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Effect of Flapless Surgery on Dental Implant Outcomes: A Review

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ABSTRACT

Implant overdentures are a popular and clinically significant treatment option to present to patients because of the large improvement achieved with a small surgical and financial investment. This article aims to address peri–implant bone loss, soft tissue changes, resonance frequency analysis, implant survival rate and intraoperative complications. This article review the efficacy and effectiveness of flapless surgery for endosseous dental implants. The available data were evaluated for short- and long-term outcomes.

Keywords: Flapless surgery, Bone loss, Resonance frequency analysis, Implant survival

ABBREVIATIONS

SD: Standard deviation; RFA: Resonance frequency analysis; ISQ: Implant stability quotient; BIC: Bone to Implant Contact

INTRODUCTION

Loss of tooth not only cases difficulty in mastication and maintenance of oral hygiene but is also psychologically disturbing on the part of the patient, as it compromises both, esthetics as well as speech. For this reason, most patients want even a single lost tooth replaced [1]. With the improved medical care and increased life expectancy, the population of elderly people has increased with rise in number of edentulous patients. This has resulted in increased acceptance of dental implants as a rehabilitation procedure for missing teeth and has increased the demand of dental implants therapy in recent years. Adell et al. [2] were the first to quantify and report marginal bone loss. Their study indicated greater magnitude and occurrence of bone loss during first year of prosthesis loading, averaging 1.2 mm with a range of 0-3 mm. Years subsequent to the first showed an average of 0.05-0.13mm bone loss per year. The number of procedures have been performed to overcome the crestal bone loss like implant size, implant collar design and implant placement procedure (crestal or subcrestal). The elevation of flap during implant placement is also important factor in determining the amount of marginal bone loss following implant placement. The introduction of flapless implant surgery provided an additional means to minimize the trauma of the two –stage implant placement protocol [3,4]. In contrast to the flap technique, implant flapless surgery does not require reflection of a mucoperiosteal flap while perforating the alveolar mucosa and bone. Therefore, flapless surgery generates less postoperative bleeding, less discomfort for the patient, surgery time is shorter, and healing time is reduced. The patients heal with minor, or no, swelling. [5,6]. The flapless technique uses rotary burs or a tissue punch to gain access to bone without flap elevation, so the vascular supply and surrounding soft tissue are well preserved with the advance of flapless surgery, the traditional flap method is being challenged because it is being perceived as unnecessary. Traditionally, flapless surgery has been regarded as having multiple limitations such as: poor control of precise drilling depth due to difficulty in observing the drilling direction of the alveolar bone; inability to preserve keratinized gingiva with a tissue punch perforation; and poor ability to assess the implant point of entry due to the lack of direct vision of the recipient bone. Therefore, it is difficult to correct intraoperative peri-implant defects. This implies that flapless

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surgery is mainly used for cases where there is sufficient quantity and quality of bone, as well as a decent quantity of keratinized gingival [7].

Peri-Implant bone loss

Preservation of the crestal bone surrounding the osseointegrated implant is of at most importance in determining the long term implant survival and is the integrated part of the evaluation of implant patient and recall visits. The blood clot acts as a physical matrix that induces and amplifies the migration, proliferation, and differentiation of various types of cells, subsequently leading to fibroplasias and angiogenesis. Neovascularization of the blood clot and subsequently new bone formation appeared to start from open bone marrow spaces of the adjacent defect borders [8]. With flapless procedure, blood clot fills the intrabony defect and provides a seal between the gingival flap and the implant surface.

