# Diagnosis and management of commonly encountered problems with cemented implant crowns

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As the relative growth of implant dentistry continues, there are more and more patients being restored with implant supported restorations. The most commonly performed implant treatment is a single tooth replacement, with cement retained crown. While the restoration of a single tooth implant can be straight forward in many respects, problems can occur through the restorative process which ultimately compromise the final treatment outcome and may ultimately jeopardise the health and longevity of the implant restoration. Most complications can be easily avoided by careful attention to detail and knowing the appropriate steps to follow during the restorative phase. This article aims to point out some of the more frequently encountered problems and how to avoid and/or manage these problems.

**Retained excess cement**

Implant abutment/crown margins are typically subgingival, which poses a significant challenge when trying to remove excess cement following crown cementation to the implant abutment. This may be compounded by the fact that the peri-implant tissues are tightly adapted to the newly placed implant crown, making it difficult to negotiate the subgingival area.

Such difficulties are more commonly encountered when replacing a round healing abutment with a definative implant abutment/crown with a developed emergence profile. This problem becomes less of an issue where you are replacing a provisional abutment/crown placed either at stage-I or stage-II surgery with the definitive abutment/crown.

Whenever possible, one should avoid placing the implant abutment/crown margin interface any more than 2-3mm subgingivally as if it is any deeper, removal of excess cement will be very difficult if not impossible without surgical access. This is where communication between the dental laboratory technician and the clinician is important and the selection of an abutment with an appropriate shoulder height is critical (Diagrams 1a and 1b).

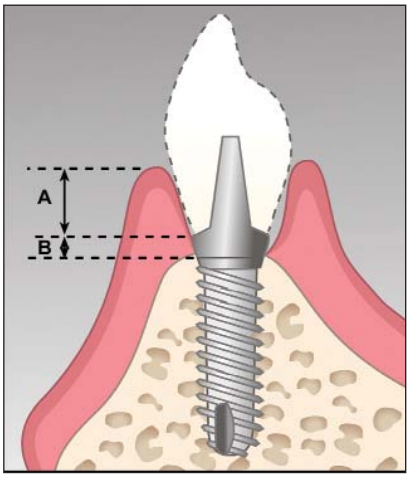


*Diagram 1a. This diagram shows inappropriate abutment design resulting in a very deep subgingival crown/abutment interface. In this case A = 5mm and B = 1mm. This equates to a 1mm high abutment shoulder and an abutment/crown interface 4mm subginigvally.*

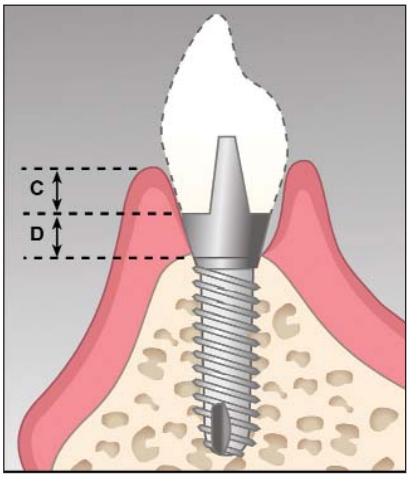


*Diagram 1b. This diagram shows the same clinical situation as in the previous diagram but with a more favourable position of the crown/abutment interface. C = 3mm and D = 3mm. This provides better access to the crown margin to remove excess cement.*

It is also important not to use excessive amounts of cement when cementing implant crowns as the subgingival margins, where excess cement will be expelled, are comparatively deeper subgingival compared to conventional margins associated with routine fixed crowns placed on prepared natural teeth.

To help reduce the chance of leaving excess cement behind, use a fine probe, sickle scaler and floss to help remove subgingival excess cement at the crown cementation appointment once there has been initial set of the luting cement.

Depending on the type of luting cement used and the amount of excess cement present, it is sometimes possible to detect its presence through a radiographic examination (Figure 1). However, many of the cements are not all that radioopaque and can be difficult to visualise. At other times excess cement may be on the facial or palatal/lingual aspects and thus not noticed on radiographs. Magnification can be a great asset when screening periapical/bitewing radiographs for the presence of excess cement. Digital radiography can also be a useful tool in obtaining better visualisation of retained excess cement.

Radiographic evaluation should always be accompanied with careful clinical evaluation of the peri-implant tissues.

