Post Surgical Management II
Implant complications

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10/28/2014
Intraoperative complications in implant placement
Incorrect implant angulation

• Buccolingual angulation
  - Angulation of 15 degrees or less is acceptable
  - Implant angulation ≥25 degrees may compromise supporting bone
Mechanical complications of off-axis loading

- Restoration fracture
- Retaining screw fracture
- Abutment fracture
- Implant body fracture
- Osseous destruction because of unfavorable loading
- Plaque accumulation under large pontics
If an implant can’t be placed with angulation $\leq 15$ degrees the implant should be placed in a different position or ridge augmentation should be done first.
Mesiodistal angulation

- **Single implant cases**
  - Excessive angulation should be avoided
  - Use of angled abutments can compensate for slight inclinations
  - Check angulation after pilot drill-radiograph
  - Lindermann side-cutting drill can be used to adjust angulation
• Multiple implant cases

- Mesiodistal inclination has lesser influence on occlusal load transfer to the implant because the prosthesis redirects occlusal forces.

- Implant survival rate 93-97.5%

- Alternative to ridge augmentation or sinus elevation.
Mal-alignment

- Use of parallel pins

- Multiple implants- check angulation of first osteotomy, if satisfactory then parallel next osteotomy to the first

- When a natural tooth is present, first pilot drill can be aligned to long axis of the tooth
Nerve Injury

- Local anesthetic needle
- Lacerated by the scalpel during incision
- Stretched during flap reflection
- Damaged by osteotomy drills
- Compressed during implant insertion
**Classification of nerve injury**

**Day, 1999**

**Neuropraxia:**
- mild injury caused by compression or prolonged traction of the nerve that results in loss of sensation
- intact axons
- sensation typically returns 4 weeks after surgery

**Axonotmesis:**
- severe compression or traction that damages the axon by edema, ischemia or demyelination
- partial sensation returns in 5-11 weeks and sensation continues to improve over the following 10 months

**Neurotmesis:**
- loss of continuity of the axon and its encapsulating structures
- repair requires microsurgery
- prognosis for fully recovery is poor
Symptoms of nerve injury

- Paresthesia: abnormal sensation
- Hypoesthesia: reduced feeling
- Hyperesthesia: increased sensitivity
- Dysesthesia: unpleasant (painful) sensation
- Anesthesia: complete loss of sensation

Spontaneous return of sensation depends on severity of the injury and the nerve involved.
Prevention of nerve injury

- Detailed knowledge of anatomy
- Careful TPL using CT SCAN images and diagnostic wax ups
- Drills stoppers
- Surgical guides
- Careful manipulation of soft tissue

*Implant surgeon should use common sense and avoid implant placement in areas with high potential for injury*
Inferior alveolar nerve

- Branch of V3
- Foramen ovale
- Sensory branches (auriculotemporal, lingual, inferior alveolar, buccal nerves)
- Motor branches (muscles of mastication)
Injury prevention

- CT scan images to determine exact distance between the superior border of IAN canal and crestal bone
- 2mm margin of safety between apical end of the implant and superior border of IAN canal
- Use of computer-generated surgical guide
- Compensation for slight additional length of the drill (drill length 0.5-1mm longer than the implant placed)
- Use drill stoppers
Mental nerve

- Exits the mandible through mental foramen
- Located between apices 1\textsuperscript{st} and 2\textsuperscript{nd} premolar
- Sensation to chin, lower lip, labial gingiva of mandibular anterior teeth and skin over mandibular body
- Anterior loop (traverses inferiorly and anterior to the mental foramen before turning back to exit the foramen)
- Implant should be placed at least 5mm anteriorly to mesial aspect of the foramen (3mm to allow for the loop and 2mm as safety margin)
• Flap releasing incisions mesial to mental nerve should terminate just superior to the mucogingival junction

• Extensive resorption-mental foramen may be located at the crest of the ridge
  - Crestal incision should be placed on the lingual
  - FTF carefully reflected until the foramen is identified
Mandibular incisive canal and nerve

