# DENTAL IMPLANT COMPLICATIONS AND MANAGEMENT

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## INTRODUCTION

The goal of modern dentistry is to restore the patient to normal contour, function, comfort, esthetics, speech and health regardless of the atrophy, disease or injury to the stomatognathic system. As a result of continued research in treatment planning, implant designs, materials and techniques, predictable success is now a reality for many challenging clinical situations. However Implant dentistry involves risks and complications that can occur with reasonable care. All available implants are subject to failure on occasion. Failures may be difficult to predict and after failure the cause of it may be difficult to identify. It is well established that failure can occur even under best care. Therefore before deciding to proceed on implant therapy the patient should be informed with the risk of complications involved in the treatment[10,11].

Knowledge regarding the types of complications that can occur with dental procedures is an important aspect of treatment planning, dentist patient communication and post treatment care. Because the design of clinical implant studies has not been standardized, the reporting of clinical complications tends to vary[10,11].

While dental implants are increasingly becoming the choice of replacement for missing teeth, the impediments associated with them are progressively emerging too. The aim of the current review is to discuss specific complications associated with dental implants. Management protocols and possible means of avoiding certain complications are also briefly discussed under following headings[15].

1. **SURGICAL COMPLICATIONS**
2. **POST-SURGICAL COMPLICATIONS AND MANAGEMENT**
3. **PROSTHETIC COMPLICATIONS AND MANAGEMEN**

**SURGICAL COMPLICATIONS:**

1. Oversized osteotomy
2. Perforation of cortical plates
3. Fracture of buccal and cortical plates.
4. Antral Perforations
5. Inadequate soft flap for implant coverage.
6. Poor angulation
7. Injuries to the mandibular neurovascular bundle.

## 1. OVERSIZED OSTEOTOM

The best way to manage problems is to practice avoidance. Usage of the larger size implants in case of failure to gain functional grip of small diameter implants. Most systems including Nobel Biocare, 3i, Calcitek, Steri-Oss offers implants of several diameters. E.g. the noble Biocare design offers a 4 mm implant to serve as replacement if the surgeon strips the bone while seating the standard 3.75mm size. The Steri-Oss series is available in 3.25mm, 3.8mm, and in larger diameters[4,.]

**This problem can be managed by:**

1. Using a mark on the rotary instrument to dictate the exact moment to reverse the motor direction.

2. Stopping the motor four to five rotations from the final seating and complete the procedure with the hand held ratchet wrench holding near its working end to neutralize the greatest leverage caused by its long handle.
3. After all these precautions if the implant does not come to a firm stop it is better to remove the implant and place the next larger diameter implant, without bone tapping or threading devices.

## 2.PERFORATIONS OF CORTICAL PLATES AND MANAGEMENT :

When performing osteotomy for the seating of imp1ants , it is possible that even if the host site is capacious, misdirection of a drill in the presence of an unexpected anatomic irregularity may cause a perforation. When ridge width is lacking while instituting expansion techniques, fracture may occur with displacement or even loss of the cortical segment. If periosteum is attached to endangered cortical plate, replacing it after implant insertion and suturing presents a good prognosis for healing. If the fragment becomes detached, it can be wedged back into position, but the prognosis is guarded. If the implant diameter prevents replacement, particulate bone segment and with DFDB serving as an expander, apply it to the external surface of the defect. The patient's blood serves as a fibrous grouting medium. The closure is made after placing a resorbable membrane over the entire graft complex. Although the plate fracture is very difficult or impossible to avoid, it can be left untreated if there is no displacement. On the other hand perforations should not go unacknowledged.

**Testing for perforations is simple:**

1. After completing each osteotomy its integrity is tested with a long thin blunt probe. If the tip falls through an inaccessible fault or perforation, then it would be wise to use a membrane, and tease a Colla Plug over it, or gently tap some synthetic or autogenous bone at the base of the defect.
2. If the mandibular canal is involved, a Colla Plug is placed gently into the base of the defect to avoid forcing graft particles into the neurovascular bundle.
3. Air bubbles emanating from the osteotomy denote perforation into the maxillary sinus. In such instance, placement of a shorter implant after deep repair with Colla Plug and graft material is an acceptable remedy.
4. Significant bleeding characterizes perforations of the mandibular canal, which may be confirmed by periapical radiograph with a probe and gutta percha point in place.

