Management of luxation injuries

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Lecture outline

- Management of concussion
- Management of subluxation
- Management of extrusion
- Management of lateral luxation
- Management of intrusion
- Management of avulsion
- Sequelae of dental trauma in permanent teeth
- Splinting traumatised teeth

Management of concussion

Concussion

An injury to the tooth-supporting structures without increased mobility or displacement of the tooth, but with pain to percussion.

Concussion

- **Management:**

Advise soft food for 1 week.

Advise brushing with a soft brush and rinsing with chlorhexidine 0.1 % to prevent plaque and debris accumulation and facilitate healing.

Monitor pulpal condition for at least 1 year.

- **Follow up:**

Clinical and radiographic control at 4 weeks, 6-8 weeks and 1 year.

Concussion

- **Prognosis:**

Usually positive with the tooth retaining its vitality and the periodontal tissues healing.

Dependent on:

- *Root development.*
- *Presence of other injuries.*
- *Pulp sensitivity testing result immediately following trauma.*

Management of subluxation

Subluxation

An injury to the tooth supporting structures resulting in increased mobility, but without displacement of the tooth. Bleeding from the gingival sulcus confirms the diagnosis.

Subluxation

- **Management:**

A flexible splint to stabilize the tooth for patient comfort can be used for up to 2 weeks.

Advise soft food for 1 week.

Advise brushing with a soft brush and rinsing with chlorhexidine 0.1 % to prevent plaque and debris accumulation and facilitate healing.

Subluxation

- **Follow up:**

Splint removal and radiographic control after 2 weeks.

Clinical and radiographic control at 2 weeks, 4 weeks, 6-8 weeks and 1 year.

- **Prognosis:**

Usually positive with the tooth retaining its vitality.

Dependent on:

- *Root development.*
- *Presence of other injuries.*
- *Pulp sensitivity testing result immediately following trauma.*

- *Around 15% of teeth with a closed apex will lose their vitality. Teeth with open apices rarely do.*

Management of extrusion

Extrusive luxation (extrusion)

Partial displacement of the tooth out of its socket.

Extrusive luxation (extrusion)

- Management:

Clean the exposed root surface of the displaced tooth with saline.

Reposition the tooth by gently re-inserting it into the tooth socket with axial digital pressure (local anesthesia is usually not necessary).

Stabilize the tooth for 2 weeks using a flexible splint.

Advise soft food for 1 week.

Advise brushing with a soft brush and rinsing with chlorhexidine 0.1 % to prevent plaque and debris accumulation and facilitate healing.

Extrusive luxation (extrusion)

- Follow up:

Splint removal and radiographic control after 2 weeks.

Clinical and radiographic control at 2 weeks, 4 weeks, 6-8 weeks and 1 year and yearly for 5 years.

- Prognosis:

More than half of the teeth with closed apex (55%) shown to develop pulpal necrosis.

A fifth of those with an open apex (20%) reported to develop pulpal necrosis.

Management of lateral luxation

Lateral luxation

Displacement of the tooth *other than axially*. Displacement is accompanied by comminution or fracture of either the labial or the palatal/lingual alveolar bone.

Lateral luxation

- **Management:**

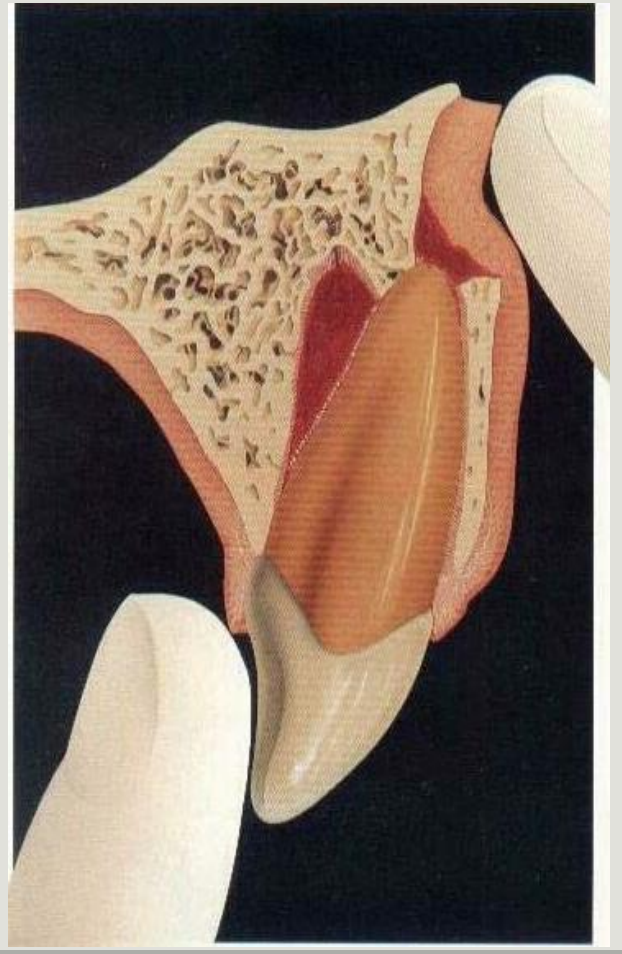
Rinse the exposed part of the root surface with saline.

