

Expedition Dentistry.

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Dental issues pose a unique set of problems. Most expedition medics have limited exposure to dentistry, but mouth, gum and teeth problems are common, especially on longer expeditions. Learning how to prevent, recognise and treat them will form the framework of this chapter.

Expedition Dental Risk Factors- Be aware so you can prepare.

Dental problems are common on expeditions. Diets change with an increasing amount and frequency in sugar intake. Participants often have dry mouths with increased respiratory rate and inadequate fluid intake. Oral hygiene often becomes a secondary consideration when people are tired. There may be exposure to extreme cold (or heat) so teeth sensitivity becomes a major issue. Teeth may be subject to trauma e.g. frozen chocolate is a common culprit.

Prevention of these Expedition Dental Risk Factors- Prevention is the best dental treatment.

Prevention is certainly possible for the vast majority of dental issues. Often pre-existing problems suddenly get worse due to the environmental stress, and remember, this can happen to you as well. Three months before the expedition: advise a proactive dental check up with chartings and necessary radiographs. Follow this up one month later and request dental chartings.

In your pre-expedition briefing, reinforce: 1) Two minute brushing twice a day 2) Flossing. 3)Spitting out excess tooth paste, not rinsing

Finally when on expedition, choose the right toothpaste to manage your needs. Table 1

TABLE 1-Expedition Dental Toothpaste- The right one for your needs.

YOUR EXPEDITION DENTAL NEEDS	SUGGESTED TOOTH PASTE	ADVANTAGEOUS DETAILS	POSSIBLE LIMITATIONS
Dentally fit and well.	A)Colgate Total	Triclosan ingredient in it gives long term action	Limited Anti-sensitivity effect
Migratory intermittent dental sensitivity.	A) Sensodyne Rapid Relief b) Colgate Pro-Relief C) Oral-B Pro-Expert	These act quickly by BLOCKING sensitive exposed portion of tooth	Relatively limited shorter duration of anti-sensitive effect
Prolonged history of dental sensitivity.	Sensodyne Repair and Protect	Novamin ingredient in it acts by locating and FORMING a BLANKET over exposed sensitive dentine. Absence of water as one of the ingredients might give it an advantage in extreme temperatures.	Takes a longer time to act. The earlier you start before heading off to expedition the better. The anti sensitivity action is longer and more durable action

YOUR EXPEDITION DENTAL NEEDS	SUGGESTED TOOTH PASTE	ADVANTAGEOUS DETAILS	POSSIBLE LIMITATIONS
Teeth chipping and getting translucent due to increase wear from frequent acid attack and mechanical wear	Sensodyne Pronamel	One of the least abrasive tooth pastes. High fluoride activity. NUMBS exposed sensitive dentine.	Relatively limited shorter duration of anti-sensitivity effect.
Constantly and repeatedly faced with the problem of dental decay.	Duraphat 2800 or Duraphat 5000	Very high fluoride content that reduces rate of dental decay	Available on prescription only
Aggressive Gum disease.	Corsodyl Mouthwash and Corsodyl Daily toothpaste.	Chlorhexidine has proven effect against gum problems. Rigorous oral hygiene maintenance is a must.	30 minutes before and after no exposure to toothpaste or action of chlorhexidene will be neutralised. It also stains teeth by attracting tannins
Tips.	<p>A) All toothpastes</p> <p>B) Whitening toothpastes</p> <p>C) All Antisensitivity toothpastes</p> <p>D) Herbal tooth pastes</p>	<p>A) Spit out excess toothpaste DO NOT rinse.</p> <p>B) Are usually more aggressive</p> <p>C) Avoid mixing, stick to the same type if it works for you. Don't stop once sensitivity is reduced.</p> <p>D) They generally are more aggressive and have a lower concentration of active fluoride for teeth uptake</p>	<p>A) Longer toothpaste stays on teeth the better it acts</p> <p>B) In expedition settings may predispose to increased sensitivity</p> <p>C) By mixing or stopping the protective layer will fade away resulting in sensitivity returning with a vengeance</p> <p>D) In an expedition setting they may have limited protective effect.</p>

What questions help you in the HISTORY?

As in medicine, if you suspect a dental problem, first take a history including:

Previous dental history/ Hopefully you will know this already

Location/ Teeth or gums? Can it be localised at all?

Sensitivity/ To what? Does it disappear immediately when stimulus is removed or does it persist for a few minutes or longer?

Character/ Is it constant or a throbbing ache? Can biting down help localise the correct tooth?

Performing an examination

Lighting/ During the day, position the patient facing the sun and leaning against a good back rest. At night, use head torch within a closed tent. Bugs rarely help dental examinations.

Positioning/ Make life easy and comfortable. Get padding for patient and for your knees. Get a willing volunteer to help you, preferably two. If examining the lower teeth, then position the patient sitting up with lower teeth parallel to the floor, uppers at an angle of 45 degrees to floor. If you are looking at upper teeth then lie patient supine, neck fully extended.

Achieving dryness/ Position multiple cotton rolls on the cheek side of upper first molars (i.e. next to the Parotid duct) under the tongue for the submandibular ducts and to attempt to hold the tongue out the way and on buccal side of the tooth needing treatment.

Rotate head to the opposite of the working side, reducing poolage. Suction is great if you have it, otherwise a rubber camera lens blower can be helpful. Don't forget to use your assistants and ask the patient politely to try to control their tongue

'Any dental procedure is a battle against the relentless waves of saliva and the unwelcome advances of an inquisitive tongue.'

Anonymous BAS Dentist

Equipment/ See the list at end of this chapter

Diagnosis and Management.

