Surgical Management of Impacted Teeth

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Impacted Teeth

Eruption of teeth is a physiologic process where teeth erupt even before the closure of root apex. Often unerupted or malposed teeth, happened due to obstruction by the adjacent tooth, thick bone, fibrous tissue, cyst or tumor.

Impacted tooth *"The tooth which fails to erupt in the oral cavity in its functional position beyond its chronological date of eruption and has lost its potential of eruption".*

Mandibular and maxillary third molars, which are the last to erupt in the oral cavity, are the most commonly impacted teeth, followed by maxillary and mandibular canines, as they erupt later than their adjacent teeth.

Theories of impaction

1. *Phylogenetic theory:* With evolution, jaw size is decreasing and teeth that erupt later than their adjacent teeth do not get desired space to erupt.

2. *Mendelian theory:* Genes inherited from one parent may cause smaller jaw size and that from other parent may cause bigger teeth set, leading to impaction of teeth in the child.

3. *Nodine theory:* With softer dietary habits, lesser masticatory effort is required. This leads to less growth stimulus of jaw, resulting into impaction.

Aetiology

The causes for impaction can be classified as local or systemic. They are as follows:

Local factors

1. Micrognathia

2. Crowding of teeth

3. Premature loss of deciduous teeth

4. Retained deciduous teeth

5. Condensing osteitis

6. Cyst

7. Tumor

8. Thick fibrous mucosa due to localized chronic inflammation

9. Dilaceration

10. Ectopic position of tooth bud.

Systemic factors

1. Prenatal hereditary causes: Down's syndrome, Hunter's syndrome, cleidocranial dysostosis, cleft palate, osteopetrosis, etc.

2. Postnatal: Malnutrition, anemia, rickets, tuberculosis, congenital syphilis.

3. Endocrine disorders of thyroid and pituitary gland.

Impacted mandibular third molars

Classification

Winter's Classification

According to the inclination of its long axis in relation to second molar:

1. Mesioangular: Long axis of third molar is tilted towards the second molar

2. Horizontal: Long axis is horizontal

3. Vertical: Long axis is vertical

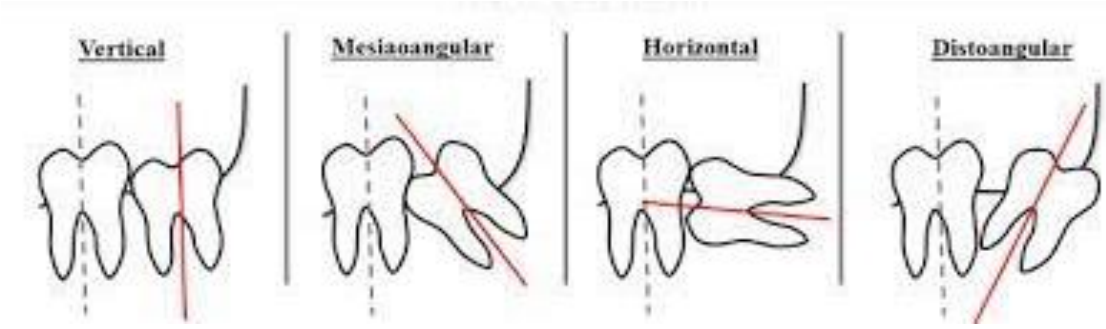
4. Distoangular: Long axis is distally tilted

5. Buccoversion: Tooth tilted buccally

6. Linguoversion: Tooth inclined lingually

7. Transverse/inverted.

Mesioangular impactions are most common and constitute 40% of all mandibular third molar impactions and 60% of all maxillary third molar impactions.



Pell and Gregory's Classification

According to the space available between distal surface of second molar and anterior border of mandible:

1. Class I: When there is sufficient space between distal surface of second molar and anterior border of mandible.

2. Class II: When there is inadequate space between distal surface of second molar and anterior border of mandible.

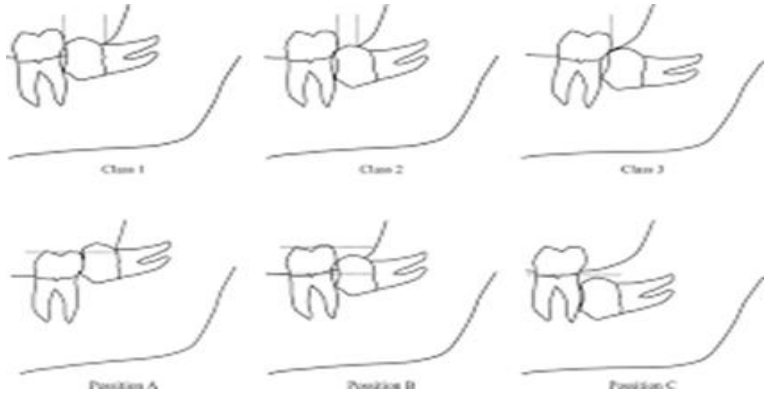
3. Class III: When third molar is totally present in the ascending ramus due to absolute lack of space.

According to its relative depth in relation to second molar:

1. Position A: When the highest portion of impacted third molar lies at or above the occlusal level of second molar.

2. Position B: When the highest portion of impacted third molar lies below the occlusal level of second molar, but above its cervical line.

3. Position C: When the highest portion of impacted third molar lies below the cervical line of second molar.



Indications for removal

1-Pericoronitis

Pericoronitis is defined as inflammation of the soft tissue that covers the crown of an unerupted tooth. Due to partial eruption or abnormal position of the third molar, this area does not remain self-cleansing and food particles accumulate and become a niche for microbes to grow. With infection and inflammation of the soft tissue in this region, pericoronitis ensues.

Clinical features:

1. Severe pain and swelling in acute stage

2. Trismus due to protective myospasm secondary to pain

3. Pericoronal tissue inflamed and oedematous

4. Mild extraoral swelling may be present

5. Difficulty in mastication and swallowing

6. Trauma from upper third molar on swollen pericoronal tissue leads to indentations of the cusp

7. Acute inflammation may localize to form abscess with pus discharge

8. Chronic stage may present with dull pain, fibrous tissue around crown and infection may spread to buccal space or submasseteric space.

Management: Management is usually conservative, with antibiotics, analgesics and anti-inflammatory drugs. Local measures include frequent irrigation with normal saline, warm saline, betadine (povidone iodine) or chlorhexidine solution for mouth rinsing, soft diet and selective cusp grinding of opposing tooth to relief trauma from occlusion. Surgery is indicated to drain pericoronal abscess in the acute phase and in chronic phase with proper planning and evaluation, operculectomy or removal of the offending tooth.

2-Caries

In case of partially erupted teeth, due to food lodgment and growth of microbes at the site, caries develops not only in the impacted tooth but also in the adjacent tooth causing further complications.

3-Periodontal Pocket Formation

Frequent food impaction leads to periodontal pocket formation between second and third molar. This results in recurrent episodes of periodontitis, root caries and sensitivity to hot and cold.

4-Pressure Symptoms

If third molars are seated quite deep in proximity to the inferior alveolar nerve (IAN), pressure symptoms such as dull pain, hypoaesthesia and tingling sensation can present.

5-Root Resorption of Second Molar

Due to chronic pressure, there may be resorption of roots of the second molar.

6-Anchorage Loss

The impacted third molars exert a mesial pressure on the dental arch, pushing teeth to drift mesially. Hence, for orthodontic reasons, it may need removal.

7-Cyst and Tumor Formation

Reduced enamel epithelium, covering the impacted tooth has a pathological potential to develop into dentigerous cyst or ameloblastoma. Hence, prophylactic removal of impacted teeth is recommended.

8-Cheek Biting

Traumatic ulceration of the buccal tissue may be evident if the impacted mandibular third molar is too far buccally or distally and impinging. Similarly, the maxillary third molar may be buccally erupted or supra-erupted and traumatize the cheek.

9-Fracture of Mandible

Impacted teeth occupy lot of space in bone, making bone weak and vulnerable to fracture, in case of trauma. Hence, prophylactic removal indicated.

10-Sagittal Split Osteotomy

Presence of impacted teeth may result in an unwanted split, hence in case of orthognathic surgical procedure; third molars are removed at least 6 months prior to the planned sagittal split osteotomy.

11-Autologous Transplantation

Impacted tooth may be removed and implanted in the first molar socket.

Contraindications for removal

• When there is adequate space for eruption of third molar, or where tooth is likely to erupt

• Where risk of surgical complications is unacceptably high

• Where there is bony pathology, chances of excessive damage to adjacent structures

• Compromised medical status

• Teeth to be used as abutment for bridge.