Apply a local anaesthesia.

Reposition the tooth with forceps or with digital pressure to disengage it from its bony lock and gently reposition it into its original location.

Stabilize the tooth for **4 weeks** using a flexible splint.

- *4 weeks is indicated due to the associated bone fracture.*



Lateral luxation

Advise soft food for 1 week.

Advise brushing with a soft brush and rinsing with chlorhexidine 0.1 % to prevent plaque and debris accumulation and facilitate healing.

Lateral luxation

- **Follow up:**

Clinical and radiographic control after 2 weeks.

Clinical and radiographic control and splint removal after 4 weeks.

Clinical and radiographic control at 6-8 weeks, 6 months, 1 year and yearly for 5 years.

Monitoring the pulpal condition is essential to diagnose root resorption. **If the pulp becomes necrotic**, root canal treatment is indicated to prevent **infection related root resorption.**

Lateral luxation

- Prognosis:

Lateral luxation is a severe form of injury, The apex of the tooth has been forced into the bone by the displacement, crushing nerve and blood supply.

The majority of closed-apex teeth (75%) will develop pulpal necrosis.

Around a third of teeth with an open apex are likely to develop pulpal necrosis.

Management of intrusion

Intrusion

Displacement of the tooth *into* the alveolar bone. This injury is accompanied by comminution or fracture of the alveolar socket.

Intrusion

- **Management:**

Dependent on stage of root development and injury severity.

Three options are possible:

- *Spontaneous eruption*
- *Orthodontic repositioning*
- *Surgical repositioning*

Spontaneous eruption

- The treatment of choice for:

Open apex teeth with mild (<3 mm) or moderate (3-7 mm) displacement.

Closed apex teeth with mild (<3 mm) displacement.

- This treatment seems to lead to fewer healing complications than orthodontic and surgical repositioning.

- If no movement within 2-4 weeks, initiate orthodontic or surgical repositioning before ankylosis can develop.

Spontaneous eruption

- Procedure:

Clean area with water spray, saline, or CHX.

Suture any gingival lacerations if present.

Allow spontaneous repositioning to take place.

Advise on soft diet, OHI for 1 week

Orthodontic repositioning

- Treatment of choice for:

Teeth with open apices with severe displacement (>7 mm).

Teeth with closed apices with moderate displacement (3-7) mm.

Teeth for whom spontaneous eruption did not work.

This treatment method enables repair of marginal bone in the socket along with the slow repositioning of the tooth.

Orthodontic repositioning

- **Procedure:**

Clean area with water spray, saline, or CHX.

Suture any gingival lacerations if present.

Orthodontic repositioning

Adapt steel arch wire to the anterior region.

Prepare fixation sites for arch wire and for bracket with acid etching.

Orthodontic repositioning

Fixate the wire with resin.

Apply elastic traction.

Advise on soft diet, OHI for 1 week

Orthodontic repositioning

Evaluate progress after 2 weeks, if the tooth hasn't started erupting, luxate the tooth gently with a forceps (under LA).

Initiate RCT for ALL teeth with a closed apex within 2-3 weeks

Once tooth is repositioned completely, stabilize with flexible splint for 4-8 weeks.