## 3.ANTRAL PERFORATION AND MANAGEMENT

While reflecting the mucoperiosteum in preparation for a maxillary subperiosteal implant impression, some eggshell thin maxillary cortical bone overlying the sinus might lift

away attached to the flap. The intact Antral membrane often noted. It is bluish gray in color and expands with every expiration of the patient. If it is torn the margins are brought together and cover with Colla Cote (collagen sheet) or a resorbable membrane to permit the bone to remain attached to periosteum. If this design characteristic is to be avoided, a need for sinus floor elevation and graft procedure is to be performed[10,11,13].

## 4.BROKEN BURS:

These may occur during pilot osteotomy stage in preparing for placement of any type of endosteal implant. This occurs most frequently as a result of bur binding to the bone.

- A way to prevent bur fracture, when binding occurs is to grasp the hand piece beneath its head at the point of bur emission with the thumb and fore finger and press the fingers together. Pinch the bur between its head and the bone, forcing it vertically upward and out of the bone in a non-torque influenced movement.
- A second technique is to release the bur from the hand piece facilitating a trauma free bur removal by rotating it in the counterclockwise direction with fingers or Howe pliers.

## 5. IMPLANT ANGULATION AND MANAGEMENT:

This is rarely a problem A number of trial seating with different abutments, at the time of surgery, is necessary until achieving the proper angulations. Straight screw in abutments present problems when making angulations corrections. Gentle bending can be attempted after the abutment has been placed into the implant but before implantation. If the angulations cannot be improved by bending, then an opportunity for correcting is available after integration by making cast, telescopic, cementable coping in proper alignment.

The guidelines used for blades may be applied in making angulations corrections for most root forms that have been placed in anatomically accepted

positions. If a press- fit implant is used with internal threading and without anti-rotational devices (E.g. Integral), and with angled one-piece abutments, inserts the abutment into the implant before seating. The implant is rotated to position that makes the abutment parallel to the adjacent teeth, and tap it into its osteotomy.

The abutment is unscrewed and replaced with a healing screw and is maintained until integration. Another alternative for use after integration is making a direct impression for casting an angled, frictional tit abutment that would require cementation.

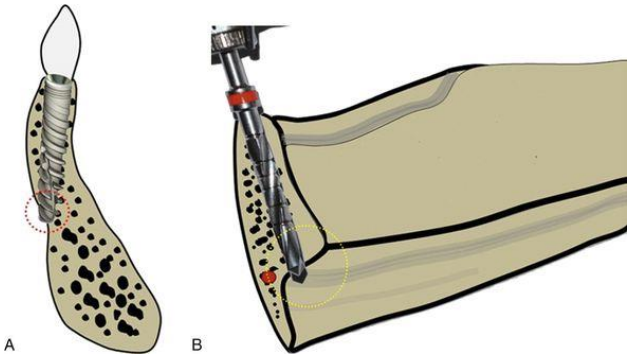
In addition, angled abutments are available that may be rotated on implants cervical platform and appropriately positioned and fastened by its fixation screw into the implants internal threading receptacle.