Managing these problems will, for the vast majority, be a temporising measure, buying time before the patient can get to a dentist. But seeing as there are rarely 'expedition dentists' coming along with you, then you will likely need to do something.

The most common issues on expedition will be these: -

Caries and Infection

Initial caries, not down to dentine will leave the patient sensitive to cold (less than one minute) with a brown spot (demineralised patch) on tooth. Manage with high fluoride paste (Duraphat) and/or anti-sensitivity toothpastes along with oral hygiene advice. Follow up with a dental hygienist. Dentine caries causes more severe sensitivity and pain with a darker, deeper and soft lesion. Clean away the soft debris and fill the hole with filling material then follow up with a dentist for a formal restoration

Pulpitis / Apical abscess

These cause pain over side of face, prolonged periods of sensitivity, and the patient will be unable to eat on the effected side, though it may be difficult to locate the responsible tooth. There are no proprioceptive receptors in the pulp, only outside. Once it infiltrates local tissues or forms an apical abscess then it will become easier for the patient to localise.

It is likely to have caries, or previous large restorations and may be tender to percussion. If you can, get ice and place it on each tooth. The diseased tooth should respond painfully.

You should seriously consider evacuation. First line of treatment is antibiotics, analgesia, no eating on that side and urgent review. Second line of treatment is Ledermix/ Odontopaste temporary filling (antimicrobial steroid dressing). Finally third line would be tooth extraction though this is a last resort and should be avoided. For follow up – standard UK treatment for this is either root canal treatment or extraction

Abscesses

Severe pain and swelling on a gum. It is very difficult to differentiate between a tooth abscess (a decayed tooth and a dead pulp causing an apical abscess) and a gum abscess (food debris in the periodontal pocket, forming an abscess to point on the gum.)

Management is incision and drainage, trimodal dosing (NSAIDs, paracetamol, opiates) and antibiotics. Follow up with an urgent dentist review for tooth abscess. Gum abscesses should settle with simple management at home but a dental review is still important.

Gingivitis

Bleeding on brushing, mild discomfort from the gums with inflamed friable gums on examination. Remember to always check behind back molars, as debris often collects there. Manage by encourage more brushing, not less, flossing and mouthwashes (see below.) Follow up with a dental hygienist.

Pericoronitis

Severe pain, facial swelling, restricted mouth opening. Look for swelling around and posterior to back molars. Examine thoroughly behind molars and irrigate with mouthwash. Give regular trimodal analgesia and antibiotics. Follow up with a dentist or potentially maxillofacial surgeon.

TABLE 2- Management of Dental Pain

Presenting Symptom	What's Happening	Why is it happening	What can you do
Short episodes of sensitivity to hot and cold	Hard tissue of the tooth is faulty. Gum protection reduced due to recession. Acid damage from decay . Trauma has resulted in a crack of tooth or filling.	Decreased insulation from hard tissue of tooth results in exposing the dental nerves that get overly sensitive	Avoid the stimuli. Protect the teeth from the stimuli topical application of Anti-sensitivity toothpaste, Fluoride varnish, Temporary filling

Prolonged sensitive to hot/cold/ sweet/ sour. This is followed by a throbbing ache lasting for a few minutes	The fault in the hard tissue of the tooth has deepened. Acid damage from decay , infected cracked tooth or filling progressing deeper	With further decrease in insulation the pulp in the centre of the tooth is getting inflamed irritating the nerves. However it is still capable of recovery.	Removal of visible decay and sealing the damage with a temporary dental filling. NSAIDs maybe necessary
Dull throbbing ache difficult to localise.	The acid damage from decay has now reached the pulp lying in the centre of the tooth	Resulting in inflammation of the pulp and build up of pressure within the centre of the tooth. This stimulates the nerves in the pulp , these nerves do not have proprioceptive receptors. Hence pain cannot be localised.	Removal of visible decay and placing a sedative dressing. This could be clove oil. Ledermix, Odontopaste (antiseptic, steroid medication) or eugenol . Antibiotics and NSAIDS . Root canal or extraction would be unavoidable .
Localised tooth ache exacerbated on biting.	The pulp in the centre tooth now dead is necrotic and infected. Infected material spreads out thru apex of root into the surrounding bone.	The products of ischaemic necrotic pulp that leaks into the surrounding bone, stimulates the nerves in the bone. These nerves do have proprioceptive receptors hence pain can be localised	NSAIDS and Antibiotics. Extraction or Root canal treatment is inevitable

TABLE 3- Management Of Gum Problems.

Presenting Symptoms	What's Happening	Why is it happening	What can you do
Bleeding painful gums	Gums are irritated, inflamed, hyperaemic . Hence bleed on brushing and flossing	Poor oral hygiene resulted in food debris collecting on tooth surface irritating the gums	Reinforce good oral hygiene, twice a day brushing and flossing. Daily rinses with chlorhexidene mouthwash or salt water. Topical application with chlorhexidene gel.
Tender tooth with a gum boil.	Exudate from necrotic material originating from gum pocket or tooth pulp has decompressed through a sinus , presenting itself as a gum boil.	A) Gum abscess- Food debris in periodontal pocket forms an abscess to point on the gums. B) Tooth abscess- decayed tooth, dead pulp causing an abscess.	Antibiotics, NSAIDs A)Curettng periodontal pocket to establish drainage and irrigation with chlorhexidene mouthwash B) Incision and drainage. The tooth will need root canal treatment or extraction.

