Top tips for the immediate management of dental trauma

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Introduction.

Traumatic dental injuries to the permanent dentition are estimated to have a global prevalence of 15.2%.[1] This equates to potentially over one billion people living today having experienced dental trauma.

The immediate management of dental trauma impacts the prognosis of the affected structures, and therefore the outcome. This is of particular note when the periodontal ligament and pulp sustain severe injuries, more likely to have long-term sequelae and complicating management.

Given the unplanned nature associated with immediate trauma management, it is crucial that clinicians are well versed in appropriate management strategies and/or can quickly access current best practice guidance.

This article aims to provide key tips for the successful management of trauma affecting permanent teeth.

1. Be informed

There are several relevant resources for trauma management, and up-to-date best practice guidance is free to access in the public domain. Online resources are frequently updated, and it is recommended clinicians likely to manage dental trauma consider incorporating regular guidance review into personal development plans.

The Dental Trauma Guide website[2] contains links to the 2020 International Association of Dental Traumatology (IADT) guidelines[3] and detailed management steps for all types of dental trauma.[4,5,6] ToothSOS[7] is a mobile application and Dental Trauma UK[8] another site providing guidance for both clinicians and patients.

As the pulp is often affected in dental trauma, it is recommended that clinicians be familiar with both the American Association of Endodontists' consensus statement from 2008 (regarding diagnostic terms used in endodontics)[9] and the 2021 European Society of Endodontology position statement on the endodontic management of traumatised teeth.[10]

Traumatic injuries can result in teeth remaining in aberrant positions. For example, an intruded tooth may fail to spontaneously re-erupt, or a displaced tooth may cause an occlusal interference. Orthodontic colleagues may be called upon to reposition and realign traumatised teeth in which case the 2020 'Guidelines for the orthodontic management of the traumatised tooth'[11] are of value.

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Not only is information available, but online videos, such as those provided by Dundee School YouTube page,[12] guide clinicians on practical skills (eg placing a dental splint).

For gathering the key information needed during emergency trauma management, developing and using a *pro forma* has been shown to aid in data capture when used for referrals.[13] The use of *pro formas* can enhance the reliability and standardisation of dental trauma patient assessment. In designing a *pro forma,* it is important General Dental Council[14] and medicolegal requirements are met.

2. Screen for medical injuries and safeguarding concerns

If medical injuries are suspected, an urgent referral to Accident & Emergency (A&E) or oral and maxillofacial surgeons (OMFS) is recommended. It is advisable to have awareness of the local A&E department location, contact details and urgent referral pathways.

Injuries which are not life-threatening/severe can potentially wait until initial dental trauma has been stabilised as this is likely to enhance the treatment outcome. Stabilisation is often best done by the patient's registered dentist in accordance with IADT guidelines, prior to referring for a second opinion and/or management in a specialist dental centre (to a paediatric, restorative or endodontic specialist), if this is needed. Severe dental trauma may require referral; less serious injuries rarely do.

In screening for urgent medical injuries, the 'ABCDE approach' as per Resuscitation guidelines[15] can be used. Key injuries to screen for and rationalisation are summarised in Table 1.

Unfortunately, some dental trauma injuries are associated with non-accidental injury (NAI) and/or intimate partner violence (IPV), defined as 'any behaviour within an intimate relationship that causes physical, psychological, or sexual harm to those in the relationship'.[18] A recent review of IPV found twice as many women were identified as victims when healthcare professionals enquired regarding abuse.[19] Figures from England and Wales estimate 2 million adults aged between 16–59 experienced domestic abuse in the year ending March 2018.[20]

Be aware of injuries which appear suspicious – for example, perhaps the injury history and the injury itself do not sensibly align; the person or their accompanying persons behave outwith the norm (eg a particularly overbearing partner). It can be helpful to see the patient unaccompanied which is sometimes difficult to achieve; however, when taking radiographs, accompanying persons must leave the room and this opportunity may be used to ask safeguarding questions.

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The National Institute for Health and Care Excellence recommend frontline staff know the signs to look for and are prepared to have a brief intervention with patients if there are fears abuse may have occurred. A helpful tool to use is 'Ask Validate Document Refer'[21] as summarised below:

- **Ask**: If concerning signs are noted or suspicion raised, **ask** the patient. This opens up the floor, inviting the patient to talk
- **Validate:** If patients reveal abuse, **acknowledge** the wrong that has been done to them, let them know it is not their fault
- **Document:** Records must be **complete and contemporaneous**, and may be used later in court. If consented to, **photographs** can be useful
- **Refer**: **Referral** to local social services, appropriate shelters, or police, if necessary, may be required.

