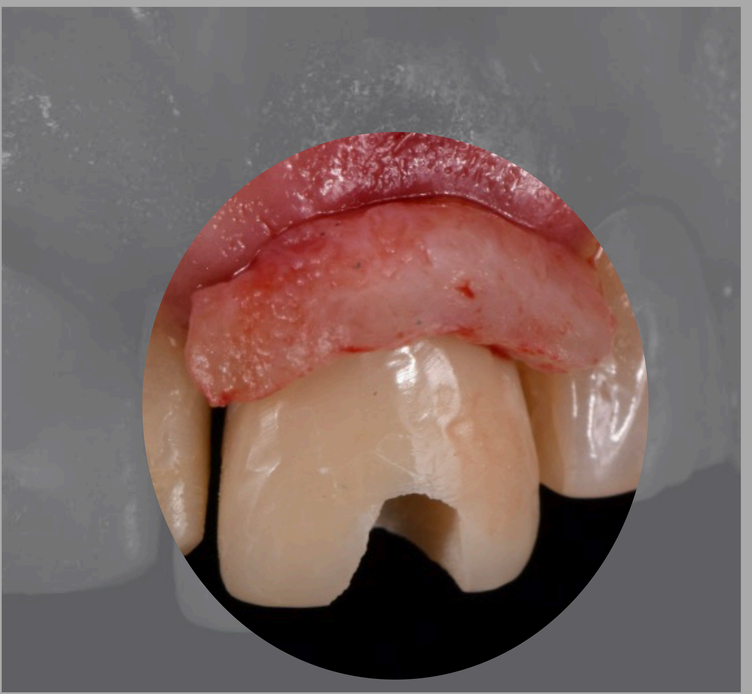
Volumetric Analysis On Facial Contour Of Anterior Immediate Single Tooth Replacement With Socket Shield vs Connective Tissue Graft : A Case Report

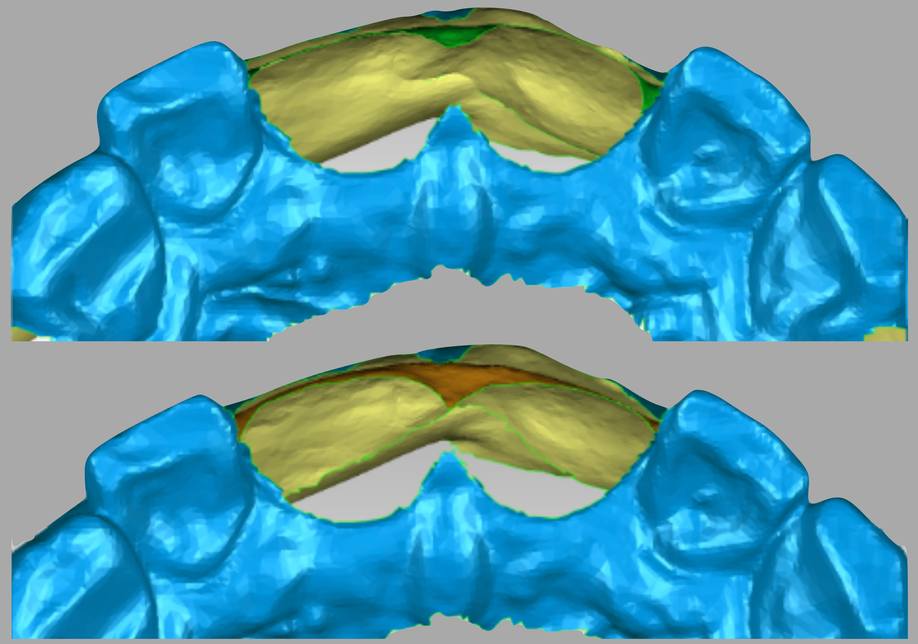


Sunee Limmeechokchai DDS MSD ; Joseph Kan DDS MS

Kittichai Rungcharrassaeng DDS MS ; Brian Goodacre DDS MSD ; John Boram Won DDS MS ; Jaime Lozada DMD ; Pasita Kerdmolee DDS