Tender, swollen gums around wisdom tooth with difficulty in opening mouth and bad taste.	Inflammation secondary to necrotic debris associated with trapped food in the pocket between the gums and partly erupted wisdom tooth.	A pocket exists between partly erupted wisdom tooth and gums. Difficulty in cleaning this pocket results in food debris collection with secondary inflammation	Antibiotics, NSAIDs and Chlorhexidine mouthwash. Irrigation of the pocket with Chlorhexidine mouthwash or warm salt water to remove collected food debris
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Preparing for dental issues on expedition

Your preparations for dental issues on expedition will depend on multiple factors. A qualified dentist with good equipment can still perform complex treatments in the middle of nowhere and they regularly do. A non-dentally qualified practitioner working where evacuation might be impossible for prolonged periods might be expected to perform some reasonably complex dental procedures. That, however, assumes that they have had the appropriate pre-expedition training and can get some advice remotely. In the case of smaller trips or where evacuation is reasonably straightforward, advanced training and equipment cannot really be justified. That notwithstanding, basic diagnosis and simple symptom management and will greatly help patients until evacuation or definitive care can be arranged. A way of thinking about the level of dental capabilities we would recommend are as follows: -

<u>TYPE OF TRIP</u>	<u>PRE EXPEDITION TRAINING</u>	<u>DENTAL CHECKS</u>	<u>EQUIPMENT</u>
Short trip, evacuation reasonably quick and straightforward – e.g. Kilimanjaro.	No prior training required, expedition medicine course (with a dental session) advised.	Advise dental checks.	Basic dental kits i.e. a few instruments, some temporary cement and oil of cloves.
Long trip, evacuation likely to be a few days – e.g. Greenland crossing.	Sit with a local dentist or attend an expedition medicine course (with a dental session.)	Strongly request participants have dental checks.	More extensive dental kit plus Duraphat, Ledermix/Odontopaste, matrix bands, local anaesthetic. Preferably some remote access dental back up.
Remote clinic, difficult or impossible evacuation – e.g. British Antarctic Survey.	Formalised dental training course and visit a local Max Fax (or attend an expedition medicine course with a dental session and a Maxillofacial trauma session.)	All participants must have regular dental checks before and during deployment.	Advanced dental kit with basic dental extraction and interdental wiring kit. A reliable remote access dental back up. Radiology and telemedicine capabilities would be an added bonus.

Analgesia

Oral analgesia according to the standard pain ladder is normally sufficient. The need for strong opiates is rare. Use regular trimodal dosing i.e. NSAIDS, paracetamol and opiates.

Anti-sensitivity toothpastes can be used if the patient is experiencing increasingly uncomfortable twinges of pain when having contact with hot, cold or sweet stimuli and an area of a tooth where a temporary filling is not possible. Retaining the toothpaste in that area for as long as practical helps to reduce the sensitivity.

Clove oil on a cotton plug placed into a cavity is often temporarily soothing.

Duraphat – a high fluoride varnish applied to dry tooth surfaces reduces sensitivity.

Local anaesthesia, either as a nerve block or infiltration around the tooth can provide temporary respite.

Odontopaste/Ledermix paste - contains the broad spectrum antibiotic and an anti-inflammatory. This can be used when there is an unremitting pulsating toothache, such as that associated with a large deep cavity, a lost filling, or a loose filling that can be easily be removed. The tooth is cleaned of all the soft debris. Odontopaste/ Ledermix paste is applied to the depth of the cavity, and the cavity then sealed with a temporary dressing eg Cavit.

Antibiotics

Dental infections typically need broad spectrum antibiotics as they are mainly caused by anaerobic bacteria. When in remote locations, strongly consider higher doses than routinely prescribed.

The antibiotics must be used in adjunct to local treatment measures where possible. Where there is a pointing abscess, drain the pus using a wide bore needle, gum incision or extraction of the affected tooth.

TABLE 4

<u>Antibiotics Commonly Used in Expedition Dentistry</u>	
<u>Not Allergic to Penicillin</u>	<u>History of Penicillin Allergy</u>
1) Amoxycillin 500mg + Potassium Clavulanate 125mg (Augmentin/ Co- amoxiclav- 625 mg) OR	1) Metronidazole 400mg + Erythromycin 500 mg
2) Amoxycillin 500 mg+ Metronidazole 400 mg	2) Metronidazole 400 mg + Clarithromycin 500 mg
	3) Metronidazole 400 mg + Azithromycin 500mg
<u>Analgesics/ Anti-inflammatories Commonly Used in Expedition Dentistry</u>	
1) Ibuprofen 400 mg OR	
2) Diclofenac 50 mg	
3) Paracetamol (Acetaminophen) 500 mg can be combined with ibuprofen or Diclofenac	

Mouthwashes

Dental pain may arise from debris collecting in the pocket between tooth and gums due to poor oral hygiene. The inflamed gums appear red and angry, bleed spontaneously to touch, and may smell foul. Mouthwashes could then be used to irrigate and clean the debris from this pocket .

The patient should be encouraged to brush the areas that are tender despite bleeding and discomfort. This mechanical debridement together with mouthwashes will help minimizing the bacteria load between teeth and gums.

- Warm salty water: half teaspoon salt in half a cup warm water, temperature of tea.
- Chlorhexidine gluconate 0.2% mouthwash : 10 ml to be rinsed for 1min to 2 min. Two to three times daily.

Fillings

Temporary filling materials are used to insulate the pulp and make the tooth feel much better. If a tooth is damaged during an expedition - whether through a lost or broken filling, decayed dentine, or cracked or broken enamel - but is not giving symptoms, then a temporary filling can still be useful as a preventive measure. There are two categories of temporary filling materials:

Premixed

Supplied in a sealed tube (e.g. 'Cavit'), They are easier to use and may be placed in a damp but not wet cavity. However they have less structural strength and require a mechanically retentive cavity to stay put. i.e. a hole with walls. The material also erodes and may require replacing .