Abuse and IPV is a very serious concern. This article cannot cover it in its entirety; seeking relevant safeguarding CPD for the benefit and welfare of all patients, and colleagues, is recommended.

If there are immediate concerns regarding the patient's safety, police may need to be involved. If there is reason to believe a person is in immediate danger, or that person is a danger to the public, it is recommended the police be called, dialling 999, if necessary. The General Dental Council Standard 4.3.1 acknowledges this.[14]

3. Be prepared clinically: consider a 'trauma tool kit'

For clinicians likely to manage immediate trauma cases, it can be helpful to have a 'trauma tool kit', enabling appropriate equipment to be quickly available chairside. Such tool kits can be developed with reference to guidelines.

As dental trauma cases can involve prosecution, taking photographic records is advised and many patients can supply pre-injury and injury photographs from their mobile phones, if the dental clinic does not have photographic facilities.

4. Aim to stabilise, preserve and protect tissues

Stabilising injured tissues involves prioritising the health and healing of the pulp and periodontal supporting apparatus. Favourable outcomes are when repair (ie scar tissue) or regeneration of tissues occurs, ideally the latter.

If the pulp is exposed, encourage healing by placing a material likely to stimulate this. Today, calcium silicate cements (CSCs) are recommended and available in pre-mixed formulations such as Biodentine. Use of biocompatible and bioactive CSCs and prevention of microbial contamination increase the likelihood of successful pulpal recovery. Use of a dental dam (if the pulp is exposed) is important to reduce the risk of microbial ingress and facilitate the use of sodium hypochlorite irrigation. Following placement of a CSC, an adhesive restoration should be placed. In some cases of pulpal exposure, partial pulpotomies are indicated (detailed in IADT guidelines) and are associated with high success rates.

Teeth which have been moved in position need the periodontal supporting apparatus stabilised. This will involve repositioning and retaining the tooth or teeth in their pre-injury position with a splint. Stabilisation in a harmonious static and functional occlusal relationship is key.

Root fractures must be stabilised in this way also, via splinting, to encourage the fracture site to heal. Splints should be placed so as not to interfere with periodontal tissue healing, the occlusion or oral hygiene practices.

In considering protection, it is of note that the use of custom-made mouth guards for contact sports appear to significantly decrease the risk of orofacial trauma, as does early orthodontic correction of overjets of >6 mm in 6–13-year-old children.[22] Each of these prevention strategies are recommended for routine use, where appropriate.

5. Splinting and maintaining aesthetics

Splinting aims to stabilise the tooth in the pre-injury position and be easy to place and remove.[23] In some cases, ascertaining the pre-injury tooth position is challenging; radiographs and recent 'selfies' may be of help. Mixed dentition cases can be more complex to splint and if needed, advice sought from specialist centres; however, teeth sufficiently loose to be an aspiration risk must be managed as a matter of urgency.

Once in place, a splint must reliably stay *in situ*, avoiding undue stress on the tooth or periodontal ligament and allow for

Table 1 Relevant non-dental injuries

Injury	Reason for concern	Signs/symptoms
Head injury	Can be life-threatening and neurologically disabling[16]	Assess for:
		- Altered mental state/confusion
		- Ask if patient has vomited and/or loss of consciousness
		- Clear fluid from the nose or bleeding from the ear
		A positive response to any of the above, indicates a possible head injury and urgent referral to A&E is indicated
Overdose	Trauma injuries are often painful and maximum analgesic dose may have been exceeded, which can be life-threatening	An accurate analgesia history, regarding the type, timing and dose, along with a full medical history should be taken
		If overdose is suspected or known, contact the local A&E department for advice. Whilst awaiting medical advice, stabilise the dental injury
Facial fractures	Diagnosis allows timely referral to OMFS and appropriate management	Mid-face: screen for visual disturbances and changes to face shape. Asymmetries may not be obvious due to swelling; however, if a patient has a significant mid-face swelling, OMFS assessment is recommended
		Ask the patient regarding visual changes, particularly double vision, restricted eye movement, or pain on upward gaze. If a fracture is suspected, contact OMFS
		Mandible: malocclusion and step deformities can indicate a compound fracture of the mandible requiring prompt surgical management. Liaise with OMFS urgently
		Distinct mandibular fractures and le Fort fractures have been reported as having a greater association with dental injury than zygomatic arch or complex fractures[17]
Facial lacerations	May require closure	If a laceration is not actively bleeding, initial dental first aid to stabilise the dental injury can be carried out, particularly if the dental injury is time-sensitive (eg replanting an avulsed tooth)
		Lacerations with profuse bleeding, altered sensation, or vast amounts of debris in the wound are best referred to A&E

functional tooth movement. To achieve this, evidence supports the use of flexible composite and wire splints (wire diameter less than 0.4 mm).[24,25]

