Longitudinal Ridge Split Osteotomy and Simultaneous Implant Placement

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Abstract: Longitudinal ridge split osteotomy was performed in 33 cases with horizontal alveolar bone deficit, with a sufficient apical basis, that provides primary stability of the implants. The survival rate of the implants was 87.9%. The mean marginal bone loss is 1.586mm. Bleeding on probing is registered in 45.5% of the cases. There was found no correlation between the marginal bone loss and the bleeding on probing. The complication rate was 33.4%. In 18.2% of the cases was registered fracture of the vestibular bone plate.

Keywords: Longitudinal ridge split osteotomy, implants

1. Introduction

Because of their high survival and success rate, the intraosseal root-form dental implants are preferred as a method for treatment of edentulism. The disadvantage is that they require a sufficient bone volume-in horizontal and in vertical direction. One of the discussed alveolar bone augmentation methods is the longitudinal ridge split osteotomy, which is performed on a patients with horizontal alveolar bone deficit. The aim of this study is to evaluate the success rate and the predictability of the implants placed simultaneously with longitudinal ridge split osteotomy as a method for treatment of edentulism in the cases of insufficient alveolar bone volume.

Literature Survey

The longitudinal ridge split osteotomy is a longitudinal cut of the residual alveolar bone and dilatation of the fragments, which bases stay connected to the bone. As original the method is described with immediate implant placement (1). Some authors perform this method only in the upper jaw (2, 3, 4), others - only in the mandible (5, 6), as the majority of the publications describe its performance in both jaws (7, 8). The space between the two plates is filled with bone grafting material, as some authors recommend the use of barrier membrane (9, 4), which covers them. Some authors report various intraoperative and early postoperative complications of the longitudinal ridge split osteotomy: inability to place the implant in the right position (9), loss of implants in the early postoperative period (before the implants are functional loaded) (3, 10, 11), bone resorption around the implants (12, 2). In a systematic literature review Bassetti et al. (13) report survival rate of implants placed simultaneously with the longitudinal ridge split-osteotomy of 91.7% to 100%, which is comparable with the results reported by some authors of implant placement in non augmented bone or implants, placed simultaneously with guided bone regeneration.

2. Methods

Longitudinal ridge split osteotomy was performed in cases with horizontal alveolar bone deficit, with a sufficient apical basis, that provides primary stability of the implants. After the elevation of muco-periosteal flap, pilot holes were done in the area of the planned implant positions. Then split osteotomy was done. One horizontal and two vertical cuts were done using piezosurgical device with graduated tip. The horizontal cut was made along the crest of the alveolar ridge and the vertical cuts were placed 1mm from the adjacent teeth. The depth of the osteotomy is 3 mm shorter than the depth of the pilot holes - resp. the length of the placed implants. Two bone plates were obtained due to the osteotomy. The alveolar ridge was expanded trough the separation of the both bone plates. The osteotomy for the implant placement was enlarged to the desired diameter consecutively with increasing diameter twist drills. Then the implants were placed and the remaining space between the both plates was filled with bone grafting material. Also the vestibular bone plate was covered with bone grafting material and barrier membrane, which also covered the opening of the split-osteotomy.

The muco-periosteal flap was mobilized, repositioned and sutured using 5/0 monofilament polyamide thread (Dafilon, B.Braun-Melsungen, Germany). When intraoperative was observed insufficient stability of the vestibular plate, it was stabilized using microscrew.

In the cases of longitudinal ridge split osteotomy with simultaneous implant placement were observed the following criteria: presence of intraoperative and postoperative complications; the survival rate for the period of observation, bone resorption visible on radiography, bleeding on probing.

3. Results

The results are shown in app.16. The mean period of observation was 5 years. The mean age of the patients was 38.45 years. The most common area, where the procedure was performed is the anterior maxilla. The implants were functional loaded 4 months after the procedure. The survival rate of the implants was 87.9%. The mean marginal bone loss was 1.586mm. Bleeding on probing was registered in 45.5% of the cases. There was found no correlation between the marginal bone loss and the bleeding on probing. The complication rate was 33.4%. In 18.2% of the cases was
registered fracture of the vestibular bone plate, which required fixation with microscrew and in 15.2% of the cases there was not achieved the correct/planned prosthetic position.

4. Discussion

The mean survival rate of the implants placed simultaneously with split ridge osteotomy according to our methodology is 87.9%, which is lower than the survival rate of the implants placed according to other methods, which we have observed(14, 15, 16, 17). Chiapasco et al.(17, 18), Sethi and Kaus(19) reported higher survival rate and their results are similar to those of Engelke et al(1). The mean marginal bone loss is higher than the mean marginal bone loss of other methods, which were included in our study -1.586mm(14, 15, 16, 17). Although it is lower than the marginal bone resorption described by other authors(20). Unlike the other observed by us methods, between the higher rate of the bleeding on probing of the implants placed simultaneously with ridge split osteotomy (45.5%) and the severity of the marginal bone loss was found no correlation. This is due to the typical for this procedure bone resorption, which is due to the increased intensity of the bone remodeling of the osteotomised bone plates, which leads to a dehiscence of the threaded surface of the implant. The threaded surface is plaque retentive, which leads to increased accumulation of bacterial plaque, that provokes inflammation.

5. Conclusion

The implants placed simultaneously with longitudinal ridge split osteotomy demonstrate the lowest survival rate, the highest mean marginal bone loss and the highest rate of periimplantitis, compared to other methods, that we observed for implant treatment of patients with insufficient bone volume of the alveolar crest. That’s why we evaluate the ridge split osteotomy with simultaneous implant placement as a method with very low success rate and predictability.

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