Royal Darwin Hospital ED

Emergency management of Dental Trauma

Acknowledgements

This first edition manual has been produced from personal notes gathered from attending multiple dental workshops, together with the assistance of various dental colleagues and by sourcing numerous open source online resources.

It is designed to assist Emergency Department medical officers to deliver emergency dental trauma care with minimal dental training.

Special thanks to Tony Skapetis (St Vincent's Hospital NSW) for his contribution on dental splints.

The author and RDH ED have no financial interests in any of the products depicted in this manual.

Mark de Souza
FACEM
2017

Contents

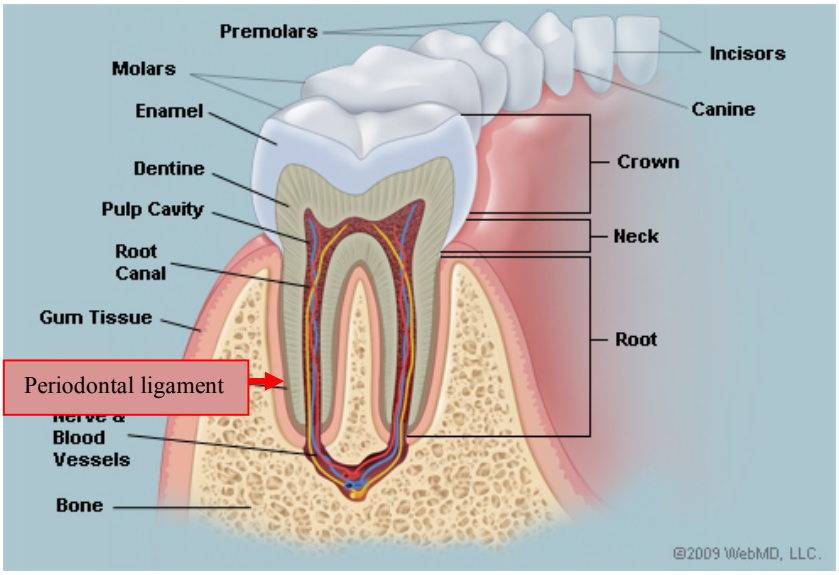
1. Rationale for managing dental trauma in the emergency department

There is limited education of the principles of dental trauma management in the medical undergraduate and FACEM curriculum. However, selective treatment of dental trauma should be instituted in the emergency department for the following reasons:

- There is limited access to after-hours emergency dental care
- ED interventions can be achieved with minimal training using readily available, cost-effective materials.
- Regional dental anaesthesia can eliminate pain while awaiting “next day” dental review.
- Timely ED management minimizes the need for expensive dental procedures such as tooth implantation and root canal therapy.

REVIEW OF DENTAL ANATOMY

Each tooth consists largely of *dentine*, which surrounds the neurovascular *tooth pulp*. The porous micro-tubular structure of dentine results in sensitivity to temperature and transmission of microbes if exposed. The visible portion of the tooth, or *crown*, is covered by tooth *enamel*. The *root* of each tooth, which is embedded in alveolar bone of the maxilla or mandible, lacks enamel and is instead covered with a thin layer of *cementum*. The neurovascular structures enter the tooth at the apex of the root. The *periodontal ligament* anchors each tooth in position and consists of collagen fibres that attach root cementum to alveolar bone (Tintinalli).



Ref:http://img.webmd.com/dtmcms/live/webmd/consumer_assets/site_images/articles/image_article_collections/anatomy_pages/tooth2.jpg

TOOTH NAMING SYSTEMS

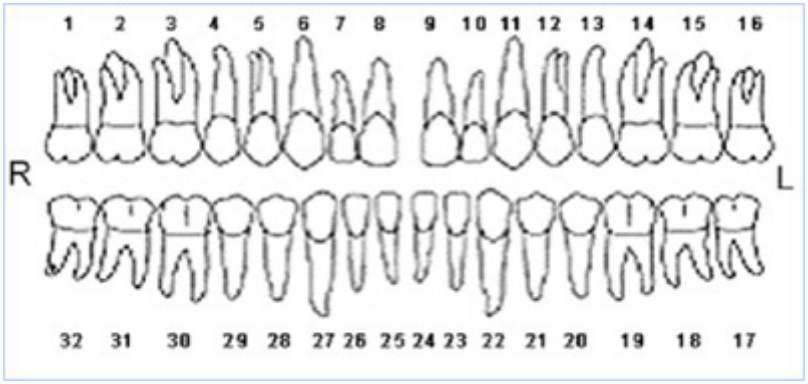
Normal primary (deciduous) dentition consists of 20 teeth, while normal adult (permanent) dentition consists of 32 teeth. Tooth agenesis and supernumerary teeth are not uncommon. Two naming systems exist, however the two-digit *FDI naming system* is often used by radiologists and maxillofacial surgeons.

Permanent Teeth															
upper right								upper left							
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
lower right								lower left							

Eg first upper right incisor is tooth “one-one”

Deciduous teeth (baby teeth)															
upper right								upper left							
			55	54	53	52	51	61	62	63	64	65			
			85	84	83	82	81	71	72	73	74	75			
lower right								lower left							

The alternate *universal* naming system for adult teeth is shown below:



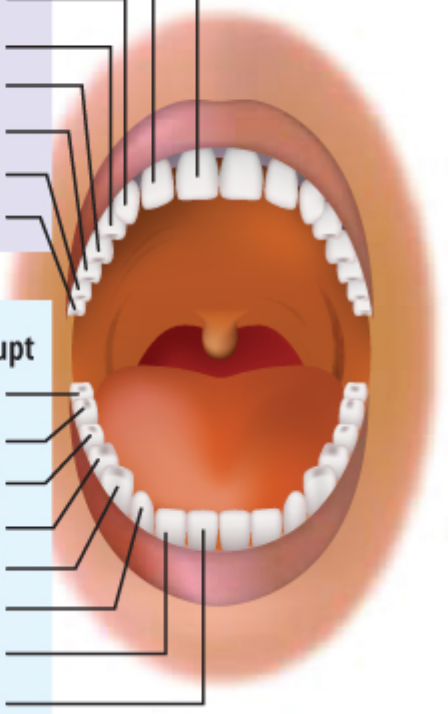
Ref: http://livingnetwork.co.za/wp-content/uploads/2009/08/dental_chart_universal.jpg

PERMANENT OR PRIMARY? USING TOOTH ERUPTION CHARTS

Children aged between 6 and 12 years of age have a mixture of primary (deciduous) and adult (permanent) teeth.

Upper Teeth	Primary Erupt	Permanent Erupt
Central Incisor	8-12 months	7-8 years
Lateral Incisor	9-13 months	8-9 years
Canine (Cuspid)	16-22 months	11-12 years
First Premolar		10-11 years
Second Premolar		10-12 years
First Molar	13-19months	6-7 years
Second Premolar	25-33 months	12-13 years
Third Molar		17-21 years

Lower Teeth	Primary Erupt	Permanent Erupt
Third Molar		17-21 years
Second Molar	23-31 months	11-13 years
First Molar	14-18 months	6-7 years
Second Premolar		11-12 years
First Premolar		10-12 years
Canine (Cuspid)	17-23 months	9-10 years
Lateral Incisor	10-16 months	7-8 years
Central Incisor	6-10 months	6-7 years



http://pidcgr.com/images/uploads/mouthdiagram1.jpg

This manual will focus on the ED management of trauma to *permanent teeth*.

**Note: Re-implantation of avulsed primary teeth may result in abnormal eruption of the permanent successor tooth.

3. Dental Injuries

EPIDEMIOLOGY

Accidents at home and school account for the majority of injuries to permanent teeth.

Trauma from interpersonal violence, motor vehicle and sporting accidents are also common causes of dental trauma (Bastone).

Incomplete lip closure, abnormal maxillary overbite and lack of use of a mouth guard and helmet are all risk factors for dental injury.

The incidence of dental trauma to the **anterior teeth of school children** aged 6-12 years of age has been reported as 1.7 per 100 children per year (2.1 teeth involved per 100 children per year).

The **most common injury to primary teeth** is periodontal injury, namely subluxation and avulsion.

The prevalence of dental trauma to **permanent teeth in high school children** ranges from 6-30% in various studies.

The **most common injury** to permanent dentition is simple **crown fracture to the maxillary central incisor**.

Males are more likely to suffer trauma to permanent dentition than females, however there is no difference between the sexes for primary dentition.

CLASSIFICATION

Multiple classifications for dental injuries have been described; however, for simplicity this manual adopts the following approach:

A. Luxations (tooth displacement)	i) Concussion ii) Subluxation iii) Intrusion (intrusive luxation) iv) Extrusion (extrusive luxation) v) Lateral luxation vi) Avulsion
B. Fractures	i) Infraction ii) Crown fractures iii) Crown-root fractures iv) Dento-alveolar fractures v) Complex maxillofacial fractures
C. Soft tissue injuries	Gingival, tongue and oral mucosal lacerations

A. DISLOCATIONS:

i) Concussion

Trauma to the periodontal ligament causing pain on tooth percussion but no visible displacement, gingival sulcal bleeding or increase in tooth mobility.

Ref: http://www.dentaltraumaguide.org/Permanent_Concussion_Description.aspx

ED treatment: Nil; non urgent dental review

ii) Subluxation

Injury to the periodontal ligament causing pain and increased tooth mobility but no visible displacement. Bleeding from the gingival sulcus confirms the diagnosis.


