PROTOCOL FOR IMMEDIATE TOOTH REPLACEMENT IN THE ESTHETIC REGION MINIMAL INVASIVE, MAXIMAL EFFECTIVE

Immediately placed front tooth implants 1: Analysis with Cone Beam Computed Tomography after modelling of the buccal plate

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Topic: Implant insertion after tooth extraction: Clinical outcomes with different approaches

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Abstract

The aim of this retrospective research was to study the stability of the buccal bone using a protocol for immediate tooth replacement described by Staas & Groenendijk. In the period 1 January 2008 to 1 January 2012, 186 patients was implanted using the protocol immediately after the removal of a mandibular incisor. Subsequent to placement of the implant, a 2 mm gap between implant and buccal plate was filled with a bone substitute. In addition to a pre-operatively and per-operatively cone beam computer tomogram (CBCT), also a late-postoperative cone beam computer tomogram was produced in 16 cases. Per-operative, the buccal plate thickness increased by 1.5 mm (mean) from 0.8 mm to 2.4 mm (mean). During the evaluation period of 1 to 4 years a reduction took place resulting in a final buccal plate thickness of 1.8 mm on average. Surprisingly, the buccal plate bone height increased by 1.6 mm (mean), to an average of 1.2 mm above the implant shoulder. In these cases it was crucial that the implant was placed in such a way that a gap of a minimum of 2.0 mm was created between the original buccal plate and the implant, and that this gap was filled with a bone substitute. With this minimal invasive treatment protocol, costs and treatment time are minimized, while patient comfort and esthetics are optimized. Although the results are promising, further research on this topic is necessary.

Introduction

The success rate and esthetic outcome of implant treatment in the esthetic region depends on multiple factors. In various studies on the topic of immediate replacement key factors, such as the initial condition of the alveolar ridge before extraction, surgical and prosthetic technique, surgical and prosthetic components and implant position are either not taken into account or not properly addressed. Colombo S & Groenendijk defined a protocol for immediate tooth replacement in the esthetic region. This protocol was implemented in order to study the stability of the buccal bone outcome using this protocol.

Material & Method

In a period from 1 January 2008 to 1 January 2012 186 patients were treated with an immediate implant to replace a lateral or central maxillary incisor. Per implant was treated by one practitioner. After some time another CBCT was indicated for diagnostic reasons in 16 cases (4.2%). This minimal invasive protocol was part of a postoperative evaluation. The ages of the 16 cases included ranged from 17 to 72 years with an average age of 44 years. A standard protocol described by Staas & Groenendijk was followed in all patients. Using this protocol a pre-operative CBCT is made for diagnostic reasons and planning of the implant treatment, while a per-operative CBCT is made to capture the three dimensional position of the implant after the flapless surgery. The pre-operative CBCT shows the natural tooth in situ or an empty socket, respectively. Two implants were at position 11, four at position 21, eight at position 12 and two at position 22. In 9 cases persistent peripatellar pathology was reason for extraction. In four cases had a crown - or root fracture and three cases were found to be a recent trauma related absent tooth. The study was performed using the manufacturers drill protocol: 1 X Ø 3.0 mm x length 13.0 mm; 4 X Ø 3.5 mm x length 13.0 mm; 6 X Ø 3.5 X 0 x length 10.0 mm; and 5 X Ø 4.5 mm x length 15.0 mm. In 15 patients Gaëtanich Bio-Oss ® was used as bone substitute with a grain size between 2.5-3.0 mm. The torque at immediate placement varied between 40 to 110 Ncm with an average of 65 Ncm.

The time lag between implant placement and the manufacture of the late-postoperative CBCT was between 43 and 202 weeks, with an average of 103 weeks after implant placement. Based on use of ‘cone-based alignment’ using software (version 2.5.0.3 Macmillan 0) the pre-operative, post-operative, and late-postoperative CBCT of each patient was superimposed. As orientation the palatine and the alveolar crest was anterior. Three sagittal cuts were oriented: central of the placed implant (the mid-buccal cross section), as well as 1 mm to the mesial and 1 mm to the distal. The width of the buccal plate was measured at 1 mm below the most coronal point. In this way the thickness of the buccal plate was measured before implant placement, directly after and on average 103 weeks (range 43-202) after surgery. By comparing the pre-operative with the direct-postoperative thickness and late postoperative thickness the change in buccal plate thickness was assessed. The data were reviewed with a paired t-test. In analogy of the bone thickness also the height of the buccal bone was determined in the middle of the implant, 1 mm to the distal and 1 mm to the mesial. The difference in bone-height can be described by reducing the late-postoperative height with the preoperative height. For all provisions the mean and standard deviation and dispersion were calculated. Differences were tested with a paired t-test and the reliability, the duplo errors and structural measurement error determined. A intraobserver error for the observers check was carried out on the basis of repetition of all measurements in 4 cases.

 RESULTS

Results

Per-operative, the buccal plate thickness increased by 1.5 mm (mean) from 0.8 mm to 2.4 mm (mean). During the evaluation period of 1 to 4 years a reduction took place resulting in a final buccal plate thickness of 1.8 mm on average. The buccal plate bone height increased by 1.4 mm (mean), to an average of 1.2 mm above the implant shoulder. The observed increase in height (± 4 values in the tables) were at review statistically significant (p < 0.001) on all measured cross sections. Both in thickness (Q5) as in height (QH) no differences were measured in the sagittal section created by the mid-facial, 1 mm to the mesial and 1 mm to the distal.

 RESULTS

RESULTS AFTER 2 YEARS: SMALL DECREASE WIDTH OF BUA-BONE - 0.6 MM

RESULTS AFTER 2 YEARS: INCREASE CRESTAL HEIGH M - 1.1 mm

(M = 1.2 mm above implant shoulder)

Conclusion

With this minimal invasive treatment protocol, in which a gain in the buccal plate thickness is seen of on average 1.5 mm and an increase in buccal bone height on average 1.6 mm in the mid-facial , costs and treatment time are minimized, while patient comfort and esthetics are optimized. Although the results are promising, further research on this topic is necessary.

References