Materials that require mixing

These include IRM (Intermediate Restorative Material) / Glass ionomer filling materials. These are harder to use but due to their inherent stickiness are more retentive. They are of great use for sticking dental splints following dental trauma.

Consider the following before starting:

1. Isolating and drying the cavity – as above
2. The exact ratio of powder to liquid is critical.
3. Generally you have 1 minute mixing time and then 1 minute working time.
4. Mix on a glass/shiny plastic slab with a flat spatula into a chewing gum-like consistency.
5. Apply and compress into a dry cavity, immediately removing all excess material from the biting surface. A Vaseline coated finger helps in smoothening and shaping the filling.

6. The same glass ionomer filling materials when mixed into a 'double cream-like' consistency can be used for reseating and cementing crowns. After removing excess cement, seal the margins of the cement around the crown, whilst setting, with vaseline to protect from saliva erosion.

Improvised materials

In the absence of temporary dental filling material improvisation may be attempted. A cotton pellet dipped into oil of cloves or Eugenol can be swabbed into the depth of the cavity. The cavity can then be sealed with candle wax, ski wax or sugarless chewing gum. Expect limited success for a very short duration.

Expedition Dentistry Kit List

Instruments

Dental mirror
Flat-plastic spatula (for placing dental filling material onto tooth)
Pair of tweezers or forceps
Spoon excavator (medium) – for scraping out soft dental decay
Cement mixing spatula
Glazed mixing paper pad

Medicaments

Temporary filling materials - Glass Ionomer or Intermediate restorative material (IRM), Cavit
Chlorhexidine 0.2% mouthwash
Duraphat (high fluoride varnish)
Odontopaste/Ledermix paste
Antibiotics – Amoxiclav 625 mg mg, Metronidazole 400mg
Painkillers – Ibuprofen, paracetamol, codeine-phosphate
Dental local anaesthetic cartridges- 2% Lidocaine with 1:80,000 adrenaline
Eugenol (oil of cloves) Topical Analgesic

Others

Sterile gloves
Cotton wool
Dental syringes – 27g long needle (can be used in upper and lower jaw)

Dental Extraction Equipment for the experienced

Upper single root extraction forceps

Upper molar extraction forceps left and right

Lower molar extraction forceps

Lower single root extraction forceps

Fine Luxator or Elevator-Coupland

Dental Trauma

TABLE 5- Dental Trauma summary guide for decision making and initial treatment.

Injury	Description	Findings #	Management*	Prognosis ^
Concussion	Minor impact. Slight bruising and oedema. Little disruption to pulp/nerves.	Painful+. Not wobbly. No blood.	Nil specific. *	Very good. <5% pulp death.
Subluxation	Minor impact. Disruption to supporting structures (periodontal ligament.)	Painful ++ Wobbly + Gingival margin bleeding +	Suture lacerations. May need to file opposition tooth if it causes pain on biting. Consider splinting for comfort.	Good. 10% pulp death at 5 years. (If tooth is insensitive at time of injury, risk increases to 25%)
Extrusion	Moderate transverse impact. Very wobbly but has not left socket. Significant damage to supporting structures and likely damage to NV supply.	Painful ++ Wobbly +++ Gum margin bleeding +++	Clean any exposed tooth and suture lacerations. Replace tooth in socket and splint 2 weeks.	50% risk of pulp death at 5 years.
Lateral luxation	Normally severe anterior transverse impact, but can occur with forceful pull of something the patient is biting. Tooth root displaces with apex lodging into labial alveolar bone fragment fracture. Tooth becomes abnormally angulated in socket.	Painful + Normally immobile Bleeding ++ Tooth often not too painful or sensitive as there is loss of pulp neurovascular supply. Sensitivity is a good sign here.	Clean. LA normally required to replace tooth and bone fragment. Splintage for 4 weeks.	50% risk of pulp death at 5 years.
Intrusion	Uncommon. Severe longitudinal impact. Tooth	Painful+	Difficult. Do not attempt	Gradual orthodontic

	rammed into alveolar bone. Normally associated with small fractures.	Impacted so not wobbly. Bleeding + 'Shorter' tooth. Likely to be 'insensitive' due to loss of NV supply.	manual repositioning. Clean tooth. Suture gum lacerations.	or surgical repositioning may be required. Pulp death virtually guaranteed (but tooth may be retained.)
Avulsion	Severe oblique/transverse impact. Complete loss of the tooth. Relatively common.	Bleeding+++clot Consider fractures of the alveolar bone and damage to the other teeth. Examine the other teeth carefully.	See below and the slides for detail. Time out of physiologic media (dry time) is key.	Pulp death is certain so root canal treatment at 1 week (approx.)

#Findings- sensitivity should be tested with all teeth. Insensitive teeth have over double the risk of pulp death.

***Standard Management**- all dental trauma will need analgesia, soft diet, careful oral hygiene with a soft brush and regular chlorhexidine wash (if available) and a formal dental review with Xrays on their return home.

^ **Prognosis** estimates generated from dentaltraumaguide.org. but prognosis is always difficult. Dentists will all tell of teeth they thought would survive but didn't and vice versa. Prognosis is significantly worse if associated with an insensitive tooth, poor dental hygiene or concomitant tooth fracture. Also REMEMBER pulp death does not necessarily mean the tooth will fall out. The tooth may still remain in place but will probably require root canal treatment if the pulp dies.

