Extraction of teeth (Exodontia)  
Principles, techniques & complications

Introduction
Science the earliest period of history of the extraction of the tooth has been considered a very formidable procedure by the Iayman, and it is because of the horrifying experiences associated with the tooth extraction in the past that even today the removal of a tooth is dreaded by a patient almost more than any other surgical procedure. Many patient suffer from extractionfobia and are often difficult o car for, despite modern method of anaesthesia. Many dentists still believe that speed is essential when extracting the teeth.

Definition
The ideal tooth extraction is: The painless removal of the whole tooth, or root, with minimal trauma to the investing tissues, so that the wound heals uneventfully and no post-operative prosthetic problem is created. (Geoffray L Howe)

General considerations
Factors complicating dental extraction:
1. Restriction by the lips and cheeks.
2. Movement of the tongue and macroglossi.
3. Movement of the mandible.
4. Communication of the mouth with the pharynx and larynx.
5. Flooding of the oral cavity with micro-organisms.
6. The related structures such as floor of mouth, tongue, hard and soft palate, and even the tonsils may be damaged.

Indications of exodontias:
1. Caries in 48.8% cases (Allen 1994), abscess.
2. Periodontal diseases, in 40.7% cases, to prevent alveolar ridge resorption.
3. Tooth with necrosed pulp and periapical lesion, not responding to endodontic treatment.
4. Over retained deciduous tooth, but take radiograph first.
5. Orthodontic purpose.
6. Prosthetic purpose.
7. Unretorable tooth.
8. Impacted tooth.
9. Supernumerary tooth
10. Grossly decayed 1st/2nd molar, make space for 3rd molar.
11. Tooth in fracture line.
12. Teeth directly involved by cyst and tumor.
13. Teeth in the area of therapeutic irradiation.
14. Teeth acting as foci of infection, as bacterial endocarditis, rheumatic fever.
Contraindications:
1. It may be judicious to delay the extraction until certain local or systemic condition corrected or modified.
2. In the era of antibiotics acute infection of odontogenic origin are not considered as absolute contraindication of immediate extraction.
3. Nucrotizing ulcerative/ herpetic gingivostomatitis, spread of infection and greater degree of systemic reaction.
4. Previously irradiatd area (within 1 year), less trauma, and pre and post antibiotic prophylaxis.

Systemic contraindications:
1. Acute blood dyscrasias as acte leukemia, agranulocytosis.
2. Nntreated coagulopathies as congenital or acquired.
3. Adrenal insufficiencies.
4. Within 6 months of myocardial infarction.

A. Absolute: Central haemangioma may cause uncontrolled bleeding, A-V malformation.

B. Relative: When some precaution have to be taken.
   1. Local as acute cellulitis, acute nucrotizing ulcerative gingivostomatitis.
   2. Systemic as uncontrolled diabetes, hypertension, bleeding disorder, cardiovascular diseases, liver disorders, patient on long-term steroid therapy, teeth that have undergone radiation (6 months to 1 years).

Principle of exodontias
The mechanical principles: expansion of bony socket specially for forceps extraction sufficient tooth structure elastic bone (children) multiple small fractures of buccal cortical bone.
1. Use of a lever and fulcrum: remove the tooth/root along the path of least resistance basic factor governing the use of elevators.
2. The insertion of wedge or wedges between tooth-root and bony socket wall.
3. Wheel and axle principle: Tiangular elevator in the role of wheel and axle mechanic used to remove root from socket.

Forces applied during extraction of tooth: Extraction forceps should be seated with strong apical root to expand crestal bone and to displace center of root.

Preoperative assessment:
A. Take history of:
   1. General disease
   2. Nervousness
   3. Resistance to inhalational aneasthesia
   4. Previous difficulty with extraction

B. Oral hygiene status of the patient:
   1. Oral prophylaxis
   2. Antiseptic mouth rinse
C. Clinical examination of the tooth
D. Clinical examination of the oral cavity any prosthesis

Preoperative radiographs, Indication:
1. History of difficult and attempted extractions.
2. Resistance to forceps extraction.
3. Planning to remove the tooth by dissection.
4. Close approximation with important anatomical structures.
5. Abnormal root pattern, as 3rd molars, in standing premolars, misplaced canine.
7. Trauma to tooth, fracture of tooth, roots and alveolar bone.
8. Isolated and unopposed maxillary molars.
9. Partially erupted, unerupted tooth and retained roots.
10. Delay eruption or having abnormal crown.
11. Condition indicating dental or dentoalveolar deformities:
   a. Osteitis deformans, hypercementosis
   b. Cleido-cranial dysostosis, hooked root
   c. Therapeutic irradiation
   d. Osteopetrosis

choice of anaesthesia:
A. local anaesthesias:
   1. 30-45 min. or more.
   2. No pre-operative preparation
   3. Respiratory tract disease.
   4. Cardiovascular disease

