Positive Crestal Bone Remodeling Adjacent to a One-Piece Implant Abutment Prosthetic Device
A Six-Year Retrospective Clinical Radiographic Study

Jan C. Kwan[1,2], Norman H. Kwan[2]

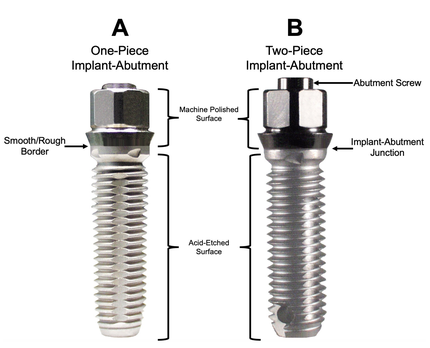
1. McGill Craniofacial Tissue Engineering and Stem Cells Laboratory, McGill University, Montreal, Canada
2. Private practice, Toronto, Ontario, Canada

Introduction

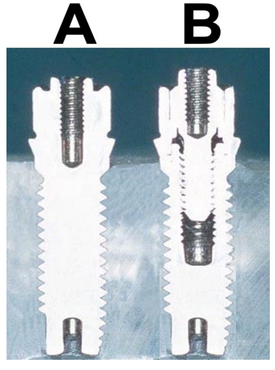
The implant-abutment interface or "micro-gap" has been the focus of many clinical and scientific studies in implant dentistry. Many complications such as peri-implantitis, marginal bone loss, and prosthetics have been linked or related to the presence of the microgap. The **aim of this study** is to use radiographic assessment to investigate crestal bone remodeling adjacent to the prosthetic margin of a one-piece implant - abutment prosthetic device (Device) when placed simultaneously in both hard and soft tissues without a microgap.

Materials and Method

365 osseointegrated one-piece titanium implant devices with a 3 mm high hexagonal-shaped abutment were placed in 125 patients supporting 160 metal-ceramic fixed partial dentures (FPDs) in function from 1–6 years. The device consists of a rough implantable and smooth prosthetic surfaces that transition at a shouldered prosthetic margin. 30 crowns were screw-retained, 35 crowns were cemented, and 95 were screw- retained FPDs. The device was placed with the prosthetic margin level with the crestal bone using a non-submerged technique. Radiolucent areas of peri-apical radiographs adjacent to the prosthetic margin of the device were manually traced and quantified to reflect the area (mm^2) of crestal bone remodeling during the healing and functional periods. No hard or soft tissue grafting was performed.

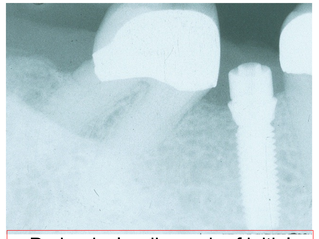


Frontal view of a (A) one-piece and (B) two-piece abutment-implant device. Both devices have a smooth machined abutment and a rough acid-etched implant surfaces.

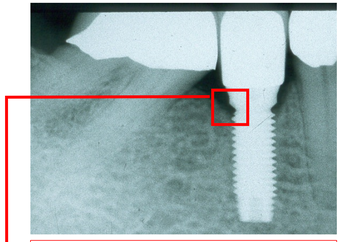


Cross sectional view of (A) one-piece abutment-implant device and (B) two-piece abutment-implant device.

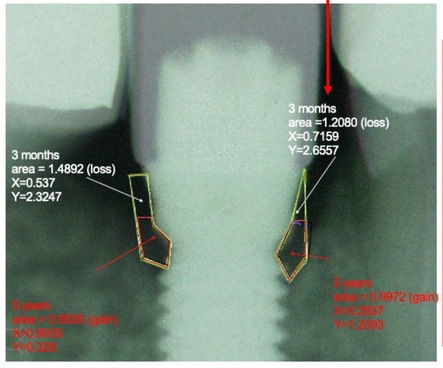
Non-submerged one-piece abutment-implant device with a 3 mm tall standard hexagonal abutment embedded in an acrylic resin block with its shouldered margin placed level with the crestal bone.