Department of Implant Dentistry Loma Linda University







Introduction

Immediate implant placement with provisionalization (IIPP) had been considered to be a viable option to optimize peri-implant soft and hard tissue in the esthetic zone.[1-4] Various surgical procedures have been proposed after tooth extraction to minimize facial soft tissue contour alteration.[5-7] In 2005, Kan et al showed subepithelial connective tissue graft (SCTG) simultaneously with immediate tooth replacement can effectively maintain the gingival architecture.[8] Alternatively in 2010, Hurzuler et al proposed the socket shield technique (SST), where facial portion of the failing root fragments was retained to prevent facial bone collapse.[9] This technique, in conjunction with IIPP, has been shown to maintain peri-implant buccal contour and gingival architecture, thus improving esthetic outcomes.[9,10]

This case report evaluated facial soft tissue contour dimensional change by 3D volumetric analysis and esthetic outcome of maxillary central incisors after immediate implant placement with either SST or SCTG after 2 years of function.



Fig 1:
A) Pre-op PA and CBCT #9
B) Pre-op photo
C) Pre-op PA and CBCT #8

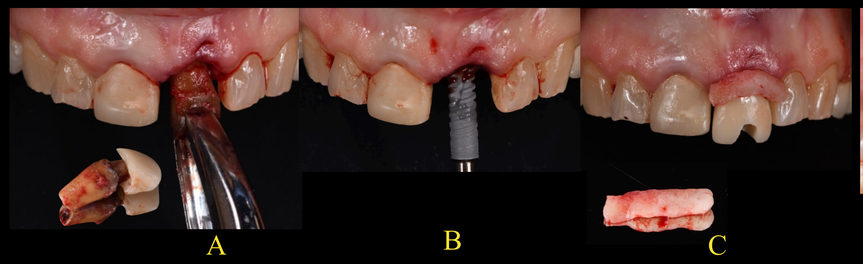


Fig 2 A-C: IIPP with SCTG #9

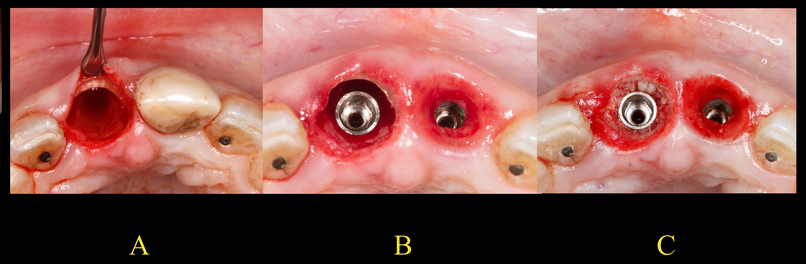


Fig 3 A-C: IIPP with SST #8

Case presenttion

A 65-year-old female patient presented with class 3 mobility of maxillary left central incisor (#9), which was deemed hopeless (Fig 1B). Periapical (PA) radiograph showed history of endodontic treatment and the presence of a large cast post on #9 without signs or symptoms of active infection (Fig 1A). Cone-beam computed tomographic (CBCT) image (Fig 1A) revealed a Class I sagittal root position (SRP).[11] After being provided with benefits and risks of different treatment options, the patient agreed and consented for IIPP in conjunction with SCTG on #9

IIPP with SCTG

Atraumatic tooth extraction was performed on #9 (Fig 2A), followed by immediate implant placement (Fig 2B). The gap between the implant and facial bone plate was then filled with allograft. Connective tissue graft (SCTG) with a dimension of 9 mm in length, 3 mm in width and 1.5 mm in thickness was harvested from the palate and was gently drawn into labial aspect of the implant while the screw-retained provisional restoration was simultaneously secured (Fig 2C).

Six months later, the patient was referred back for implant treatment on #8 due to unsuccessful restorative attempt. Radiographic evaluation showed no signs or symptoms of active infection and revealed Class I SRP (Fig 1C).[11] To mitigate inter-implant papillary loss, IIPP in conjunction withh SST was proposed and accepted by the patient.