- IAN splits into the mental nerve and the incisive nerves
- In some cases a true canal with large lumen is present (0.48-2.9mm) extending anteriorly and inferiorly to the mental foramen, 8-10 mm from the lower border of the mandible
Lingual nerve

- Branch of V3
- Sensory innervation to anterior 2/3 of the tongue
- Receives taste fibers from the *chorda tympani* (branch of facial nerve)
- It is anesthetized during IAN block
- Located medial to the lingual cortical plate of the mandible, below the crest of the ridge and posterior to 3rd molar roots
- Covered by a thin layer of alveolar mucosa and may be visible clinically

*Miloro et al*: Nerve crosses over the retromolar pad in 10% of the patients
Prevention of injury

• Placement of distal releasing incision at 30 degrees toward the buccal in the retromolar pad
• Careful and gentle reflection of the lingual flap in the posterior mandibular region
• Avoid lingual releasing incisions
Infraorbital nerve

- Branch of V2
- Infraorbital foramen
- Innervates the skin between the lower eyelid and the upper lip
• Can be damaged during flap reflection for lateral window sinus elevation
• Implant placement in anterior area of highly resorbed maxilla
• Prevention of injury:
  - CT scan evaluation
  - flap reflection inferior to the foramen
  - gentle management of the soft tissue
  - careful use of retractors
Management of nerve injuries

• If there is concern that nerve damage has occurred the situation should be assessed soon after the injury

• Take ct scan to determine if altered sensation is due to impingement by the implant or result of tissue manipulation or edema

• If the implant is the cause of the altered sensation should be removed

• Altered sensation can be due to inflammatory reaction- 3 week course of anti-inflammatory meds (Ibuprofen 800mg)
• The area of decreased or altered sensation should be outlined in detail

• Lingual nerve injury is suspected- test taste sensation with salt and sugar

• IAN, mental nerve injury: sensitivity of lip and gingiva can be tested by cotton swab, thermal sensitivity with ice and warm mirror handle and ability to distinguish direction of movement with a soft brush on the lip and chin with eyes closed.

• Examination should be repeated after 1 month

• At this time complete loss of sensation, diminishing sensation or spontaneous pain are signs that normal sensation is unlikely to return spontaneously

• Refer to microneurosurgeon

• If improvement is noted at follow up appointments- follow-up 4 months before referral
1998-2009: 92 Liability claims associated with persistent altered sensation following DI placement

63% of LCs submitted by women

30 LCs were issued during 2nd post-op year and 15 LCs>5 years

4.4% submitted by practitioner

95.6% submitted by patient

76% of LCs- related to sx performed based on PA and PANO
24% of LCs- related to operations based on CT

65% of LCs- general practitioners, 34% OMFS or Periodontist
### Number, Site, and Timing of Placement of Dental Implants Resulting in Neurosensory Deficiency (N = 92)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
<th>Number of Neurosensory Deficiencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of dental implants</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>&gt;3</td>
<td>42</td>
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<tr>
<td>Site of placement of dental implants</td>
<td>Above the inferior alveolar nerve canal</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Above the mental foramen</td>
<td>22</td>
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<td></td>
<td>Mesial to the mental foramen</td>
<td>5</td>
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<tr>
<td></td>
<td>Combination*</td>
<td>10</td>
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<tr>
<td>Timing of dental implant placement</td>
<td>Immediately after tooth extraction</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>After socket healing</td>
<td>75</td>
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</tbody>
</table>

* Dental implants above the inferior alveolar canal and mesial to the mental foramen.
In most cases the implant length was greater than the available bone height.

Action was taken by the practitioner short after being informed of altered sensation in 52.2% of cases.