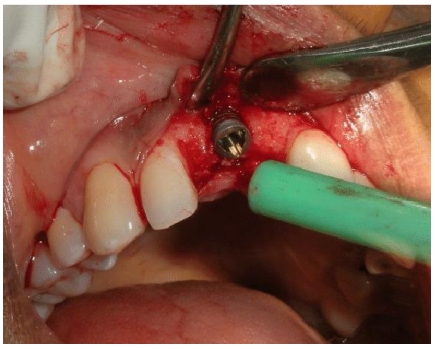
Selecting blades or root forms that permit the use of significantly angled abutments, abutments with adjustable necks, angular corrections made with the use of bone grafting materials or using subperiosteal implants are alternatives that assist in governing operative decisions

## 6.INJURIES TO THE MANDIBULARNEUROVASCULAR BUNDLE AND MANAGEMENT:

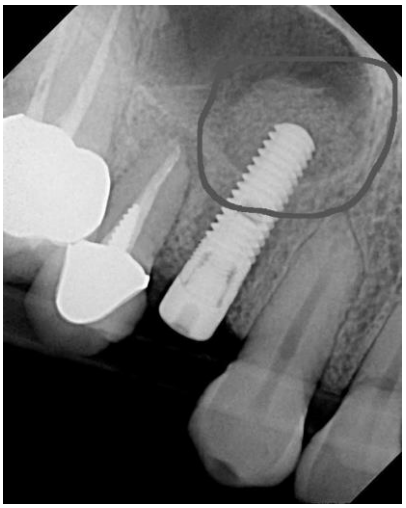
In instances when an implant or instruments unintentionally penetrate the mandibular canal, the implant must be removed and the patient must be informed of the possibilities of dysesthesia. This is an event less frequently experienced.

If the nerve has been injured or cut and it is within the bony canal, time may permit healing. Less chance for healing exists if injury occurs to a neurovascular bundle in the soft tissues such as the mental branch. If after 6 weeks, the dysesthesia has not diminished or changed in depth, nature, or character the exploration and possible repair must be considered.

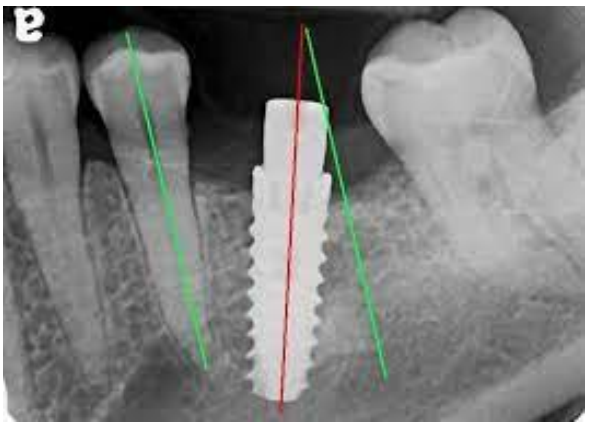


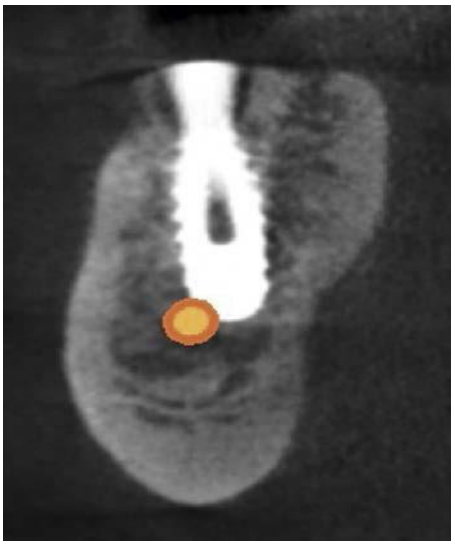
**PERFORATIONS OF CORTICAL PLATES**



**ANTAL PERFORATION**




**IMPROPER ANGULATION**



**IMPLANT IN MANDIBULAR CANAL**

## POST-SURGICAL COMPLICATIONS AND MANAGEMENT:

They can be classified as:

1. Short-term complications.

2. Long term complications

### SHORT TERM COMPLICATIONS (FIRST SIX MONTHS, POSTOPERATIVE MONTHS):

**POSTOPERATIVE INFECTION:**

Infection may manifest itself by drainage, swollen tissues, or pain. If there is an abscess it is incised and drained under antibiotic coverage. Early infections do not mean that the implant fails, but prompt and aggressive therapy is mandatory[1,8].