Ref: http://www.dentaltraumaguide.org/Permanent_Concussion_Description.aspx

ED treatment: No specific treatment usually required.
Soft diet, analgesia, dental referral

iii) Intrusion

Axial displacement of the tooth into the alveolar bone


Ref: http://www.dentaltraumaguide.org/Permanent_Intrusion_Description.aspx

ED treatment: Nil (tooth is usually firmly embedded and minimally painful).
Leave in situ, soft diet, analgesia, urgent dental referral

iv) Extrusion

Disruption of the periodontal ligament causing partial displacement of a tooth from its socket.

Ref: http://www.dentaltraumaguide.org/Permanent_Extrusion_Description.aspx

ED treatment:

Analgesia +/- regional anaesthesia if required
Irrigate exposed root with saline
Reduce with digital pressure, check occlusion (bite) and apply splint
Soft diet, urgent dental referral

NB: Young children: If the risk of tooth aspiration is high, consider extracting the nearly-avulsed deciduous tooth in the ED unless prompt dental review is possible (see avulsion below).

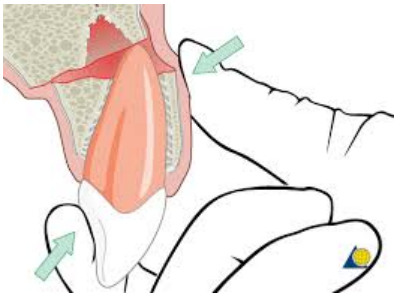
v) Lateral Luxation

Displacement of tooth with associated fracture of **one side** of the supporting alveolar bone

Ref: http://www.dentaltraumaguide.org/Permanent_Lateral_luxation_Description.aspx

ED treatment:

Permanent teeth:
LA, reduce with digital pressure, splint
Soft diet, urgent dental referral



Primary teeth: Reduce and splint only if there is grossly abnormal occlusion and dental review is likely to be delayed

vi) Avulsion

The tooth is completely displaced from its socket

Ref: http://www.dentaltraumaguide.org/Permanent_Avulsion_Description.aspx

Survival of an avulsed adult tooth survival exceeds 90% if re-implantation occurs **within 15-60 minutes** (Krasner et al) and if the tooth has been kept in an optimal over-the counter storage solution such as Hank's Balanced Salt Solution (Save-a Tooth®). Use of normal saline, whole milk and saliva to store avulsed teeth has also been associated with greater tooth survival compared with dry storage (Blomlof et al).

If extra-oral dry time exceeds 60 minutes, tooth survival is poor (Andreasen et al). However, replantation of an avulsed adult tooth should still be performed in ED for functional, aesthetic and psychological reasons pending formal dental review.

For **confused or unconscious patients with a missing tooth** consider performing chest or facial imaging to exclude tooth aspiration or intrusion respectively.

Displaced teeth or their fragments may also be concealed within oral lacerations, and may be detected by careful wound inspection or trauma imaging (XRAY or CT).

As mentioned, deciduous (primary) teeth **should not be replanted** due to the risk of interfering with the development and eruption of adult teeth (Zamon, Dental Trauma Guide). See permanent teeth eruption chart on page 6.

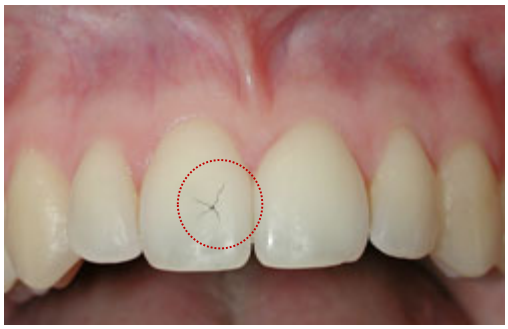
ED treatment of an avulsed PERMANENT tooth:

- Handle tooth by crown only
- Store tooth in normal saline immediately upon arrival to triage (unless already in an acceptable medium as discussed above)
- Aim for replantation within 60mins from time of avulsion (scan the ED waiting room for “ATS 4” dental patients)
- Provide regional anaesthesia as required
- **Gentle** saline irrigation of root and socket if visibly contaminated, however avoid excess instrumentation due to risk of damage to periodontal cells
- Reduce with digital pressure and check occlusion
- Apply splint
- Check tetanus vaccination status
- Give antibiotics only if *high risk cardiac valvopathy* (see page 39)
- Soft diet, urgent dental referral

B. DENTAL FRACTURES

i) Infraction

Fissuring of enamel without loss of substance.



Ref:
http://www.dentaltraumaguide.org/Pictures/infraction/crown-fracture-infraction1.jpg

ED treatment: Nil
Marked infractions may be restored by a dentist non-urgently

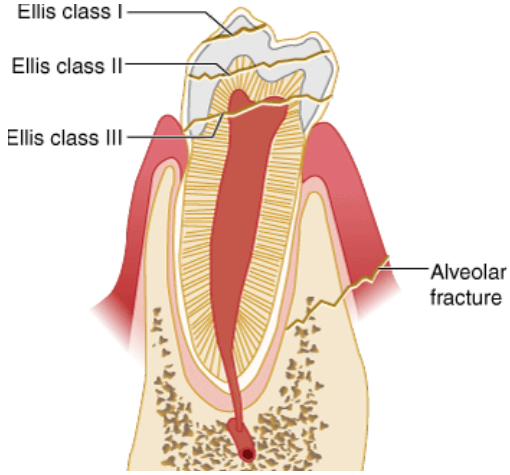
ii) Crown fractures:

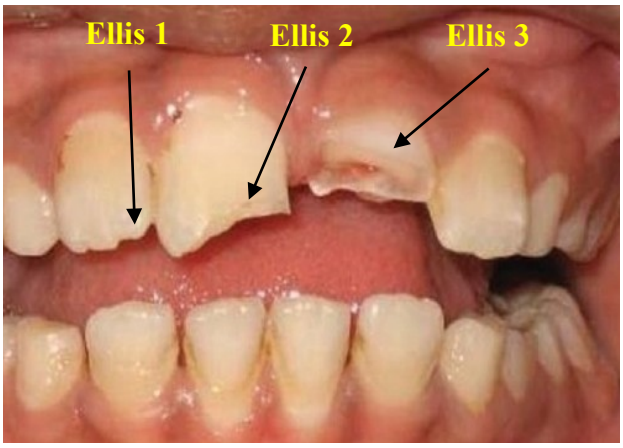
Fractures and dislocations may occur simultaneously in the same tooth.

- **Ellis 1** fractures involve the enamel only.
  There is no sensitivity to air

- **Ellis 2** fractures expose the yellow / ivory-coloured dentine.
  The dentine is porous, making the tooth sensitive to air and prone to infection (pulpitis).

- **Ellis 3** fractures expose a central blush of pink or bleeding pulp surrounded by dentine. These injuries are extremely sensitive to air, chewing and palpation.



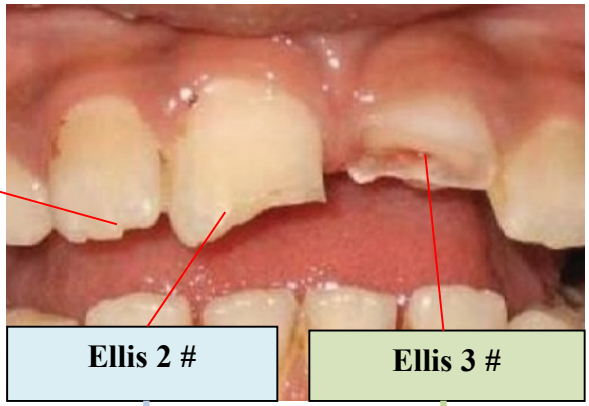


Ref:
http://classconnection.s3.amazonaws.com/33/flashcards/602033/gif/ellis_system_of_dental_fractures1341812341239.gif

ED treatment of ELLIS 1-3 fractures:

Fractures of both primary and permanent teeth are **managed in the same manner** using dental dressings.

Tooth **fragments are never reattached**: the injured tooth will be restored with composite material or a dental implant at a later date.



Ellis 1 #

Ellis 2 #

Ellis 3 #

Soft diet

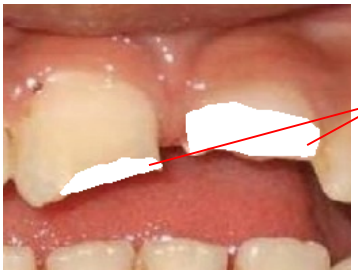
Non-urgent dental review

Local anaesthesia as required

Reduce associated dislocation if present

Irrigate fracture site with saline and blot dry with gauze

Ellis 3 # only:
Cover exposed tooth pulp with calcium hydroxide paste (CaOH)



Cover dentine / CaOH with glass ionomer cement (GIC)

Splint any co-existing luxation

Soft diet, urgent dental review

iii) Crown-Root fractures

These injuries expose both pulp and dentine and are managed as per Ellis-3 fractures.


Ref: http://www.scielo.cl/fbpe/img/ijodontos/v6n1/art04_f1.jpg;
http://snellville-dentist.com/wp-content/uploads/2012/05/horizontal-fracture.jpg

iv) Dento-Alveolar fractures

Alveolar bone on both sides of the tooth is fractured (cf lateral luxation)


Ref:
http://www.dentaltraumaguide.org/Permanent_Alveolar_fracture_Description.aspx

ED Treatment: Regional anaesthesia, reduce and apply splint

Soft diet, urgent dental review

*Consider inpatient maxillofacial referral if defect is extensive or associated trauma mandates hospital admission.

v) Complex maxillofacial injuries

Patients with complex facial fractures (eg Le Fort injuries) may have associated trauma requiring critical care.

