A Non-Detaching Modified Abutment Design for Preservation of Biologic Width Around Platform-Switched Dental Implants: A Preliminary Clinical Report

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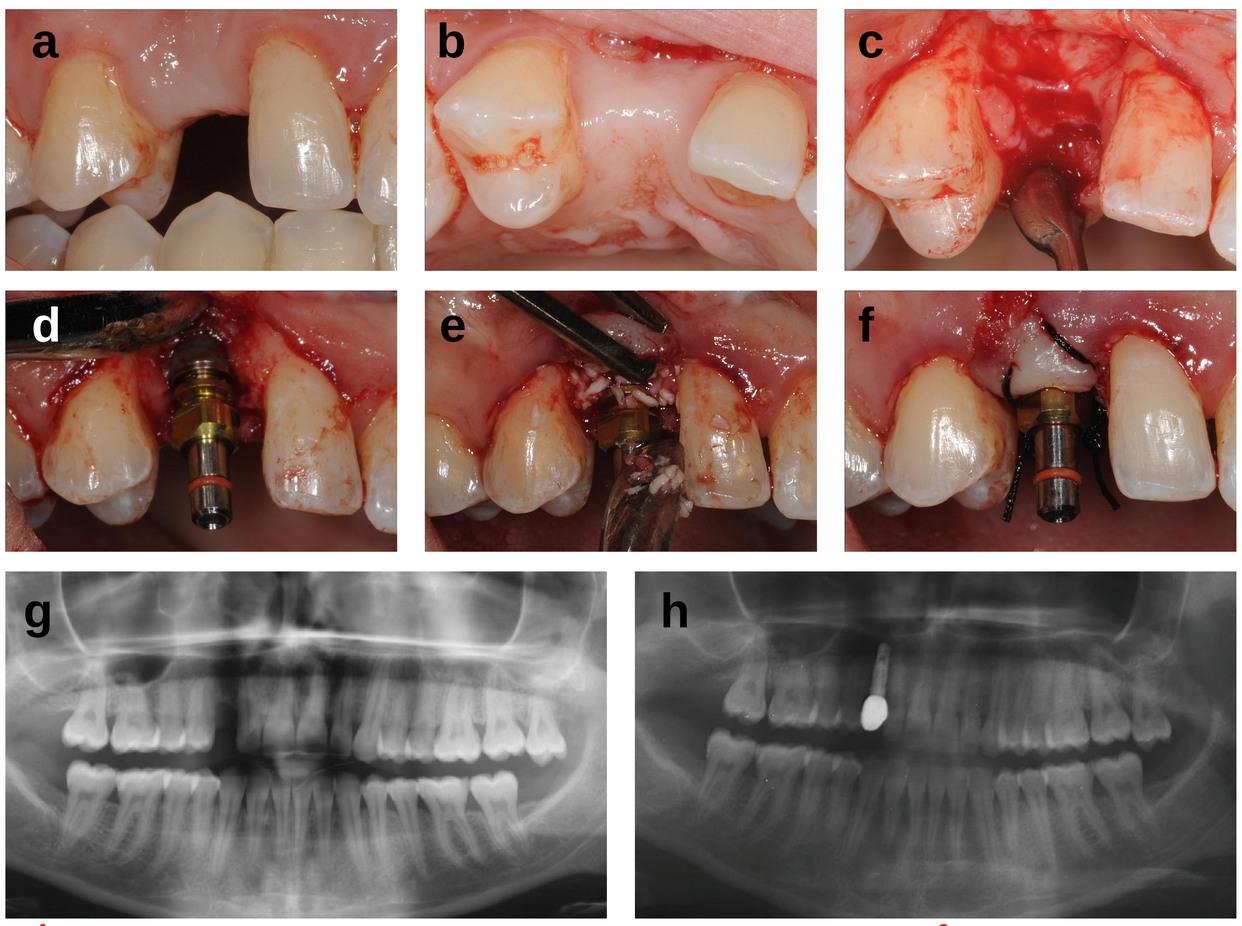
Objective