Where teeth have been avulsed and lost, it is important to maintain aesthetics and the edentulous area (preventing drifting and tilting of neighbouring teeth), until definitive restoration. A 'Flipper' (partial denture replacing one or more teeth and clasping molars) or Essix retainer with pontic can be quickly made and effectively maintains the space and aesthetics.

6. Recognise more serious dental trauma injuries

Those injuries most damaging to the pulp and periodontal tissues are luxations, particularly lateral and intrusion, and avulsions. These injuries are most likely to develop challenging long-term sequelae which must be monitored for (discussed later).

Those teeth which have been avulsed or intruded and have complications, and teeth with cervical or crown root fractures, are those most likely to be lost.

7. Follow-up and further planning

Having dealt with immediate trauma stabilisation, longer-term planning must take a more holistic approach, including discussing patient expectations. The IADT guidelines provide follow-up schedule advice and possible complications arising from the trauma itself.

In the longer term, the general oral condition must be considered and in particular aesthetics, function and prognosis of traumatised teeth. If teeth have a guarded or poor outlook, whether from trauma, caries or periodontal disease, factors in relation to tooth replacement must be assessed. This will include consideration of patient age, caries and periodontal status and risk, smile line, gingival phenotype, occlusal factors, the chances of further trauma, and the position and number of teeth likely to be lost. Specialist input may be of help if loss of several teeth is anticipated.

8. Shared decision-making and consent

To maximise the trauma outcome, accurate diagnoses, effective management and prediction of prognosis is needed. These must be discussed with the patient in an understandable manner. Any treatment must be with the informed consent of the patient, or where necessary, the patient's advocate. Medicolegally, advice on the diagnosis, reasonable treatment options and associated risks/benefits must be discussed and documented, along with referral arrangements, if relevant.

The Scottish initiative Realistic Medicine[26] is a useful resource regarding shared decision-making. This aims to help clinicians and patients communicate effectively about options. Patients may find the simple questions about treatment options particularly useful.

Following healthcare consultations, patients' retention of information is known to be low;[27,28] this, coupled with a stressful trauma event, means that patients may not be receptive to information. It is therefore sensible to

Table 2 Sequelae of traumatic dental injuries

Tooth colour changes	Rationale	Previous injury	Management
Yellow/brown clinical crown	Usually associated with pulpal obliteration	Luxations	Sensibility test. If pulp is vital, monitor only +/- improve aesthetics
			If pulp is non-vital, endodontic treatment more complex Magnification required
			Consider specialist referral
Grey clinical crown	Blood products from pulpal haemorrhage	Luxations	Confirm loss of vitality, endodontically treat and improve aesthetics.
		Avulsions	Alternatively, extract
		Complicated crown fracture	
Pink area in clinical crown	Shine through of invading tissue, usually from external cervical root resorption (ECRR)	Aetiology unclear but associations with previous trauma reported[29]	If very soon after trauma, may indicate tooth revascularisation. Monitor, frequently review, should reverse within days or weeks
			If several months/years after trauma and accompanied by subgingival cavity/defect, suspect ECRR. Refer urgently to specialist centre (endodontic, restorative or paediatric dentistry)
Loss of pulp vitality	**Rationale**	**Previous injury**	**Management**
More likely to arise in closed apex cases	Healing (repair/regeneration) capacity of closed apex teeth is less than that of open apex, younger teeth	Luxations	Identify loss of vitality as soon as possible and endodontically treat
	Injuries which stretch (displacements) or sever the neurovascular bundle at the root end predispose to loss of vitality in closed apex cases	Avulsions	If a complex case (eg horizontal root fracture and coronal portion is non-vital), consider specialist referral for coronal segment to be managed as though an open apex is present
	Even in less severe injuries, traumatised teeth which remain intact may have unseen cracks present which admit biofilm and can lead to deterioration of pulp	Complicated crown fractures can challenge pulp survival	
	In fractured traumatised teeth, exposed dentine tubules and pulp can suffer microbial invasion		
	Root fractures where the segment coronal to the fracture has been displaced are more likely to lose vitality		

reiterate prognosis and long-term sequelae advice at follow-up appointments and consider sending summary letters or producing relevant patient information leaflets.