Surgical repositioning

This treatment is used for closed apex teeth with major dislocation (>7 mm).

Associated with more healing complications than other methods of management.

Surgical repositioning

- **Procedure:**

Apply local anaesthesia

Reposition tooth with forceps

Reposition displaced bone with figure pressure labially and lingually.

Surgical repositioning

Clean the area with water spray, saline, or CHX

Suture ginigival lacerations if present.

Apply a flexible splint for 4 weeks

Surgical repositioning

Advise on soft diet, OHI for 1 week

RCT for ALL teeth with closed apices after 2-3 weeks.

Remove splint after 4 weeks.

Intrusion

- **Follow up for all intrusion cases:**

Clinical and radiographic controls after 2 weeks.

Splint removal and clinical and radiographic controls after 4 weeks.

Clinical and radiographic controls after 6-8 weeks, 6 months, 1 year and yearly for 5 years.

Intrusion

- **Prognosis:**

All teeth with closed apex are reported to lose their vitality.

A third are reported to development replacement resorption (ankylosis).

Prognosis in open apex teeth is dependent on severity of injury and stage of root development.

Up to 68% of open apex teeth will develop pulp necrosis, a third will develop inflammatory root resorption.

Management of avulsion

Avulsion

The tooth is completely displaced *out* of its socket. Clinically the socket is found empty or filled with a coagulum.

Avulsion

An avulsed permanent tooth is one of the few real emergency situations in dentistry.

Successful periodontal healing and pulpal revascularisation are largely dependent on extra-alveolar dry time (EADT), extra-alveolar storage medium, and total extra-alveolar time (EAT).

Hence, the tooth should be replanted as soon as possible.

Advice to patients on the phone

Make sure it is a permanent tooth (primary teeth should not be replanted).

Keep the patient calm.

Find the tooth and pick it up by the crown (the white part). Avoid touching the root.

Advice to patients on the phone

If the tooth is dirty, wash it briefly (10 seconds) under cold running water and reposition it.

Encourage the patient / parent to replant the tooth.

Bite on a handkerchief to hold it in position.

Advice to patients on the phone

If this is not possible, place the tooth in a suitable storage medium:

Glass of milk.

Special storage media (e.g. Hanks balanced storage medium or saline).

**HBSS is a bicarbonate rich solution made to a physiological pH and isotonic salt concentration.*

The patient's mouth, between the molars and the inside of the cheek (If the patient is very young, he/she could swallow the tooth).

Advice to patients on the phone

Avoid storage in water!

Seek emergency dental treatment immediately.


ماذا تفعل اذا كُسرَ سنك
Save your tooth
انقذ سنك
ماذا تفعل اذا خُلِعَ سنك
يمكنك المحافظة على أكثر الأسنان الدائمة إذا كنت تعلم ماذا تفعل بعد تلقي صدمة على الفم
ماذا تفعل اذا كُسرَ سنك
1
ابحث عن قطعة السن المكسورة وضعها في مكان آمن
2
إن قطعة السن يمكن الصاقها في العيادة السنية
3
لأجل ذلك اطلب حالاً مساعدة طبيب الاسنان
ماذا تفعل إذا خُلِعَ سنك
1
ابحث عن السن
2
امسك السن من التاج
3
(أغلق المقبسة بسدادة) اغسل السن بمياه الصنبور الباردة
4.
اتبع احدى البدائل التالية
a
ضع السن في مكانه
b
ضع السن في كأس حليب أو مصل فيزيولوجي
c
إذا لم يتوفر الحليب، ضع السن في الفم مابين الخد واللثة
5
اطلب حالا المعالجة السنية المختصة
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Management of avulsed teeth

- Multiple scenarios are possible depending on apex development stage and extra-alveolar dry time:

- **Open apex:**

  Tooth replanted by the patient.

  EADT less than an hour

  EADT more than an hour

- **Closed apex:**

  Tooth replanted by the patient.

  EADT less than an hour

  EADT more than an hour

Open apex/ replanted by patient

Leave the tooth in place.

Clean the area with water spray, saline, or chlorhexidine.

Suture gingival laceration if present.

Verify normal position of the replanted tooth both clinically and radiographically.

Apply a flexible splint for up to 1-2 weeks.