- **DYSESTHESIA:**

The onset of dysesthesia during the post operative period is most often a result of patient failing to notice or report immediately after surgery because he or she was unable to sort out this symptom out among others such as pain and swelling. If it is an accurate complaint after the abatement of edema, it is suggested that the implant may be removed. If the symptoms do not seem to be abating in 6 weeks after implant retrieval, exploration and repair is indicated.

- **DEHISCENT WOUNDS**

In the immediate l0-day postoperative period, a wound sometimes breaks down and the underlying implant gets exposed.

At this point, it is impossible to regain primary closure, and if it is attempted, the tissues investing the implant recede even further. The wound is left surgically untouched and is irrigated frequently. Gentamicin is diluted in 50 ml of saline and is used to clean the exposed metal or membrane with a cotton applicator tip. Usually

the wound fills in by secondary intention, either completely or at adequately so that bone becomes covered. With strict hygienic regimen, such implants most often proceeds to integration and even demonstrate reasonable epithelial recovery.

- **DEHISCENT IMPLANTS:**

From time to time, a two-stage blade or root form implant does not remain buried beneath the gingival tissues. There may not be signs of distress or infection, but a distinct implant component, usually the healing cap or screw is seen. This does not indicate failure. Instead the hygiene is improved and this is followed with application of Peridex. A good chance of Osseo integration remains despite this complication. The implant site is evaluated periodically both clinically and with radiographs[1,8].

- **RADIOLUCENCIES:**

If at the 4 or 8 week postoperative examination the implant shows peri-implant radiolucency then it is assumed that Osseo integration will not occur. In case of root form it is appropriate to inform the patient that the implant will have to be removed. If the radiolucency appears at the apex of the implant only then it often represents a perforation of the cortical plate and introduction of epithelial cells, probably at the time of surgery. An apicotomy like repair, using bone replacement materials to fill the defect is often effective in managing this finding.

- **IMPLANT MOBILITY**

One-piece endosteal implants such as blades, the ramus group, or screws may be mobile before the initial healing phase and may come to an end (3 to 6 months). If this finding is noted the possibilities for reestablishing the firmness is virtually nonexistent. The patient is informed about the failure and the implant is removed.

## 2.LONG TERM COMPLICATIONS

- **PERI-IMPLANTITIS:**

A Periodontitis like process, peri-implantitis can affect dental implants and because untreated periodontitis may ultimately lead to loss of natural teeth, perimplantitis can result in loss of dental implants. Clinical findings around failing implants include masked gingival inflammation, deep pocket formation, and progressive bone loss[6]

Implants in partially edentulous cases appear to be at greater risk for peri- implantitis than in implants in completely or fully edentulous cases. It is possible that natural teeth may act as a reservoir for periodontal pathogens from which they may colonize implants in the same mouth. Plaque accumulation during the postoperative period following implant placement may result in compromised epithelial attachment to the implant surfaces

- **RETROGRADE PERI-IMPLANTITIS:**

Retrograde implant failure may be due to bone micro fractures caused by premature implant loading or overloading other trauma or occlusal factors. Implant failures from retrograde peri-implantitis are characterized by peri apical radiographic loss without, at least initially, gingival inflammation[6].

Rosenberg et al demonstrated that in failing implants with a primarily infectious etiology 42% of the sub gingival flora consists of Pepto streptococcus, Fusobacterium and enteric gram-negative rods. Failing implants with traumatic etiology have a micro flora containing primarily streptococci[1.8].

- **AILING, FAILING OR FAILED IMPLANTS:**

Bone loss around implants often begins with gingival inflammation. The phenomenon of hyperemic decalcification is one of the contributing factors leading to demineralization of bone that lies beneath the skin or inflamed mucosal. Other factors can be nutrition and age related, secondary to systemic diseases or caused by bruxism, traumatic occlusion, improperly designed superstructures, unacceptable oral hygiene, or physiologically incompetent implant design. Most of the possible cause can be managed by innovative practitioners by adding implants correcting occlusion, revising superstructures, performing definitive periodontal therapy[2,4].