9. Sequelae

Ongoing clinical and radiographic monitoring is advisable because complications can arise more than ten years after injury. Teeth with closed apices are more likely to have complications (Tables 2 and 3).

10. Summary

Many clinicians work in dental settings where patients sustaining trauma can present; however, this may be infrequent, heightening stress when dealing with trauma.

To support trauma management, consider displaying trauma management pathways in the clinic. For example, a flowchart with web links to best practice guidance; warning signs indicative of more serious medical injuries; contact numbers for local A&E, OMFS and other dental specialist services.

The use of a *pro forma* can encourage robust and thorough trauma assessment, as well as be an educational tool. Having a 'trauma tool kit' either physically set up or as a laminated *aide-mémoire* list can facilitate speedy management when unscheduled emergency trauma patients attend. To support good quality patient communication, summary letters or information leaflets highlighting the timescales for follow-up, possible sequelae and prognosis are helpful.

Trauma cases can highlight interesting clinical conundrums in their immediate and longer-term management. Peer discussion activities and sharing learning from cases is valuable, along with CPD activities. Many specialist societies have annual conferences of relevance to trauma management, which together with the points raised in this article aim to equip clinicians with the knowledge and skills of ways in which to provide high-quality care when trauma is sustained to permanent teeth. ■

Table 3 Radiographically identified complications

Pulpal obliteration	**Rationale**	**Previous injury**	**Management**
Pulpal narrowing/ obliteration +/- yellow/brown clinical crown	In more severe injuries, odontoblasts die, and differentiation of new odontoblast cells occurs	Mostly luxations	Sensibility test. If pulp is vital, monitor only +/- improve aesthetics
	Secretion of reparative dentine (bone-like tissue) commences in pulp chamber and along root canal system (RCS) walls, obliterating RCS		If pulp is non-vital, endodontic treatment more complex Magnification required
			Consider specialist referral
Infection-related root resorption	**Rationale**	**Previous injury**	**Management**
External infection related root resorption (ERR)	Two situations are needed for ERR to arise:	Luxation	Manage as per IADT guidelines
	The root canal system must have microbial infection and in addition, damage or loss of cementum has occurred and dentinal tubules are exposed to the PDL and bone[30]	Avulsion (with increased extraoral dry time or non-physiologic storage medium)	Aim to extirpate pulp and prepare root canal system under dental dam and using sodium hypochlorite. Removal of necrotic canal contents aims to halt/stabilise resorption
			Evidence of ERR at a horizontal root fracture site suggests the coronal fragment has become necrotic. Refer for endodontic management
Internal root resorption	Rare	Aetiology unclear[31]	Refer urgently for specialist input because prognosis decreases if resorption perforates through radicular wall
	Destruction is seen within the root canal system and histologically metaplastic bone, or cementum-like tissue is seen adjacent to resorption		
External cervical root resorption (ECRR)	Thought to derive from inflammation following disruption of the PDL[32]	Aetiology unclear. May report previous trauma	Refer urgently to specialist centre (endodontic, restorative or paediatric dentistry)
Replacement resorption (RR)	**Rationale**	**Previous injury**	**Management**
Replacement resorption leads to ankylosis	Compression of periodontal ligament (PDL) leads to macrophage and osteoclasts removing necrotic PDL fragments and infection related, or RR resorption may be seen	Intrusive luxation	Loss of tooth inevitable. Plan for future replacement
		Avulsion (as extraoral dry time increases, risk of RR increases)	If patient <18 years of age, consider disguising infra-occlusion using composite or decoronation until growth ceased. Alternatively, orthodontic space closure
			If patient >18 years of age, consider a fixed solution where possible: a resin-bonded bridge or dental implant. Removable options can be useful short term
Gingival recession or severe clinical attachment loss	**Rationale**	**Previous injury**	**Management**
Most likely in closed apex teeth which have been displaced	Maxillary cortical plate thinner and can fracture on lateral luxation	Lateral luxation	Encourage excellent oral hygiene
	If displaced teeth are not optimally repositioned, marginal bone loss more likely	Intrusive luxation	Consider referral to a specialist clinic. May need multidisciplinary input (restorative, orthodontic, paediatric dentistry)
		Replanted avulsed teeth	

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