Marginal Bone Maintenance and Soft Tissue Aesthetics with the Astra Tech OsseoSpeed™ Profile Implant: A Case Report

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The aim of this case report is to present and evaluate the maintenance of the lingual, facial and inter-proximal bone and the development of the peri-implant tissue over a period of two years following the insertion of an OsseoSpeed™ Profile implant in a healed and sloped bone site. Six months after extraction of the tooth due to endodontic failure, the planned implant site showed a bone level difference of 2.1 mm from the highest lingual bone level to the level of the facial bone crest. An OsseoSpeed™ Profile implant with a length of 15 mm and a diameter of 4.5 mm was inserted using a one-stage surgical protocol. A healing abutment was connected to the implant during the planned, unloaded healing phase of four months. To assess the marginal bone level, in particular at the facial and lingual implant shoulder, a re-entry was made after the healing phase.

The healing period was uneventful and without irritation or complications. At the re-entry maintenance of marginal bone at the level of the implant shoulder was observed. A cone beam computed tomography (CBCT) was performed to assess the marginal bone level and the development of the peri-implant tissue.

A new dental implant with sloped shoulder contour – the Astra Tech OsseoSpeed™ Profile (Astra Tech AB, Mölndal, Sweden) – has been developed to improve implant insertion in the situation where the anatomy of the alveolar process is sloped from lingual to buccal or facial.

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Although a better understanding of the maintenance of marginal bone levels has been achieved in recent years [10] the fundamental problem of the marginal tissues has remained unsolved.

The vast majority of the implants available on the market have a flat prosthetic shoulder. Thus, the implant configuration does not correspond to the contour of healthy marginal bone in an edentulous area. The fresh extraction socket in the anterior area has a vertical height difference of 2 to 4.1 mm between the facial and inter-proximal bone levels [4]. The contour of the healed bone in the premolar area shows a difference in level of around 2 mm from the lingual to the buccal bone crest [1].

To prevent titanium from being visible through the gingival mucosa above the marginal bone contour, implants have to be inserted deeper than the lowest point of the buccal or facial bone level. An implant with a flat shoulder will, in such situations, lead to lack of support for the inter-proximal and lingual bone areas. Thus, a remodelling of the marginal bone will occur and lead to flattening, with loss of the osseous support of the papillae. This is particularly significant between two adjacent implants and can lead to considerable aesthetic problems. The need for development of an implant with a sloper shoulder was therefore recognized.

This case report describes the clinical success of a new implant design, the OsseoSpeed™ Profile implant (Astra Tech AB, Mölndal, Sweden). This implant has a sloped marginal contour and has been developed in order to improve implant treatment in situations where there is a difference in height of the alveolar process in the bucco-lingual direction.

Clinical and radiological studies have shown that pronounced changes in the height and width of the alveolar ridge occur following the extraction of single or multiple teeth [8,9]. Both the lingual and the buccal aspect of the extraction alveolus showed bone resorption, while the reduction of the buccal surface was more pronounced. A definite reduction in the ridge width was also seen, particularly during the first three months after tooth extraction.

Animal studies revealed pronounced changes in the size of the alveolar process in the area of mandibular premolars during the first eight weeks after extraction [1]. However, the height loss was more marked at the buccal surface than at the lingual surface of the extraction alveolus. The resorption of the buccal and lingual walls of the extraction socket took place in two overlapping phases.

During the first phase, the alveolar bone was resorbed and replaced by woven bone. Since the buccal-crestal part of the extraction alveolus consists exclusively of alveolar bone, the subsequent resorption of the alveolar ridge led to a substantial vertical reduction at the buccal aspect. In the second phase, a resorption of the outside surfaces of both walls of the extraction socket was observed.

After a healing phase of eight weeks, the buccal wall was seen to have resorbed much more than the lingual wall. In addition, the buccal ridge was approximately 2 mm lower than the lingual bone level.

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The aim of this case report is to present and evaluate the maintenance of the lingual, facial and interproximal bone and the development of the peri-implant soft tissue over a period of two years following insertion of an OsseoSpeed™ Profile implant in a healed and sloped bone situation.

Material and Methods

In addition to implant survival, the primary objectives were the assessment of the marginal bone maintenance and the development of the peri-implant soft tissue. The lingual and facial bone level at the implant was measured clinically at the time of the implant insertion and at re-entry after four months of healing. The inter-proximal bone levels were measured radiographically at the time of implant insertion, at re-entry, following final prosthetic treatment and at the one-year and two-year annual check-ups. The peri-implant soft tissues were assessed using the papilla index according to Jemt [7], and the Pink Esthetic Score according to Fuerhauser [6].