DI removed in 32.6% of patients, lifted in 19.6% of patients.
Management

• Immediate removal of DI suspected to have caused the injury

• *Misch and Resnik*: intraoperatively observed trauma to the nerve mandates the local introduction of IV form of dexamethasone into the osteotomy site, followed by a 6-day regimen of oral dexamethasone

• If neurosensory deficiency reported
  - \( \leq 1\) week of sx: a course of steroids followed by 3-weeks of NSAIDS
  - \( >2\) weeks: only NSAIDS
Curved extraction socket

- Immediate implant placement
- Thick palatal/lingual wall of the socket directs the drill towards the thinner buccal plate
- Perforation of the buccal wall can occur
- Use Lindermann bur
- Groove cut in the lingual wall facilitating direction of subsequent implant drills
- Maxillary anterior, mandibular premolar and anterior sites
Another way to manage curved socket

- Pilot drill at sharp angle into the lingual wall of the socket

- As preparation proceeds apically and drill diameter increases, severity of entry angle lessens and straight osteotomy is created

- Shallow sockets or with damaged buccal plate (intact buccal plate will prohibit drilling at the required angle)
Injury to adjacent teeth

• Placement of implant too close to a tooth
  - can impinge its blood supply
  - overheat its surrounding bone during osteotomy preparation
• Tooth may become non-vital
  - endo therapy
  - apicoectomy
  - extraction
Symptoms

- Severe pain
- Swelling
- Thermal sensitivity
- may be immediate or delayed
- Pa radiolucency may be present within short period of time after injury occurs
Prevention

• Careful space assessment of the edentulous area using CT scan
• Minimum amount of bone between implant and adjacent tooth is 1mm
• If space is too narrow- Orthodontic treatment
• Check position after pilot drill
• Computer-generated surgical guides
Management

- Redirection with Lindermann bur
- If osteotomy is enlarged and its redirection is not satisfactory implant placement must be delayed
- If pulpal damage is suspected post-op: antibiotics+ endo therapy immediately
- Implant should be removed if it appears to have penetrated the root of the affected tooth- development of an abscess can affect implant osseointegration
Retained root tips at the implant site

• Placement of DI in contact with root tips can lead to inflammation
• May require implant removal
• Gher-Vermino animal study
  -implants placed in contact or close proximity with root fragments- no signs of inflammation
• Buser et al, titanium implants placed in mandibles of monkeys with retained apical root fragments
  -histology: cementum on the implant and collagen fibers inserted into cementum
Implants should never intentionally be placed in contact with remained root tips
Prevention

- CT scan should be taken to identify exact position and size of root tip
- Removal and GBR
- Implant placement 2-4 months after root tip removal
- In some cases simultaneous implant placement with the removal of the remaining root tip can be achieved
If root tip found post-op

- monitor the area for signs of infection
- administer antibiotics
- Remove root tip and implant
- Remove root tip, excision of infected tissues and GBR in the bony defect
Bleeding

- Thorough medical history
- CT scan evaluation

*Soft tissue*

*Bone*

*Arteries*
Soft tissue bleeding

- Most common sign: contusion or bruise
  - petechiae <2mm
  - purpura 2-10mm
  - ecchymosis >10mm
- Bruising: result of intra-op and post-op bleeding into the soft tissue spaces (subcutaneous) adjacent to surgical site
- Gravity may cause the blood to travel under the skin along fascial planes to other locations (chest)
- Older patients >50 years old
- Extensive flap

Likelihood and severity of bleeding
- pt’s systemic health
- flap size
- anatomy of the site
To minimize soft tissue bleeding:

- Avoid vertical releasing incisions
- Incise cleanly
- Avoid crushing or tearing soft tissue
- Smooth sharp bony areas
- Eliminate granulation tissue
- Identify and manage small soft tissue arteries
- Place sufficient sutures
To control soft tissue bleeding:

• Apply pressure to the area. If not successful, clamp the vessel with a hemostat and ligate it with resorbable suture