Evaluation of patient for third molar surgery

Careful evaluation of the patient is required prior to any surgery, to ensure a smooth and uneventful procedure. Poor planning may result into increased surgical time and unwanted complications. History: A short relevant medical history includes any past medical illness and its treatment, any allergy, smoking, bleeding issues, past episodes of pericoronitis and its management, etc.

Clinical evaluation

• Level of eruption and angulation

• Soft tissue around impacted tooth.

• Condition of crown: Size, non-vital, fractured, decayed

• Condition of adjacent tooth: Caries, fracture, endodontic treatment, prosthesis

• Acute infection

• Size of tongue

• Trismus/oral submucous fibrosis.

Radiographic evaluation

A good quality intraoral periapical radiograph should normally be adequate to evaluate the third molars, but if they are very deep or too posterior, complete visualization not possible on this radiograph. A panoramic view or lateral oblique view mandible will completely visualize the tooth.

Features to be observed on the radiographs include:

• Size of crown and roots

• Number and form of roots: fused/conical/divergent/dilacerated/hypercementosed, etc.

• Any caries, periapical pathology or cyst/tumor

• Depth of tooth in bone

• Relationship with adjacent teeth

• Resorption of roots of adjacent tooth

• Relation with nerve

• Type and amount of bone covering the impacted tooth.

If the proximity to inferior alveolar nerve is found, cone beam CT scan should be done to visualize the relationship of the nerve to the tooth roots, as it gives accurate information.

Factors responsible for increasing the difficulty index for removal of impacted teeth are as follows:

1. Angulation

2. Depth

3. *Space available for eruption:* If space is available then removal of the impacted tooth is easier. If tooth is locked against the crown of second molar due to lack of space, then there is no space for elevation, tooth has to be sectioned before removal.

4. *Crown size:* Large bulbous crown increases difficulty.

5. *Configuration of roots*

a. Length of roots: Longer the roots, more difficult to extract.

b. Root development: If less than one-third root formed, it is more difficult as tooth rotates like a ball.

c. Curvature of roots: Dilacerated, curved, divergent roots, more difficult to remove. Fused conical roots are easy.

d. Root size: Thin, slender roots are difficult to remove. Hypercementosed or bulbous roots also increase the difficulty.

6. *Bone texture and density:* Spongy, elastic pliable bone as in younger patients makes removal easy than sclerotic bone as in older patients.

7. *Follicular sac:* Large follicular sac makes extraction easier while smaller sac requires bone removal around the impacted tooth, creating more difficulty in its removal.

8. *Relation to inferior alveolar nerve (IAN):* Proximity to IAN increases the possibility of damage to IAN during extraction, resulting in transient loss of sensation to lower lip.

9. *Covering tissue:* If covered by soft tissue only, removal is easier than full bony cover.

10. *Limited access:* If patient has inability to open mouth wide or a large tongue, or small oral sphincter, it becomes more difficult to extract the tooth.

11. *Gag reflex:* Severe gag reflex increases difficulty.

Surgical procedure

Surgical procedure in most of cases can be performed under local anesthesia, using lignocaine with adrenalin, in a dental chair. Surgery is indicated under general anesthesia, if patient is uncooperative, apprehensive, mentally retarded, impacted tooth is quite deep and requires long extensive surgery, or all four impacted third molars are to be removed in a single setting.

- Part Preparation

Cetrimide (2% chlorhexidine) and betadine (5% povidone iodine) are used for extra oral part preparation prior to surgery.

• Incision, flap designing

• Ostectomy

• Odontectomy

• Elevation

• Extraction

• Debridement and irrigation

• Suturing

• Medication

• Postoperative care.

Incision and Flap Designing

The mucoperiosteal flap for removal of impacted tooth has to be designed well for adequate access and elimination of the obstruction in the path of removal. Envelope flap (with no releasing incisions), L shaped flap (with one releasing incision) or a pyramidal flap (with two releasing incisions) may be used to expose the surgical site for removal of third molar.

Ward's incision is the most commonly practiced incision for removal of impacted mandibular third molar. It was advocated by T Ward. It has three limbs, anterior, intermediate and posterior limb.