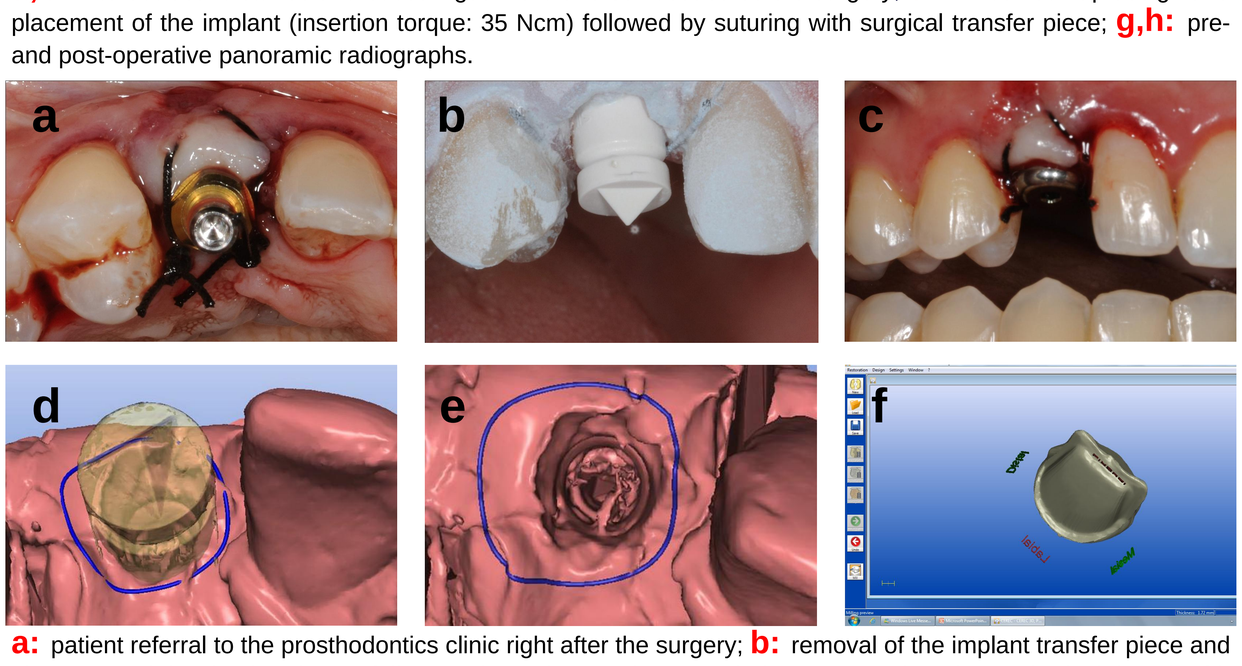
Initial marginal bone loss commonly begins following implant placement and may progress toward the apical region, risking the health of the implant itself, as well as the implant suprastructure. During the first year of function of an endosseous implant, a vertical bone loss of 1 mm is usually observed, at the alveolar crest, followed by an additional 0.1 mm for every subsequent year. Crestal bone loss has been attributed to several factors with undisturbed biologic width concept being the most accepted theory (1). The theory defends the maintenance of periimplantary connective tissue with stabilizing the biologic width by not detaching the initially placed healing cap/abutment during prosthetic try-in stages , thereby preventing the apical migration of the biologic width. Also, incorporation risk of the impression material and/or laboratory work remnants in the prosthetic pieces into the gingival sulcus can be avoided.
Since the osseointegration and marginal bone loss are currently not considered as problems with the introduction of numerous rapid osseointegration methods and implant surface characteristics, the popular biomimetic approach has more shifted to preservation of the bacteria-resisting connective tissue area and biological width just aimed as in a natural tooth (2). The objective of this clinical report, being a preliminary clinical outcome of an ongoing project is to fabricate an individually designed non-functioning modified healing abutment which would further serve as a base for individually fabricated zirconia crowns without the need of further removal for prosthetic stages and thereby not disturbing the connective tissue formed initially. This would help maintain the biological width and prevent initial marginal bone loss which is the main concern for contemporary implant dentistry, especially in periodontally compromised high-risk factor patients.