• Ask the patient to bite on 2-inch gauze for 30 min

• Control bleeding points with electrocautery
• **Bleeding from an extraction socket**
  - gelfoam absorbable gelatin
  - surgicel oxidized regenerated cellulose
  - topical bovine thrombin
  - Heliplug cross-linked collagen

• **Bleeding from a bony artery**
  - adjacent bone can be crushed into the bleeding orifice
  - bone wax
  - electrocautery
Arterial Bleeding

- Greater palatine
- Palatine/incisive
- Lingual
- Sublingual
- Submental
Anterior region of the mandible

- **Sublingual artery** (branch of the lingual)
- **Submental artery** (branch of the facial)
Hemorrhage from the floor of the mouth

- Perforation of lingual plate with rotary instruments
- Elevation of lingual periosteum
- Flap manipulation

-Onset intraoperative or 4-6hrs post-op

Signs: swelling, elevation of the floor of the mouth, protrusion of the tongue, respiratory distress, excessive hematoma, inability to swallow, profuse or pulsating intraoral bleeding
Management protocol

• At first sign of swelling at the floor of the mouth call 911

• Using one hand apply pressure to the suspected perforation site intraorally with the thumb and extraorally with the index finger
• Calmly explain the complication to the patient

• For buried bleeding vessels attempt to ligate the vessel by applying pressure on the source of bleeding

Needle should enter the tissue about 6mm away from the vessel on one side, exit 3mm away from it on the other side, enter the tissue 3mm from the vessel on the original side and exit 6mm away from it on the other side, knot.
• If the bleeding vessel can be identified and isolated, close its lumen with hemostat and place a suture
• Pull the tongue forward against the hyoid bone to reduce bleeding from the lingual artery and its branches
• If injury is to facial artery press the common carotid artery against the 4th cervical vertebra
• Do not make incision in the floor of the mouth to relieve hematoma
• If the implant has already been placed, do not remove it
• If pt develops respiratory distress insert a flexible nasal airway
• Transfer pt to nearby hospital
Overheating of bone during drilling

- Bone cell death and resorption around the implant
- Impair successful osseointegration
  Radiographically: radiolucency soon after sx

_Eriksson et al:_
*Bone tissue sensitive to heat at 47 °C*
*Irreversible bone injury after 1 min of exposure to 53°C*
*Bone necrosis at temperatures >60°C*

When proper technique and irrigation are used temperature never exceeds 38.8°C during a maximum of 5 seconds of drilling
• Use sharp drills
• Use correct drilling sequence
• Use an adequate amount of coolant

Drilling in maxilla may require a second source of external irrigation to compensate for coolant lost due to gravity.
• Use in and out motion (contact between the drill and the bone 1-3sec)
• In the presence of adequate amount of coolant, sharp drills and proper drilling techniques, the speed of the drill does not influence the heat generated at the osteotomy site
Treatment of failed implants due to overheating

- Implant should be removed and any necrotic bone debrided
- Antibiotics, anti-inflammatory and pain meds
- Monitor area
- Bone grafting and implant placement can be re-attempted after 3-4 months of healing
Stripping of the implant site

• Dense bone
• Clinician attempts to seat the implant deeper than initial osteotomy
• During insertion the torque levels are high and then become suddenly low, stripping has occurred and implant should be removed
3 options

- Abandon the osteotomy and prepare a new site
- Remove loose implant and prepare deeper osteotomy for longer implant if possible
- Remove the implant and place a wider one without enlarging the osteotomy
Sinus floor perforation

- If perforation occurs after pilot drill (2mm), implant placement procedure can proceed as long as successive drills do not contact the sinus floor.