• *Anterior limb*: Anterior releasing incision begins from the vestibule upwards towards midway of the CEJ of second molar at an angle. If the tooth is deeply impacted, this incision should be placed anterior to the second molar. This modification is modified Ward's incision.

• *Intermediate limb*: The incision is continued as crevicular incision in the gingival sulcus (over the alveolar crest, if tooth is fully covered) up to the distal aspect of third molar.

• *Posterior limb*: Distal releasing incision is started from the most distal point of third molar across external oblique ridge into the buccal mucosa. This limb of incision is made bony deep (full thickness) at the start and becomes superficial as it goes into the buccal mucosa.

Incision should not be taken lingually as the lingual nerve found at or above the lingual crest may get damaged. Normal position of lingual nerve is 2 mm inferior to the crest and 0.5 mm lingual-to lingual cortex in third molar region.

Incision should not be extended too far superiorly, as brisk bleeding may be encountered from nutrient canals in retromolar triangle and buccal anastomosing branches from lingual and facial arteries. Cutting through fibers of temporalis muscle will cause postoperative trismus.

Sharp point of periosteal elevator is used to carefully elevate the mucoperiosteal flap. The flat end of periosteal elevator is then used to reflect the rest of the flap. Austin retractor is used to retract the buccal flap for exposure of the surgical site. It is safe to reflect the lingual flap subperiosteally to protect the lingual nerve and tissue from any accidental injury while extraction.

Ostectomy

Bone removal is required to expose the crown of the impacted tooth. Bone cutting can be done using bur and dental motor, or piezoelectric saw blade, or chisel and mallet.

With advent of better rotary instruments, use of chisel and mallet is not a preferable method, as it creates more anxiety in patients undergoing surgery.

Sharp stainless steel or carbide burs are used for bone cutting. Diamond burs are not used as they do abrasive cutting, generating more heat, increasing the chances of bone necrosis. Ideal speed of bur should be 18,000–20,000 rpm. Higher speed will produce more heat and cause bone necrosis, hence not recommended. Air rotors are contraindicated for this reason and also may cause surgical emphysema as air under pressure can enter open tissue planes.

Initially round bur is used to make the indentation as it does not slip, and then fissure bur is used to complete the bony cuts. Copious irrigation with normal saline is used to dissipate the heat generated and also to flush out the bony debris. Protection of overlying soft tissues is done by good retraction.

Bone cutting should be carefully done and only minimal bone should be removed. Excessive bone removal will make this already weak site more prone to fracture with external trauma. It is mostly the distolingual bone, which obstructs the path of

removal of third molar, so should be carefully removed. Distobuccal bone is removed to expose the crown and facilitate the application of elevator at the purchase point (distobuccal guttering or Moore Gilby's collar technique). Blindly removing the bone will lead to unnecessary and excessive bone removal.

******Lingual Split Technique***

Lingual split technique was described by Sir William Kelsey Fry. It is indicated for removal of mandibular third molars placed lingually. With age, it is the lingual bone that resorbs. Hence, this technique becomes advantageous as here the lingual bone is split and removed which would otherwise resorb in the long term. The other advantage is that the socket size is decreased, thereby reducing the clot size and minimizing chances of clot dislodgement and dry socket.

Odontectomy

Splitting of tooth is called odontectomy. It is done to facilitate removal of tooth in pieces without excessive bone cutting. As the tooth is to be discarded, it can be cut as needed in order to protect the patients precious bone.

Indications for odontectomy are as follows:

1. Large bulbous crown.

2. Deep horizontal or mesioangular impaction.

3. Distoangular impaction with lot of bone cover.

4. Unfavorable root form: Divergent, locking, dilacerated or hypercementosed.

5. Roots in close proximity to IAN.

6. Carious and fragile tooth structure.

Advantages:

• Reduces amount of bone to be removed for tooth removal.

• Reduces risk of damage to adjacent tooth.

• Permits part of tooth to be removed separately atraumatically.

• No psychological discomfort to patient.