IIPP with SST

The maxillary right central incisor (#8) was decoronated and the root was sectioned mesiodistally from coronal to apex and the palatal half of the root was removed. The remaining facial root fragment was then adjusted at level of facial crestal bone to form a 1.5-mm thick C-shaped encompassing from mesial, facial to distal aspect of socket (Fig 3A) Following sequential osteotomy, a 3.5 x 13 mm implant was placed (Fig 3B). Allograft was placed into the gaps between root fragment and implant, as well as surrounding bony socket (Fig 3C), followed by placement of a screw-retained provisional restoration.

Definitive restorations for both #8 & #9 were placed ~6 months thereafter and the patient had seen for periodic followed-ups.

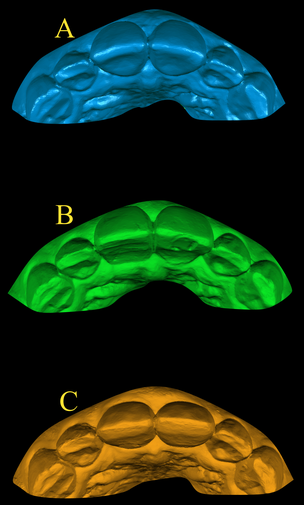


Fig 4: STL model at
A) T0
B) T1
C) T2

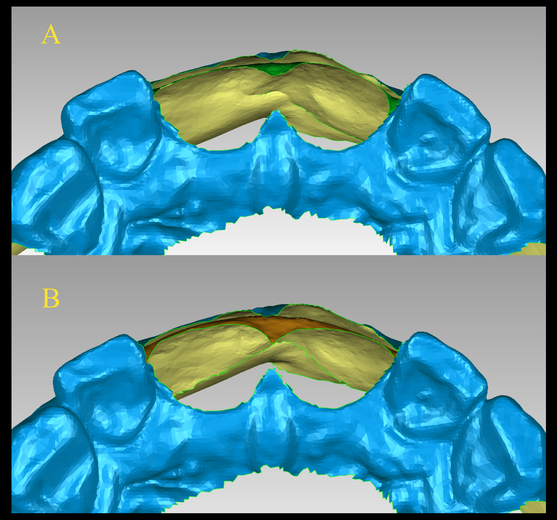


Fig 5: The distance of the labial contour space between the two 3D surfaces on #8, #9
A)T0-T1
B) T0-T2

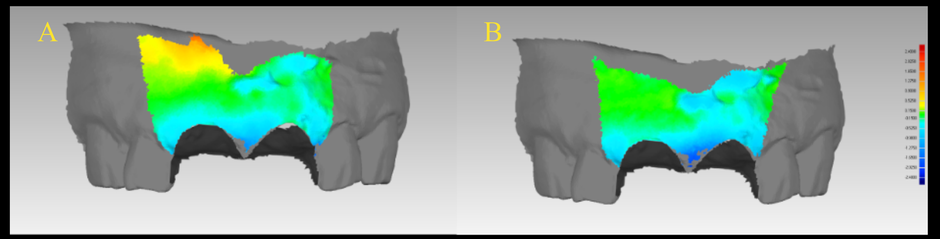


Fig 6: Color spectrum showing positive (Red), negative (Blue) or no (Green) facial contour change between A) T0-T1 and B) T0-T2 models

Volumetric Analysis

An intraoral scanner was used to obtain the three-dimensional (3D) Standard Tessellation language (STL) files (Fig 4) at A) pre-surgery (T0), B) 12 months (T1) and C) 24 months (T2). All STL files were exported to Geomagic software and superimposed between T0-T1 and T0-T2 using the best fit alignment algorithm. Volumetric change could be visualized using the color map that shows the amount and location of deviation between the two time points. Any deviation within ±150 µm was considered negligible and displayed in green. Areas with negative change (volume loss) would trend towards blue, and areas with positive change (volume gain) would trend towards red in the color spectrum (Fig 6A-B) .