- If a larger diameter has penetrated the sinus floor, abort the procedure, place collagen dressing and obtain primary soft tissue closure.
Prevention

• Careful assessment of pre-sx CT scan
• Use drill stoppers
• Plan for sinus augmentation
Nasal floor perforation

- Bleeding
- Pain
- Swelling

-Bone augmentation if no adequate bone height

Management: anti-inflammatory, antibiotics, no smoking, no blowing nose, no coughing with mouth closed
Displacement of implants into the maxillary sinus

- **Partial displacement**
  - Implant intrusion into the sinus if implant is longer than the available bone
  - Ct scan evaluation
  - Caution when there is a dehiscence into the sinus floor apical to the root that is extracted for immediate implant placement
  - Use shorter implant/sinus augmentation
• **Complete displacement**
  - Can occur during implant placement or later
  - Risk is higher when implants are placed simultaneously with lateral window sinus elevation
  - Single stage approach - at least 5mm residual bone height
  - Displacement of implants into the maxillary sinus: a) spontaneous expulsion of them through the antrum into the nose and then out through the nostrils or the pharynx/oral cavity b) migration of the implant to other paranasal sinuses c) persistence of implant into the maxillary sinus

- **Removal:**
  - (FESS)endoscopic approach through nasal cavity
  - Caldwell-Luc procedure (intraoral approach)
• 36 healthy patients
• Displaced implants into the maxillary sinus
• No signs of acute or chronic sinusitis
• “Pedicle bony window technique”
• Draw outline of the window

• 2 pairs of holes, 2 over the inferior border, 2 below

• 2 vertical and lower horizontal osteotomy: bone+ membrane
  upper horizontal: only bone

• Window rotated inwards or outwards

• Implant removed with suctioning tip

• Rinse with sterile saline

• Resorbable sutures through the created holes to reposition the window
• CT scan taken 4-6 months after surgery - correct stabilization of the window
• Vascularization provided by sinus mucosa ensures the survival of bony window
• Short operating time 20-30min
• Quick healing
Displacement of dental implant into Maxillary incisive canal

- Penetrating the canal will compromise osseointegration because of epithelial tissue found in the canal
- Incisive foramen
  - mean diameter 4.6mm
- Nasopalatine nerve and anterior branch of the greater palatine nerve meet at the incisive foramen
- Greater palatine artery
- Iordanishvilli: distance between incisive foramen and roots of anterior teeth is 3.5mm
- Bone resorption together with enlarged foramen may challenge implant placement
Grafting of the incisive canal

- Excision of nerves and blood vessels of the incisive canal, bone grafting, immediate or delayed DI placement
- Nerve and artery of the incisive canal anastomose with greater palatine nerve and artery permitting revascularization and gradual re-innervation of the region within 3-6 months
- Possible loss of sensation in the anterior palate should be informed
Nasopalatine duct cyst delayed complication to implant placement

- Developmental, epithelial, non-odontogenic cyst
- 1% of population
- Radiographically can be mistaken for endodontic lesion
- Radiolucency apical to central incisor teeth
- Average diameter is 1.5cm
- Epithelial remnants of the nasopalatine duct
- Midline of anterior maxilla
- 4th, 6th decades
- Slight male predominance
- Asymptomatic (advance cases pain)
- Swelling anterior part of palate

McCrea 2012
• Ct scan: extent of involvement of neighboring anatomic structures

• Sx:
  - small swellings: marsupialization
  - large swellings: marsupialization, cystectomy, bone grafting

• If not diagnosed early can expand through the buccal and palatal walls
Aspiration or ingestion of foreign objects

- Drills
- Screw drivers
- Parallel pins

**Aspiration**
- coughing, choking, decreased breath sounds, wheezing, cyanosis
- patients may be asymptomatic initially
- refer for chest radiograph
- CT scan virtual bronchoscopy

**Ingestion**
- infection
- GI blockage
- sharp objects can erode the thin esophageal wall and cause deadly complications
Prevention

- Small instruments should be tied with floss
- Large piece of gauze to shield the airway
Mandibular bone fracture

• Rare complication
• Placement or removal of implants in severely resorbed mandibular bone

