

# **Mechanical Complications of Dental Implants**

**Screw Loosening and Fracture**

## Screw Loosening and Fracture

Abutment-screw loosening has been shown to be the most common dental implant prosthetic complication, accounting for up to 33% of all post-implant prosthodontic issues. Screw loosening causes many complications that may contribute to crestal bone loss, screw fracture, implant fracture, or implant failure.



## Screw Loosening and Fracture

Screw loosening usually occurs as a result of micromovement at the joint interface. This micromovement may be associated with an inadequate initial torque, ill fitting frameworks, occlusal overload and cantilevers.



Loose abutment screw UL3 implant retained crown.

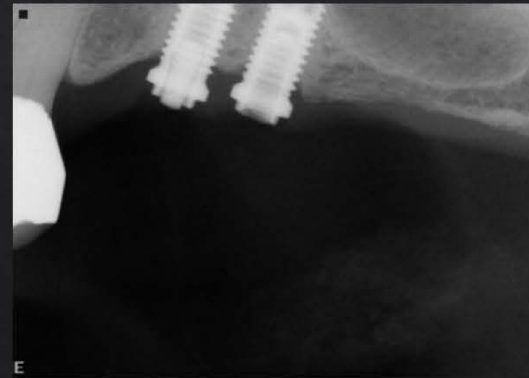
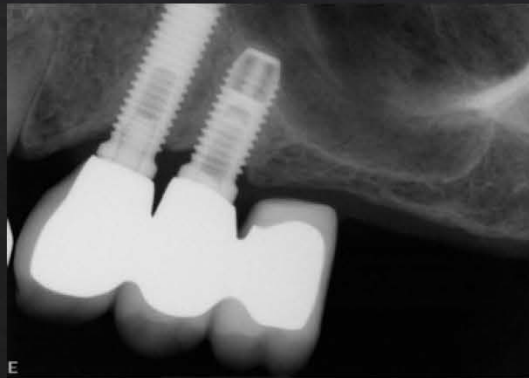


Fractured abutment screw



## Screw Loosening and Fracture

External hex (Branemark style) implants: The external hex on these implants provided little resistance and/or retention, so a lot of load was placed on the screw itself. Today's implants are mainly designed with an internal connection utilizing a platform-switch concept. With this design, the screws get very little load as most of the forces are distributed in the internal connection.



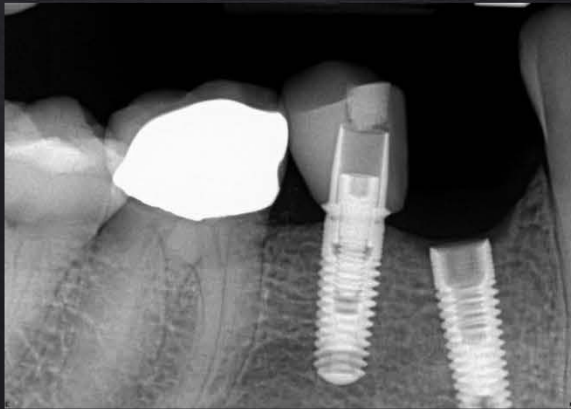
# Screw Loosening and Fracture

## Factors that increase screw loosening

1. Cantilevers
2. Increase crown-height space.
3. Parafunction
4. Abutment not fully seated
5. Inadequate or excessive torque.
6. Poor implant position

## Screw Loosening and Fracture

To verify if the abutment screw is loose, two diagnostic tests may be used. When the crown is moved in a buccal-lingual position, if no pain is present, this most likely is the result of the abutment screw being loose. If pain does exist, it is most likely the non-integration of the implant that is the origin of the discomfort.





## Screw Loosening and Fracture

Caution should be exercised in attempting to remove a cemented crown from a mobile abutment with conventional crown-removal techniques (eg, with a crown bumper or by sectioning the crown). The impact force that is applied to the mobile crown is dissipated because of the loose screw. This may result in damage to the internal threads of the implant body. Additionally, in poorer bone densities, overzealous use of a crown remover may result in a loss of bone-implant interface.

## **Screw Loosening and Fracture**

When cutting off the crown, one needs to be careful, as, in most cases, it is difficult to determine the cement location because sectioning the crown too deep may cause damage to the abutment, abutment screw, or implant body.



