implant insertion in the posterior third in type III bone within a range of 350–830 Hounsfield units (HU), according to Norton and Gamble's classification;[3] absence of medical contraindications to oral surgical procedures (ASA I/II); and willingness to provide informed consent to take part. The exclusion criteria were as follows: presence of a disease or condition or use of medication that could compromise healing or osseointegration (diabetes mellitus, severe osteoporosis or bisphosphonate administration); pregnancy or lactation; and radiotherapy of