Associated Tooth Fractures

Enamel only 'chipped tooth'/ Assess for luxation injury as above. Sharp edges should be filed. If you have good resin you could build up a restoration but often this is more trouble than it is worth on an expedition. A drop of surgical glue can be used to cover exposed tooth to reduce sensitivity.

Crown and/or root no pulp/ The fragment will lose sensitivity and, if mobile, should be gently removed. Then just like a lost filling, a new cement filling should be placed.

Crown and /or root with a pulp fracture/ This will be tender on percussion and the fracture line will either extend below the gingival margin or be invisible as it is at the level of the root. Without Xrays it is virtually impossible to distinguish this from subluxation/extrusion. If undisplaced, it should be left alone, splinted and dealt with upon return. 2 weeks untreated will not really affect the prognosis. If the fractured fragment has been avulsed, cement the fragment back on and splint.

Alveolar fracture/ This is a fracture of the alveolar part of the maxilla or mandible bone and will likely involve 2 or more teeth. This will be fairly obvious, normally involving more severe trauma, gingival lacerations and two or more teeth moving together. Use local anaesthetic if you have it. Once restored to normal position by simple manipulation, a longer splint will be required and a dental surgeon will need to be consulted in the next few days

Dental Avulsion: Reimplantation of a Tooth That's Been Knocked Out.

Reimplantation stands a worthwhile chance of success (up to about 80%) if the accident occurred within the past hour and the tooth was stored correctly. Teeth displaced for over than an hour are much less likely to recover (<20%.)

The Laws of Tooth Transport

1. The best way to carry the tooth after avulsion is in the mouth (to clarify, the patient's mouth) —saliva is reasonably isotonic, is at body temperature, and the presence of friendly commensal bacteria and protein matrices will help control the risk of infection. It should be stored in the cheek to avoid accidental swallowing.
2. Never handle the avulsed tooth by touching the root (it is still covered by fragile, potentially regenerative connective tissue cells) always handle using the enamel i.e. the white bit at the end.
3. Tooth and root must both be gently cleaned for about 10 seconds, not scrubbed, in physiologic medium (e.g. milk, saliva, saline) prior to reimplantation.

Preparation for Reimplantation

Your working environment/ Positioning for yourself and the patient; appropriate location, excellent lighting, assistance etc

Available equipment/ Ideally the affected tooth is splinted to the teeth on either side of it by means of a wire stuck on with filling material. We would advise getting hold of some appropriate splinting material if you can from your MaxFax dept or local dentist if you ask nicely. It is very light weight and very small. The alternative is a temporary measure – use cyanoacrylic tissue adhesive (wound glue) with supplementary steristrips if needed.

Assess strength of adjacent teeth/ Strong solid adjacent teeth will be able to support the avulsed tooth on their own. If the supporting teeth have been concussed or subluxed, more teeth may need to be involved in the splint.

Examine for clot in the socket/ This will need to be removed prior to reimplantation

Consent/ Talk your assistant and the patient through what you are going to do.

Local anaesthetic/ If available, discuss with patient and use it.

The Process

1. Create a splint by cutting a suitable metallic material (a paperclip, folded foil, nose clip from the oxygen mask/ surgical face mask) to an appropriate length. Its length could equate to one or more teeth on either side of the recently avulsed tooth. If several teeth are loose, use a longer wire. Bend the wire to a suitable curve. See pictures.
2. Remove the displaced tooth from the saliva.

3. Briefly rinse the tooth (10 seconds) in saline but previously boiled and cooled water may have to do.
4. Remove the clot and clean the socket. This allows you to firmly embed the root full depth into the socket.
5. Stimulate bleeding gently as you clean the socket down to the base. This will improve the chances of healing.
6. Re-insert tooth to its full depth within its socket so that it stands at a level height with the adjacent teeth.
7. Hold in position until haemostasis is re-achieved—typically 4–8 min. This can be achieved by patient gently biting on a wooden spatula, ice cream stick or thin card folded multiple times.
8. Make sure the teeth are dry.
9. Attach the splint wire to the displaced tooth and its neighbours using white filling material (Glass Ionomer.)
10. If you have no dental filling materials, an alternative but weaker bond can be made by sticking the tooth to its neighbours with cyanoacrylate skin adhesive such as Liquiband or Dermabond.
11. Prescribe analgesia and a broad-spectrum antibiotic for at least 7 days. Doxycycline is a reasonable first line treatment, cheap and should be in most expedition drug kits. Clorehexidine mouthwash or gel twice a day for a week.
12. Ensure diligent oral hygiene after every meal with a soft brush even though it will be difficult and uncomfortable. Soft food for up to 2 weeks.

Follow up

The patient will need to attend a dentist within a week of injury for root canal treatment. The pulp is dead but the tooth may still survive functionally with good follow up. If this is impossible due to environmental issues we suggest a dental review as soon as possible. Attempt should be made to preserve the splint until the dental review.

DENTAL LOCAL ANAESTHESIA

Dental local anaesthesia is administered using a 'dental syringe', a piece of equipment that many will be unfamiliar. It's advantage is the excellent control it gives down deep holes such as the mouth. It also has specific screw-on long, thin needles and purpose built cartridges of lignocaine and adrenaline. It's disadvantage is that it is a lot of extra kit and requires a little practice to use effectively. If your expedition is large and lengthy it is a piece of kit worth taking along.

No specific dental kit? Here are the options.

Standard needle and syringe/ Can be used but it will be more difficult for blocks towards the back of the mouth. The standard short 25g orange needle is not long enough for inferior alveolar block and the blue 23g needle, while more painful and slightly more risk of causing direct damage to the nerve, should be able to reach it.