Open apex/ replanted by patient

Administer systemic antibiotics.

- Tetracycline is the first choice (Doxycycline 2x per day for 7 days at appropriate dose for patient age and weight).

- The risk of discoloration of permanent teeth must be considered before systemic administration of tetracycline in young patients (In many countries tetracycline is not recommended for patients under 12 years of age).

- In young patients Phenoxymethyl Penicillin (Pen V) or amoxycillin, at an appropriate dose for age and weight, is an alternative to tetracycline.

Open apex/ replanted by patient

If the avulsed tooth has been in contact with soil and if tetanus coverage is uncertain, refer to physician for a tetanus booster.

Advise patient to:

- *Avoid participation in contact sports.*
- *Soft food for up to 2 weeks.*
- *Brush teeth with a soft toothbrush after each meal.*
- *Use a chlorhexidine (0.1%) mouth rinse twice a day for 1 week.*

Open apex/ replanted by patient

Splint removal and clinical and radiographic control after 2 weeks.

Root canal treatment should be avoided unless there is clinical or radiographic evidence of pulp necrosis.

- *The goal for replanting still-developing (immature) teeth in children is to allow for possible revascularization of the tooth pulp.*

➢ **Prognosis:** The tooth has a chance to re-vascularize. Studies show that more than half of those teeth will become necrotic and a quarter might become ankylosed.

Open apex/ EADT less than 60 min.

The tooth has been kept in physiologic storage media or osmolality balanced media (Milk, saline, saliva or Hank's Balanced Salt Solution) and/or stored dry less than 60 minutes.

Open apex/ EADT less than 60 min.

Clean the root surface and apical foramen with a stream of saline.

Topical application of antibiotics has been shown to enhance chances for revascularization of the pulp.

- *minocycline or doxycycline 1 mg per 20 ml saline for 5 minutes soak.*

Administer LA (vasoconstrictor not shown to be contraindicated).

Examine the alveolar socket. If there is a fracture of the socket wall, reposition it with a suitable instrument.

Open apex/ EADT less than 60 min.

Irrigate the socket with saline.

Replant the tooth slowly with slight digital pressure.

Suture gingival lacerations, especially in the cervical area.

Verify normal position of the replanted tooth clinically and radiographically.

Apply a flexible splint for up to 2 weeks.

Open apex/ EADT less than 60 min.

Give systemic antibiotics.

Consider a tetanus booster.

Advise patient to:

- *Avoid participation in contact sports.*
- *Soft food for up to 2 weeks.*
- *Brush teeth with a soft toothbrush after each meal.*
- *Use a chlorhexidine (0.1%) mouth rinse twice a day for 1 week.*

Open apex/ EADT less than 60 min.

Splint removal and clinical and radiographic control after 2 weeks.

Root canal treatment should be avoided unless there is clinical or radiographic evidence of pulp necrosis.

- If RCT is needed:

CaOH or antibiotic steroid dressing for up to 4 weeks.

Repeated CaOH dressing every 3 months until apical barrier forms, alternatively use MTA plug.

Obturate canal with GP.

Open apex/ EADT less than 60 min.

- **Prognosis:** The tooth has a chance to re-vascularize, studies have shown around 25% of those teeth have recovered.

- However:

There is a risk of infection-related root resorption. This resorption can be very rapid in children. If revascularization does not occur, RCT may be recommended.

Up to half of those teeth might develop replacement resorption (ankylosis)

Open apex/ EADT more than 60 min.

Delayed replantation has a poor long-term prognosis.

The periodontal ligament will be necrotic and not expected to heal.

The goal in delayed replantation is to restore the tooth to the dentition for esthetic, functional , and psychological reasons and to maintain alveolar contour.

The eventual outcome will be ankylosis and resorption of the root.

Open apex/ EADT more than 60 min.

Remove attached non-viable soft tissue with gauze.

Treatment of the root surface with fluoride has been suggested (2 % sodium fluoride solution for 20 min) to slow down replacement resorption.

Root canal treatment can be carried out prior to replantation or later.

Open apex/ EADT more than 60 min.

Administer LA.

Irrigate the socket with saline.

Examine the alveolar socket. if there is a fracture of the socket wall, reposition it with a suitable instrument.