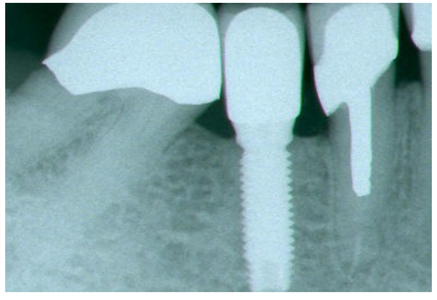
Peri-apical radiograph of initial placement (**0 months**) of a one-piece abutment-implant device with its shouldered margin placed level with the crestal bone.



Peri-apical radiograph with crestal bone loss adjacent to the same one-piece abutment-implant device at time of crown insertion (**3 months**).



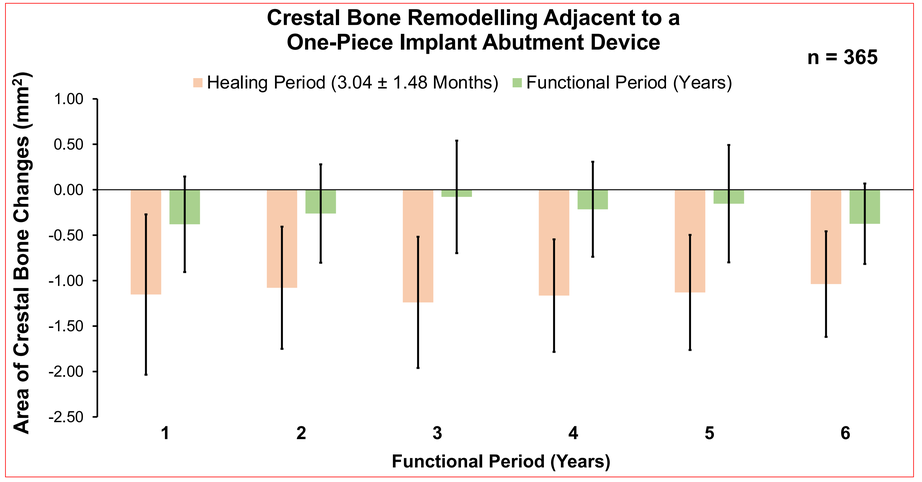
Peri-apical radiograph with radiolucent areas (mm^2) adjacent to the prosthetic margin of the one-piece abutment-implant device were manually traced and compared to crestal bone levels at initial and final functional periods (**5 years**).



Peri-apical radiograph of the same one-piece abutment-implant device in function for **67 months** demonstrating positive crestal bone remodeling.

Results

During the 3.04 ± 1.48 months healing period, an average area of -1.13 ± 0.11 mm^2 negative crestal bone remodeling was observed adjacent to the prosthetic margin for all devices. During the first functional year, crestal bone levels increased by 0.77 ± 1.03 mm^2 to -0.38 ± 0.53 mm^2 for all devices. Devices with two and up to six years of function had similar stable crestal bone levels at -0.26 ± 0.54 mm^2, -0.08 ± 0.62 mm^2, -0.21 ± 0.52 mm^2, -0.15 ± 0.65 mm^2, and -0.37 ± 0.44 mm^2, respectively. There was no significant difference ($p > 0.05$) when comparing the crestal bone areas between each of the respective functional years in this study.



The area (mm^2) of crestal bone changes adjacent to one-piece implant-abutment devices during the healing period of 3.04 ± 1.48 months followed by the area of crestal bone changes during their respective functional period. Devices were either in function for the duration of one year or up to six years.

Conclusions

Significant positive crestal bone remodeling adjacent to all devices was observed after the first year. Increased crestal bone levels remained stable over the following five years in function. The absence of a microcap in a one-piece implant abutment device can provide a stable and positive crestal bone environment supporting the dental prosthesis over the long-term.