Prevention:
- TPL in severely resorbed mandible, increase in # of implants will increase the risk of fracture
- CT scan evaluation
- Attention to bone density (pts with osteoporosis)
- Ridge augmentation procedures before implant placement
- Avoid excessive tightening of implants during placement
- Using short abutments to minimize stress on implants
- Soft diet during healing period to limit stress
• Symptoms
  - pain
  - swelling
  - presence or absence of mobility in the mandible
  - change in occlusion
  - fracture with no history of trauma

• Management
  - clinical and radiographic examination
  - anatomical reduction and immobilization of the fractured site
  - restoration of occlusion
  - application of stable fixation
  - Minimally displaced fractures: External fixation device (acrylic splint, denture)
  - Stainless steel reconstructive bone plates, screw retained block grafts to bridge non union fractured areas, splints, maxillomandibular fixation

  - extraction of diseased teeth within the fracture line
  - monitor healing, soft diet, limit jaw movements
Should the implant at fracture line be removed?

• Not necessary if fixation can be achieved
• Avoid exposure or movement of the implant during reduction of the fracture
• Additional healing time should be provided
• Importance of the implant to the overall TPL
• Presence or absence of infection
• Mobility or immobility of the implant
Boffano et al, 2013

Mandibular fractures and implant placement

- Atrophic mandible
- During Implant placement, or implant failure and subsequent osteomyelitis
- Higher incidence in females
- Mean age 57.9 years
- Mandibular symphysis most frequent site
- Most fractures occurred 3-6 weeks or 3 months after implant placement
- Open reduction reduction and internal fixation most frequent tx option
- Soft diet
Deep implant placement

- Ideal position is 3mm apical to ideal free gingival margin (1-2mm below the CEJ of adjacent tooth)
- Deep position of the implant - deeper positioning of implant-abutment microgap

*Bone resorption-soft tissue recession (thin biotype)- pocket formation (thick biotype)*
Deep placement

- Bone loss around the implant neck
- Increase crown/implant ratio
- Increased crown height - increase occlusal forces
- Increased sulcus depth
- Compromised esthetics: bone loss - decreased papilla fill
- Difficulty seating prosthetic components
- Difficulty removing excess cement
Shallow implant placement

- Exposure of cover screw during healing
- Poor emergence profile - no adequate tissue thickness over the implant platform
- Decreased crown height
- Exposure of implant body
- Bone/soft tissue grafting, implant removal
Implant fracture

- **Intraoperative**
  - Small diameter internal hex implants more prone
  - When placing implants in type I and II bone precise preparation of the osteotomy to decrease torque at implant placement
  - Use of trephine drills to remove the implant
• **Post-operative**
  - occlusal overload
  - bruxism/clenching
  - cantilever forces
  - Premature loading
  - Prosthesis without passive fit
  - Poor prosthetic design
Remove the implant with trephine, graft the area and place the implant after 3-4 months.
Walia et al, *Implant abutment screw fracture*

- More frequent in posterior region
- More frequent in partially dentate to completely edentulous patients
- Primary reason: undetected screw loosening, ill-fitting superstructure or overloading
Case report

- Occlusal access hole through the crown to access the screw head and retrieve the crown along with the abutment

- Fine tapered carbide bur was used to make a notch on the occlusal surface of the abutment between center of the screw and its periphery

- Ultrasonic scaler tip was engaged to the notch

- Tip of scaler was moved counterclockwise

- Broken part was retrieved

- **Lever arm around the central axis**
  - torque = length of lever arm x force
  - the greater the length the less the force
Excessive torque-Bone necrosis

- Excessive insertion torque-bone compression beyond physiologic tolerance-ischemia-necrosis
- Crestal region more susceptible to necrosis-cortical bone-decreased blood supply
- Bone necrosis will appear within 1st month after placement
- Optimum level of torque -20-45Ncm
• **High density bone:**
  - more prone to necrosis
  - no >45Ncm torque
  - follow drilling sequence
  - tapping drills

• **Low density bone:**
  • Omit final one or two drills in the drilling sequence, no tapping drill
  • Use osteotomes to condense bone laterally than removing bone
Inadequate initial stability