Open apex/ EADT more than 60 min.

Replant the tooth slowly with slight digital pressure.

Suture gingival lacerations if present.

Verify normal position of the replanted tooth clinically and radiographically.

Stabilize the tooth for 4 weeks using a flexible splint.

Open apex/ EADT more than 60 min.

Administer systemic antibiotics.

Consider tetanus booster.

Advise patient to:

- *Avoid participation in contact sports.*
- *Soft food for up to 2 weeks.*
- *Brush teeth with a soft toothbrush after each meal.*
- *Use a chlorhexidine (0.1%) mouth rinse twice a day for 1 week.*

Open apex/ EADT more than 60 min.

Splint removal and clinical and radiographic controls after 4 weeks.

All teeth will require endodontic treatment to prevent inflammatory bone resorption. This could have been done prior to re-implantation or 7-10 days after.

- *CaOH or antibiotic steroid dressing for up to 4 weeks.*
- *Repeated CaOH dressing every 3 months until apical barrier forms, alternatively use MTA plug.*
- *Obturate canal with GP.*

Open apex/ EADT more than 60 min.

- **Prognosis:**

Ankylosis is unavoidable. In children and adolescents it is associated with infraposition and decoronation may be necessary when infraposition (> 1 mm) is seen.

Closed apex/replanted by patient

Leave the tooth in place.

Clean the area with water spray, saline, or chlorhexidine.

Suture gingival lacerations if present.

Verify normal position of the replanted tooth both clinically and radiographically.

Closed apex/replanted by patient

Apply a flexible splint.

Administer systemic antibiotics.

Consider tetanus booster.

Advise patient to:

- *Avoid participation in contact sports.*
- *Soft food for up to 2 weeks.*
- *Brush teeth with a soft toothbrush after each meal.*
- *Use a chlorhexidine (0.1%) mouth rinse twice a day for 1 week.*

Closed apex/replanted by patient

Initiate root canal treatment 7-10 days after replantation and before splint removal.

Splint removal and clinical and radiographic control after 2 weeks.

- RCT protocol:
  - *Place calcium hydroxide as an intra-canal medicament for up to 1 month OR antibiotic-corticosteroid paste for at least 2 weeks.*
  - *Obturate canal with GP.*

Closed apex/replanted by patient

- **Prognosis:**

RCT always performed to avoid the necrotic pulp leading to inflammatory root resorption.

Ankylosis occurs in a large number of cases (70%)

Closed apex/ EADT less than 60 minutes

Clean the root surface and apical foramen with a stream of saline and soak the tooth in saline thereby removing contamination and dead cells from the root surface.

Administer LA

Irrigate the socket with saline.

Examine the alveolar socket. If there is a fracture of the socket wall, reposition it with a suitable instrument.

Closed apex/ EADT less than 60 minutes

Replant the tooth slowly with slight digital pressure.

Suture gingival lacerations if present.

Verify normal position of the replanted tooth both, clinically and radiographically.

Apply a flexible splint for up to 2 weeks.

Closed apex/ EADT less than 60 minutes

Administer systemic antibiotics.

Consider tetanus booster.

Advise patient to:

- *Avoid participation in contact sports.*
- *Soft food for up to 2 weeks.*
- *Brush teeth with a soft toothbrush after each meal.*
- *Use a chlorhexidine (0.1%) mouth rinse twice a day for 1 week.*

Closed apex/ EADT less than 60 minutes

Initiate root canal treatment 7-10 days after replantation and before splint removal.

Splint removal and clinical and radiographic control after 2 weeks.

- **Prognosis:**

RCT always performed to avoid the necrotic pulp leading to inflammatory root resorption.

Ankylosis occurs in a large number of cases (80%)

Closed apex/ EADT more than 60 minutes

Remove attached non-viable soft tissue with gauze.

Treatment of the root surface with fluoride has been suggested (2 % sodium fluoride solution for 20 min) to slow down replacement resorption.

Root canal treatment can be carried out prior to replantation or later.

Closed apex/ EADT more than 60 minutes

Administer LA.

Irrigate the socket with saline.

Examine the alveolar socket. if there is a fracture of the socket wall, reposition it with a suitable instrument.

