Dental Implant Restorations

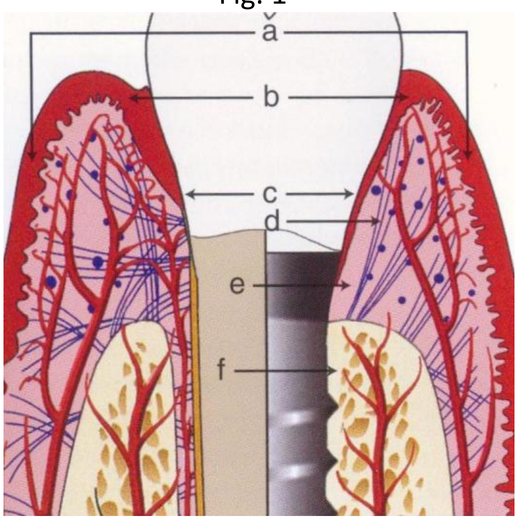
The problem of cement

When Dr. Branemark introduced dental implant treatment at the University of Toronto in 1982, his research begun 15 years earlier would revolutionize dentistry. Today, dental implant replacement teeth are a standard treatment option for patients missing a single tooth to a full arch. Dental implant treatment today is quite predictable and enjoys a 98-99% bone integration success rate.

Long-term success however is determined by the success of the prosthetic restoration since failure here is ultimately a failure in function for the patient. Early dental implant restorations were primarily screw retained; however there were problems experienced early on with screw loosening and even screw fracture. These problems have been virtually eliminated in the last 10 years with dental implant manufacturers moving away from the original external hex design to internally hexed implants with an internal implant-abutment connection. Accurate torqueing of current implant screws with the internal connection has resolved the early problems with implant screws.

Now that we have patients with dental implant restorations in service for as long as 20 years, a new challenge in dental implant maintenance has surfaced; the problem of managing peri-implantitis when it arises. Peri-implant tissues differ from natural teeth. A dental implant has a long, thin junctional epithelium with connective tissue attachment to the alveolar crest of bone and no direct connective tissue attachment to the implant restoration. In contrast, a natural tooth has a robust junctional epithelium and direct connective tissue attachment to the tooth, the cementum, and the alveolar bone as well as a periodontal ligament. (Fig. 1 Source: Sclar, Soft Tissue and Esthetic Considerations in Implant Therapy. 2003:3)

Fig. 1



The direct implant-to-bone interface and the lack of an interposed tissue ligament makes a dental implant less susceptible to the traditional disease mechanisms of periodontitis, however the long, thin junctional epithelium is a less resilient tissue barrier and a point of penetration for chronic inflammation which can lead to peri-implantitis. Any chronic inflammatory response around an implant will damage the bone to implant interface with potential loss of osseointegration.

Today, about 75% of dental implant restorations are cement retained. Incomplete removal of cement from the sulcular peri-implant tissues leaves a nidus of inflammation that causes bone loss that can lead to loss of osseointegration. The thin junctional epithelium around a dental implant is not a good barrier against the hydraulic pressure placed on it from apically extruding cement secondary to forces applied during cementation of an implant restoration. Excess cement that coats a roughened implant surface is also near impossible to remove completely and will damage a successful integrated implant.

Fig. 2A Fig. 2B

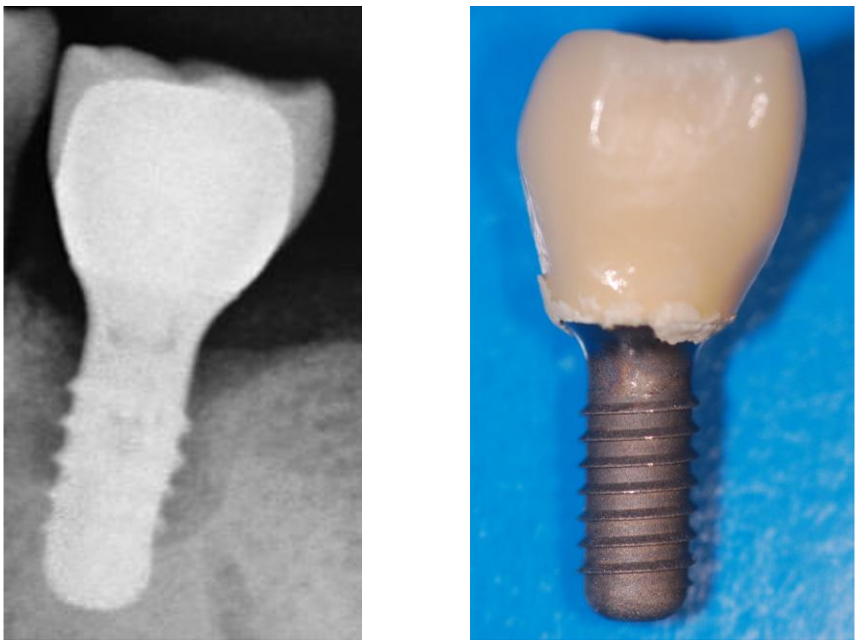


Fig. 2

Peri-implant bone loss (A) from excess subgingival cement (B) with loss of implant integration.