EMST and airway considerations apply.

Life-threatening oro-facial haemorrhage may require intubation and **packing of nasal and/or oral cavities.**

Dental blocks may be useful for pain control of maxillary and mandibular fractures during the initial resuscitation phase.

Dental splinting should be considered early in the ED to assist with the control of pain and bleeding.

Ref: http://www.lakewoodomfs.com/webreadyimages/trauma-photo-275.jpg

C. GINGIVAL, TONGUE AND ORAL MUCOSAL LACERATIONS

Dental injuries are often associated with lacerations to the gingiva (gums) and oral mucosa.

Dental luxations are usually reduced prior to repairing mucosal injuries in order to minimize the risk of pulp necrosis. However, consider first repairing wounds that bleed persistently or if the planned dental splint will obscure access to the laceration.

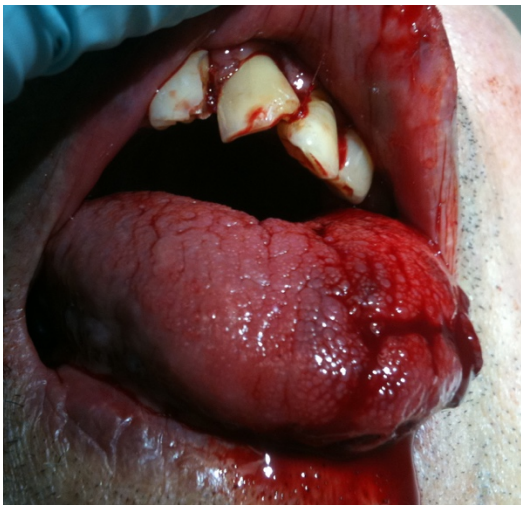
Regional nerve blocks may anaesthetize an area that allows management of both the dental and soft tissue injury without the need for additional soft tissue infiltration (see nerve blocks below). Anaesthesia of the tongue can be achieved by either direct infiltration of local anaesthetic or lingual nerve block.

Patients who have undergone inferior alveolar or lingual nerve block should be advised not to eat or drink while numbness persists (1-3 hours) to minimize the risk of tongue biting and aspiration.

Small lacerations (<1cm long) of the mouth and tongue can usually be managed with mouth rinses and left to granulate spontaneously. Larger, gaping lacerations can be closed with absorbable material (Moncryl®, Vicryl®) in one or two layers.

Large, complex or paediatric tongue lacerations may require repair under general anaesthesia or procedural sedation.

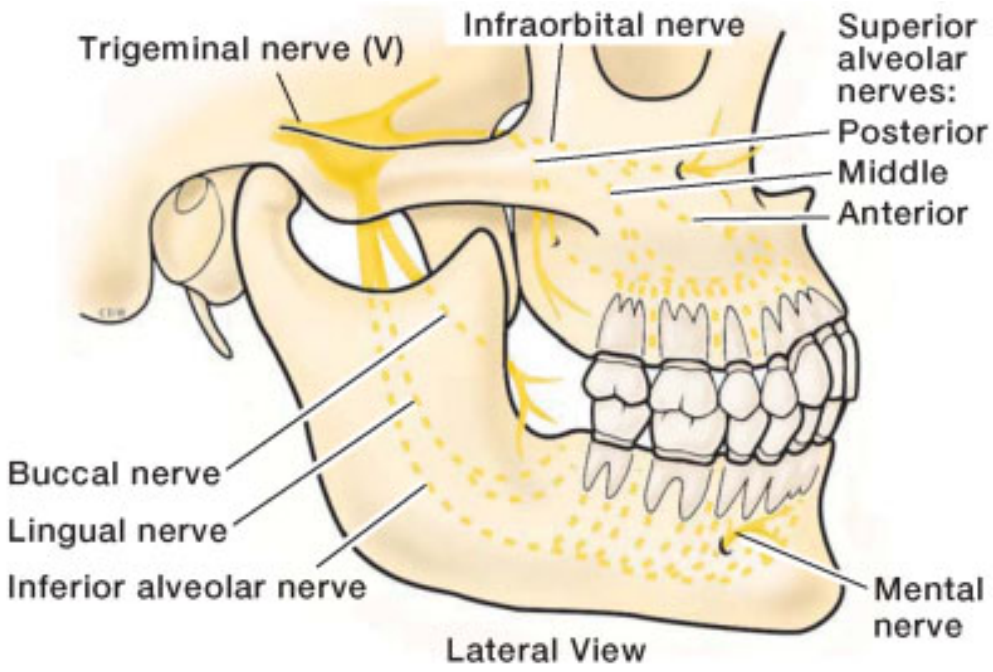
Gaping tongue laceration requiring 2-layer closure



Tongue laceration associated with Ellis 2 fracture and extrusion

4. Regional anaesthesia of the teeth and oral cavity

Branches of the maxillary and mandibular divisions of the **trigeminal nerve** innervate all teeth and gingivae, the tongue, anterior oral mucosa and the lips.



Ref: http://www.lostdent.com/img/ldent-15.jpg

Extra-oral approaches to nerve blocks may be necessary in patients with trismus or significant apprehension.

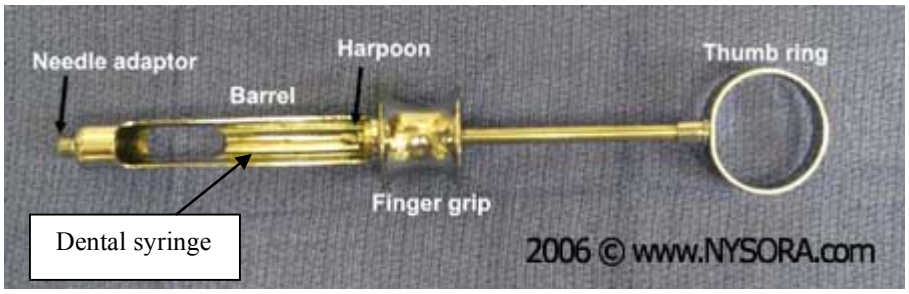
Distraction techniques may significantly reduce patient discomfort during infiltration. These include applying a gentle squeeze to the lip with the finger and thumb or using a cotton tip applicator to apply gentle pressure immediately adjacent the intended puncture site, just prior to mucosal penetration.

Where available, application of a tiny amount of **topical LA ointment** at the intended site (eg 10% lignocaine) 2-5 minutes prior to injection can also reduce the discomfort of mucosal penetration.

A **dental syringe and needle** should be used as the thumb ring allows aspiration without changing hand position, while the fine 27-30G needles have sufficient length to reach their targets. Most ED's use cartridges containing a mixture of lignocaine and adrenaline. The usual weight-based limits for lignocaine should be applied.

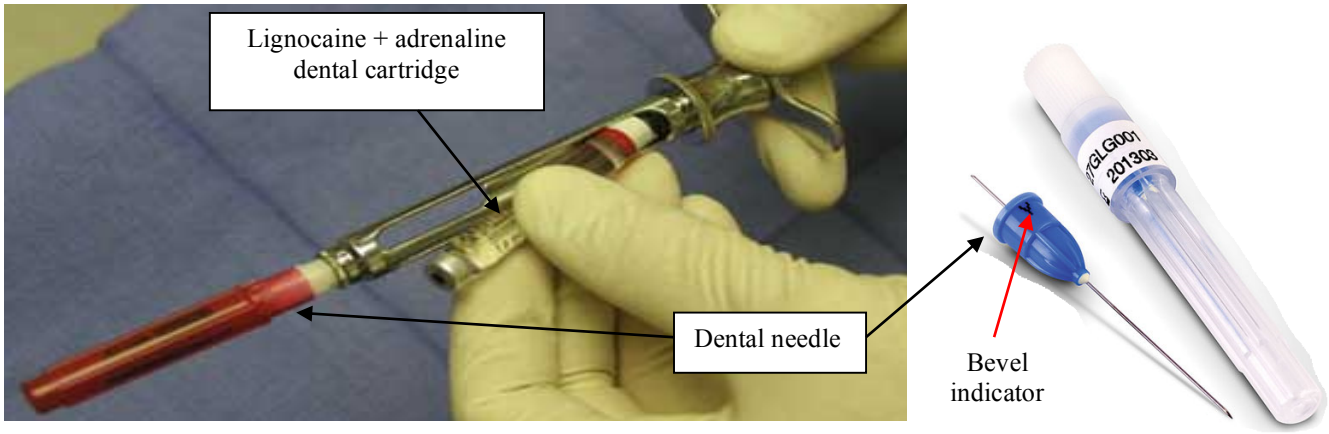
Ensuring the needle bevel faces towards the target nerve increases the success of nerve block. The bevel position is marked on the needle hub to assist with directing the LA.

Equipment for dental anaesthesia:



Ref: http://www.nysora.com/techniques/nerve-stimulator-and-surface-based-ra-techniques/head-and-neck-blocka/3420-oral-and-maxillofacial-regional-anesthesia.html

Ref: http://www.net32.com/ec/tsk-30-ga-short-dental-needles-sterile-d-73374



Anaesthesia of the upper teeth

In the majority of ED cases, either **supraperisoteal infiltration** of individual maxillary teeth or **infra-orbital nerve block** will provide adequate anaesthesia for treatment.