## **Screw Loosening and Fracture**

The safest and most predictable treatment option to correct abutment screw loosening and retain the existing crown is accomplished by making an occlusal access and transforming the cement-retained crown into a screw-retained crown via an occlusal access hole. In situations where the access hole is through the facial aspect of the prosthesis (ie, anterior crowns), the crown will need to be removed and a new crown fabricated.

# Management of Screw Loosening



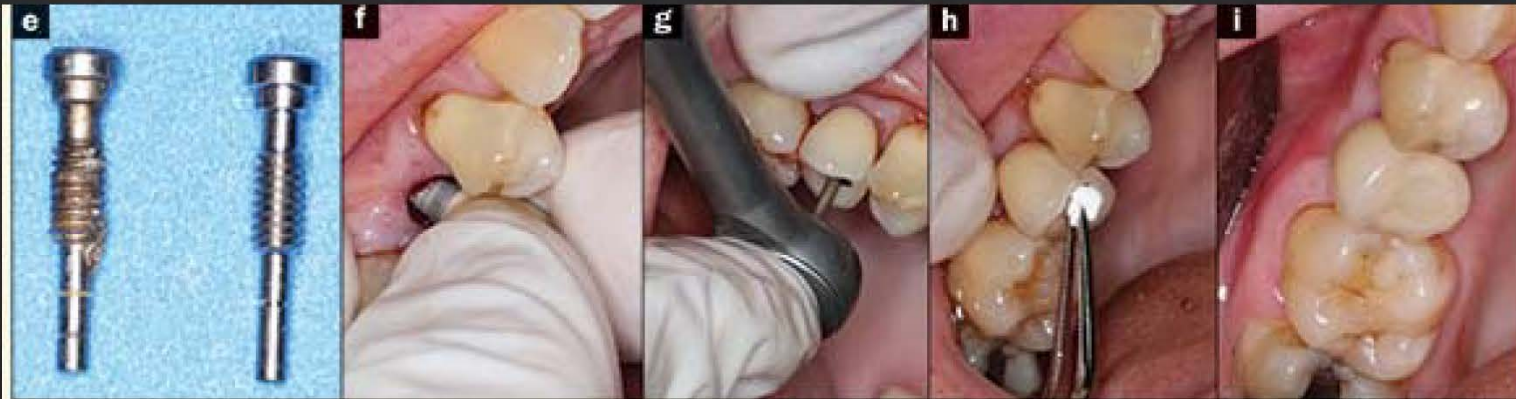
**Figure 3a.** A radiograph of a loose implant-supported crown.

**Figure 3b.** An occlusal access hole is made with a #8 round diamond bur to determine the location of the abutment screw.

**Figure 3c.** An appropriate driver is used to remove the loose screw and crown.

**Figure 3d.** The loose crown was removed. Note the presence of retained cement.

# Management of Screw Loosening



**Figure 3e.** The screw is removed from the abutment/crown assembly (left). Because the loose screw has been elongated and distorted, the screw should be discarded and replaced with a new screw (right).

**Figure 3f.** The abutment/crown assembly is reinserted.

**Figure 3g.** The new abutment screw should be torqued according to the manufacturer's specifications.

**Figure 3h.** A filler (PTFE) is placed to protect the screw head.

**Figure 3i.** A light-polymerized opaque composite resin is placed over the access hole, and the occlusion is adjusted accordingly.



# Screw Loosening and Fracture

## Prosthetic Parameters that reduce screw loosening

1. Narrow occlusal plane
2. No lateral forces
3. Decrease cusp height
4. Occlusal contact in central fossa, not marginal ridges
5. Minimized cantilevers
6. Occlusal guards, if parafunction is present
7. Increase abutment diameter

# Screw Loosening and Fracture

## Prevention

Preventing screw loosening and fractures is best accomplished by ensuring screws are tightened using either a hand or electronic torque device and making sure prostheses fit properly.



# Screw Loosening and Fracture

## Ideal Torque Technique

1. Lightly finger tighten with an implant driver ( $\sim 10$  N/cm)
2. Maximally finger tighten screw with a driver ( $\sim 20$  N/cm)
3. Implant screw should be torqued to the manufacturers specifications
4. After 5 to 10 minutes, the screw should be re-torqued to the manufacture specifications



# Screw Loosening and Fracture

## Treatment

When screws loosen, they can be retightened. If the screw has been in service for some time, it is advisable to replace the screw with a new one.