Topical anaesthetic agents/ Such as Xylonor 5% lignocaine gel to numb the oral mucosa for injections. Again this may well not be carried in your kit. EMLA cream, a commonly used lignocaine and prilocaine mix, is not licensed for the use on oral mucosa or wounds but a number of studies have demonstrated its efficacy and safety (Vickers et al 1997, Larijani et al 200). It can be applied to the mucosa under gauze for approx. 20-30 minutes. The absorption of the drugs is greater than when applied to unbroken skin but has still been shown to be far lower than toxic thresholds. That notwithstanding, it is advisable to be very conservative with the dose of anaesthetic used for the block if EMLA has been used to numb the mucosa. Luckily the amount required for any given dental block will be small.

Also it is recommended to use adrenaline (epinephrine) which will reduce the systemic spread of local anaesthetic even further. You can mix your own quite easily. Add 50mcg into 10ml of 1% lignocaine and you will have a 1:200,000 adrenaline mix. 50 mcg is 0.05ml of 1:1000 adrenaline (the 1ml ' anaphylaxis' ampoule) or 0.5ml of 1:10,000 (the 10 ml ' arrest dose' ampoule.)

Anatomical considerations for dental local anaesthesia- To block or infiltrate?

Mandibular molars require nerve block. They are held in very thick bone which will not be affected by infiltration.

Maxillary bone and the front of the mandible bone (up to the first premolar) is porous and therefore injected anaesthetic infiltrates around the affected tooth. For tooth extractions infiltration on both sides (buccal/labial and palatal) will be required.

Aim for the apices of the roots of the teeth which will be approximately 20mm from the occlusal surface (the biting end) and remember canines are longer ~ 30mm.

At the front of the mouth there is little room for anaesthetic volume so infiltration should be slow or it will be extremely painful, especially on the palatal side.

Mandibular (inferior dental) nerve block

The mandibular branch of the trigeminal nerve becomes the inferior alveolar nerve and runs within the mandible bone itself. It enters along the medial aspect of the ramus through the mandibular foramen, supplies all the teeth of the lower half of the jaw and then exits the mental foramen supplying cutaneous sensation to the lower lip and chin. Before it enters the bone, it throws off two relevant branches, the buccal nerve and then the lingual nerve. For the purpose of dental extraction it is desirable to block these nerves as well.

Complications are rare but worth considering:

Toxicity By direct intravascular injection can easily be avoided by aspirating prior to injection.

Neurological complications Short lived but will cause considerable anxiety if the patient and the medic are unprepared for them. Anaesthetic agent may affect the facial nerve causing a palsy, or even effect the optic nerve. Unfortunately the classic 'electric shocks' warning the clinician of direct

contact with the nerve occur in only about 5% (Smith, Lung. J Can Dent Assoc, 2006) and barbing of a needle may occur when hitting the mandible bone causing damage to the nerve as it is withdrawn. Larger needles are more likely to cause damage and careful assessment of the anatomy is key to avoiding problems.

As with any procedure, we would strongly recommend that consent is gained from the patient with a discussion of the risks and time should be taken getting some experience with a dentist or in-hospital maxillofacial department.

The Procedure

Preparation/ Kit, gloves and informed consent.

Position/ Stand in such a way that you can see clearly where you need to inject. Ask the patient to open mouth as wide as possible. If operator is right handed position yourself behind patient to anaesthetise the lower left quadrant and in front of the patient for the lower right.

Target/ Understand and visualize that you are aiming to place LA just above canal entrance (lingual.) Find the intersection of the horizontal line (height of injection) and the vertical line (anteroposterior plane) on the medial aspect of the ramus.

Height of Injection/ Put your thumb beside the last molar tooth. Feel the jaw bone as it turns upwards to the head. Rest your thumb in the depression there - the coronoid notch. It is about 6-10 mm above the occlusal table of the mandibular teeth. That defines your horizontal plane.

Anteroposterior plane/ Find the Pterygomandibular raphe (the muscular pillar that connects the lower third molar region to the upper third molar region) and go just lateral to it.

Angle of approach/ Approach from over the contra-lateral premolars which will be a 45 degree angle. Angle the needle backwards towards and just above the lingula.

Retraction/ Using the non-dominant hand to retract the cheek with your thumb positioned in coronoid notch of mandible as above and index finger along the posterior border of the mandible from outside the mouth.

Depth/ Make a visual note on the needle of 3cm. The needle should gently touch bone at 3 cm deep. Too shallow indicates you are in front of the lingula and in the wrong place. Too deep and the needle will be passing towards the posterior aspect of the mandible and all the vital neurovascular structures that will be waiting.

Aspirate and Administer/ Check you are not in a blood vessel –if you are, reposition the needle and reaspirate. Once you are happy, deliver a full cartridge slowly over one minute.

Withdraw/ Continue to inject slowly on withdrawing to anesthetize the lingual branch.

Consider Anaesthetising the Buccal Branch/ To perform a long buccal nerve block, inject another cartridge of anesthetic into coronoid notch region of the mandible in the mucous membrane distal and buccal to most distal molar.

Watch and Wait/ Wait for a clear indication of anaesthetic effect to the midline of the mandible and full length on the side of the tongue. This may take seconds or minutes. Commence when there is a clear sensory distinction across the mandibular midline.

Dental Extractions

When you are in a remote area and a great distance from help, in special circumstances this can be contemplated to avoid evacuation. It may also be an emergency procedure when evacuation is not likely in the near future. It is highly recommended that appropriate training and practice has been done prior to departure.

Indications for extraction under these circumstances would include

Loose teeth associated with a dental abscess/ Extraction of which would provide drainage and relief of pressure pain.