Patient

In the autumn of 2008, a 39-year old patient expressed a wish for implant treatment in the region of the upperleft canine. The tooth had been endodontically treated but after persistent discomfort the tooth was removed. Six months later, the implant was inserted. The general case history was unremarkable and the patient was a non-smoker (Fig. 1).

Clinical Pre-Examination

The natural adjacent teeth were present and vital. Although the inter-proximal plaque index was increased, the patient was periodontally unremarkable and there was no need for further restorative or prosthetic treatment. Clinical observation of the canine area showed a favourable soft tissue situation with sufficient width of attached mucosa. The gingiva biotype was thick and the resorption of the alveolar ridge was limited, though the facial soft tissue level was found to be 2 mm lower than at the lingual level. The inter-

Fig. 2: The pre-operative clinical situation shows a favourable facial soft tissue contour and a thick mucosal biotype.

Fig. 3a and b: The pre-operative radiological diagnosis with intraoral radiograph and cone beam computed tomography shows a difference in level from the highest lingual bone level to the facial prominence of more than 2 mm.

Fig. 4: Astra Tech OsseoSpeed™ Profile implants in conical and straight implant configuration and in different diameters. Because of the different implant configurations, these have variable height differences (1.5, 1.6 and 1.7 mm) between the buccal-facial and lingual implant shoulder.

Fig. 5: After a marginal incision and elevation of a full thickness flap, the implant is aligned according to prosthetic aspects.
dental papillae revealed a considerable loss of height (Fig. 2). Cone beam computed tomography was done in order to evaluate the bone volume in the buccal-lingual direction. The difference in height between the lingual and the buccal bone levels was 2.1 mm. The ridge width of 7 mm and height of 17 mm was favourable to insertion of a 15 mm long implant with a diameter of 4.5 mm (Fig. 3a+b).

**Implant Insertion**

The OsseoSpeed™ Profile implant is a screw-shaped, self-tapping implant with a conical implant abutment connection. The diameters available are 4.5, 5.0 and 5.0S (Fig. 4), and the lengths are 9, 11, 13, 15 and 17 mm. This new implant design is a development based on the OsseoSpeed™ implant, already known.

The one-stage implant insertion took place according to the manufacturer’s recommendations. The surgery was performed under local anaesthetic. After a crestal and intrasulcular incision, a full thickness flap was elevated and the alveolar ridge exposed. The favourable volume of the alveolar ridge documented as part of the pre-operative radiological diagnosis was confirmed (Fig. 5).

After marking with a guide drill 2.5 mm facially of the most coronal aspect of the crest, the implant site was first prepared with 2 mm twist drill with the aid of a guide template. A pilot drill was used to widen the diameter of the implant site from 2 mm to 3.2 mm. The apical preparation was completed with the 3.2 mm twist drill. The preparation depth measured with the depth gauge was 15 mm lingually and 13.5 mm facially. To accommodate a conical 4.5 mm implant, the coronal portion had to be widened with the conical drill at reduced speed. The OsseoSpeed™ Profile implant was inserted into the implant bed at slow speed under profuse irrigation with a saline solution. A high primary stability of the implant was achieved. The facial contour of the implant shoulder was aligned slightly sub-crestally, the lingual contour epicrestally.

Finally, a gingiva former (Healing Abutment Uni 4.5/5.0, Astra Tech AB, Mölndal, Sweden) was attached to the conical internal connection of the implant for the four-month healing phase. Flap adaptation to the gingiva former was achieved by alternating single and mattress sutures using a monofilament suture material (Ethilon 5-0 FS-3, Ethicon, Norderstedt, Germany). To prevent infection, the patient was prescribed antibiotics (Clindamycin 300 mg, one tablet three times a day) and was instructed to rinse twice a day with a 0.1% chlorohexidi-

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**Fig. 6:** At re-entry the bone level is stabilised coronally of the facial implant shoulder.

**Fig. 7a and b:** The radiographic evaluation four months after implant insertion reveals stable osseous conditions coronal to the implant shoulder.