To measure the amount of change at different time intervals, midfacial sagittal images at #8 and #9 of the superimposed models (T0-T1, T0-T2) were made (Fig 7). From an occlusal view, 3D morphology surfaces at T1 and T2 were observed and found mild collapse when compared to T0 (Fig 5A-B). Negative values demonstrating facial soft tissue contour collapse for #8 and #9 were -0.37 µm and -0.24 µm at T0-T1 (Fig 7A-B); and -0.02 µm and -0.33 µm at T0-T2 (Fig 7C-D), respectively.

CBCT images (Fig 8) reveal minimal buccal bone thickness changes in both A) #8 (T0 = 2.65 mm; T2 = 2.67 mm) and B) #9 (T0 = 2.79 mm; T2 = 2.74 mm).

Conclusion

Both IIPP along with SST and SCTG demonstrated comparable and acceptable preservation of facial contour after 2 years of function.

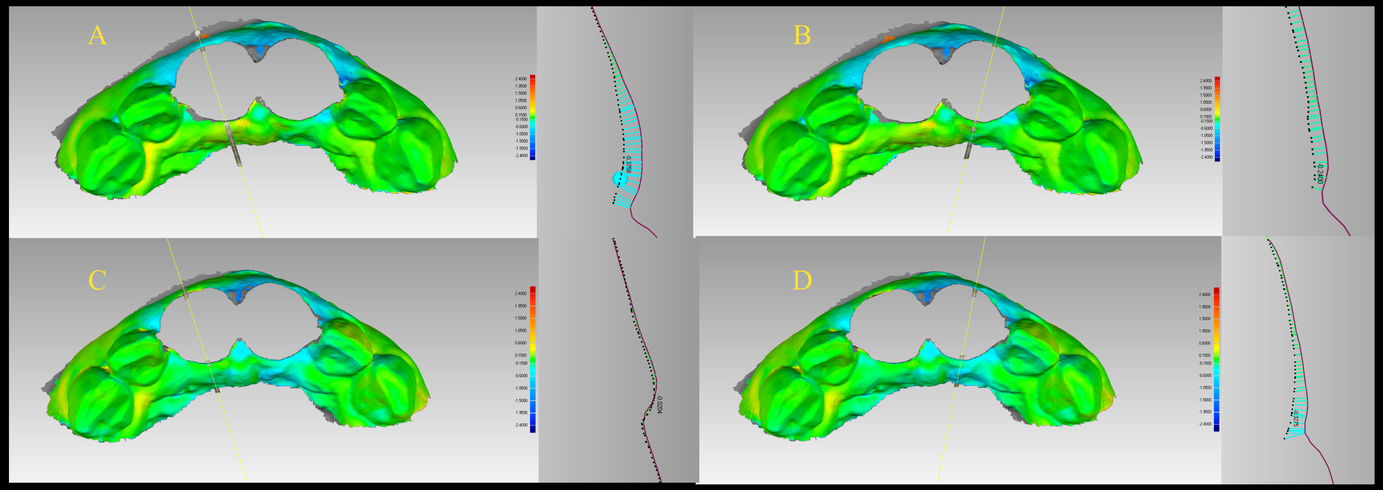


Fig 7 A-D: 3D Superimpositions and measurements of facial contour changes
A) T0-T1 of #8, B) T0-T1 of #9,
C) T0-T2 of #8 and D) T0-T2 of #9