B. general anaesthesia:
   1. 5-10 min.
   2. Uncooperative patients.

General arrangement:
1. Position of the operator:
   a. Stand erect, equal distribution of weight on both feet.
   b. Force delivery, with arm and shoulder not with hand.
   c. Application of force without stress to shoulder and back.
   d. Generally on right hand side.
   e. For right posteriors, back side.
   f. Operating box
3. Height of dental chair:
   A. maxillary teeth: 8cm/3 inch below the shoulder level of operator.
   B. Mandibular teeth: 16cm/6 inch below the elbow of operator.
4. Angulation of chair:
A. Maxillary teeth: 45-60 degree 
B. Mandibular teeth: parallel or 10 degree 

5. Light: good illumination 
6. Role of opposite hand: 
   a. Reflection of soft tissue. 
   b. Protection of other teeth. 
   c. Stabilization of patient's head. 
   d. Supporting and stabilizing the mandible. 
   e. Supports alveolar bone. 
   f. Tactile information. 
   g. Compress socket 
   h. Deliver the whole tooth, tooth, dislodged filling. 

7. Role of assistant: 
   a. Helps the surgeon to gain access and visualize the field. 
   b. Suction. 
   c. Protect the teeth of opposite arch. 
   d. Support the head. 
   e. Support the mandible. 
   f. Psychological and emotional support. 
   g. Avoid casual, offhand comments: 
      1) Increase patient's anxiety. 
      2) Decrease patient's sopperation. 

Principles of tooth removal: 
A. Clear access to and vision of the surgical field. 
B. Use of controlled force. 
C. Unimpeded path of removal. 

**Extraction procedures**
What we do in extraction of a tooth? 
A. Separation of tooth from alveolar bone with crestal and principal periodontal fibers. 
B. Alveolar expansion. 
C. Bleeding is arrested by pressure pack. 

Separation of tooth from soft tissues, serving soft tissue attachment reflection of soft tissue. 

Techniques of exodontias: 
A. Intra-alveolar extraction (closed technique): 
   1. Forceps technique 
   2. Elevator technique 
B. Trans-alveolar extraction (open method) 

Forceps technique: commonly used, but not used in hypercementosis, root deformities, grossly decayed crown, grossly decayed root, brittle root.
Advantages:
1) Least trauma
2) Gingival fibers reduces the size of extraction orifice so promotes healing.

Basic principles for forceps technique:
1. Beaks should be seated as far apically as possible.
2. Beaks should be parallel to the long axis of tooth
3. Excess force should be avoided.

How to hold the forceps?
Thumbs just below the joint, handle in palm, little finger inside the handle.

Adaptation of blade:
1. Buccally and lingual parallel to long axis of tooth.
2. Forced through periodontal membrane, towards apex.
3. Firm pressure.
4. 1st apply on less accessible side of tooth under direct vision.
5. 2nd on other side.

Displacement of tooth from socket:
Pressure applied by operator by moving his trunk from hip not from elbow, movements:
1. Buccopalatal
2. Linguobuccal and buccolingual
3. Rotator and figure 8
Firm, smooth and controlled.
A. Maxillary buccal bone is thinner, buccally removal of teeth.
B. Mandibular buccal bone till molar is thinner, buccally removal of teeth.
C. Mandibular buccal bone in molar region is thicker, lingually removal of teeth.
D. Socket compression.
E. Avoid soft tissue laceration.

Extraction of maxillary canine: In multiple extraction cases canine should be extracted prior to extraction of incisors, as prior extraction of incisors weakens the labial cortex.

Extraction of mandibular canine heavy bladed forceps are used.
Extraction of deciduous teeth due to permanent successors and limited access so use fine blades as Warwicj james elevators. Extraction of deciduous molar with forceps so the positioned mesially or distally on the crown and not the center of the tooth.

2. Elevator technique: works on lever and fulcrum principle, it forces the tooth/root a long the line of with drawal. The fulcrum over bone or adjacent tooth if need to extraction.
The application of elevator in periodontal space 45°to long axis of tooth.
Placement of gauze between finger and palatal/lingual side, for protection from injury in case the elevator slips.

Point of application of elevator either buccally, mesially, or distally.

Care after extraction (post-extraction care) follow:

1. Inspection of the socket.
2. Irrigation of the socket.
3. Removal of debris and any tooth fragments
4. Squeeze of the socket.
5. Mouth with warm bland water for once.
6. Suturing if require.
7. Moist gauze pack
8. Trim and smooth any sharp edges from the alveolar plate of bone.
9. Clean the patient lips and face.
10. Medication if need.
11. Post extraction instructions as verbal and written.
   A. Keep biting on gauze, sponges for about one hour after extraction, by the time if bleeding is controlled, discontinue pressure pack.
   B. No mouth wash for at least 24 hours after extraction
   C. Avoid any hot food or drink for the rest of the day to prevent bleeding.
   D. The diet must be cold fluids or soft food to avoid irritation of the wound.
   E. Avoid any hard labor and have an adequate rest.