Rana et al. [9] Crestal bone level the mean difference in mesial bone loss from 0-3 months and 0-12 months was significantly more among Flap implant placement technique. The mean difference in distal bone loss from 0-3 months was significantly more among flap implant placement technique and mean difference in distal bone loss from 3-12 months was significantly more among Flapless implant placement technique. You et al. [10] similarly reported mean bone resorption of 0.2+-0.3mm in the flapped group 3 months after implant placement and no bone loss in the flapless group. Similar resorption patterns were reported by Job et al. [11] more specifically, the radiograph evaluation 3 months after implant placement indicated 0.4 mm bone loss in the flapped group and 0.06mm in the flapless group [12] evaluated annual bone loss in seven non-smokers and 13 smokers after flapless implant placement using guided surgery. The authors did not report any substantial differences with regard to the mean marginal bone levels between the two groups at baseline and after a 1 year follow-up: non-smokers baseline 0.1 mm (SD 0.5 mm), 1 year 0.8 mm (SD 1.1 mm); and smokers baseline 0.1 mm (SD 0.4 mm), 1 year 1.1 mm (SD 1.4 mm).

Soft tissue changes

The effect of flapless surgery on soft tissue changes was well demonstrated in a study [13] of 79 implants using a flapless technique and delayed loading where baseline probing depths up to 1 month after insertion of final prostheses, were recorded. The results showed no significant differences between the baseline (2.2 mm, SD 0.9) and up to 1 month (2.3 mm, SD 0.8). A long term study would be required [14] randomly assigned patients to one of two groups: Immediate loading or delayed (after 4 months) loading. A flapless approach was chosen for both groups. The authors assessed probing depths, modified bleeding index, modified plaque index and the width of keratinized gingiva. There were no significant differences between the groups at each time and over 6 months.

Resonance frequency analysis

Resonance frequency analysis (RFA) is a noninvasive method for the quantitative assessment of implant stability [15]. The RFA measurements are expressed by the so-called implant stability quotient (ISQ) indicating the degree of stability on a scale between 1 (lowest stability) and 100 (highest stability). RFA measurements have not been performed in many studies and information on the ISQ-values of implants that were inserted in a flapless, template guided procedure is limited.

Katsoulis et al.[8] reported in his study that mean ISQ values of the flapless-group were significantly higher at baseline ($p<0.001$) and at re-entry ($p<0.001$) compared with the flap-group. The flapless procedure showed favourable conditions with regard to implant stability and crestal bone level. Researchers [9] found that the mean ISQ value in the Flapless group was observed to be 63.00±7.071, 64.00±1.414, 72.50±3.56 and 79.50±0.707 at the time of insertion, 3 weeks, 3 months and 12 months respectively. An RFA measurement for flapless group was higher as compared to flap implant placemnt technique. Another author reported of enhanced osseointegration of the flapless implants (70% BIC) compared with the implants inserted with a flap (60% BIC) and bone height of 10 mm vs. 9 mm [16].

One could speculate that the surgical procedure has an impact on the primary stability of implants, on the process of bone remodelling, and subsequently, on ISQ values.

Implant survival rate

In a long term study [17] of implant outcomes of 778 patients and 2040 implants over a mean study period of 19 months, the results indicated a fairly high survival rate. Three studies [18-20] used flapless method in conjunction with navigated surgical protocols and the authors reported survival rates ranging from 87.3% to 97.8%. The authors concluded that the navigated surgical technique might not be appropriate for all types of bone morphology, but could be a viable and predictable treatment modality. Interestingly, one group of authors [21] associated the only two implant failures (n=78 implants) with the limitations of the transmucosal flapless technique rather than with the navigated surgical protocol for the implant placement. The authors noted that this technique might not be suitable for all bone morphologies.

Intraoperative complications

Intraoperative complications range from perforations of bony plates to poor primary stability whereas postoperative complications include technical, biological and aesthetic complications. Technical complications include mechanical failures, biological encompass problems with

osseointegration and pain, infections and aesthetic refer to poor gingival appearance and unattractive prostheses. Intraoperative complications using the flapless method were reported in the five included studies. [22,23]. These complications range from perforations of bony plates to poor primary stability.

CONCLUSION

In conclusion, the current data obtained from various studies showed that flapless surgery could be a viable and predictable treatment method for implant placement, indicating efficacy and clinical effectiveness. The flapless approach requires greater knowledge and skill than the conventional surgical techniques. This implies that the implant practitioners must be willing to learn and adapt to new technology.

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