Additional anaesthesia of the palatal side of the maxillary teeth and hard palate may occasionally be required (**nasopalatine** and **greater palatine nerve blocks**).

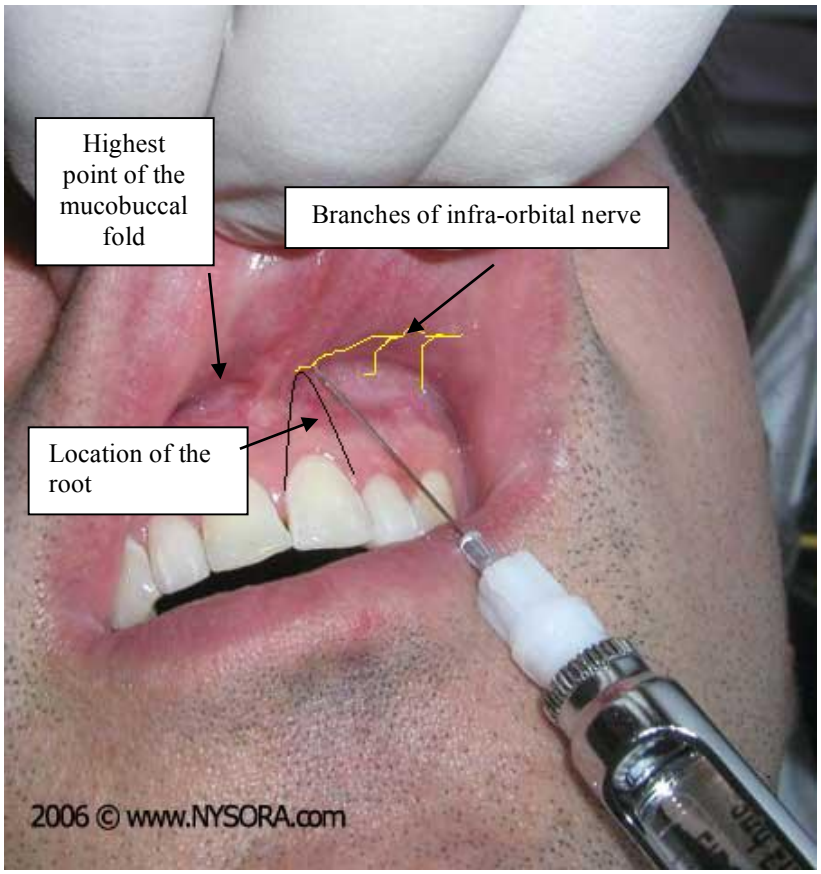
SUPRAPERIOSTEAL INFILTRATION

Can be used for all upper teeth as the alveolar process of the maxilla is porous.

Zone of anaesthesia: Tooth immediately adjacent the injected bolus of anaesthetic

Technique:

- Retract the lip and identify the point of needle entry overlying the root of the required tooth, located at the highest point of the mucobuccal fold.
- Advance the needle 1-2mm and inject 1/3-1/2 cartridge slowly over 30 seconds
- If anaesthesia is inadequate repeat with a further 1/3-1/2 cartridge applied in a wider distribution. If still inadequate consider either nasopalatine or greater palatine nerve block (see below).



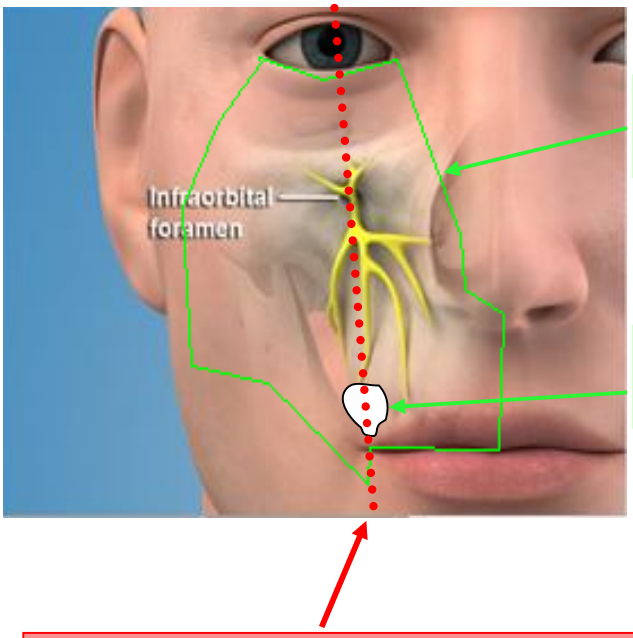
Ref: http://www.google.com.au/imgres?safe=active&rls=com.microsoft%3Aen-au&biw=1151&bih=601&tbm=isch&tbnid=Bohr8r5abom8qM%3A&imgrefurl=http%3A%2F%2Fwww.nysora.com%2Ftechniques%2Fnerve-stimulator-and-surface-based-ra-techniques%2Fhead-and-neck-blocka%2F3420-oral-and-maxillofacial-regional-

INFRAORBITAL NERVE (ION) BLOCK

Zone of anaesthesia:

Both incisors
Canine
Variable block of 1st and 2nd premolars
Gingiva adjacent the anaesthetised teeth
Lower eyelid, lateral nose, upper lip and cheek.

NB: Injuries at the midline may require bilateral ION blocks or may be supplemented with supraperiosteal infiltration.



Technique: **Internal** and **external** approaches to ION block are possible:

Internal approach:

- Retract upper lip and identify mucosal puncture site at the height of the mucobuccal fold **over the 5th tooth**.
- Pierce mucosa and advance parallel to maxilla
- Continue 1-2cm towards the infraorbital foramen until infraorbital margin is encountered
- Aspirate then deposit ½ - 2/3 cartridge slowly over 30-60 seconds

Ref:
http://static.wixstatic.com/media/e3012c_acc8dce5720deaac93dcd8fe76d904ef.jpg_srz_576_498_85_22_0.50_1.20_0.00_jpg_srz

External approach:

- Identify position of infraorbital foramen and prepare skin with alcohol wipe
- Approach foramen at 45 degree angle from below and ensure bony endpoint (avoid entry into infraorbital foramen)
- Aspirate then deposit ½ - 2/3 cartridge slowly over 30-60 seconds

Ref: http://www.aafp.org/afp/2004/0201/afp20040201p585-f3.jpg

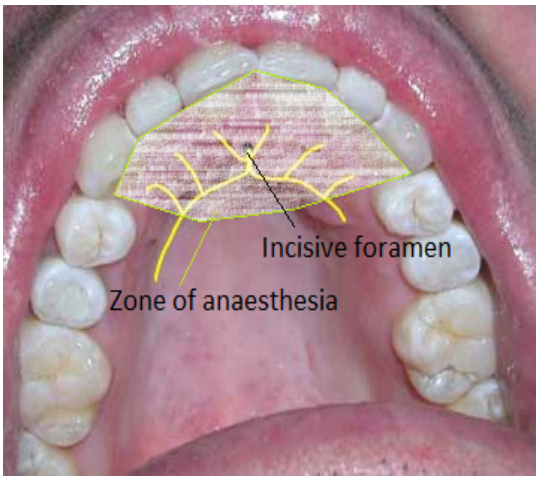
NASOPALATINE NERVE BLOCK

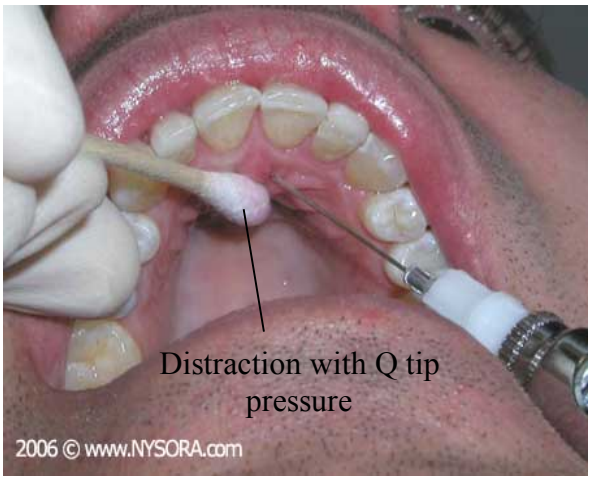
Consider this block in addition to an infraorbital nerve block if the injury involves the palatal side of the upper canines/incisors or adjacent palate.

The nasopalatine nerve emerges from the *incisive foramen* which lies at the confluence of 3 rugal folds on the hard palate located just posterior to the upper central incisors.

Only a small volume of LA is used (< 0.5ml) as mucosa is firmly bound to the hard palate.

Avoid injecting within the foramen (no bony endpoint) as this may increase the risk of nerve trauma. Use a Q-tip to apply nearby pressure just prior to mucosal puncture.



