Comparative analysis of one time abutment versus repeated abutment removal on crestal bone and gingiva in immediate implants restored with digital work flow.

Dr. Burzin Khan¹, Dr.Purvi Bhargava², Dr. Niraalee Shah³
Opus Dental Specialities, Mumbai, India

Abstract

Background:

Immediate implant restoration of fractured teeth helps prevent the collapse of the alveolar architecture and maintains a good emergence profile for an aesthetic final restoration. Repeated removal of trans-gingival components after the placement of implants should be avoided or minimized as this strips the soft tissue attachment causing repeated re-modeling and in turn changes the hard and soft tissue profile. Digital work flow for implant restorations has made the entire procedure from treatment planning to the final restoration precise and time saving.

Aim:

The aim of the study is to compare the effect of one time abutment placed at the time of implant insertion, as oppose to repeated abutment removal, on the crestal bone and marginal gingiva with immediate implants, restored with digital work flow.

Material and Methods:

Two patients, one with fractured upper second bicuspid and other with a fractured central incisor, were planned for immediate implant placement. The right fractured bicuspid (15), post implant placement received an immediate customized provisional resin abutment and a Bis-GMA crown. During the final restorative phase a digital scan was done using a scan body followed by trials, where in each time the provisional abutment & crown were removed. A definitive two piece prosthesis was made using a customized CAD CAM milled ceramic modified PEEK abutment with a High Impact Polymer Composite (HIPC™) crown. Trials were taken where in each time the provisional abutment & crown were removed. The definitive crown was luted after 8 weeks of implant placement (Fig.4).

For the left second bicuspid (25), a complete guided digital work flow for implant restoration, was planned and executed. A CBCT scan was taken along with a scan of the cast and this data superimposed to prepare a surgical stent. Guided implant placement was followed by an intra-oral scan, using a scan body. A customized CAD CAM milled ceramic modified PEEK definitive abutment with a Multilayered composite provisional crown was fabricated and immediately inserted. After 8 weeks an abutment level scan was made for a final full contour Zirconia crown. In this case the abutment was not removed through the study period.

At the time of implant placement customization of abutments for both implants in 15 and 25 region was required as the preformed abutments did not adequately support the socket profile.

The fractured incisor (21), post implant placement, was restored with a provisional crown over a standard preformed ceramic reinforced PEEK abutment. The abutment (M-medium gingival collar); supported the socket profile adequately during the healing phase. After 8 weeks, an abutment level digital scan was made after adjusting the margins, and a definitive Full contour Zirconia crown was luted. Hence from the day of implant placement, the abutment was not removed throughout the study period.

Follow up radiographs and probing depths were recorded at 1, 3, 6, 12 months. Bleeding on probing was assessed with a ball ended CPI probe.

Results:

Peri-implant six point Periodontal Probing Depth (PPD) performed at 1,3,6,12 months post implant placement revealed an average mean in both the one time abutments as Buccal(B) 1mm, Mesio-Buccal(MB) 1mm, Disto-Buccal(DB) 1mm, Palatal(P) 0mm, Mesio-Palatal(MP) 1mm, Disto-Palatal 1mm(DP). The probing depths were constant throughout the study period. Peri-implant analysis of the repeated removal of abutment revealed an average PPD was B-2mm, MB-3mm, DB-3mm, P-1mm, MP-2mm, DP-3mm. It also showed an increase in probing depth after 3 months of implant placement.

Walking the CPI ball ended probe in the gingival sulcus showed no Bleeding on probing (BOP) in both the one time abutments whereas a positive BOP was observed at all intervals where the abutment was repeatedly removed. Periapical radiographs revealed no bone changes at one month evaluation in all the cases. There was a definitive reduction in crestal bone level observed from the third month in the two-stage abutment as opposed to the one-time abutments where bone levels were maintained through the study period.

Conclusion And Clinical Implications:

The non-removal of abutments placed at the time of surgery significantly reduces the crestal bone changes resulting in a healthier soft tissue around the implant. A good peri-implant seal, ensures a predictable aesthetic restoration. Further long term studies with a larger sample size would help derive a definitive conclusion on the effect of repeated removal of the trans-gingival components on the peri-implant hard and soft tissues.

Digital workflow for 25 Implant Restoration

Background and Aim

Immediate Implant restoration is a successful treatment option for failing teeth. Tissue remodeling post extraction poses an aesthetic restorative challenge. It is therefore essential that with immediate implant placement in an extraction socket, a well contoured abutment and a crown, be immediately placed so that it supports the soft tissue contours and helps maintain the emergence profile of the natural tooth. An attempt should be made to restrict the repeated removal of trans-gingival components for impressions, trials and fitting of the final crown, as the stripping of the gingival attachment initiates a remodeling process that can change the final soft tissue profile.