# Screw Loosening and Fracture

## Treatment

Occasionally, when a crown has been cemented over an abutment, the abutment screw can loosen and there is no access to the abutment screw for the purpose of retightening. For this reason, some practitioners use lingual retaining screws rather than cementation of the crown to permit future retrieval of the crown.



# Screw Loosening and Fracture

## Treatment

Digital images of screw access hole locations in abutments are valuable resources should an abutment screw come loose beneath a cemented crown.





# Screw Loosening and Fracture

## Treatment

When screws fracture, it can be a challenge to remove the screw fragment. However, the design of many older screws was such that they did not incorporate frictional fit with the implant threads, thus permitting an explorer or other dental instrument to be used to manipulate the fragment slowly in a counterclockwise direction.

# Screw Loosening and Fracture

## Treatment

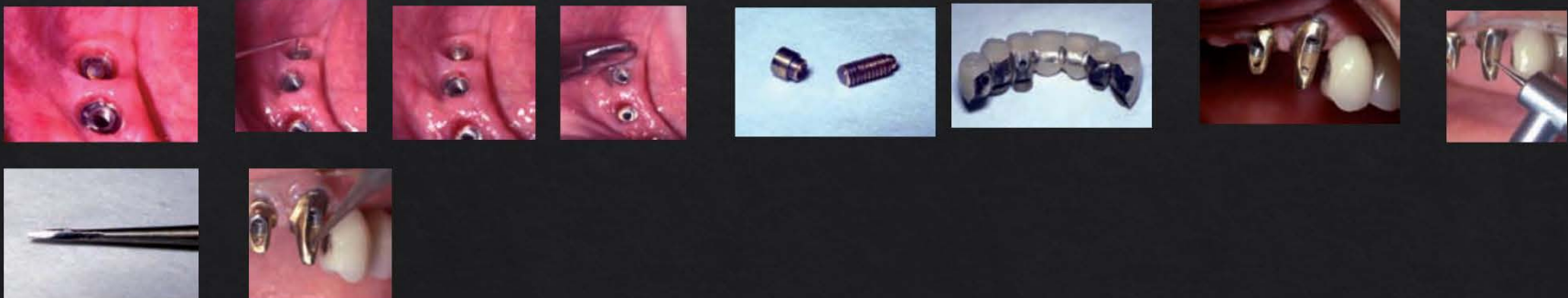
When a screw breaks at the top of its threaded section, it may be accessible to a dental instrument and the screw can be rotated counterclockwise until it can be grasped with an instrument and removed.



# Screw Loosening and Fracture

## Treatment

When the fractured segment of a prosthesis retaining screw is located inside a prefabricated or custom abutment, the abutment can be removed if necessary to facilitate removal of the fragment in the laboratory.





# Screw Loosening and Fracture

## Treatment

Methods of removing screw fragments that cannot be rotated with a hand instrument or grasped by a hand instrument have included running a drill in reverse to grasp and remove the fragment, drilling into the screw fragment so it can be grasped, grinding a slot into the top of the screw fragment and modifying some instrument so it fits into the slot and the fragment can thereby be unscrewed.



# Screw Loosening and Fracture

## Treatment

When a fractured abutment screw fragment is located inside an implant, there are manufactured retrieval instruments that can aid in the process. Screw taps are also manufactured to refresh implant threads should they become disturbed during the screw fragment removal .



## Conclusion

Screw loosening is a recognized complication in implant dentistry. The reliability and stability of the abutment-implant screw joint connection is an essential for long-term success of the implant and prosthesis. This is a complication that most implant clinicians will be met with in their careers. By having a strong understanding of the biomechanical principles responsible for this complication, the clinician will be able to prevent and effectively manage screw loosening.



## References

- Froum S. J. (2010) *Dental Implant Complications Etiology, Prevention, and Treatment* . Blackwell Publishing. UK.
- Vere J., Bhakta S. and Patel R. Prosthodontic complications associated with implant retained crowns and bridgework: a review of the literature. *British Dental Journal* volume no. 6 (24 )2012.
- Kourtis SG, Sotiriadou S, Voliotis S, et al. Private practice results of dental implants. Part I: survival and evaluation of risk factors—Part II: surgical and prosthetic complications. *Implant Dentistry*. 2004;13:373-385.
- Jemt T. Single implants in the anterior maxilla after 15 years of follow-up: comparison with central implants in the edentulous maxilla. *Int J Prosthodont*. 2008;21:400-408.