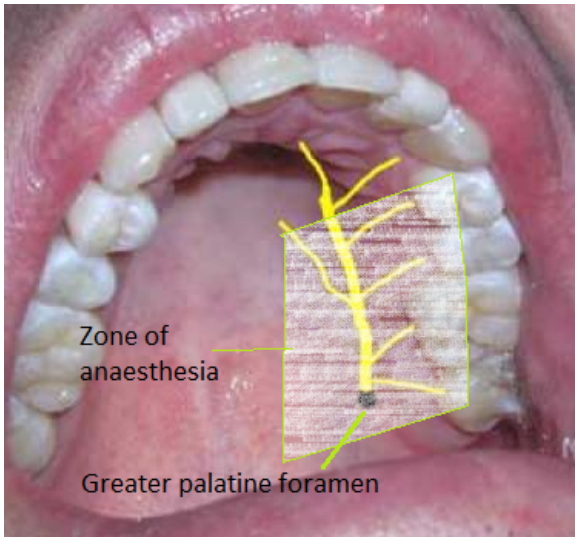


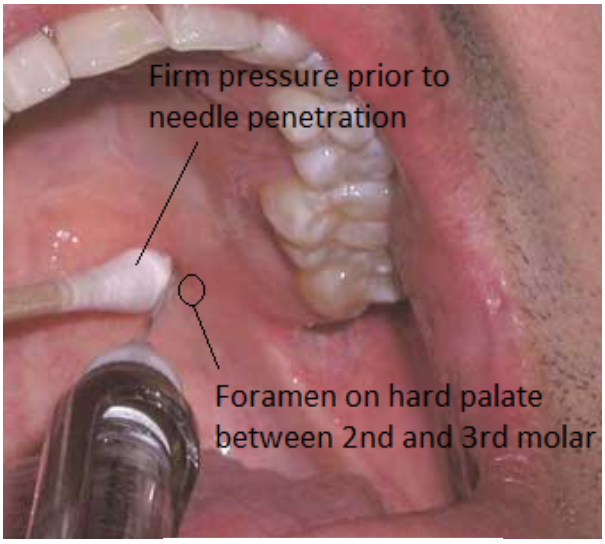
GREATER PALATINE NERVE BLOCK

Consider this block in addition to supraperiosteal infiltration if the injury involves the palatal side of the upper premolars/molars or adjacent palate.

The greater palatine nerve emerges from its foramen which is located most frequently between the 7th and 8th teeth (2nd/3rd molars), at the angle between the alveolar process and hard palate.

Only a small volume of LA is required (< 0.5mL)





Ref: www.nysora.com

Anaesthesia of the lower teeth

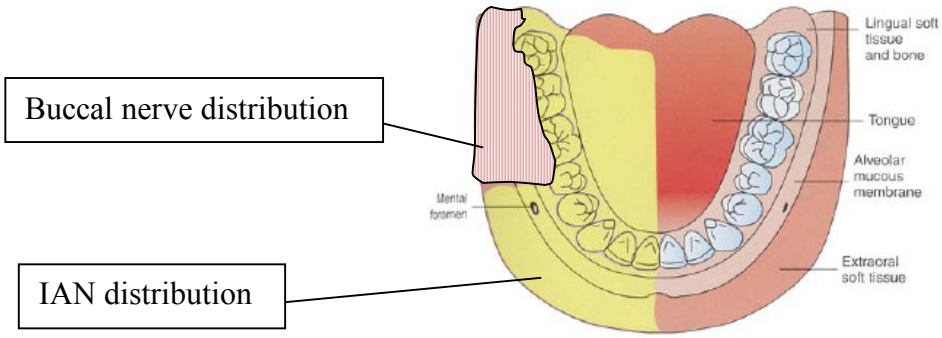
Supraperiosteal anaesthesia of the mandibular incisors and canine may be possible as the alveolar process of mandible is relatively porous in this location. However, more reliable anaesthesia is possible with inferior alveolar nerve blocks. Mandibular molars are poorly anaesthetized by supraperiosteal infiltration due to the density of local alveolar bone.

INFERIOR ALVEOLAR NERVE (ION) BLOCK

Zone of anaesthesia: Mandibular teeth and gums
Lower lip and chin

The proximity of the lingual nerve to the IAN usually results in ipsilateral anaesthesia of the tongue, which can be exploited when anaesthesia of the tongue is required.

NB: 1. The buccal (cheek) side of lower 3 molars is supplied by the **buccal nerve**, which may also need to be anaesthetized (see below).
2. Injuries at the midline may require **bilateral** IAN blocks



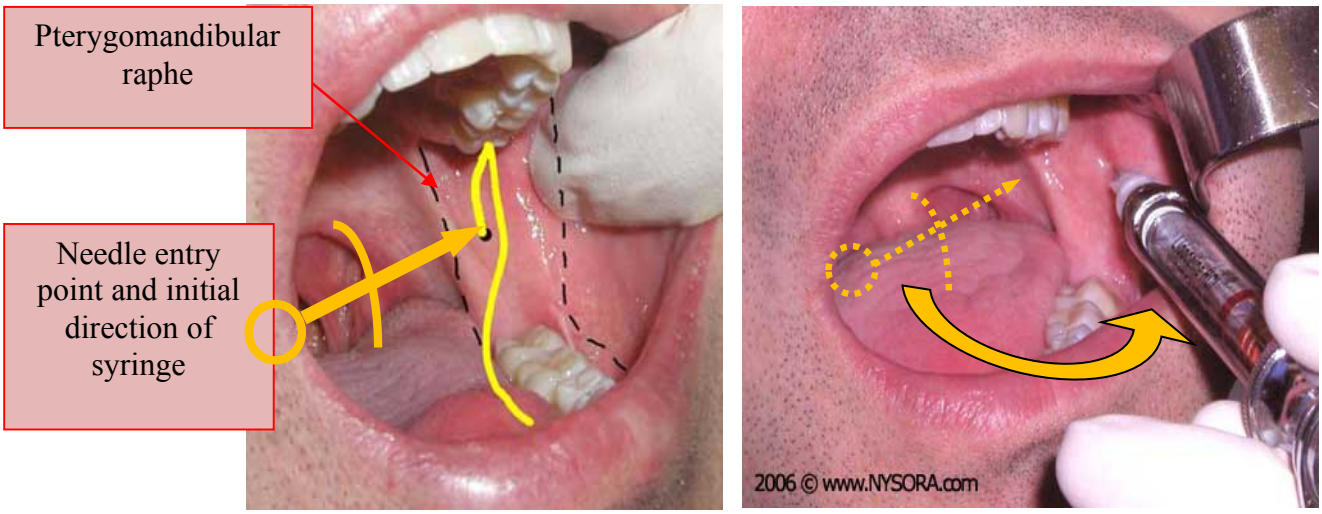
Technique: The two most common approaches to IAN block in the ED are described below:

A: Traditional intra-oral approach – requires wide mouth opening (ie cooperative patient).

- Visual inspection or palpation of pterygomandibular raphe,
- Syringe approaches from opposite molars to ensure bony endpoint (position 1)
- Place needle tip lateral to raphe, 1cm above occlusal surface of molars
- Advance 2-3 cm until bony endpoint is achieved on mandible
- Withdraw 1mm, swing syringe to lie over the molar occlusal plane (position 2)
- Advance needle posteriorly until inserted ¾ of its length (approx. 1cm more), confirm negative aspiration then slowly infiltrate 3/4 cartridge over 30-60 seconds
- Continuing to inject remaining LA while the needle is withdrawn will result in lingual nerve block.