The tight tolerances that implant restorations are made to today with abutment analogs and CAD/CAM technology compared to a traditional lost wax technique allows for much less cement needed for retention of an implant restoration. We recommend that an implant restoration be seated with cement loaded just in the occlusal 1/3 of the restoration. This prevents gross cement excess and escape into the peri-implant sulcus during seating and minimizes the chance of missed cement during cement clean-up. In recent years, manufacturers have developed implant specific resin cements with good retention, but still allowing for restoration removal if needed. These cements typically have low solubility and low wash out for a good marginal seal. They are formulated to allow for easy clean-up of excess cement without the typical cement brittleness seen with set cement (Premier, Parkell, Preat Corporation).

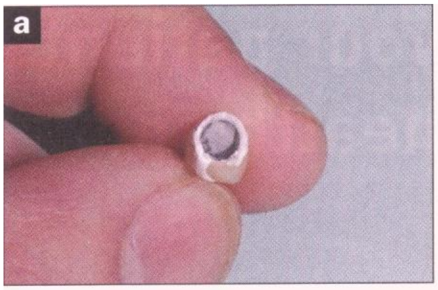


Figure 5a. Technique for fabricating a vinyl polysiloxane copy abutment with ideal lute space of 50 μm—this precoats the inside of the crown, minimizing excess and improving cleanup time.

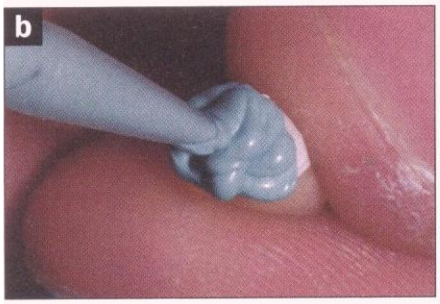
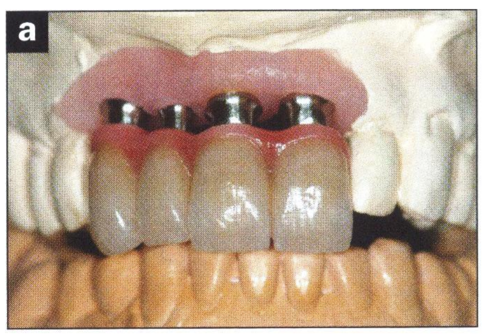


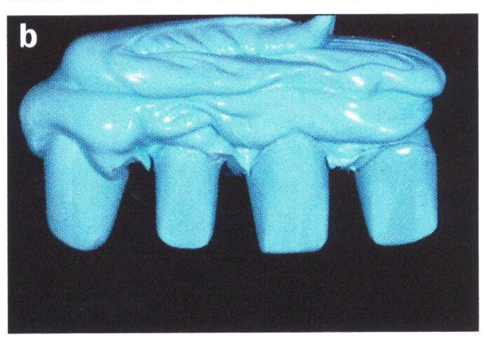
Figure 5b. The inside of the polytetrafluoroethylene crown is filled with a fast setting material (eg, Blu-Mousse [Parkell]).

Figure 5c. When the copy abutment is removed, it is compared to the original abutment, and orientation is noted.

Figure 5d. The crown loaded with cement has the copy abutment seated into it. This allows for the cleanup to be primarily done outside the mouth.

An interesting technique published in the January 2012 edition of Dentistry Today by Drs. Wadhwani and Pineyro shows another solution to the problem of excess implant cement. To prevent excessive cement delivery vs. having enough cement quantity for retention, the authors fabricate a chairside copy abutment to use as an insertion analog. This copy abutment controls the amount of cement placed in the restoration prior to cementation in the mouth. Their technique involves placing a polytetrafluoroethylene tape (PTFE, "plumber's tape") into the restoration and then injecting a fast set VPS material (e.g. Blu-Mousse, Parkell) into the restoration. Once set, the VPS material creates a copy abutment. The PTFE tape is removed and a space of about 50 μm has now been created between the restoration and the final abutment. The restoration is loaded with cement and placed on the copy abutment, expressing out the excess cement extraorally. The restoration can now be carried to the mouth and seated on the final abutment with minimal cement excess expressed since most was removed extraorally. This significantly minimizes the risk of peri-implant sulcular cement and damage to the peri-implant tissues.





Note, figures above adapted from Wadhwani and Pineyro, Implant Cementation: Clinical Problems and Solutions. Dentistry Today, January 2012.

Interestingly, the authors also note that highly retentive cements are typically chosen for implant restorations. Durelon from 3M ESPE is one such frequently used cement with implants. If you read the manufacturers labeling on Durelon, you will find that it states “not suitable for cementing titanium”. The authors state that this is due to possible corrosion of titanium that comes into contact with Durelon. Restorative dentists that choose to use Durelon should employ the method described above to ensure that sulcular cement is not a problem.

As implant restorations become more common place, understanding the differences between natural teeth and implant teeth are essential. Managing implant cementation differently from natural teeth is one such step needed to achieve and maintain optimal peri-implant health.

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