**THE FAILED IMPLANT:**

In the event of mobility of either root form or blade implant, the only acceptable treatment is removal. A major cause of loosening of a successful implant is cement failure on an adjacent natural implant tooth.

Castings should fit well, be cemented carefully, and checked with frequency for evidence of mobility or tell tale signs of fluid that appear at the margins when depressing them. An alternative that discourages cement loosening is the generous uses of inter locks between the super structural elements of the natural and the implant abutments. If there are deep bony protrusions locking the implant to the host site, extra long surgical fissure burs may have to be used in a light brushing movement running directly against the implant.

**THE FAILING IMPLANT:**

If routine radiography demonstrates progressive bone loss around cervical area of the implant the cause must be analyzed and rectified (Fig: A) Corrective surgery dictates creation of full thickness facial, palatal and lingual flaps as for periodontal operations. The cervical granulomas are curetted down to the bone but care should be taken not to scratch or injure the implant surfaces. In cases of HA coated implants the particulate material is removed. (Fig: C) Thin water cooled fine diamond stones are effective. If there are no signs of purulence the area are primed with the application of saturated citric acid for 5 minutes till fresh bleeding is evident. Screw placement or removal. The material peels of like rubber and must be reapplied with every time the superstructure is seated[2].

**THE AILING IMPLANT:**

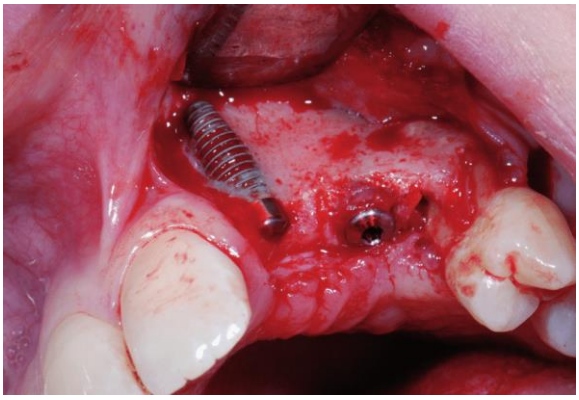
This is the least seriously affected of the three pathologically-states. Nothing more than radiographic evidence of bone loss may direct the implantologist to be suspicious. If local conservative measures maintain the status, continued observation

and pocket watch system is all that may be required.

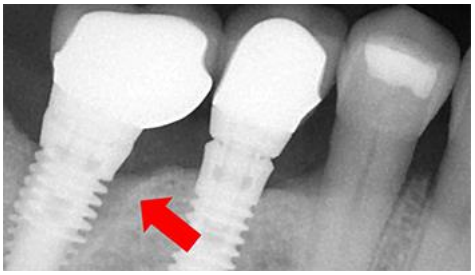
On the other hand if slow but consistent bone loss with deepening of pocket is evident, a complete soft tissue correction is done without removing the surface coating. Instead the local environment is exposed to citric acid for 5 minutes followed by irrigation grafting and closure[3].

**ACTISITE:**

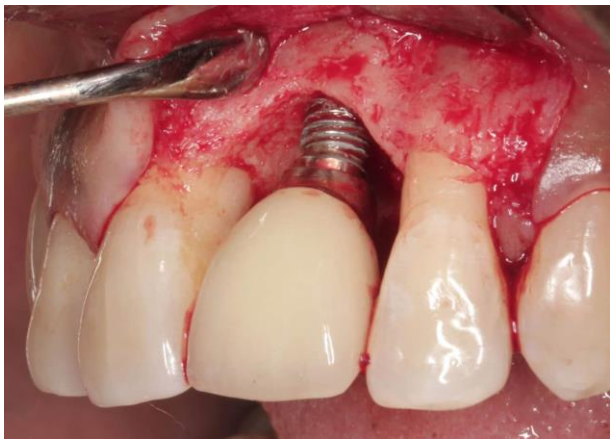
In cases of shallow pocketing, plastic or gold plated curettes are used for debridement. A tetracycline impregnated co polymeric filament called actisite is quite effective. This form of antibiotic therapy placed within the peri-implant pocket for an I0-day period can lead to significant reversal of symptoms. Reapplication every 3-9 months and maintenance of state of oral health often solves problems of chronic infection.