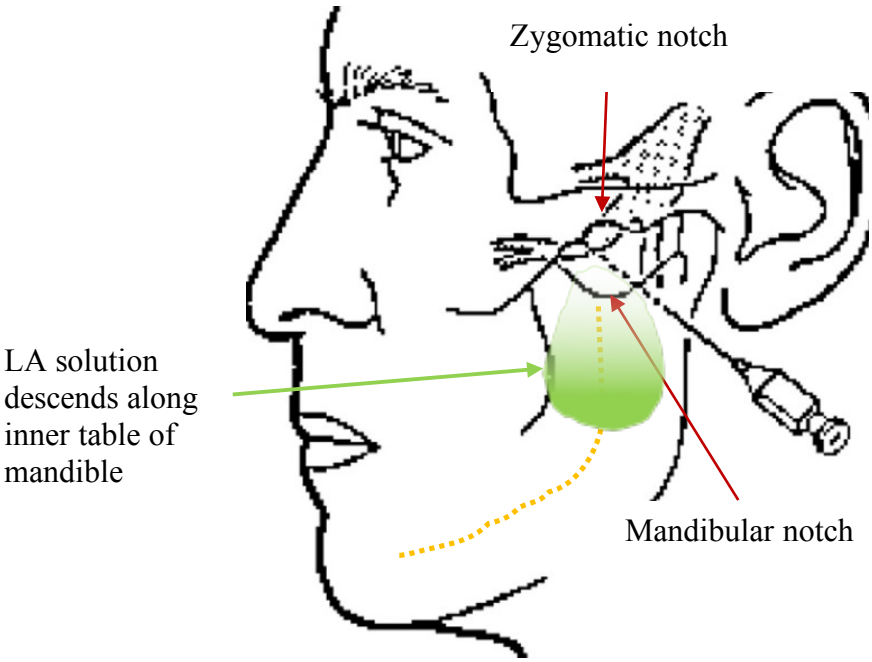
Position1

Position 2

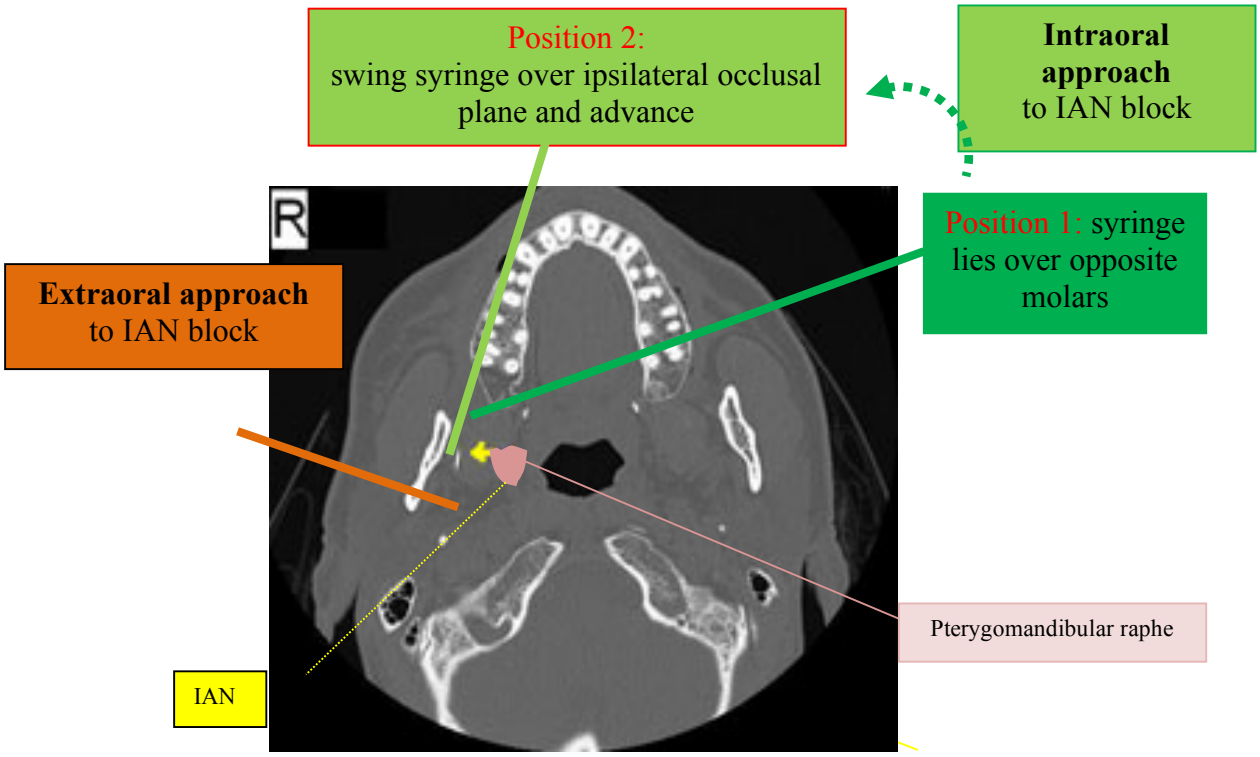


B: Extra-oral approach – useful for trismus / TMJ ankylosis

- Locate notch by palpating inferior aspect of zygomatic arch with thumb of non-injecting hand
- Prep skin with alcohol wipe and reapply thumb
- Needle penetrates immediately inferior to thumb
- **22G blue needle technique**: Advance needle to hilt, aspirate and slowly inject 5ml 1% lignocaine over 30-60 seconds
- **Dental syringe technique**: Advance needle to deliberately strike mandibular notch, then "walk off" superiorly until needle just passes over the notch. Aspirate and infiltrate 2mL cartridge of LA.



Coronal view showing needle paths for intra and extra-oral approaches to IAN block:

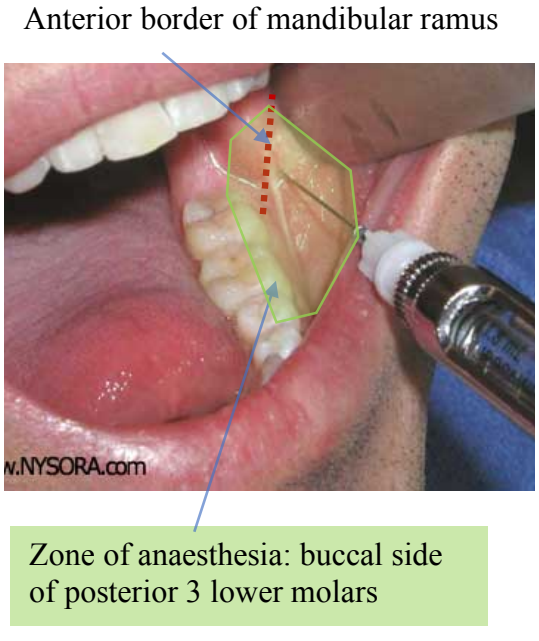


BUCCAL NERVE BLOCK

Block of the buccal nerve may be required in addition to IAN block when anaesthesia of the buccal (cheek) side of the lower molars is required. This nerve crosses the anterior border of the mandibular ramus adjacent to the 3rd molar.

Technique:

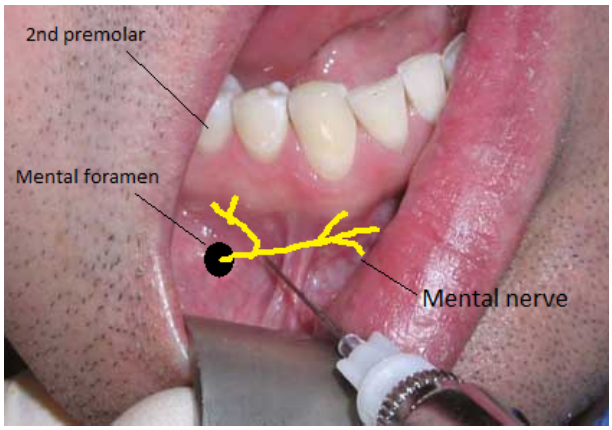
- Retract the cheek with a tongue depressor Palpate the anterior border of the mandibular ramus with a finger.
- Insert the needle into mucosa just buccal to the anterior border of the ramus. Direct the needle bevel towards the ramus with the syringe lying parallel with the occlusal surface of the molars.
- Inject a few drops of local while advancing; once contact is made with the lateral aspect of the ramus inject 0.25mL local anaesthetic.



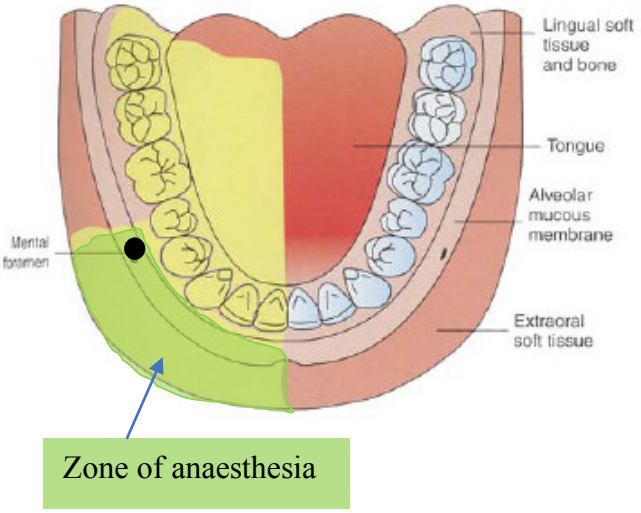
MENTAL NERVE BLOCK

The mental nerve is the cutaneous termination of the inferior alveolar nerve as it exits the mandible at the mental foramen (located inferior to the 2nd lower premolars).

Block of the mental nerve can be performed to repair lacerations of the lower lip and chin. Injuries at the midline may require bilateral mental nerve blocks.



Ref: http://www.nysora.com/index.php?news=3421



5. Dental splints and dressings

Emergency **dental splints** are used to temporarily support mobile tooth injuries while awaiting definitive dental care. They can be fashioned from almost any material (including aluminium foil over blue tack). In order to be effective the splint should form a bridge between one or two intact teeth on either side of the injury.

Splints should always be applied to the **buccal** (cheek) side of the teeth and positioned in a manner that does not interfere with occlusion ("bite"). Ensure luxations are adequately reduced before the splint material sets hard.

Most materials adhere best to dry teeth; roll up gauze and leave between the injured teeth and cheek while preparing your dressing to blot saliva and blood. Give a final wipe of the tooth just before applying the material.

If proprietary disposable mixing spatulas are not supplied in the ED, wooden Q-tips and tongue depressors are suitable alternatives.

Dental dressings are materials applied to the fractured or diseased surface of teeth. From the ED perspective the same materials can be used as a splint or dressing.

