

Complications in Dental Implants: A Mini Review

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Abstract:

Dental Implantology is an ever-growing field and has become an integral part of dentistry within no time. It has given an upright to overall dentistry by rehabilitating patients with teeth that not only appear esthetically comparable to natural teeth but also functionally correspondent with them. However, like almost every surgical procedure, implant complications or failures do occur making its placement highly technique sensitive. This article reviews the complication of the dental implants, its etiological factors, and ways to overcome and/or manage these problems.

Keywords: Implantology, implant complications, periimplantitis.

Introduction

Implant dentistry has evolved and improved massively in the last twenty years making it a more viable option for rehabilitation. Implants are used to rehabilitate both complete and partially edentulous patients along with rehabilitation of extra-oral fixed maxillofacial prosthesis. Implants both conventional as well as basal have complications that can be surgical, prosthetic, or delayed. An era ago complications used to be very common which can be due to less availability of material options, fewer methods for implant placements, inadequate methods for analysis of bone availability. However, with passing time, efforts have been made to overcome these problems. The most common etiological factor for failure of Implant is loss of osseointegration¹ whereas with the increasing demand of esthetics, failure to rehabilitate esthetically pleasing prosthesis is also becoming common.

Commonly occurring complications can be classified as follows²:

According to **Pjetursson et al. in 2008** (A 5-year cumulative complication rate)

- i. Fracture of Prosthesis- 13.2%
- ii. Peri-implantitis or peri-implant mucositis- 8.6%
- iii. Loss of the screw access restoration- 8.2%
- iv. Abutment screw Loosening-5.8%
- v. Abutment screw Fracture- 1.5%
- vi. Fracture of Implants- 0.4%

Complications can be classified as follows:

A. According to Carranza et al ³

1. Surgical complication

- i. Hemorrhage and Hematoma
- ii. Neurosensory disturbances
- iii. Damage to adjacent teeth
- iv. Implant Malposition
- v. Related to Sinus lift procedures

2. Biological complication

- i. Inflammation
- ii. Periimplantitis and bone loss
- iii. Implant mobility
- iv. Dehiscence and Recession

3. Mechanical /Technical complication

- i. Screw Loosing and fracture
- ii. Implant failure
- iii. Fracture of framework or restorative material
- iv. Cement failure

4. Esthetic/ Phonetic complication

- i. Esthetic complications
- ii. Phonetic complications

B. According to Misch and Wang (2008)

1. Early-Stage Complications

- i. Infection
- ii. Edema
- iii. Ecchymosis
- iv. Bleeding
- v. Flap dehiscence

2. Late-Stage Complications

- i. Perforation of mucoperiosteum
- ii. Mandibular fractures
- iii. Failed osseointegration
- iv. Maxillary sinusitis
- v. Bony defects
- vi. Periapical implant lesion

C. According to Canin

1. Intra-operative complications

- i. Endosteal implants
 - a. Oversized osteotomy
 - b. Perforation of cortical plates
 - c. Fracture of cortical plates
 - d. Broken burs
- ii. Subperiosteal implants
 - a. Loss of anesthesia
 - b. Inability to make an accurate impression.
 - c. Antral perforation
 - d. Injury of the mental or infraorbital nerve

2. Short term Complications

- i) Endosteal implants
 - a. Dehiscent wounds
 - b. Dehiscent implants
 - c. Radiolucency
 - d. Pterygomandibular raphe
- ii) Subperiosteal implants
 - a. Pterygomandibular raphe
 - b. Scar contraction
 - c. Post-operative infection

3. Long term complications

- i) Endosteal implants
 - a. Broken prosthetic inserts.
 - b. Screw fracture
 - c. The inaccurate fit of castings
- ii) Subperiosteal implants
 - a. Bone resorption
 - b. Broken abutments
 - c. Recurrent peri-cervical granuloma

In the following section, the most common complications are discussed in detail.

1. Hemorrhage and hematoma

Fatal events associated with dental implants are very few, but major complications can occur. Severe bleeding and the formation of massive hematoma in the floor of the mouth are results from arterial trauma. These can be in form of Petechia (less than 2 mm), Purpura (2-10mm), Ecchymosis (more than 10mm)⁴.

A common accident occurs as a consequence of local anatomic or systemic causes. These include lesions in any sublingual, lingual, peri mandibular, or submaxillary artery. Surgeries in the lower and anterior area of completely edentulous patients who have deficient quality as well as quantity of bone such as patients who had undergone radiation therapy, severe smokers, patients with systemic diseases, unreliable patients (patients with mental or psychological disorder). The early mode of treatment is to prevent airway obstruction. Treatment involves taking the patient tongue out to compress the blood vessels against the body of the mandible. Placing pressure with gauze in the sublingual area does not work. So, extraoral pressure to submental or submandibular arteries for 20 minutes against the body of the mandible provides help. For active hemorrhage bone wax, pressure, crushing, and electrocautery can be used. Besides these, ligation of arteries, bone cement, vasoconstriction, compression is also useful⁵.