Loose teeth on side of a jaw fracture/ That are preventing reduction and haemorrhage control.

Excruciatingly painful tooth/ That can't be made pain free medically but responds well to LA and is within your skill levels to attempt extraction

Procedure for Tooth Extraction

Position/ Upper Extraction- You stand in front and to the right of the patient.

Lower Extraction- You stand slightly to the back and right of the patient

Support/ Head and Jaw must be well supported

Elevators (look like flattened screwdrivers)/ These are wedged in the ligament space between tooth and surrounding bone. They are used as levers to compress the soft bone around the tooth thus increasing the size of the socket. This increases the tooth mobility allowing the forceps a better purchase.

Forceps/ All forceps are made such that their beaks would be parallel to the long axis of the tooth. This allows force to be applied precisely along that long axis, as tangential force will increase likelihood of tooth fracture.

Lower Forceps /Have a sharp bend to allow the above without damaging the lower lip

Upper Forceps/ Are straighter as they can achieve the above without the need of a sharp bend.

Direction Of Force/ A) Firstly would be towards the root. To push the beaks of the forceps as far towards the root apex, below the gum margin as possible. This lowers the center of rotation decreasing force on root apex reducing likelihood of root fracture. B) Then exert pressure towards the cheek/lip followed by pressure towards tongue/palate. It's like removing a tent peg from the ground, by moving it back and forth to widen the hole in which it is lodged. Using this slow but firm focused force the tooth is slowly rotated out following the line of least resistance.

Pressure Pack/ Within five minutes of extraction advise patient to bite hard on a small firm pack of cotton roll or absorbent paper placed over the socket to achieve hemostasis for at least fifteen minutes.

Post Extraction Patient Instructions

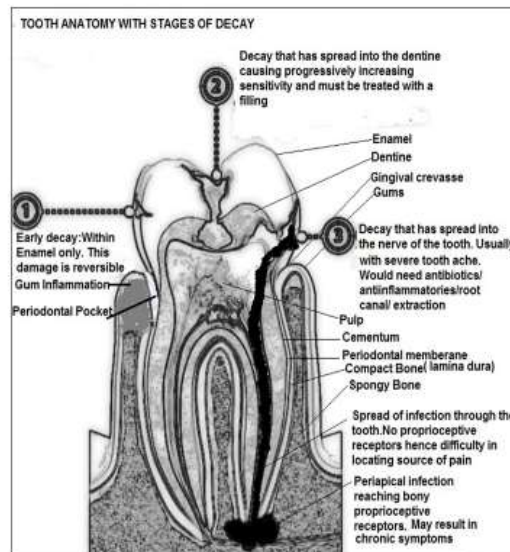
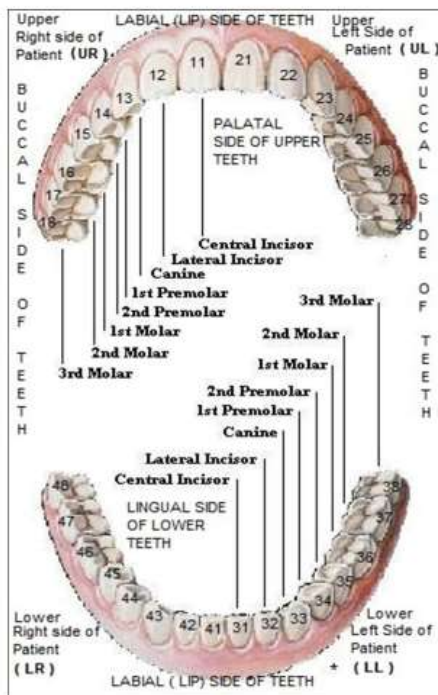
Fifteen to Thirty minutes/ Gently rotate out the pressure pack

Twelve Hours/ Avoid eating anything hot/hard.

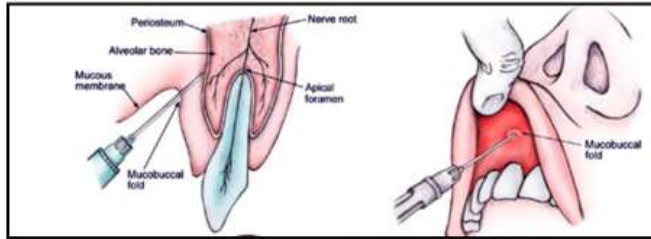
Twenty Four hours/ Avoid vigorous spitting, rinsing and smoking

Oral Hygiene/ Mouth washing, gentle brushing after every meal strongly advised even though this may be uncomfortable.

A GUIDE TO DENTAL CHARTING



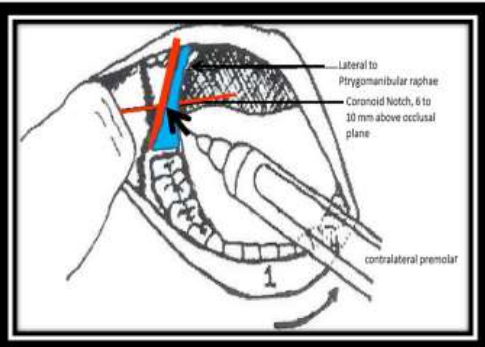
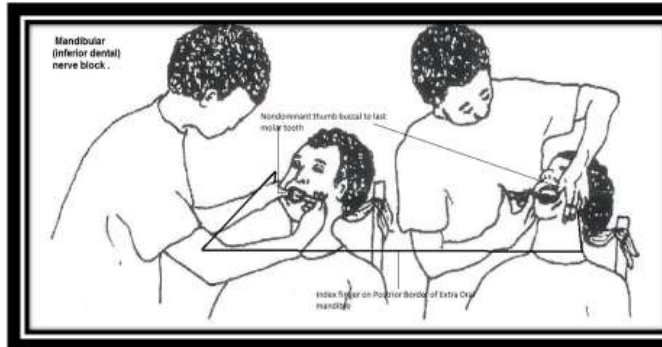
A Guide On How To Give Dental Local Anaesthesia.