Steps:

1. Direction of sectioning of tooth depends on the angulation of impacted tooth

a. *Mesioangular or vertical impaction*

i. Distal half of tooth sectioned off from the buccal groove till CEJ from buccal to lingual and extended into the furcation.

ii. Warwick-James straight elevator placed in the cut and used to rotate and remove the distal portion of the crown.

iii. Then the straight elevator is placed at mesial aspect of third molar below the cervical area.

iv. Cryer elevator used to elevate the tooth engaging the purchase point.

b. *Distolingual or horizontal impaction*

Most difficult to remove as path of removal into ascending ramus. Large amount of distal bone removal required.

i. Crown sectioned just above CEJ from the roots, after removal of sufficient bone from occlusal and distobuccal aspect.

ii. Entire crown removed to improve visibility and access to roots.

iii. If roots divergent, they too are sectioned into two pieces and delivered individually.

Irrigation of socket

Debridement and smoothening of bony margins:

• Curettage to remove any remaining part of dental follicle, pieces of tooth

• Check for caries/damage to the adjacent tooth

• Round off margins of socket using bone file

• Irrigate again

• Control bleeding before suturing.

Closure of wound

• 3-0 black braided silk used and interrupted sutures made and maintained for 7_10 days.

• First suture is placed just distal to second molar and should be water tight to prevent pocket formation.

Complications

During incision

Hemorrhage: As buccal or facial vessel may be cut or nutrient canal in the retromolar trigone may bleed.

During bone removal

• Damage to second molar/roots

• Slippage of bur into adjacent soft tissues

• Fracture of bur

• Fracture of mandible

During elevation

- Luxation of neighboring tooth
- Fracture of adjoining bone
- Slippage of tooth into sublingual
- Damage to overlying teeth and lingual or inferior alveolar nerve
- Fracture of mandible
- Soft-tissue injury
- Breakage of elevator tip
- TMJ dislocation

Postoperative

- Pain
- Swelling & Oedema
- Trismus
- Dry socket
- Infection
- Osteomyelitis
- Hypoesthesia, sensitivity.
- loss of vitality of neighboring teeth
- Hemorrhage
- Pocket formation
- Sinus tract formation.

Maxillary third molar impaction

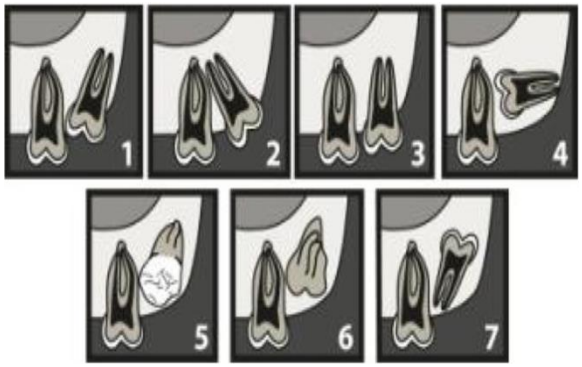
Classification

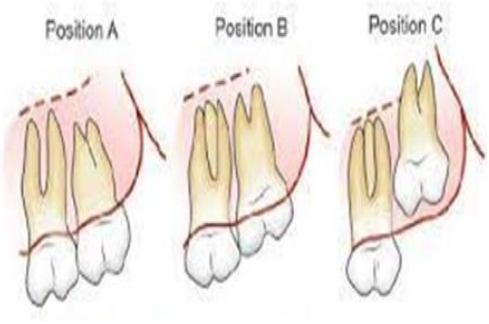
1. Angulation and depth is same as in mandibular third molar.

2. Relation with maxillary sinus

a. *Sinus approximation (SA):* No bone or very thin bone present between maxillary third molar and maxillary sinus.

b. *No sinus approximation (NSA):* 2 mm or more bone present between maxillary third molar and maxillary sinus.





Surgical removal of maxillary third molar

Removal of maxillary third molar can be deferred for some time, if tooth is deeply impacted or if there is no radiographic sign of any developing pathology such as cyst, tumor arising from the impacted tooth.

Incision

Incision is chosen based on whether buccal or palatal approach is required for the removal of impacted maxillary third molar.

1. *Buccal sulcus incision:* Starts from distal part of tuberosity up to distal surface of second molar and extends in gingival sulcus of second molar and first molar as required.

2. *Buccal sulcus incision with vestibular extension:* Similar to the previous incision, with an additional releasing incision at the anterior end of sulcular incision at 45 extending onto attached mucosa on the buccal sulcus.

Herniation of buccal fat pad into the surgical field will reduce proper visualization of the surgical field.

3. *Palatal incision:* Palatal crevicular incision is made from distal of the tuberosity to the mesial of the first molar.