Trans-alveolar extraction (open method)

Indications:
1. Intra-alveolar attempt is failed.
2. Retained roots in proximity with maxillary sinus and not accessible to forceps.
3. History of difficult or attempted extraction.
4. Heavily restored tooth.
5. Geminated/dilacerated tooth/root.

Main components of trans-alveolar extraction are:
   A. Design of mucoperiosteal flap.
   B. Method to be used to deliver the tooth/root from socket.
   C. Bone removal used to facilitate tooth/root removal.

Design of mucoperiosteal flap: base broad, raise to render the operative site clearly visible and accessible, suture should not be placed over blood clot, and obliteration of buccal sulcus should be avoided.

The incision should be done by sharp scalpel, firm pressure, mucousa with periosteum, avoid button hole formation in case of sinus, and incision of sufficient length at once.

After incise the flap must reflect the flap and cheek and tongue for the mandible.

Bone removal due to:
1. To expose root/tooth.
2. Facilitated by large flaps.
3. Provides point of application.
4. After tooth/root removal, remove all sharp edges and bone prominences.

The instruments used for bone removal are dental burs, bone chisels/osteotome and mallet, dental chisels, and bone files.

The dental burs must used are:
1. Round/rose head provides less clogging, better control.
2. It doesn't cut the tooth that easily.
3. Should not contact soft tissue.
4. Avoid overheating.
5. Postage stamp method.
6. Then join with chisel.

Tooth division done by:
1. Different line of removal for different roots.
2. Divide the root from furcation area.
3. Make space for application of forceps/elevator.
4. Osteotome/burs.

Removal of tooth or root by engage the elevator in a notch on side of root. If notch is not present then create it with round bur directed at 45° angle to the long axis of root.

Care after extraction include:
1. Irrigation of the socket.
2. Suturing.
4. Medication as antibiotic and analgesic.
5. Post extraction instructions, verbal and written.
6. Recall after 48 hours.

Suture removal normally after 7 days. If the suturing for control of haemorrhage within 2 days, and for oro-antral communication repair after 10 days.

Rubber band and extraction the indications are:
1. Patient under coverage of bisphosphonate.
2. Haemophilic patients.

**Technological advancement in extraction techniques:**
1. Powered periotome
2. Piezosurgery
3. Lasers
4. Coronectomy
5. Orthodontic extraction
6. Physics forceps
Powered periotome:
1. Precise extraction of tooth.
2. Preserves bone and gingival architecture.
3. Option for immediate implant placement.
4. Mechanism of wedging and severing.
5. Severs the periodontal ligament.
6. Multirooted teeth requires sectioning.

Piezosurgery:
Piezosurgery is an innovative bone surgery technique that produces a modulated ultrasonic frequency of 24-29 kHz, and a microvibration amplitude between 60 and 200 mm/s. The amplitude of the vibrations created allows a very clean and precise surgical cut. It works selectively, without harming soft tissues such as nerves and blood vessels even with accidental contact with the cutting tip. The surgical control of the device is effortless compared with rotational burs or oscillating saws because there is no need for an additional force to oppose rotation or oscillation of the instrument. Despite the longer time of the procedure, the investigators also noted that the piezoelectric osteotomy reduced postoperative facial swelling and trismus. Uses of piezosurgery device to cut and elevate a precisely defined bone lid on the lateral cortex of the mandible to provide access to the teeth needing extraction or even a lesion that needs to be excised. The bone window is then elevated with the help of a curved osteotome. After the visual confirmation of an undamaged inferior alveolat nerve and adjacent tissues, the bone lid is placed back into its original position and fixated with absorbable miniplates.

Laser for extraction of impacted teeth
For the surgical extraction of the teeth, the covering bone was first ablated, layer by layer, using Er:YAG laser. In the case of fiber-optic Er:YAG (erbium:yttrium-aluminum-granet), laser the fiber is closely guided around the teeth, creating a narrow gap with minimal bone loss. The benefits of laser therapy include the creation of a bloodless surgical field and thus improved visualization during surgery, decreased postoperative pain, and limited scarring and contraction.

Time consuming, sound and smell, significantly inhibition the laser cutting because of overall volume of irrigation and blood covering the bone surface. A potential problem with this technique is soft tissue damage from impingement on the mucosa of the cheek and the gingiva. In additional working in this area of the mouth presents great difficulty, and the action of masseter muscle leads to cheek compression against the orthodontic appliances. This technique will be of no value for a tooth that cannot move because of ankylosis.
This technique should be used only in carefully selected cases in conjunction with an orthodontist, being certainly difficult, time consuming, and not always successful.

Physics forceps
The physics forceps uses first class level mechanics to atraumatically extract a tooth from its socket. One handle of the device is connected to a bumper, which acts as a fulcrum during the extraction. Together the beak and bumper design acts as a simple first class lever.

A squeezing motion should not used with these forceps, by contrast, the handles are actually rotated as one unit using a steady yet gentle rotational force with wrist movement only. Once the tooth is loosened, it may be removed with tradional instruments such as a conventional forceps.