**Fig. 8:** Irritation-free peri-implant conditions can be seen after removal of the healing abutment.

**Fig. 9:** Five months after implant insertion, the gingiva former is removed and a Ti-Design™ Profile abutment is attached.
ne solution for ten days. The patient did not want a provisional prosthesis. To avoid overloading of the implant, the patient was put on a soft diet and instructed to eat on the opposite side. The patient presented ten days post-operatively for examination of the wound and for removal of the sutures.

Four months after implant insertion, a re-entry was made under local anaesthetic to check the marginal bone situation at the lingual and facial areas of the implant. To do this, the gingiva former was removed, a crestal incision made and a mucoperiosteal flap elevated. The implant stability was assessed and the marginal bone height measured in relation to the implant shoulder (Fig. 6).

The gingiva former was then re-attached, tight flap adaptation was achieved by mattress sutures. The patient returned a week later to have the sutures removed. Two weeks after re-entry, the final impression was taken for the implant prosthetic treatment using a polyether moulding material (Impregum, 3M-Espe, Seefeld, Germany) and an individual tray (Fig. 8).

In the dental laboratory, the master model was fabricated with a Profile implant replica. A TiDesign™ Profile Abutment (6 mm in diameter, 2 mm in height) was adapted to the emergence profile and the contour of the marginal gingiva.

Two weeks later, the PFM crown was cemented on the TiDesign™ Profile abutment (25 Ncm torque) with a glass ionomer cement (Ketac-Cem, 3M-Espe, Seefeld, Germany). The marginal cement surplus was removed thoroughly (Fig. 9+10).

Radiological Examination

Intraoral radiographs were taken pre-operatively, after insertion of the implant, at the time of re-entry (Fig. 7a+b), after delivery of the prosthesis and at the first and second annual check-ups. In order to achieve reproducibility, both the right-angle technique and a Rinn film holder system were used. The implant shoulder was used as a reference point for calculations of changes in the marginal bone.

Results

The patient attended the follow-up checks regularly. The implant achieved a good primary stability (25 Ncm; final insertion torque) at implant insertion. No soft tissue problems were observed within the two-year follow-up period. No peri-implant inflammation, bone loss or radiological peri-implant translucency of the clinically stable and irritation-free implant were found.
No problems with loosening of the gingiva former or abutment screw were reported. The marginal bone level at the lingual implant surface was located at the level of the implant shoulder at the time of the implant insertion and at re-entry. The facial bone level showed no resorption from implant insertion to re-entry and stabilised 1 mm coronally of the implant shoulder.

The inter-proximal bone level, which, at the time of implant insertion, was located 1 mm coronally of the implant shoulder was also stabilised above the implant shoulder after two years (Fig. 13). A cone beam computed tomography two years after implant insertion showed that facial bone coronally of the implant shoulder was maintained (Fig. 14).

At the time of the final prosthetic treatment, the assessment of soft tissues using the papilla index according to Jemt [7] resulted in a score of 1 mesially and distally of the crown. At the time of the second annual check-up, it had however increased and a score of 3 mesially and 2 distally was reported. The Pink Esthetic Score according to Fuerhauser [6] was 10 at the time of the prosthetic treatment, while it was 13 at the second annual check-up (Fig. 11+12).

The improvement of the aesthetic parameters are essentially due to the positive height development of the papillae. The width of the attached mucosa increased from 5 mm to 6 mm.

Discussion

This case report describes the maintenance of the marginal bone and the development of the peri-implant mucosa around the new sloped OsseoSpeed™ Profile implant over a follow-up period of two years after a one-stage implant insertion in the healed alveolar bone. The result proves the maintenance of the peri-implant marginal bone level, particularly on the facial side. The avoidance of peri-implant osseous re-modelling forms the basis for the regeneration and aesthetic improvement of the peri-implant mucosa.

It was also observed that a flattening of the marginal bone to the same level on the lingual as on the buccal side did not occur in the present case during the two-year observation period. Through the combined effect of an internal conical connection, Connective Contour™ and MicroThread™, the sloped implant shoulder was able to stabilise the peri-implant bone level. The purpose of this case report was to evaluate the favourable osseous and soft tissue support provided by the sloped implant design.

If lingual bone loss can be minimised in sites with a sloped crest profile, a positive osseous architecture with aesthetic support of the soft tissues will be possible.

Summary

The case report shows that it is possible to maintain the peri-implant bone in situations where the bucco-lingual bone crest is sloped by using the OsseoSpeed™ Profile implant and, through the circumferential osseous support, to obtain an aesthetically pleasing scalloped contour of the peri-implant soft tissue.

LITERATURE


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