Closed apex/ EADT more than 60 minutes

Replant the tooth slowly with slight digital pressure.

Suture gingival lacerations if present.

Verify normal position of the replanted tooth clinically and radiographically.

Stabilize the tooth for 4 weeks using a flexible splint.

Closed apex/ EADT more than 60 minutes

Administer systemic antibiotics.

Consider tetanus booster.

Advise patient to:

- *Avoid participation in contact sports.*
- *Soft food for up to 2 weeks.*
- *Brush teeth with a soft toothbrush after each meal.*
- *Use a chlorhexidine (0.1%) mouth rinse twice a day for 1 week.*

Closed apex/ EADT more than 60 minutes

If RCT hasn’t been performed before re-implantation it should be done 7-10 days after.

Splint removal and clinical and radiographic controls after 4 weeks.

- **Prognosis:** Ankylosis is unavoidable. In children and adolescents it is associated with infraposition and decoronation may be necessary when infraposition (> 1 mm) is seen.

Follow up of avulsion cases

Clinical and radiographic control after 4 weeks, 3 months, 6 months, 1 year and then yearly thereafter.

Splinting traumatised teeth

Splinting traumatised teeth

The aim is to immobilize the tooth in the correct anatomical position so that further trauma is prevented and healing can occur.

Splinting regimen depends on the tissues that need to heal:

- *Periodontal tissues (luxation injuries): 2-4 weeks, flexible splint to reduce the risk of ankylosis.*
- *Root fractures: 4 weeks up to 4 months depending on site and mobility.*
- *Bone fractures: 4 weeks, rigid splint.*

Types of splints

Composite resin and wire splint

Orthodontic bracket and wire splint

Foil-cement splint

Laboratory splints

Composite resin and wire splint

Clean the area with water spray, saline, or chlorhexidine.

Suture any gingival lacerations if present.

Reposition the tooth as necessary.

Composite resin and wire splint

Bend a flexible ortho wire to fit the middle third of the labial surface of the injured tooth and one abutment on each side

Stabilize the injured tooth with soft red wax palatally

Clean the labial surface, isolate, etch, wash and dry.

Composite resin and wire splint

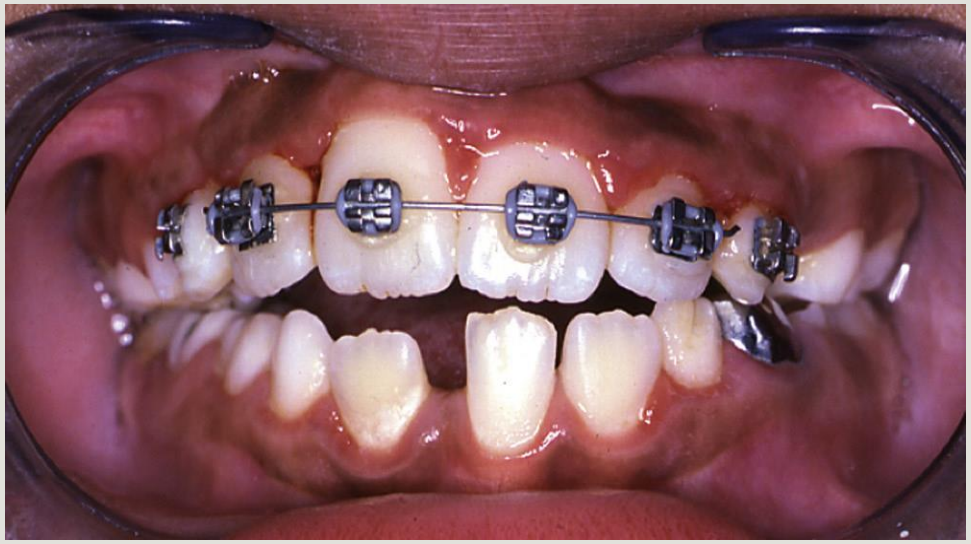
Apply a 3mm diameter circle of composite to the center of the crowns.

Position the wire into the composite circles and add more composite over the wire.

Cure and smoothen any sharp edges.

Orthodontic bracket and wire splint

These splints provide the advantage of allowing more accurate reduction of displacement injuries and extra-articulations by gentle forces.