- Overpreparation of the site with excessive in and out motions during drilling
- Use of dense bone drills in low-density bone
- Following an elliptical or imprecise pathway during drilling

Management:
- Loose implants should be removed and replaced by a wider or longer diameter implant
- Abandon osteotomy and make a new one if possible
- Abort procedure, graft and place implant later
Kim, 2012

Subapical osteotomy (SAO)

1. Gingiva-colored porcelain to camouflage tissue defects in left anterior teeth.
2. Preoperative panoramic radiograph.
3. Seven millimeter vertical defect was observed. Average of 3 mm probing depth.
4. Mucogingival incision line was marked.
5 Subapical osteotomy was performed. Seven millimeter segmental down-fracture was performed. Periosteal soft tissue attachments were connected to down-fractured segment.

6 Right side ramal bone harvested using microsaw and drill.

7 Harvested ramal bone grafted to gap and fixed with microplate and miniplate.

8 Seven millimeter downward position was observed immediately after surgery.
• Only case reports
• Risk of bone necrosis and failure of the implants
• Post-op vitality in teeth within and adjacent to bone segment is another significant consideration
• Implant survival and changes in bone to implant contact have not been investigated
Post-operative complications
Pain

• Pain at its maximum 1 day post-sx
• Inflammation- 48hrs post-sx
• Limit activities for the first 3 days after sx
• Proper handing of soft and hard tissue to minimize pain
• Delayed wound healing: infection, incision line opening, smoking, malnutrition, aging
• Post-op patient should start antibiotics and anti-inflammatory meds (ibuprofen, dexamethasone)
• Post-op compliance (no smoking, good OH, take meds, ice pack, soft diet)
Incision line opening

- Increases the risk of infection at the surgical area
- Prevention
  - midcrestal incision
    - not buccal or lingual, more tension from lips, cheeks or tongue
  - no smoking
  - proper suturing technique (every 3-5mm along the incision line, needle penetrating 3mm from the incision line)
  - non-tension flap closure
Flap releasing technique

- Score the periosteum layer of the flap with a sharp blade (1-3 incisions)

- If not enough release, muscle layer release
  - Insert closed blunt tip scissors into the score lines
  - Open the scissors within the muscle layer and close before removing them
Prevention

- Relieve pressure of prosthesis
- Meds to minimize swelling
- Do not raise the lip to look the area
- Ice packs
- Soft diet
Treatment

• If incision line opening is minor no attempt to close, healing by secondary intention

• Good OH, rinse with 0.12% CHX twice/day
Cover screw exposure

• Higher risk of implant infection
• Etiology
  - pressure from prosthesis
  - thin tissue
  - shallow implant placement
  - immediate implant placement in extraction site
Management

• Partially or completely exposure- recovering may not be necessary
• Identify factors
  - Interim prosthesis must be relieved
• More close follow-up appointments to monitor for potential infection
• Check screw for looseness, rinse with Peridex
• Hygiene compliance: gentle brushing and Peridex at home
• Soft food (no pressure)
Van Asshe, 2008

*Early perforation of cover screws-marginal bone loss*

- Retrospective study
- 60 Astra Tech microthread implants
- Partially edentulous jaws
- 20 2-stage exposed, 20 2-stage submerged, 20 one-stage
- X-rays: after abutment sx for 2-stage, after 3-months for 1-stage
• Bone loss
- 2-stage exposed: 1.96mm
- 2-stage submerged: 0.01mm
- 1-stage: 0.14mm

One could consider placing a healing abutment as soon as perforation is noticed to prevent further bone loss

Needs to be clinically confirmed
• Non-perforated mucosa covering submerged implants was compared to mucosa from edentulous sites treated with non-submerged implants.
• Non-perforated mucosa covering submerge implants:

- inflammatory fibro-epithelial hyperplasia

- mineralized material in the connective tissue (mostly sequestra)