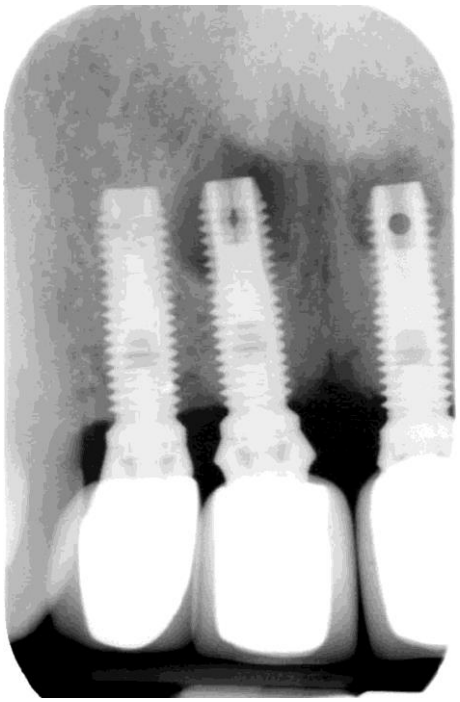
**DEHISCENT IMPLANT**



**LOOSNING OF IMPLANT DUE TO BONE LOSS**



**PERI IMPLANTITIS**



**RETROGRADE PERI-IMPLANTITIS**

## PROSTHETIC COMPLICATIONS AND MANAGEMENT

Losing one or several implants mandates a change in prosthetic strategy. The status of the newly acquired support mechanism is assessed. The options are to shorten bars, eliminate cantilevers, and change location of ERA's, O-rings, or other retentive devices from terminal bar positions to pier or intra-implant locations. If bars are retrievable, these changes can be done in the laboratory with the assistance of pick up impressions. Cemented bars may require the use of pneumatic, reverse hammer, crown remover.

A viable alternative is to retrofit implants into existing coping or crowns. This may be a departure from the impeccable Prosthodontics practices demanded by implantology, but experience has shown it to be an effective technique. The coping bar, hybrid prosthesis, or fixed bridge is removed and the failed implant is lifted from its crypt, and the surrounding granulomata are completely resected. If the residual site reveals healthy bleeding, bone and sufficient dimensions in width and length an immediate replacement implant is inserted graft material is placed and closed. Such replacements should be threaded and of maximum height and length permitted by the host site. After allowing 3-6 month hiatus to elapse in order to permit Osseo integration, stage two surgery permits the fixation of an angled abutment of a three-piece variety. Collared abutments (e.g. Pragon) allows 18 different angulations, one of which would permit retrofitting into an existing crown or coping. Some diamond point alterations of the abutment may be required to bring it to conformation. Also a fixed detachable unit made for it can be torqued into place after removing the old unit from the prosthesis and performing a classical dental floss of GC pattern type verification assembly, leading to soldering of a new super structural component.

## FRACTURED ROOT FORM IMPLANTS:

## BROKEN PROSTHETIC INSERTS:

In root form and submergible blade implants there are three types of abutments; threaded, cementable, and frictional. If because of abuse (bending more than 20 degrees, over bending, and straightening, or moving the pliers sharply) an internal flaw in cervix occurs, or because of metal fatigue an abutment fractures at the implant body level, it may be necessary to retrieve the fractured insert so that another may be placed. In the case of fracture of the thread variety, which is by far less frequent, a half round bur is used to cut a groove into the superior surface for the use of a screwdriver[7].

The cemented or fictional cold weld presents far greater problems. The residual fragment is drilled out bit by bit. The problem of lateral wall perforation is a major one, and if this should occur, a subsequent parietal abscess of fistula may result. A flap with HA- GTRM repair becomes necessary[7,9].