Foil-cement splint

A temporary splint made of soft metal and cemented with quick setting zinc oxide eugenol.

Used when providing a composite resin is not available or while awaiting a lab made splint.

Laboratory splints

Used when it is not possible to make a splint in the direct method (no abutment teeth present).

Could be made from acrylic or thermoplastic copolymer after an alginate impression.

Sequelae of dental trauma in permanent teeth

- Pulp necrosis (PN)
- Pulp canal obliteration (PCO)
- Replacement resorption
- Inflammatory resorption:
  - *External*
  - *Internal*
  - *Cervical*

Pulpal necrosis

In traumatic dental injuries where the neurovascular supply to the pulp has been totally severed, mechanisms for revascularization and re-innervation are present.

The probability of successful revascularization is determined primarily by:

- *size of the apical foramen (stage of root development).*
- *length of the pulp space*
- *whether bacteria infect the revascularization site.*

Pulpal necrosis

- Periapical radiolucency
- Grey (blue or red) discoloration of the tooth crown
- Infection-related external root resorption
- No response to pulp sensitivity test
- Tenderness to percussion and palpation in the vestibule develops after an asymptomatic period
- Presence of a fistula (sinus tract)
- Unchanged thickness of dentinal walls (arrested development)

How do we evaluate pulpal healing?

In immature developing teeth:

- Revascularization can be confirmed radiographically by evidence of continued root formation, initiation of pulp canal obliteration and usually a return to a positive response to sensibility testing.

In fully formed teeth:

- *A continued lack of response to sensibility testing (i.e. exceeding 3 months) should be taken as evidence of pulp necrosis **together with** periapical radiolucency and sometimes crown discoloration.*

- *TTT: endodontic treatment.*

Pulp canal obliteration (PCO)

A condition where hard tissue is deposited along the wall of the root canal and fills most of the pulp canal.

Occurs when revascularization is successful due to accelerated deposition of hard tissue along the pulp canal walls.

A common sequela in all types of luxation injuries that include displacement.

TTT: none necessary.

Replacement resorption

- A progressive resorptive process seen in traumas where the tooth has received extensive damage to the innermost layer of the periodontal ligament and sometimes also the cementum.
- When a large proportion of periodontal cells die as a result of the trauma, bone cells will grow in contact with the root surface.
- The root becomes involved in the normal remodelling proves of the bone and is gradually replaced by bone.

Replacement resorption

Diagnosis:

The tooth will have reduced mobility

Percussion test gives a high metallic sound

The tooth might be infraoccluded

Radiographically the periodontal space is lost.

TTT: irreversible process, retain tooth for as long as possible as space maintainer, decoronation can be considered.

Inflammatory root resorption

Caused by the action of multinuclear giant cells (osteoclasts) activated by bacterial contamination.

Can be arrested if the infected pulp is removed and endodontic therapy performed.

When the infection-related resorption is arrested, a healing process will be initiated in which new cementum, bone and periodontal ligament will be formed.

If infection-related resorption affects a large surface area, healing with normal periodontal ligament may not occur. Instead ankylosis may occur.

Divided into **external**, **internal**, and **cervical.**

External inflammatory root resorption

Occurs in non vital teeth with infected pulp canals

Resorptive activity is initated by damage to PDL in trauma.

Propagated by infected root canal contents seeping to the external root surface through dentinal tubules.

Diagnosis: radiolucency on the external surface of the root

TTT: Endodontic treatment.

Internal inflammatory root resorption

Seen in the root canals of traumatised teeth undergoing pulp necrosis.

Infected material in the nonvital coronal part propagate the resorption in the vital apical part.

Diagnosis:

Rounded radiolucency centered on the root canal within the tooth.

resorptive lesions in the coronal third of the root might lead to some pink discolouration of the tooth.

TTT: Endodontic treatment.

Cervical inflammatory root resorption

Initiated by damage to the root surface in the cervical region

Propagated by either infected root canal contents or the periodontal microflora

Diagnosis:

cervical radiolucency

Pink crown discolouration in more extensive lesions

TTT: Endodontic treatment if the tooth is non-vital; Lesion curettage with CaOH and appropriate restoration if tooth is vital

Thank you