1. Coepak®

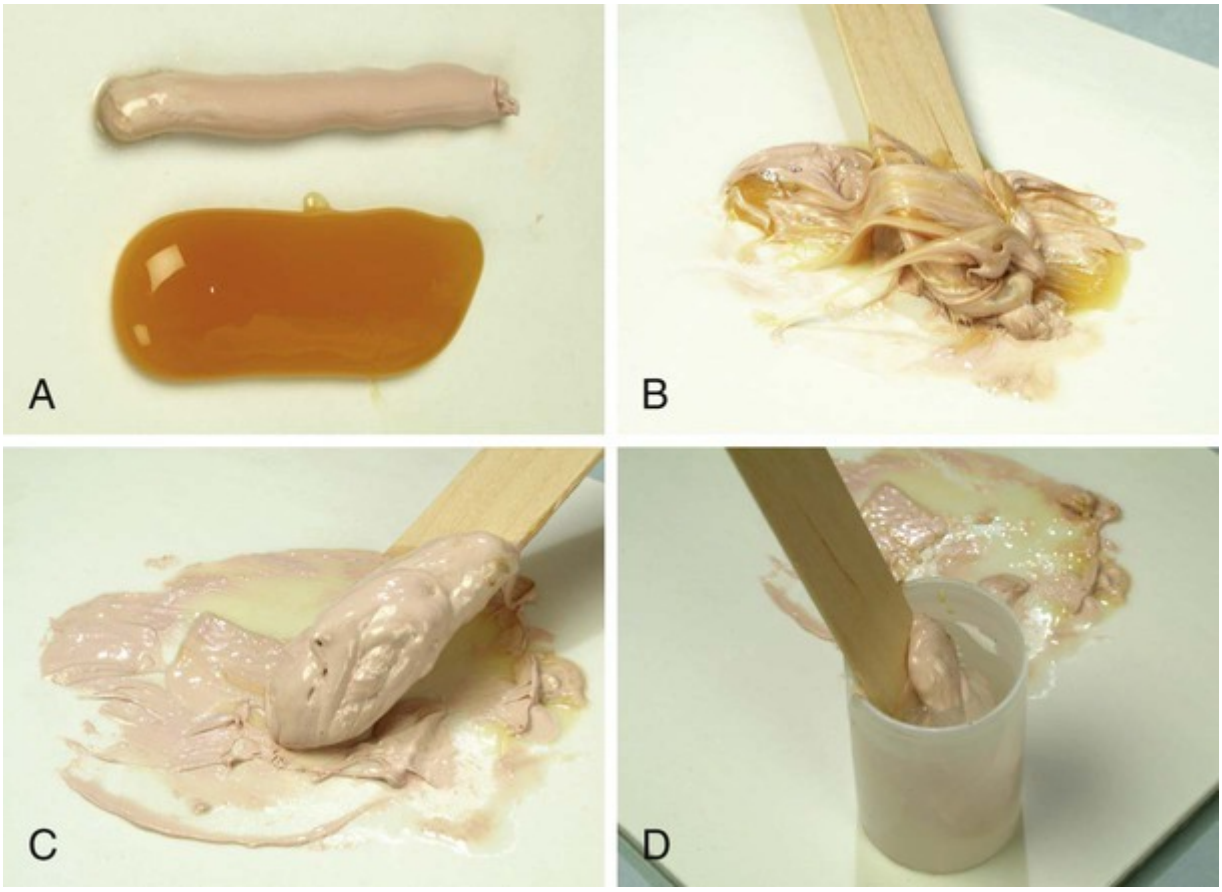
When well-moulded to the teeth, Coepak forms a snug "mechanical bond" similar to a custom-made mouth guard, and will remain in place for several weeks.

Coepak is a versatile material. It can also be used as a temporary filling in patients presenting with toothache from caries and dislodged amalgam (filling), or as a dental dressing for a tooth fracture if no other material is available.

Avoid using excess material which may interfere with occlusion or feel bulky to the patient.

Technique:

- **A.** Squeeze approximately 5cm lengths of part A and B side by side onto a mixing sheet (ideally use a non-absorbable material such as laminated / waxed paper or plastic).
- **B-C.** Wearing gloves, use a wooden tongue depressor to mix the parts until streak-free
- **D.** When combined, scrape the material into a ball and submerge in a cup of tap water.
    - Dip gloved fingers of 1 hand in the water and then transfer the material to wet gloved fingers. Roll for 20-30seconds until it firms to the consistency of blue tack. Roll into a sausage shape.
    - Reduce the dental luxation if not already performed – you may need to hold the tooth to prevent dislodging (continued next page)



https://pocketdentistry.com/wp-content/uploads/285/B9780323188241000553_f055-001ad-9780323188241.jpg

- **E.** Apply the roll of Coepak to the dry buccal surface of teeth, ensuring contact with at least one sound tooth on either side of the injury. Ensure the occlusal (biting) surface is free of Coepak. Press the material into all dental sulci. Some coverage of the gums will occur. Ask the patient to bite the back teeth gently to confirm adequate reduction and occlusion.

https://thuanhhihi.files.wordpress.com/2014/12/images.jpg

2. Glass ionomer cement (GIC)

GIC forms a chemical bond with enamel that will remain in place for several weeks.

The product can be used as either a dental splint to stabilize luxations or applied to fractured teeth as a dental dressing.

Most non-dental facilities supply formulations that must be mixed by hand from two components. The compound then hardens spontaneously within 1-2 minutes.

For larger injuries spanning several teeth the quantities of GIC can be doubled or tripled. Otherwise the splint can incorporate an “arch bar” using a paper clip trimmed to size.

Technique:

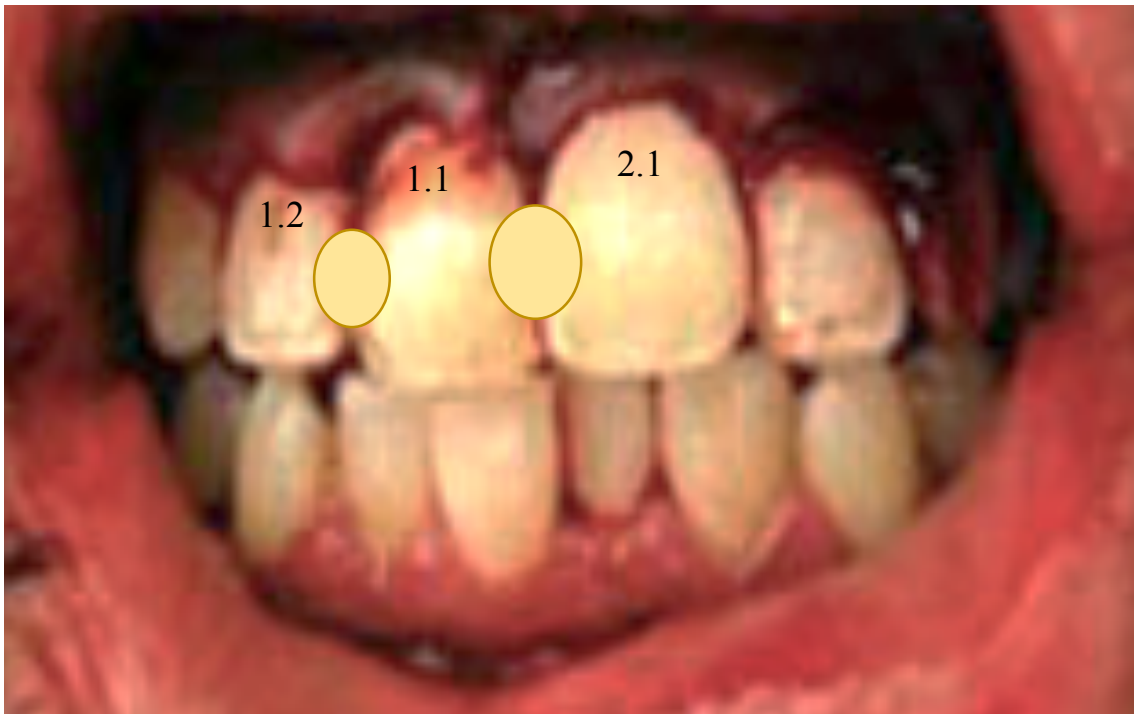
- Reduce any luxation injury and dry the tooth surfaces to which the GIC is to be applied.
- Place **one drop** of GIC liquid and **one level scoop** of GIC powder onto the mixing surface.
- Mix for a few seconds with a spatula until combined
- Gather up the compound while still glossy and apply as follows:

For tooth fractures:

- Cover the exposed dentine (Ellis 2) or exposed dentine and pulp once capped with calcium hydroxide paste (Ellis 3) to the tooth fracture or luxation. Tap gently in place with the spatula.

For luxations:

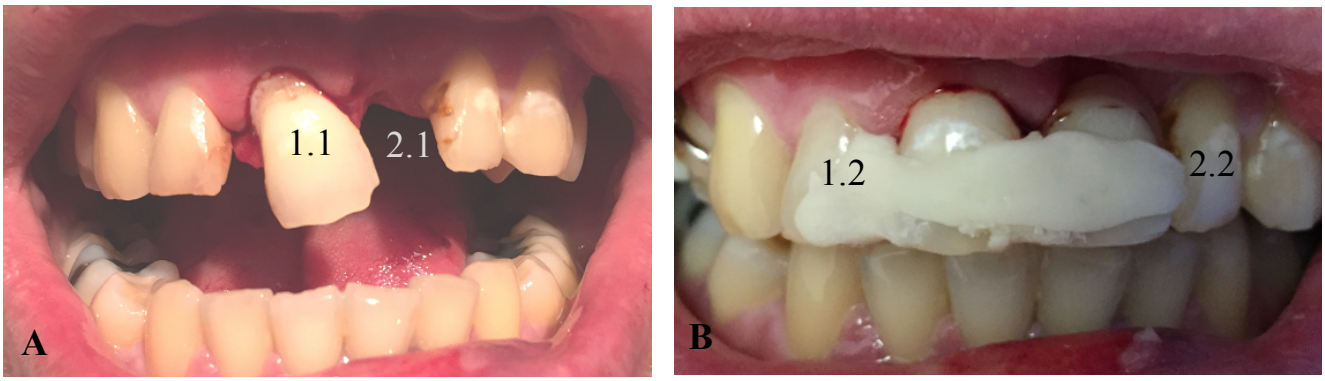
- Stabilise a **single tooth luxation** to sound teeth on either side of the injury by applying a small amount of GIC to the interdental spaces. Tap the material gently into the spaces and confirm occlusion prior to the material hardening.