## IMPLANTS OF IMPROPER ANGULATION:

### THE DOUBLE BAR TECHNIQUE:

Although the problem of angulation may have been anticipated at the time of surgery, it is usually not until the try in stage if prosthetic reconstruction that it manifests. This problem may be solved may the use of the double bar technique. The laboratory is instructed to obtain three screw attachments from the European companies. Each attachment is made in three parts:

1. An internally threaded cylinder or tube.

2. Smooth cylindrical collar.

3. A fixation screw.

The three internally threaded cylinders are fixed to the original malposed

superstructure bar in positions that are angled lingually to permit esthetic placement of fixation screws. They are placed as far apart as possible and not in a straight line so that optimal support and stress distribution is encouraged. When the positions appear to be acceptable these three threaded tubes are soldered to the bar.

The next step is to have a laboratory transfer the location of these threaded tubes to the underside of an acrylic resin or cast metal second superstructure that is fitted onto the original bar, which now bears the threaded tubes. Holes are made that pass through the second superstructure, each one directly over one of the threaded tubes. Into these holes the smooth cylindrical collars are processed with acrylic or soldered depending on whether the material chosen for the second bar is a polymer or a metal. At this point the original cast bar is seated onto the implant abutments in the normal manner, and screwed into place being sure that the screw heads are flushed with the bar.

Next the second superstructure bar is placed over the first one and using new fixation screw it is attached through the three attached collars into the internally threaded cylinders.

**SCREW PROBLEMS:**

One of the most frequent problems in the postoperative period is fracture or striping of screws or screw housings. This can occur during manipulation or simply when the prosthesis is in function.

**BREAKAGE OF RETENTION SCREWS IN FIXED DETACHABLE BRIDGES:**

This is a common problem that may occur when they have addition of distal cantilever segments. The maximum extension of the cantilever should be 15mm in the mandible and none in the maxillae. If posterior extensions are too long the retention screws may loosen or break. This happens because posterior biting forces cause non-vertical loading, which affects the anterior segment. This also places shearing forces on the retention screws, leading to loosening and finally to fracture. If the superstructure loosens repeatedly a properly balanced centric occlusion must be established. The retention screws can be changed to new ones[12,13,14]

Implant seal a product available from Life core is used to coat fixation screws. It serves as an antibacterial sealant but does not interfere with the within the interior of the implant, the superstructure is removed without creating damage to the threads, and a groove is cut on top of the residual screw fragment. To retrieve the fragment a half- inch round high speed, water-cooled bur in the Impactair to scribe the horizontal groove into the top of the residual shaft. Then a small compatible screwdriver is used to back off the segment.

**STRIPPED IMPLANT THREADS:**

An excessive manual effort sometimes causes stripping of the thread interface. If this occurs a new screw introduction is attempted. If this is successful it indicates that the screw threads have failed. If the replacement screw fails to bite then the fault lies in the implant core. Each company manufactures screw threader for purposes of recutting the internal threads within the implant core. These tapping tools, made of hard iron steel, are used manually and they work efficiently and predictable. Screws of the same diameter as the tap are supplied to return the retention mechanism to its pre incident condition.

When all these fail the final alternative is to treat implant as if it were a natural tooth. It is prepared for post and core and fabricated in one of the precious metals. Casting cannot be done until the abutment is retrofitted into the lubricated original crown using GC Pattern. In the end the new abutment is cemented into the implant and the prosthesis resting over it is also cements.

**FABRICATION OF IMPLANT-BORNE TEMPORARY PROSTHESIS:**

Occasionally it may be necessary to send a fixed detachable prosthesis to the laboratory for repair after it has been in use. A composite facing may have fracture, an occlusal wear may have occurred, or a metal junction may need to be soldered. The temporary prosthesis that the patient wore should have been retained or a new one must be made.