- epithelial width 1.5 times higher compared to controls

- inflammatory infiltrate almost double
• Bone debris produced during osteotomy can cause chronic inflammatory cell infiltration as-well-as epithelial covering reaction
• Research on perforated sites needed to be done
• No conclusions can be made
Bone growth over the cover screw

- Remove bone to allow removal of cover screw
- Proper seating of healing abutment
- Care should be given to avoid damage of implant platform
- Curettes, small hand chisels
- After placement of healing abutment take pa to ensure that no gap exists
Berglundh, 2012
Systematic review-Implant complications

- Follow-up period at least 5 years
- 51 studies included
- Edentulous/partially edentulous
- Single crowns, fixed partial and complete bridges, overdentures
- Implant loss prior to functional loading- 2.5%
- Implant loss during function-
  - 2-3% of implants supporting fixed restorations
  - >5% of implants supporting overdentures are expected to be lost during a 5-year period
- 1-2% incidence of persisting sensory disturbance >1 year post-sx
- Soft tissue complications higher in patients with overdentures
- Implant fracture <1% of all implants during 5 years
- Complications in implant components higher in overdentures
Failures and Complications in 391 Consecutively Inserted Fixed Prostheses Supported by Brånemark Implants in Edentulous Jaws: A Study of Treatment From the Time of Prosthesis Placement to the First Annual Checkup

- Overall success rate
  - 99.5% for prostheses
  - 98.1% for implants
- 1.1% of implants failed before prosthesis connection
- 0.6% of loaded implants were lost the first year of function
- Implant Failures: Maxilla 2.9%, Mandible 0.4%
- 2 maxillary fixed prostheses were replaced by overdentures
- None of the mandibular prostheses failed completely
- Most common problem with prosthesis
  - maxilla: speech problems 31.2%
  - mandible: lip-cheek biting (6.6%)
- Fractures
  - 14% of maxillary prostheses
  - 1.7% of mandibular
- Gingival problems: 1.7% of the implants

More problems in maxilla

Torsten 1991
Esposito, 1999

- Clinically lack of osseointegration – implant mobility
- A *mobile implant* is a *failed implant*
- An implant that is progressively losing its bone anchorage but is still clinically stable- *failing implant*
- Biologic complications: peri-implant mucositis, hyperplastic mucositis, fistulae- *No loss of supporting bone*
- Mobile abutment vs mobile implant
- Implant complications: infection, impaired healing, overload
- Treatment of complications of failing implants- Leave patient with functional restoration and acceptable esthetics
Complications

• **Before prosthesis placement**
  Wound dehiscence, persistent pain, swelling, fistula during submerged period
  *Soft tissue or bone?*

Clinical and radiographic examination

*Soft tissue*: residual suture material, not fully seated cover screws, premature wearing of the denture, not adequate relief

*Bone*: presence of radiolucent line surrounding the implant, peri-implant apical radiolucency

Peri-implant apical radiolucency:
  a) Asymptomatic or pain/fistula swelling
  b) Inactive vs active
     - inactive: residual bone cavity created by placing shorter implants than the drilled implant site/heat induced aseptic necrosis
     - active: bacterial contamination
• **After prosthesis placement**

Patient should be enrolled in maintenance program

Soft tissue conditions

Occlusion

Prosthesis stability

Radiographs

In case of bone loss and peri-implant radiolucency, remove prosthesis to inspect implant
• Patients should be advised to report immediately any adverse symptoms such as pain, sensitivity on pressure, swelling, pus, mobility

• Therapy of infected failing implant should be immediate, aggressive and combined (systemic or local antibiotics and surgical debridement)
References


• Tal, H: Spontaneous early exposure of submerged implants I Classification and clinical observations. J Periodontol. 70: 213-219, 1999
• Asshe, N et al: Correlation between early perforation of cover screws and marginal bone loss: A retrospective study: J Clini Periodontol. 2007:35: 76-79
Thank you