Clinically, excess cement can be difficult to detect with periodontal probing, usually because of the tight adaptation of the surrounding peri-implant tissues. The presence of residual cement becomes more apparent in patients that are recalled at 3-4 months following the completion of the prosthesis. It is at this time that significant bleeding on probing is often

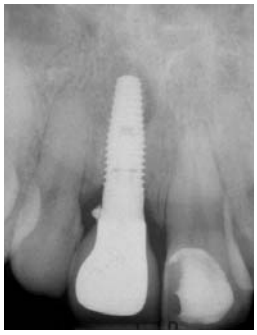

*Figure 1. Periapical radiograph showing excess crown cement deep subgingivally on the distal aspect of the 11 implant.*

*Figure 2. Marginal inflammation resulting from deep subgingival excess cement associated with the implant crown on the 22. Note the bluish tinge above the 22 and the thin gingival biotype in this patient.*

*Figure 3. A lower implant supported molar crown presents with significant marginal inflammation 4 months following crown cementation. Excess subgingival cement was subsequently removed from the buccal aspect.*

*Figure 4. Implant supported crown in the 11 position. Note swelling in the peri-implant tissues at 4 months post crown placement.*

*Figure 5. With the use of local anaesthetic and fine periodontal curette, excess crown cement is carefully removed.*

*Figure 6. Larger pieces of excess cement are removed from the peri-implant sulcus.*

found. The tissues will often appear red, oedematous and there may be some gingival exudate from the gingival sulcus (Figures 2 and 3). Occasionally, patients may complain of slight discomfort of the gingival tissues around the implant, although typically these areas are asymptomatic. The acute inflammation associated with the presence of excess subgingival cement can also lead to crestal bone loss. It is therefore imperative that this problem be identified and treated in a timely fashion so as not to jeopardise the long-term health of the implant. If excess cement is removed early (within the first 3-4 months post restoration, it is possible to see reversal of crestal changes radiographically).

Removal of excess subgingival cement involves anesthetising the peri-implant tissues with local aesthetic and then using a periodontal curette to carefully negotiate the sulcus until the tip of the instrument makes contact with the cement. One should aim to get the tip of the instrument below the deposit so that a coronal sweeping action will dislodge the cement and remove it from the sulcus (Figures 4-6). In most cases, the tissues around the implant will be softened and more pliable due to the associated inflammation and while this will assist with instrumentation of the subgingival areas, care needs to be taken to minimise trauma to the peri-implant tissues. This is particularly important in patients with a thin biotype and with implants in the aesthetic zone where tissue trauma may lead to unsightly recession of the marginal peri-implant tissues. Furthermore, care should be taken to minimise scratching the implant abutment surface during removal of the subgingival cement. When possible, plastic implant scalers should be used, however, these will often be insufficient to remove adherent excess cement. Fine tipped periodontal curettes such as a mini after-5 or similar, used judiciously, will often be a better alternative (Figures 7 and 8).

*Figure 7. Sometimes, infection caused by retained excess crown cement can cause a gingival abscess, such as shown here on the buccal of the 46 implant. A gutta percha point is used to track the origins of the infection. This can be left in placed when taking a radiograph and can therefore help pinpoint the origins of the infection.*

*Figure 8. Following careful subgingival debridement, numerous pieces of excess crown cement were removed from around the 46.*

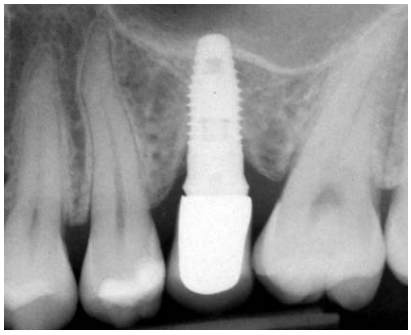

*Figure 9. Periapical radiograph showing incomplete seating of this premolar crown on the implant abutment on this implant in the 25 position.*

*Figure 10. Small labial fenestration or sinus tract resulting from incomplete seating of the crown on the implant abutment in the 12 position.*

*Figure 11. Incomplete seating of the final implant abutment on the 22 implant. Note the marked soft tissue swelling and inflammation around the 22 and adjacent teeth.*

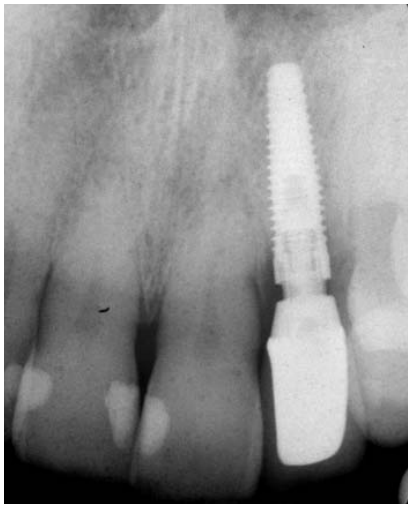

*Figure 12. Periapical radiograph showing incomplete seating of the definitive abutment. Note also the loss in density of the crestal bone around the fixture head.*

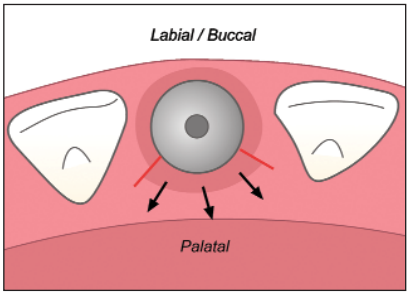


*Diagram 2. Small releasing incisions on the mesial and distal palatal aspects (redlines) and careful elevation of the surrounding peri implant tissues (shaded areas). The palatal tissues can be displaced slightly palatally (arrows).*

**Incomplete seating of the crown on implant abutment**

Due to the subgingival position of most implant supported crown margins in the anterior aesthetic zone, it is generally not possible to visually check the seating of the crown at the time of cementation. The exception to this is when the crown has been designed in such a way that the crown-abutment margin is more equigingival or even supragingival on the palatal or lingual aspect.