## FRACTURED MESOSTRUCTURE BAR:

Pre insertion bending, poor structural integrity, overly long spans, insufficient implant support, loss of integration of an abutting implant, or excessive occlusal trauma may cause a meso structure to fracture. If it is of the fixed detachable type that it can be removed and an index is made and the bar is repaired and reinforced. In case of cemented coping bar fractures or partial loss of cementation intraoral welding is used. This produces virtually no heat and creates firm reliable unions on titanium and its alloys.

## PARTIAL LOOSENING OF CEMENTED BARS OR PROSTHESES:

Although benefits of cementation are many, its major disadvantage is the difficulty of retrieval. If the porcelain or composite material fractures, or if a solder joint breaks, or if there is a substructure problem such as infection or bone loss, bar removal must be possible.

The loosened segment is removed by sectioning with ultra thin carborundum disks, and the crown is prepared on either side of the removed segment with diamonds to receive a new crown. The newly constructed telescopic abutments may be cemented. Before this the etiology of the cement failure is determined and eliminated.

An effective pneumatic reverse hammer attached to hand piece coupling has been shown to remove event the most recalcitrant cemented prostheses[9].

**FRACTURED BLADE ABUTMENTS:**

One-piece blade implants are usually made of pure titanium are designed to be bent. But overstressing coupled with chewing forces and galvanism caused by dissimilar metals of the fixed prosthesis, may cause cervical fractures. Another common cause of fracture is related to cement loss beneath the abutment or a natural tooth in a bridge that shares natural and implant abutments. Attempts to tap the bridge from the still firmly cemented implant abutment often cause this[2,3].

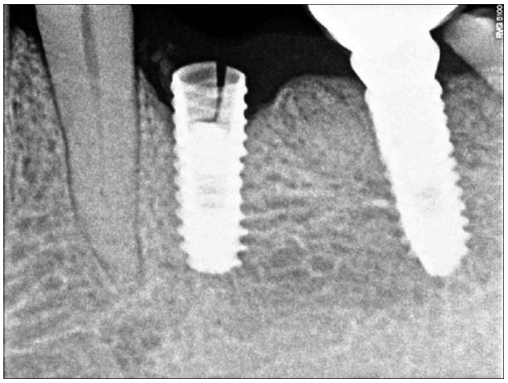
A safe alternative is to cut a slot in the cemented crown, permitting the bridge to be sprung free easily with the use of a small operator chisel.

If, despite the most cautious approach, cervical fracture of a blade implant should occur but the infrastructure is firm and well embedded in healthy bone it is possible to reconstruct and use the residual portion.

**BROKEN ABUTMENTS:**

Subperiosteal implants rarely fracture. Taking metallurgic x-rays of all castings before surgical placement can prevent this. Bubbles and casting defects show up easily with such views and indicate rejection of casting. If an abutment should break, and enough cervix is left, a casting can be made over to a telescope over it. If this is not possible the protruding cervix is shaved down as much as possible, some bleeding is created by abrasion with a diamond drill and the epithelium covers the altered stump by secondary intention. This is particularly applicable if the affected[2,3.]

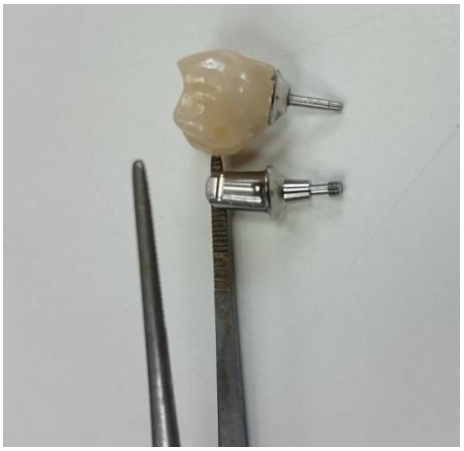
site is a posterior one. In such cases super structural sectioning the saddle just distal to the anterior abutment and building in a DE makes alterations hinge as a connecter. This allows the posterior saddle to function on a stress broken basis.



**IMPLANT FRACTURE**

**BROKEN PROSTHETIC INSERTS**

**STRIPPED SCREW THREADS**



**BROKEN ABUTMENTS**

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