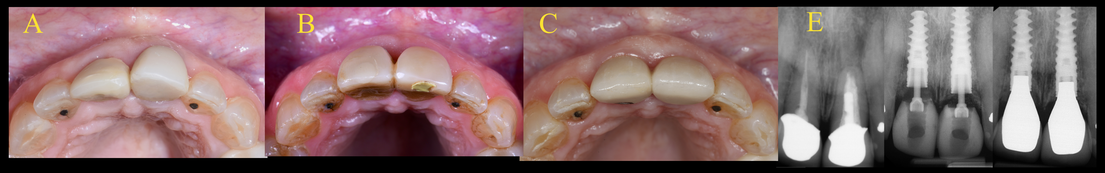


Fig 9A-D: Occlusal view of A) T0, B) T1 and C) T2. D: PA at T0, T1 and T2

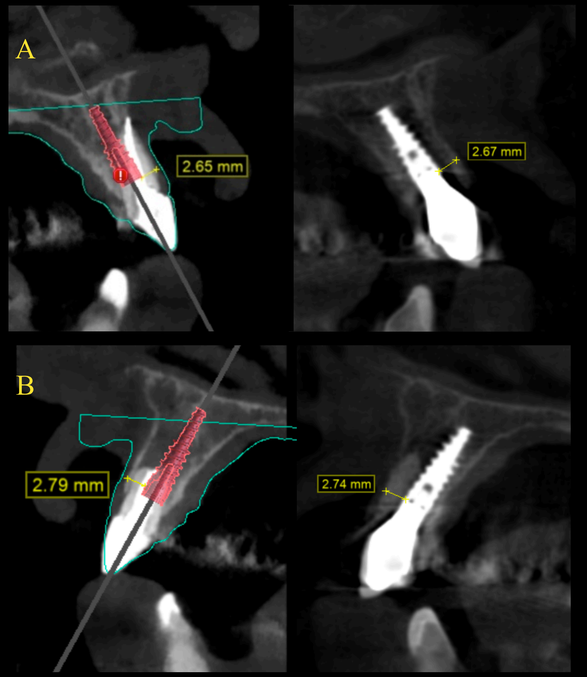


Fig 8: CBCT showing facial bone dimension of
A) T0 and T2 of #8
B) T0 and T2 of #9

References

1. Kan JYK, Rungcharassaeng K, Lozada JL. Immediate placement and provisionalization of maxillary anterior single implants: 1-year prospective study. Int J Oral Maxillofac Implants 2003;18:31-39.
2. Wöhrle PS. Single-tooth replacement in the aesthetic zone with immediate provisionalization: Fourteen consecutive case reports. Prac Periodontics Aesthetic Dent 1998;10:1107-1114.
3. Kan JYK, Rungcharassaeng K. Immediate placement and provisionalization of maxillary anterior single implant: A surgical and prosthodontic rationale. Prac Periodontics Aesthet Dent 2000;12:817-824.
4. Garber DA, Salama MA, Salama H. Immediate total replacement. Compend Contin Educ Dent 2001;22:210-218.
5. Yan Q, Xiao LQ, Su MY, Shi B. Soft and hard tissue changes following immediate placement or immediate restoration of single-tooth implants in the esthetic zone: a systemic review and meta-analysis. Int Oral Maxillofac Implants. 2016;31:1327-1340.
6. Tarnow DP, Chu SJ, Salama MA, Stappert CFJ, Salama H, Garber DA, Sarnachiaro GO, Sarnachiaro E, Gotta SL, Saito H. Flapless postextraction socket implant placement in the esthetic zone: part 1. The effect of bone grafting and/or provisional restoration on facial ridge dimensional change-a retrospective cohort study. Int J Periodontics Restorative Dent. 2014;34:323-331.
7. Raes F, Cosyn J, Crommelinck E, Coessens P, De Bruyn H. Immediate and conventional single implant treatment in the anterior maxilla:1-year results of a case series on hard and soft tissue reponse and aesthetics. J Clin Periodontol. 2011;38:385-394.
8. Kan JYK, Rungcharassaeng K, Lozada J. Bilaminar subepithelial connective tissue grafts for implant placement and provisionalization in the esthetic zone. J Calif Dent Assoc 2005;33:865-871.
9. Hurzeler MB, Zuhr O, Schupbach P, Rebele SF, Emmanouilidis N, Fickl S. The socket-shield technique: a proof-of-principle report. J Clin Periodontol 2010;37:855-862.
10. Kan JY, Rungcharassaeng K, Morimoto T, Lozada J. Facial gingival tissue stability after connective tissue graft with single immediate tooth replacement in the esthetic zone: consecutive case report. J Oral Maxillofac Surg 2009;67:40-48.
11. Kan JY, Roe P, Rungcharassaeng K, Patel RD, Waki T, Lozada JL, et al. Classification of sagittal root position in relation to the anterior maxillary osseous housing for immediate implant placement: a cone beam computed tomography study. Int J Oral Maxillofac Implants 2011;26:873-876.