2. Neurosensory disturbances⁶

Nerve lesions are both an intraoperative or postoperative complication that can affect the infra-orbital nerve, the inferior alveolar nerve, or its mental, incisive branch or lingual nerve. These complications have a low incidence (0.4%). Etiology can be classified as direct or indirect.

Direct- compression of implant body into the canal, accidental intraneural injection, cut, overheating, stretch, and accidental puncture, traumatic flap reflection, penetration of the osteotomy preparation, poor flap design.

Indirect- hematoma produces a temporary pressure increase, post-surgical intraoral edema.

The nerve injury may cause one of the following -paraesthesia, hypoesthesia, dysesthesia, anaesthesia. Treatment includes-Neural anti-inflammatory drugs that can be used such as clonazepam, carbamazepine, Radiograph to be taken if clinicians have any doubt during drilling, Topical application of Dexamethasone or 2 minutes enhance recovery, Micro-surgery techniques to re-establish the nerve continuity.

3. Damage to adjacent teeth

This problem arises more commonly with single implant placement. Damage to teeth adjacent to implant after the insertion of implants along an improper axis, dilacerated root or excessive tilting in the mesiodistal direction that invades the implant space, placement of excessively large implant⁷. A space of 1.5mm need to be maintained in between if two implants are placed and if single implant placement is done then space of about 3mm from adjacent teeth. A proper surgical guide or careful radiographic analysis is necessary to avoid improper angulation.

4. Implant Malposition

Placing an implant in the wrong location can be frustrating and avoidable complication especially while planning the prosthesis and can affect esthetic outcome of the prosthesis. The most common cause for malposition of the implant is a deficiency of osseous housing around the implant site, condition like Osteoporosis, Bone remodeling after bone resorption. The spatial orientation should be in line with the occlusal plane and centered according to the opposing occlusion to prevent cross-bite or additional stresses⁸.

5. Related to Sinus lift procedures.

Schneiderian membrane characterized by periosteum overlaid with a thin layer of pseudo ciliated stratified respiratory epithelium. Complications occur when this membrane is perforated at the time of surgery. It occurs in 10%-60% of all the cases. It occurs due to anatomical variations such as maxillary sinus septum, spine, or sharp edge are present, Very thin or thick maxillary sinus wall, Autoimmune reaction to implant, Angulation between the medial or lateral walls of the maxillary sinus. In patients with less than 5mm of bone, mastication can cause the implant to move during the graft maturation timeframe. So, trans-antral endoscopy surgery is a reliable method to retrieve the implant with minimal complications⁹.

6. Dehiscence and Recession

The most common postoperative complication is wound dehiscence which sometimes occurs during the first 10 days. This contributes to the risk for the healing of peri-implant tissue. This may be due to flap tension, continuous mechanical trauma or irritation, incorrect incisions, poor quality mucosa, heavy smoking, a patient treated with corticosteroids, diabetics, irradiated patients. In these cases, bone regeneration with implant placement is mandatory¹⁰. For small dehiscence, no surgical correction is needed whereas for large dehiscence resuturing can be done.

7. Aspiration and ingestion

One should be extremely cautious while handling small components such as screw-driver as there is a chance that the instrument enters the airway. Instrument become slippery in the presence of saliva. So, it is recommended to tie all tiny or slippery instruments with a silk ligature thread, gauze throat screens, or else use a rubber dam. If the patient swallows an implant component, he should be immediately placed in a head-down position to recover the lost component. The patient should be referred to the hospital because acute obstruction can be life-threatening, and with the help of colonoscopy or gastroscopy component can be located. The aspirated object should be removed within 24 hours. Chest radiograph can also be used as a diagnostic tool to rule out ingestion or aspiration¹¹.

8. Peri-implantitis

It is defined as the inflammation of the tissues around an Osseo integrated implant in function, resulting in the loss of the supporting bone, which is associated with bleeding, suppuration, increasing probing depth, mobility, and radiographical bone loss. The peri-implant mucositis is the reversible inflammatory changes of the peri-implant soft tissues without any bone loss. If left undiagnosed leads to implant failure.

Most patients with Diabetic, poor oral hygiene, a habit of smoking, the patient undergoing radiation therapy¹² due to a decrease in salivary flow in them, patients with a bone condition such as osteoporosis, patient with a history of periodontitis has peri-implantitis.