Materials and Methods

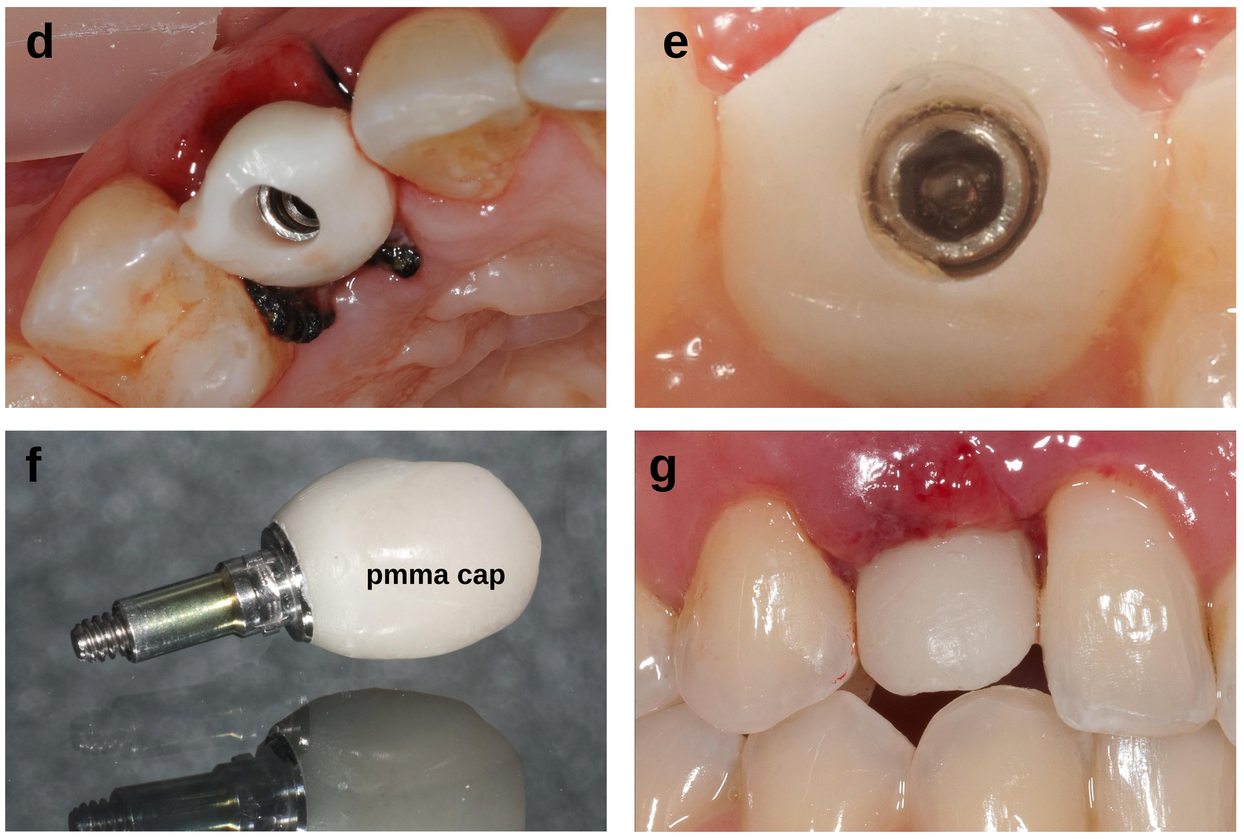
A 20-year-old female patient had applied to Ege University School of Dentistry, Prosthodontics Clinic for implant rehabilitation of her missing maxillary right canine. Informed consent form designated by the ethical committee approval (Ege University, No:12-3.1/16) was signed by the patient. The intraoral and dental volumetric tomographic (Kodak 9000C) examinations revealed sufficient vertical and horizontal bone volume for placing an implant (Camlog Screw-Line, 3.8 mm diameter, 11mm length).



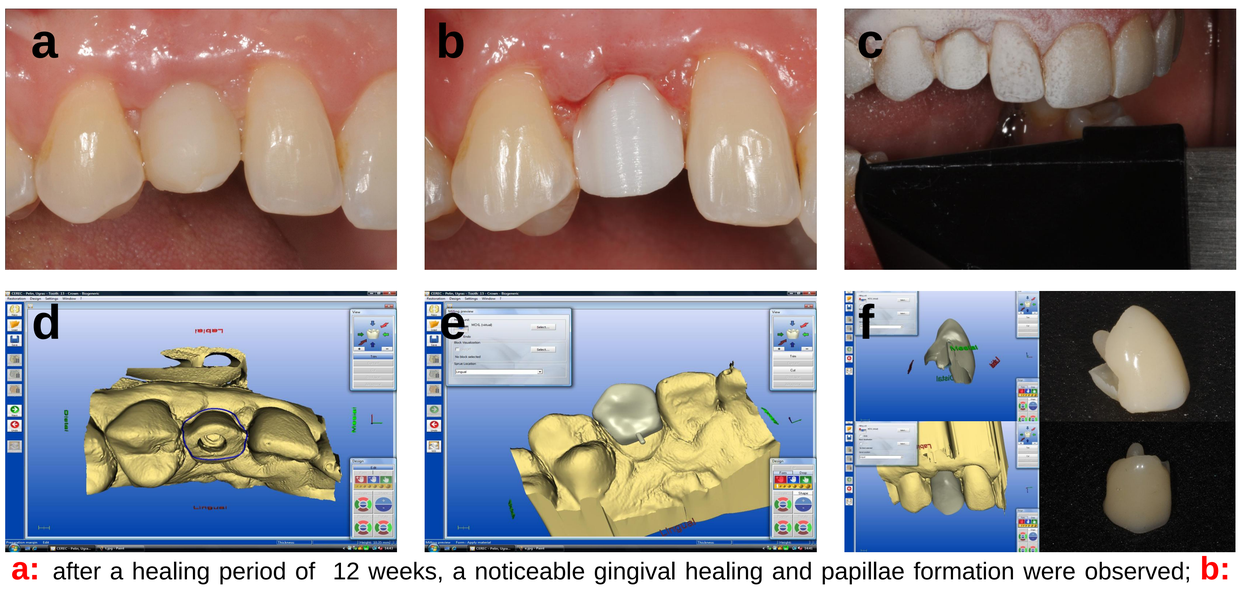
a,b: interocclusal distance and buccolingual hard and soft tissues before surgery; **c-f:** modified flap design and placement of the implant (insertion torque: 35 Ncm) followed by suturing with surgical transfer piece; **g,h:** pre- and post-operative panoramic radiographs.