Incomplete seating of the crown on the abutment creates a subgingival 'step' or gap which will be plaque retentive and lead to chronic inflammation of the peri-implant tissues (Figure 9). This can potentially lead to instability of the marginal gingival tissues and in cases with a thin biotype lead to recession or small fenestrations within the peri-implant tissues (Figure 10).

The improper seating of a crown onto an abutment can be caused by the following:

- Premature contact interproximally on the adjacent teeth;
- Resistance from peri-implant tissues or entrapment of tissue between the abutment-crown margin;
- Incorrect orientation and seating of the abutment on the implant.

To help avoid this problem, crown seating should be checked visually where possible and confirmed with a radiograph, prior to final cementation. When the surrounding soft tissues are preventing proper seating of an implant crown, it is usually possible to feel this as one seats the crown. Typically, tactile feedback of a 'soft' or 'springy' seating of the crown is noted clinically. Marked blanching of the surrounding gingival tissues is also commonly seen. If soft tissue is impairing full seating of the implant crown it may be necessary to carefully relieve the soft tissues to allow for a more passive seating of the crown on the abutment.

Adjustment of the peri-implant tissues must be undertaken with extreme caution. One should always avoid adjusting tissues on the labial aspect directly in the aesthetic zone. If gingivoplasty or troughing is required to reduce the bulk of tissue and allow proper seating of the crown, this should be limited to the palatal of lingual aspects where possible. If there is adequate width and bulk to the interproximal tissues, a small amount of reduction could be undertaken here also, with a tendency to keep toward the palatal/lingual aspect, thereby reducing the possibility of aesthetic embarrassment though loss of interdental papilla. A diode laser can be beneficial in these instances. One should avoid the use of electrocautery.

A further technique involves displacing the tissues rather than resecting them. Using a scalpel, small releasing incisions of 2-3mm are made in the mesial and distal palatal-line angles of the peri-implant tissues (Diagram 2). A small periosteal elevator is then used to push and gently displace the tissues, creating space and allowing for easier seating of the crown onto the abutment.

**Incomplete seating of the abutment on the implant**

Failure to properly seat the definitive implant abutment onto the implant can in turn lead to difficulties with seating of the crown. It can also increase the risk of loosening of the abutment screw and lead to chronic inflammation of the peri-implant tissues (Figures 11 and 12).

Incomplete seating of the definitive abutment on the dental implant can be caused by:

• Improper alignment of the abutment connection with the implant fixture head (more likely on an external hex based prosthetic table);
• Entrapment of soft tissue between the abutment and the fixture head; and
• Interference from bone immediately adjacent to the fixture head.

Confirmation of complete seating of the definitive abutment should always be confirmed prior to torquing the abutment down into position by taking a periapical radiograph. Accurate radiographs are essential and one should not rely on bisecting angle technique, instead using film holders (i.e. Rinn) to allow for detailed evaluation of the implant abutment to fixture head seating. Once confirmed, the radiography should form part of the patients clinical record and you can proceed to torque the abutment screw. If an abutment is not fully seated, it will be clearly visible on the periapical radiograph.

If tissue entrapment is noted, a tissue punch or scalpel blade can be used to carefully trim back and remove the tissue from over the fixture head. When looking though the soft tissue collar, it should be possible to clearly visualise the entire fixture head surface. Occasionally, a small lip or edge of bone may also impair complete seating of the abutment. This is more likely if the implant has been placed deep and is more countersunk into the alveolus. Removal of a small area of bone must be undertaken very carefully so as not to inadvertently cause damage to the fixture head. A scalpel blade combined with a surgical curette can be used, as can small periodontal surgical files. Hand instruments are preferred and rotary instruments should be avoided as they increase the risk of damaging the fixture head.

**Summary**

The key to completing a successful cement-retained implant crown is attention to detail. As clinicians, we tell our patients that dental implants are a long-term treatment solution. With the emphasis on long-term, we should therefore strive to deliver a high standard of implant prosthesis to ensure that longevity of the implant and implant prosthesis is assured for our patients.

**Recommendations**

1. Always have the patient return for follow-up visits once final prosthesis has been placed and there had been approximately 4 months of function. The purpose of these follow-up visits is to evaluate the condition of the peri-implant tissues, crestal alveolar bone levels and general oral hygiene. Problems related to excess crown cement will often be easier to diagnose a few months after the prosthesis has been placed.
2. Fully understand the potential complications that can occur during the course of final abutment and implant crown placement and know what steps you need to take to avoid these problems from occurring.
3. Always check the fit of the final abutment and crown on the model when it is returned to you from the dental laboratoryand then in the patient's mouth and confirm the fit of these components with appropriate radiographs before torquing down the abutment and cementing the crown.

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