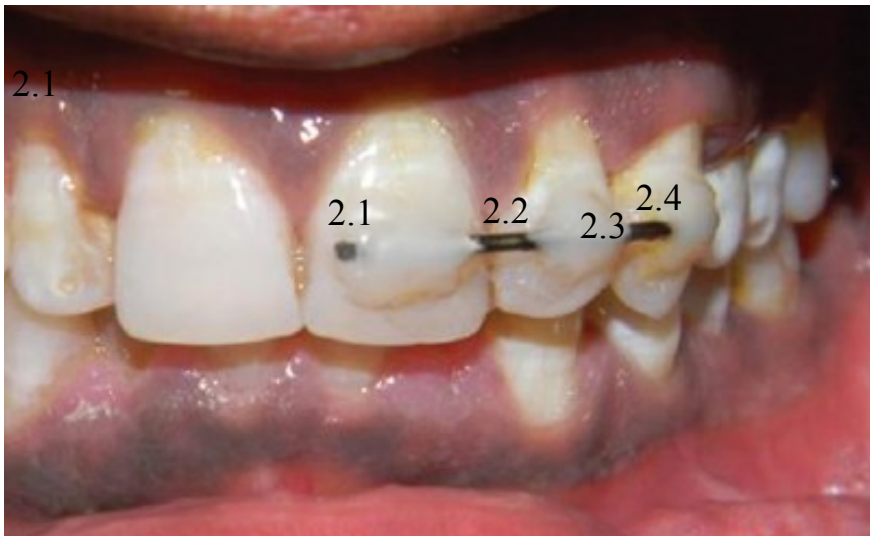
Tooth 1.1 avulsion, reduced and splinted to 1.2 and 2.1 using GIC

- To stabilize **multiple adjacent luxations**, double or triple the quantity of the mix to yield enough material to span across all injured teeth, anchoring the splint to a sound tooth on either side of the injury.

A: Extruded 1.1 and avulsed 2.1.
B: Subsequent reduction and splinting with continuous GIC splint anchored to 1.2 and 2.2



- An alternative method using an “arch bar” secured to teeth using GIC:



http://www.saudiendodj.com/articles/2013/3/2/images/SaudiEndodJ_2013_3_2_90_118160_u10.jpg

Luxations of teeth 2.2 and 2.3 are splinted to teeth 2.1 and 2.4 using GIC and an arch bar made from a trimmed paper clip

3. Convatec Stomahesive® tape:

Novel use of stoma dressing material which is comprised of food-grade materials. Very simple application with no mixing required however lasts only 12-24hours before becoming loose from saliva. Useful when there is limited time available in the ED and in patients who are well motivated to see a dentist within 24 hours.

Technique:

- Locate Stomahesive wafers in the dental drawer of the Fast Track ENT trolley.
- Cut a 1cm wide strip of wafer. It should be long enought to span the injury and anchor to two sound teeth on either side.
- Reduce the avulsion or luxation and check dental occlusion.
- Blot copious blood and saliva; a small amount of moisture will assist with adhesion.
- Remove adhesive backing from a 1cm wide strip of material and mold firmly onto the enamel and interdental spaces for 5-10 seconds without disrupting your reduction.

Courtesy of Tony Skapetis, St Vincent's Hospital NSW

4. Calcium Hydroxide paste

Calcium hydroxide [$Ca(OH)_2$] paste is used to cover tooth pulp ("pulp capping") exposed by an Ellis 3 fracture.

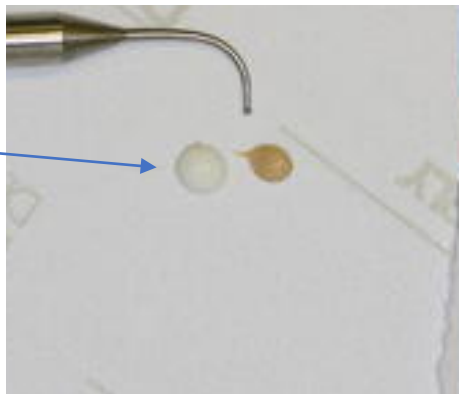
Application of calcium hydroxide is thought to stimulate new dentine formation and preserve the pulp (Carrotte).

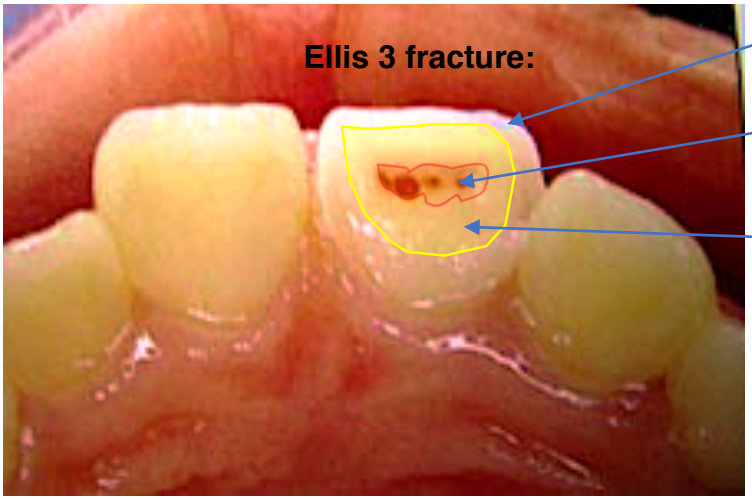
The material is friable and porous
thus the pulp cap and any exposed dentine
of Ellis 2 and 3 fractures must be covered by glass ionomer cement to produce a dressing that is impermeable to air and bacteria.

Calcium Hydroxide is prepared from a two-part mix (base + catalyst) .

<u>Technique (pulp capping of Ellis 3 fractures)</u>:

- Ask the patient to bite gently down on a dental pledget or wad of gauze to stop pulp bleeding while preparing the mix.
- Squeeze out a match head-sized quantity of base and catalyst onto a mixing sheet.
  Only a tiny quantity of each is required.
- Combine using the wooden end of a Q tip until streak-free
- Paint onto the exposed pulp while the mixture is still shiny: it will dry within 20-30 seconds
- Prepare a GIC dressing to cover both the $Ca(OH)_2$ pulp cap and the exposed dentine.





Enamel

Exposed pulp: cap first with $Ca(OH)_2$

Exposed dentine: cover second with GIC

6. Annexe

Antibiotic prophylaxis for patients with cardiac lesions

Prophylaxis against infective endocarditis should be given to patients with the following specific cardiac lesions at the time of re-implantation of an **avulsed tooth**:

- Rheumatic heart disease in indigenous Australians only
- Prosthetic cardiac valve
- Previous infective endocarditis
- Congenital heart disease with unrepaired cyanotic defects OR with 6 months post repair with prosthetic materials
- Cardiac transplant

Oral amoxicillin, clindamycin or cephalexin are most commonly used (see Therapeutic Guidelines http://www.tg.org.au/uploads/PDFs/Prevention%20of%20endocarditis.pdf)

There is no evidence to support the routine use of prophylactic antibiotics in otherwise healthy patients with non-avulsion type injuries to the soft and hard tissues of the mouth. However, if the injury is severely contaminated or cannot be adequately debrided, prophylactic antibiotics should be considered (Walton et al).

7. References:

1. Tintinalli et al. *Emergency Medicine: A comprehensive study 5th Ed*. McGraw-Hill 1999

2. Bastone, EB, Freer, TJ, McNamara JR. *Epidemiology of dental trauma: A review of the literature*. ADJ V45, Issue 1. http://onlinelibrary.wiley.com/doi/10.1111/j.1834-7819.2000.tb00234.x/pdf

3. http://www.dentaltraumaguide.org/Default.aspx

4. Benaifer et al. *Oral and Maxillofacial Regional Anaesthesia*. New York School of Regional Anaesthesia (NYSORA). http://www.nysora.com/techniques/nerve-stimulator-and-surface-based-ra-techniques/head-and-neck-blocka/3420-oral-and-maxillofacial-regional-anesthesia.html

5. Skapetis T and Curtis K, *Emergency Management of Dental Trauma*. Austalasian Emergency Nursing Journal 2010 13, 30-34; Tony Skapetis, Convatec Stomahesive Splinting, personal correspondence

6. Krasner P, Rankow H. *New philosophy for the treatment of avulsed teeth*. Oral Surg Oral Med Oral Pathol 1995; 79:616-23.

7. Andreasen JO, Hiorting-Hansen-E. *Replantation of teeth: I. Radiographic and clinical study of 110 human teeth replanted after accidental loss.* Acta Odontol Scand 1966;24:263-86.

8. Carrotte **, P.** *Endodontics: Part 9 Calcium hydroxide, root resorption, endo-perio lesions.* British Dental Journal **197**, 735 - 743 (2004). Published online: 25 December 2004 | doi:10.1038/sj.bdj.4811897. https://www.nature.com/bdj/journal/v197/n12/full/4811897a.html

9. Australian Therapeutic Guidelines

10. Walton RE, Zerr M, and Peterson L. *Antibiotics in dentistry--a boon or a bane?* ALLIANCE FOR THE PRUDENT USE OF ANTIBIOTICS *Newsletter* 15(1):1-5. 1999 http://www.tufts.edu/med/apua/news/15_1a.html