A mucoperiosteal flap is reflected to visualize the tooth and surrounding bone easily. The tooth is usually delivered distobuccally, so any bone covering the buccal and distal aspect of the tooth is removed to expose the main bulge of the crown using bur or chisel, taking precautions not to injure the flap or adjacent tooth or burn the bone. Tooth is then elevated by placing elevator mesiobuccally between second and third molar. Care need to be taken to avoid slippage of tooth into pterygopalatine fossa.

Complications (return back to complication of impacted lower third molar)

- Herniation of buccal fat pad: Hence, a vertical releasing incision is not made posteriorly.
- Displacement of tooth into infratemporal fossa, maxillary sinus
- Hemorrhage
- Fracture of tuberosity.
- Oro-antral fistula.

Impacted maxillary canine

Classification

Class 1: Palatally placed

1. Horizontal

2. Vertical

3. semivertical

Class 2: Labially placed

1. horizontal

2. vertical

3. semivertical

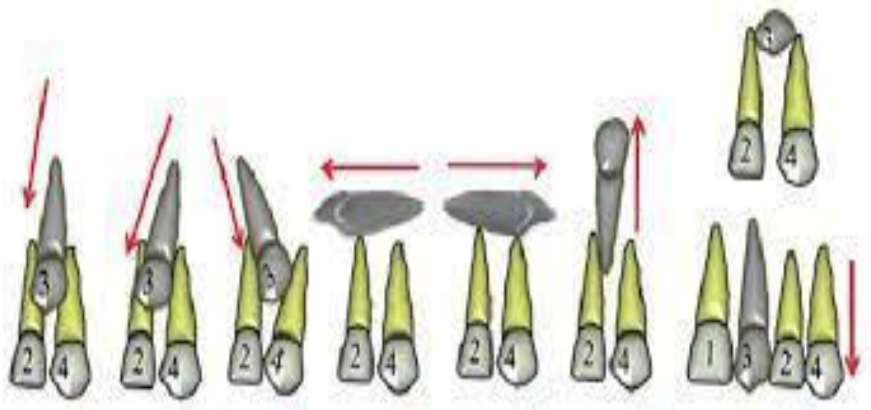
Class 3: Involving both buccal and palatal bone (crown on palatal aspect and root towards buccal aspect)

Class 4: Impacted in alveolar process between incisors and premolars

Class 5: Impacted in edentulous maxilla.

Permanent maxillary canines develop deep within maxilla, complete their development late and emerge in the oral cavity after eruption of adjacent teeth. The prevalence of non-eruption or ectopic eruption of maxillary canine varies from 0.8 to

2.3%, more common in females than males, and mostly unilateral. Usually, it is palatal to lateral incisor but in 15% cases lies buccally.



Tube shift technique (Clark's rule)

This concept is related to change in position of the object in relation to change in position of X-ray tube. If tube is shifted mesially and the reference object also moves mesially, then the object lies lingually. If tube is shifted mesially and reference object shifts distally, this implies that the object is buccally placed. It can be remembered with the acronym SLOB (same lingual, opposite buccal).

Surgical Removal

Surgical removal varies from labial to palatal approach, with position of the canine.

Incision

1. Labial semilunar incision or regular two or three sided flap.

2. Palatal crevicular incision from premolar to premolar.

Mucoperiosteal flap is raised and bone removed to expose the crown. If needed, crown is sectioned first and removed and then root is elevated out. Socket is irrigated and flap is repositioned and sutured.

Complications (return back to complication of impacted lower third molar)

• Perforation of nasal floor or maxillary sinus floor and oro-antral fistula formation.

• Hemorrhage from greater palatine artery due to accidental damage when using palatal approach

• Damage to adjacent tooth roots.

Classification of impacted mandibular canine.

According to depth:

Level A: The crown of impacted lower canine is at the cervical line of the adjacent teeth

Level B: The crown of impacted lower canine is between the cervical line and root apices of the adjacent teeth

Level C: The crown of impacted lower canine is beneath the root apices of the adjacent teeth

Incision for Mandibular Canines

If buccally placed then crevicular incision from the midline is taken up to first molar. Anterior releasing incision is given close to the midline. Care should be taken to protect the mental nerve. If the canine is placed on the lingual side, then lingual envelope flap is taken.

Complication (return back to complication of impacted lower third molar)

Damage to mental nerve.