Clinical Features:

1. Radiographical evidence for vertical destruction of the crestal bone
2. Saucer shaped bone loss
3. Formation of peri-implant pocket
4. Pain
5. Bleeding and suppuration
6. Swelling of the peri-implant tissues and hyperplasia

The bacterial regime found in peri-implantitis is mostly gram-negative bacteria (*Porphyromonas gingivalis* and *Prevotella intermedia*).

For the treatment Cumulative Interceptive Supportive Therapy is given by Lang in 2004 that includes¹³: -

- i. **Mechanical cleaning** using rubber cups and polishing plaster, acrylic scalers for chipping off the calculus¹⁴. Debridement that includes scaling and root planing. Effective oral hygiene practices are recommended.
- ii. **Antiseptic cleaning**-Use of 0.2 % of chlorhexidine digluconate for 3-4 weeks as a mouthwash.
- iii. **Antibiotic therapy** -that can be given both systemically or locally for 10 days. Systemically includes a combination of metronidazole with amoxicillin or ornidazole. Locally include the application of antibiotics using controlled released devices such as tetracycline fibers.
- iv. **Surgical approach**- includes regenerative surgery.

9. Screw loosening and fracture

Implant components fractured more frequently in the posterior region than the anterior region. In screw-retained restorations, retention is obtained by a fastening screw. It is mostly indicated in the provisional prosthesis, patients with inadequate interarch space (less than 5mm) or in full mouth implant rehabilitation cases. It depends upon factors such as-

1. Insufficient clamping force
2. Screw settling
3. Biomechanical Overload
4. Off-axis centric forces
5. Misfit of implant components and prosthesis
6. Differences in screw material and design
7. Hex height and implant diameter

Peri-implant vertical bone loss and biomechanical overloading lead to compressive as well as tensile forces on the prosthesis that causes screw fracture. However, Screw fracture can be a serious complication that can lead to prosthetic failure¹⁵. These screw fracture components can be removed with both conservative as well as invasive methods. Conservative includes the use of spoon excavator, scaler tip, probe whereas invasive include screw retrieval kits. The conservative approach should be considered first and then the invasive as they are non-reversible procedures.

9. Fracture of framework or crown

Framework fracture or prosthetic component fracture results from biomechanical overloading and non-passive fit of the prosthesis¹⁶. The prosthesis should be free from any high points that act as a stressed house. The prosthesis should have a passive fit. Prosthesis misfit causes uneven forces, leading to porcelain fracture. Metal-ceramic restoration material is more recommended for the posterior region and zirconia for the anterior region.

10. Cement Failure

Dental cement plays an integral part in fixed prosthodontic treatment. Their most important characteristic property is the resistance to dissolution in oral fluids. The oral cavity has a dynamic environment and dental luting cement is subjected to multiple sources of fluid flow. According to **Tae Hyung Kim**, low solubility and high strength are the most desirable properties for any luting material¹⁷. So, to decrease cement solubility and increasing the life of the prosthesis resin cement can be used. They are composed of resin matrix and filler. Solubility depends upon the filler content of the resin cement. More the filler content in the cement, the less will be its solubility. Resin cement has better mechanical properties are compared to other conventional luting cement. The water absorption capacity of resin cement depends on resin polarity as dictated by the concentration of polar sites available to form hydrogen bonds with water.

If final restoration is to be cemented with resin cement, then provisional prosthesis should be adhered to with Non-Eugenol temporary cement as in permanent restoration eugenol cement interferes with the polymerization of resin cement.

11. Esthetic Complications

It depends upon the patient's expectations, perceptions, desires, and patient-related factors that as bone quality and quantity. The complications increase when patient has high esthetic demands. It can result from poor implant placement, deficiencies in the existing anatomy of the edentulous sites, crown form and height, the site may not be ideal, esthetic region-high esthetic demands, thin periodontium, lack of hard and soft tissue support in the anterior region. This can be managed with appropriate treatment planning and using reconstructive procedures to develop the natural emergence profile of the implant crown. If no such treatment is followed, it results in the appearance of black triangles that are highly unesthetic.

12. Phonetic complications

These complications mostly occur in implant prosthesis with unusual palatal contours such as restricted or narrow palatal space, spaces under or around the superstructure of the implant which allow the escape of air or saliva, or after abutment or prosthetic loosening. Mostly observed in a patient with the severe atrophied maxilla. Some patients learn to adapt to the situation while others need to make use of a removable component such as an elastomeric bung, which can be placed palatally or a removable acrylic labial flange. It is important to inform the patient in advance if it is thought that the speech problems are likely to occur¹⁸.

Conclusion

Complications in dental implants are however decreasing in the coming days with the advancement in Implant materials and techniques for Implant placement. Proper case selection, careful treatment planning, adequate knowledge of landmarks, and proper sterilization protocol with thorough information of implant placement procedures help to reduce these complications making implants long term successful. Proper recognition of developing problems and their proper management is the key to minimize postoperative complications.

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