Infiltration Technique of Dental Anaesthesia-
Where Cheek gum meets tooth bone.
Aim for the apices of the roots of the teeth which will be approximately 20 mm from the occlusal Surface (the biting end)

Operator Position to Give Mandibular Block

Horizontal And Vertical Landmarks And Angle Of Approach



A Guide On How To Do A Temporary Dental Filling.



1. Dental Excavator- use to clean soft leathery debris from cavity.
Cleaned using **CONCAVE** side
not CONVEX side

2. Now Clean the soft cheesy decay From the cavity. This is done **AWAY** from the pulp of the tooth.
FROM Hard tooth structure TO Soft debris. Gentle Superficial spooning, removing small bits at a time.

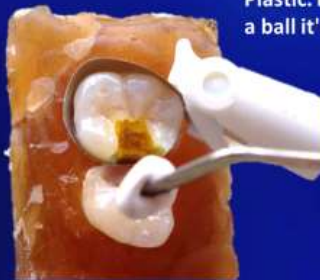


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3. Take some Cavit on Flat Plastic. If hard roll into a ball it'll soften.

4. Pat, Press and shape with finger. If filling too Sticky, coating the finger with Vaseline helps



A Guide On How To Reimplant And Splint An Avulsed Tooth.



1. Remove blood clot gently to allow full insertion of tooth, Stimulating bleeding to help in healing



2. Gently flush the tooth clean for approximately 10 seconds. Holding the tooth by the crown NOT touching the root



3. Push the tooth slowly with slight digital pressure (Do not use force) to its full depth within its socket so that it stands level height with the adjacent teeth . Hold in position until haemostasis is re-achieved typically 4-8 min.



4. Try to adapt the splint(Nasal clip from face mask) on the Mid surface of the tooth between gum line and the top of the tooth. Length of splint is one or more teeth on each side of the damaged tooth. Fix the splint to the teeth with dental filling material (Glass Ionomer)



A Guide To Dental Extraction Forceps.



Lower Anterior forceps with fine beaks are used to extract lower incisors, premolars. All these teeth have one root. Beaks parallel to long axis of tooth. Acute angle in Forceps allows this without pressing on Lower lip



Upper Anterior forceps with fine beaks are used to extract maxillary incisor to premolar teeth . They are straight or slightly curved forceps. Beaks parallel to long axis of tooth.



Lower Molar forceps have pointy beaks that fits in the furcation between the front and back roots of the molars. Can be used on the right or left side.



Maxillary Right Molar Forceps

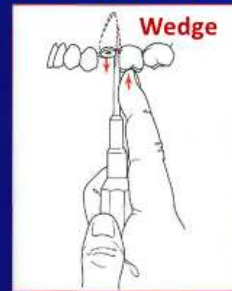
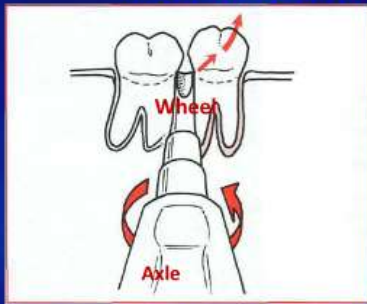


Maxillary Left Molar Forceps

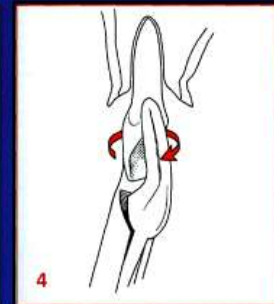
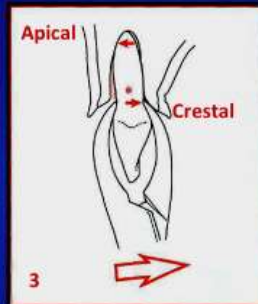
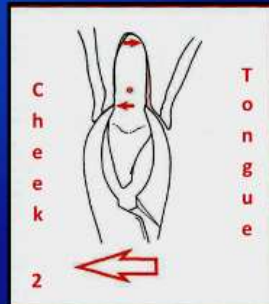
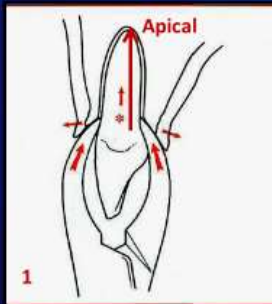


Upper Molar Extraction Forceps are also relatively straight (compared to lowers). The buccal(outer) beak of each forceps has a pointed design, which fits into the buccal(Cheek side) bifurcation of the two buccal roots. Remember pointy bit outside, roundy bit inside ☺

A Guide To Dental Extraction Using Elevators and Forceps.



The Elevator acquires a contact point on the root surface as a wedge . The handle serves as the axle and the tip of the elevator acts as a wheel and engages and loosens the tooth.



First Pressure is strong apical pressure to expand bone and to displace centre of rotation as apically as possible. Then buccal (Cheek) or labial (Lip) pressure is applied to tooth. This will expand the buccal cortical plate toward the crestal bone with some lingual (Tongue side) expansion at apical end of the root. Then Lingual (Tongue side) or palatal (Roof of Mouth side) pressure is applied . This will expand lingual cortical plate at crestal area and slightly expand buccal bone at apical area. Tooth slowly rotated out following the line of least resistance