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Evaluation of four designs of short implants placed in atrophic areas with reduced bone height: a three-year, retrospective, clinical and radiographic study

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Abstract

The aim of the present study was to evaluate retrospectively the clinical and radiographic behaviour of four commercially-available short implants with different macrodesigns and microdesigns in areas in which the height of the bone was reduced. We took into account the success and survival, peri-implant crestal bone loss, and the level of probing at which the gum bled. Patients were included if they had been given one or more short implants (≤8.5 mm long) in the posterior jaws at least three years earlier. Three hundred and ninety-one short implants were placed in 170 subjects, and were divided in four groups based on the brand of implant. The implants were evaluated one, two, and three years after they had been inserted. Short implants had a three-year survival and success rate of 90% in all groups, and bone loss was acceptable after three years with no significant differences between them. These results support the use of short implants as an effective and safe treatment. However, within the limitations of this study, the design of the implant does seem to influence the behaviour of peri-implant bone at the crestal level.

Keywords: short dental implants; macro-design; micro-design; atrophic areas

Introduction

Limited availability of bone, which is more common posteriorly, increases the difficulties of placement of dental implants. Several surgical techniques have been used, including guided bony regeneration, sinus lift, distraction of bone, transposition of the alveolar nerve, angled implants, and zygomatic and pterygoid implants.[1–3] Each one has had some degree of success, but most require more complex treatment. Short dental implants are one alternative to these advanced procedures, they achieve similar results,[4,5] and can reduce processing time, costs, and morbidity.

Numerous studies have focused on the biomechanics of short implants,[6,7] and the authors concluded that higher rates of bone stress occurs independently of the length of the implants, and that the diameter of the implant is more important. It has also been reported in previous studies that the width of the implant has more influence on osseointegration and survival than the length.[8] However, the implant connection also seems to influence the stress supported by short implants.[9]

The use of short implants can be considered safe and predictable if used under strict conditions.[8,10,11] The objective of the present study, therefore, was to evaluate the clinical and radiographic success of different designs of short den-

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tal implants from the point of view of survival, peri-implant crestal bone level, and the level at which the gum bled on probing.

Patients and methods

One hundred and seventy patients were selected for study in this retrospective case series. There were 89 women and 81 men, mean (range) age 58 (33–67) years. The study was approved by the Ethics and Research Committee of the Catholic University of Murcia, Spain. All patients were informed about the nature of the study and their participation, and written consent was granted by every participant according to the Helsinki Declaration, 1994.

The inclusion criteria were based on the stability of each patient's current medical condition, their ability to withstand the stress of having dental implants, and the request for short implants (≤8.5 mm long) in the atrophic areas with bone of limited height. To achieve the objectives of the study, the medical records database of the clinic was reviewed to find potentially eligible patients, and their medical and dental histories checked. Smokers (defined as people who smoked more than 10 cigarettes a day) were included the study. All implants were inserted by a single experienced operator.

A total of 391 short implants between 3.75 and 6.00 mm in diameter and between 6.0 and 8.5 mm long from four different implant systems were evaluated: Group 1: Cone Essential® implants (Klockner® Implant System, Barcelona, Spain); Group 2: Seven® implants (MIS, BarLev Industrial Park, Israel); Group 3: Osseotite® implants (Biomet 3i™, Palm Beach Gardens, Florida, USA); and Group 4: Implants BTI® (Biotechnology Institute BTI, Vitoria-Gastez, Spain). Fig. 1 show the macrodesign and microdesign of each implant.

A cone-beam computed tomographic scan and panoramic radiographs were taken before the intervention to assess the quality and quantity of bone, and to measure the height and width of the ridge of supporting bone to allow careful planning of treatment. The same plan was followed for all patients. Preoperatively patients had a routine dental clean before the implant to make sure that the gingiva was in good condition. In all cases, the implants were installed using a full-thickness flap, and the osteotomies were made in accordance with the manufacturers' instructions.

In general, healing was allowed for a minimum of three months, after which the surgical abutments were fixed. Most implants (93%) were loaded between three and four months after insertion (mean (SD) 4 (1) months) by experienced prosthodontists.

Postoperatively patients were referred for periodic evaluations 5–10 days later, at 1, 3, and 6 months, and then annually. At each follow-up visit patients were assessed to verify the state of the implant (gingival health, mobility of the prosthesis, pain, infection, resorption of the alveolar ridge, and any other complications). They also had periodic panoramic radiographs.

Intraoral radiographs were used to measure marginal bone loss. To reproduce the radiographic angles in posterior reviews, XCP positioners were used (Dentsply, Des Plaines, IL, USA), with the guide bar placed parallel to the direc-

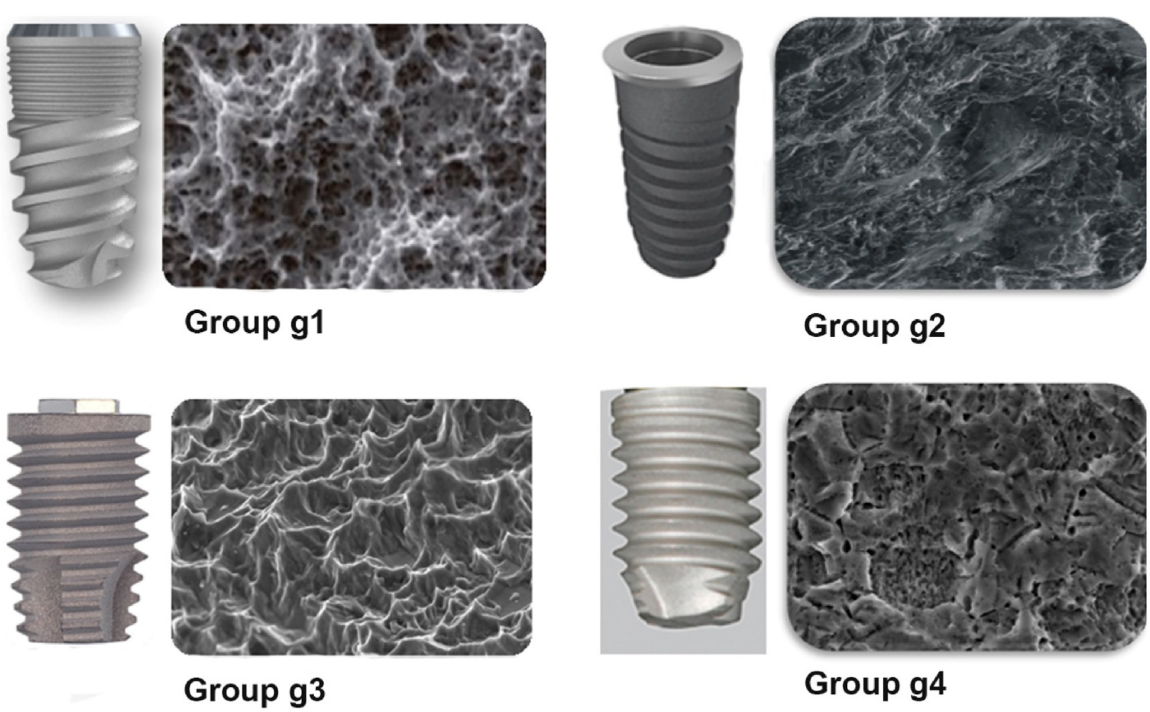

Fig. 1. Images of the implants used (scanning electromicroscopy of the surface ×5000).