A study by Kuppusamy et al which evaluated the effects of abutment removal and reconnection in inflammatory cytokine level revealed lower IL-1 β level and probing depths in the test group, in which the abutment was not changed after second stage surgery, as compared to the control group which received healing abutments at the time of stage two surgery and in which the abutment was disconnected more than three times until final prosthesis delivery.¹

Degidi et al in a three year follow up study in healed mandibular posterior partial edentulous areas reported a clinically significant increased horizontal bone loss in the implant platform over 6 and 12 months in the control group in which the abutment was removed at the time of impression making as compared to the group in which the abutment was not removed from the day of implant placement to final prosthetic delivery.²

A study done by Canullo et al in premolar post extractive sockets with immediate implants revealed a statistically significant increased peri-implant bone loss around implants which received provisional abutments as compared to sockets which received definitive abutments on the day of surgery. Digital subtractive radiography determined a higher radiographic density around implant necks which received definitive abutments.³

An evaluation done by Syrek et al showed that crowns from intraoral scans revealed significantly better marginal fit and better interproximal contact area than crowns from silicone impressions. However marginal discrepancies in both groups is within limits of clinical acceptance and both groups performed equally well with regards to occlusion.⁴

The aim of the current study was to compare the crestal bone levels and soft tissue condition around immediate implants, receiving definitive abutment at the time of placement, as oppose to having a provisional abutment being disconnected and reconnected at several stages.

All the study cases were restored with different digital work flows.

Methods and Materials

Two patients were planned for immediate implant placement. One with fractured upper second bicuspid and another with a fractured upper central incisor with different restorative protocols. All implants had a placement torque of >35Ncm and were immediately loaded.

The patient with bilateral fractured bicuspid was restored in two different ways. The right bicuspid (15), post extraction and implant placement received an immediate cement retained Bis-GMA crown over a customized provisional resin abutment (Fig.1). After 8 weeks the provisional crown & abutment were removed and a digital scan was made using a scan body. The definitive two piece prosthesis was made using a customized CAD CAM milled ceramic modified PEEK abutment with a High Impact Polymer Composite (HIPC™) crown. Trials were taken where in each time the provisional abutment & crown were removed. The definitive crown was luted after 8 weeks of implant placement (Fig.4).

For the left (25), implant restoration a complete guided digital work flow was planned and executed. A CBCT scan was taken in which a virtual extraction was done to prepare a surgical stent for a guided implant placement. A scan was made to register the soft tissue profile and a scan body used to determine the implant position. A customized CAD CAM milled ceramic modified PEEK, definitive abutment with a multilayered resin, milled provisional crown was fabricated and inserted the same day (Fig.3). After 8 weeks of healing an abutment level scan was made and a Zirconia cement retained crown luted (Fig.6). Here the abutment was not removed through the study period.

Customization of abutments in both the provisional (15) and definitive (25), at the time of implant placement was required as the preformed abutments did not support the socket profile.

The fractured incisor (21), post implant placement, was restored with a standard preformed ceramic reinforced PEEK abutment and a provisional Bis -GMA crown (Fig.2). In this case the standard definitive abutment supported the socket profile adequately. After 8 weeks the provisional crown was removed, margins were adjusted and an abutment level digital scan was made. A definitive Zirconia full contour cement retained crown was luted (Fig.5). Hence from the day of implant placement the abutment was not removed through the study period.

Follow up radiographs, were standardized using a digital sensor positioner. Probing depths were recorded at 1, 3, 6, 12 months. Bleeding on probing was assessed by walking the gingival margin with a ball ended CPI probe.

Preoperative images of the cases

15 root piece 21 root piece 25 fractured mobile crown

Periapical radiograph taken post implant placement

Implant in 15 Implant in 21 Implant in 25

Provisional Restorations

Fig. 1 Fig. 2 Fig. 3*

*Digital workflow for provisional restoration with customised abutment in 25

Fig. 4 Fig. 5 Fig. 6

Results

Comparison of the average mean of the six point probing depths through the study period

Comparison Of Mean Of Pocket Probing Depths(mm) At Regular Time Interval

Bleeding on probing was positive in the repeated abutment removal case, only at 1 and 3 months evaluation.

Bleeding on probing was negative at all time intervals in the one time abutment cases.

Conclusions

The one time abutment concept reduces the interphase of multiple trans-gingival components and the soft tissue re-modeling due to their repeated removal and replacement. The non-removal of abutments placed at the time of surgery significantly reduces the crestal bone changes resulting in healthy soft tissue profile around the implant. It thus helps maintain the gingiva from natural tooth to final implant restoration, with an excellent emergence profile.

A good peri-implant seal, ensures a healthy tissue for a predictable aesthetic restoration.

This also improves patient compliance by reducing the treatment time and number of appointments.

However, further long term studies with a larger sample size would help derive a definitive conclusion on the effect of repeated disconnection of the trans-gingival components.

12 month follow up with peri-apical radiographs

Probing depth using a calibrated probe Good emergence profile & gingival health No bleeding as assessed by CPI probe

References

- Kuppusamy M, Watanabe H, Kasugai S : Effects of Abutment Removal and Reconnection on Inflammatory Cytokine Production Around Dental Implants. Implant Dentistry 2015;24(6):730-734.
- Degidi M, Nardi D, Piatelli A: One abutment at one time: non-removal of an immediate abutment and its effect on bone healing around subcrestal tapered implants. Clin Oral Implants Res. 2011;22(11):1303-7.
- Grandi T, Guazzi P et al : One abutment-one time versus a provisional abutment in immediately loaded post-extractive single implants: A 1-year follow-up of a multicentre randomised controlled trial. Eur J Oral Implantol 2014 ;7(2):141-9.
- Syrek A, Reich G, Ranftl D, Klein C, Cerny B, Brodesser J: Clinical evaluation of all-ceramic crowns fabricated from intraoral digital impressions based on the principle of active wavefront sampling. J Dent 2010 ;38:553 – 559