a: patient referral to the prosthodontics clinic right after the surgery; **b:** removal of the implant transfer piece and placement of the titanium base (Tibase; Sirona for Camlog; Bensheim, Germany) and scanbody (Sirona) with titanium dioxide spray (Optispray, Sirona). Intraoral optical impression was made (Cerec AC Bluecam, Sirona) **c:** Tibase and scanbody were removed; a healing cap was placed, and the patient was waited in lounge until the modified zirconia abutment was prepared **d,e:** emergence profile was marked with the CAD software (InLab 3.86, Sirona) **f:** modified short zirconia abutment in the shape of a laminate veneer was designed to serve as a healing cap and further a framework for the final restoration.

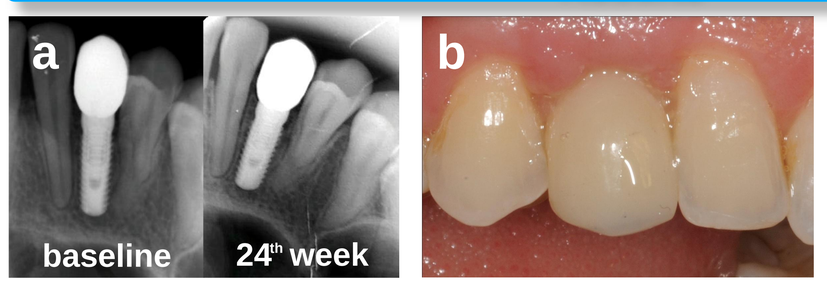


a: the designed restoration was milled through a milling unit (InLab MCXL, Sirona) from a zirconia block (InCoris Meso, Sirona) followed by fast sintering of the zirconia (InFire HTC Speed, Sirona); **b:** Tibase and zirconia abutment were luted to each other (Panavia F 2.0, Kuraray, Osaka,Japan); **c:** emergence profile with a controlled smooth surface; **d:** after a 3 hour manufacturing period; intraoral try-in was performed; **e:** the modified short zirconia abutment with a ‘’endo-laminate veneer’’ design for promoting additional mechanical stability to adhesive retention; **f:** after try-in of the emergence profile and smooth surfaces, a PMMA cap was designed and milled (Telio CAD, IvoclarVivadent; Schaan,Liechtenstein) and tried on the the zirconia abutment; **g:** the prepared temporary non-detaching healing abutment was screwed and torqued to 15 Ncm for the healing period. The fabricated PMMA cap was bonded to this abutment (Heliobond, IvoclarVivadent).



a: after a healing period of 12 weeks, a noticeable gingival healing and papillae formation were observed; **b:** the bonded polymer cap was carefully removed without detaching the zirconia abutment; **c:** intraoral digital impression was made (Contrast Spray, IvoclarVivadent & Cerec AC Bluecam); **d:** the finish lines were drawn by the software (InLab); **e:** an ‘’endo-laminate veneer’’ type of restoration was designed; **f:** the restoration was milled from a glass-ceramic block (IPS Empress CAD Multi C14, IvoclarVivadent) and glazed. The zirconia surfaces were intraorally sandblasted (CoJet, 3M ESPE, Germany) and the glass-ceramic restoration was luted with a dual-curing resin cement (Variolink II, IvoclarVivadent). The margins were carefully cleaned.

Results



a: the periapical radiographs at the time of placement and after 24 weeks of healing. Marginal bone loss was measured by using the parallel technique and found as 0.1 mm; **b:** the restoration *in situ.*

Conclusion

Preliminary observations revealed prevention of periimplantary marginal bone loss and biologic width maintenance with this novel abutment design. Results will be obtained with higher populations after the end of this project. Further *in vivo* studies might also be conducted for observing the effects of advanced surgical procedures on the clinical outcome of this techniue.

References **1.** Petrie CS, Williams JL. Comparative evaluation of implant designs: influence of diameter, length, and taper on strains in the alveolar crest: A three-dimensional finite-element analysis, Clinical Oral Implants Research, 2005, 16:486–494. **2.** Hermann JS, Buser D, Schenk RK, Higginbottom FL, Cochran DL. Biologic width around titanium implants. A physiologically formed and stable dimension over time,Clinical Oral Implants Research, 2000, 11:1-11.

This clinical report is a preliminary clinical outcome of on ongoing *in vivo* research.
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