

Emergency management of sport-related orofacial trauma

Geoffrey St George,^{*1} Lyndon Meehan² and Sally McCarthy³

Key points

Dental trauma has a high prevalence, highlighting the need for effective prevention and management strategies.

It is important to be prepared and establish links with dental professionals to manage these often-stressful injuries effectively.

Managing elite athletes requires individualised risk assessments and collaborative decisions with other members of the supporting team balancing the athlete's desire to return with the need to prioritise their long-term dental health, as specific return-to-play guidelines for dental trauma are lacking.

Abstract

Sport-related orofacial trauma is a common occurrence, particularly in contact sports and among young adults, necessitating effective emergency management. This article highlights the prevalence of these injuries and emphasises the importance of proactive planning, including athlete and staff education, establishment of emergency protocols, and ensuring access to dental expertise. Immediate and appropriate on-site management, guided by the International Association of Dental Trauma guidelines, is crucial for optimal outcomes, especially in cases of avulsion. Furthermore, the complexities surrounding return-to-play decisions for elite athletes are discussed, advocating for a collaborative, individualised approach that prioritises long-term health and necessitates further research to establish specific guidelines. The evolving nature of dental trauma management in sports underscores the need for continuous professional development and a commitment to prioritising athletes' wellbeing.

Introduction

To many, sport dentistry is synonymous with dental trauma. Being a team dentist or sports dentist can be very rewarding and satisfying, especially when treating athletes who have sustained these injuries. It can foster collaboration with various dental specialists. This experience in collaborative trauma management provides a significant boost to technical proficiency and treatment planning, directly applicable to general dental practice. It also allows the development of professional relationships with sports team staff members and athletes. This can give a pleasant diversion

from the hustle and bustle of day-to-day general practice. It also gives the dental healthcare professional the chance to be part of something special with their own local team or sports club.

Prevalence of sport-related trauma

In a recent study,¹ the estimated world-wide prevalence of dental trauma affecting the permanent dentition was 15.2% and the primary dentition was 22.7%. The incidence was estimated at 2.82 events per 100 persons per year. Therefore, over a billion people around the world may have had a traumatic dental injury.

For injuries caused by accidents, oral injuries represented 5% of all injuries sustained in individuals aged from birth till the age of 30 years.² Interestingly, in the same study, it was found that those in the age group from 16–30 years sustained oral injuries most commonly at athletic sites.

There is great variation in the prevalence of dental trauma within each sport,³ depending on whether it is a contact sport (11.38%) or non-contact sport (5.24%).⁴ The prevalence in a number of popular sports can be seen in Table 1.^{5,6,7,8,9,10,11,12,13,14,15,16,17}

When looking at one sport in particular – boxing – prevalence varies across studies which is most likely due to differing assessment methods (Table 2).^{18,19,20,21}

Comprehensive examinations of athletes reveal higher dental trauma rates than questionnaires, suggesting underreporting in self-reporting studies.

Injuries to teeth

Well-fitting mouthguards are a key element in the chain of prevention of dental trauma. Detailed guidance is outside of the scope of this article. However, recent recommendations have been published.²²

Dental trauma affects all tissues in the mouth, categorised by those involved: hard tissues/pulp, periodontal tissues, bone, and the gingiva/mucosa. Injury types include fractures, and compression and tearing of tissues (Fig. 1). Delayed or improper management also damages the pulp and periodontal ligament. Compressed tissues, like the periodontal ligament, often become necrotic and repair rather than regenerate, leading to resorption (Fig. 2).

¹Department of Endodontics, Royal National ENT and Eastman Dental Hospitals, 47–49 Huntley Street, London, WC1E 6DG, UK; ²Swansea Bay University Health Board. Department of Restorative Dentistry, Port Talbot Resource Centre, Moor Road, Port Talbot, SA12 7BJ, UK; ³Barts and The London School of Medicine, Queen Mary University London, Garrod Building, Turner Street, London, E1 2AD, UK.
*Correspondence to: Geoffrey St George
Email address: sfaages@ucl.ac.uk

Refereed Paper.

Submitted 3 June 2025

Accepted 7 November 2025

<https://doi.org/10.1038/s41415-026-9542-9>

Table 1 The prevalence of trauma in some popular sports

| Study | Sport | Assessment method | Type of trauma reported | Overall prevalence of dental trauma |
|---|---|--|-------------------------|--|
| Ilia <i>et al.</i> ⁵ | Rugby | Supervised questionnaire | Orofacial | 64.9% |
| Caglar <i>et al.</i> ⁶ | Ice hockey | Supervised questionnaire | Dental | 29.72% |
| Ferrari <i>et al.</i> ⁷ | Jiu-jitsu Judo Skate hockey Basketball Handball Soccer | Interviewer-administered questionnaire | Dental | 28% overall 41.2% 22.3% 11.5% 36.4% 37.1% 23.1% |
| Azodo <i>et al.</i> ⁸ | Basketball | Interviewer-administered questionnaire | Orofacial 'mouth' | 62.8% 6.4% |
| Dursun <i>et al.</i> ⁹ | Soccer | Self-reported | Orofacial | 9.8% |
| Fasciglione <i>et al.</i> ¹⁰ | Inline skates | Interviewer-administered questionnaire | Dental | 9.2% |
| Gass <i>et al.</i> ¹¹ | Equestrianism | Interviewer-administered questionnaire | Dental | 15.00% |
| Schmid <i>et al.</i> ¹² | Mountaineering | Self-reported | Dental | 1.33% |
| Persic <i>et al.</i> ¹³ | Squash | Interviewer-administered questionnaire | Orofacial 'dental' | 37.7% 4.5% |
| Gülses <i>et al.</i> ¹⁴ | Cycling | Data obtained from the ORBIS Information-Management-System for patients treated at a German department of oral and maxillofacial surgery | Dental | 28.4% |
| Bolhuis <i>et al.</i> ¹⁵ | Hockey (field) – international athletes | Non-supervised questionnaire | Dental | 20% |
| Pueringer <i>et al.</i> ¹⁶ | Tennis | National Electronic Injury Surveillance System (USA, using A&E hospital data from 100 departments) | Dental | 1.5% |
| Ineichen <i>et al.</i> ¹⁷ | Alpine skiing | Non-supervised questionnaire based | Dental | 23.6% |

Table 2 The prevalence of dental trauma in boxing

| Study | Assessment method | Overall prevalence of dental trauma |
|--------------------------------------|--|-------------------------------------|
| McCarthy <i>et al.</i> ¹⁸ | Supervised questionnaire, and clinical and radiographic examination (including cone beam computed tomography scan) | 68.9% |
| Shirani <i>et al.</i> ¹⁹ | Clinical examination and radiographic examination (not including periapical views of teeth) | 46.7% |
| Emerich <i>et al.</i> ²⁰ | Non-supervised questionnaire based | 35.9% |
| Ifkovits <i>et al.</i> ²¹ | Non-supervised questionnaire based | 10.7% |

Planning ahead

While unexpected dental trauma is stressful, sports-related injuries can be managed through planning: education, readily available emergency care, and accessible follow-up care.

Education

An on-site dentist with experience in sports dental trauma management is ideal but uncommon due to logistical, financial, and access limitations. Therefore, educating medical and sporting colleagues on basic management is crucial, as knowledge is often lacking in dentists,²³ doctors,²⁴ athletes²⁵ and coaches.²⁶ However, studies show educational tools like pamphlets,²⁵ apps,²⁵ audio-visual aids²⁷ and posters²⁸ (Fig. 3) can improve trauma care knowledge.

New organisations like the UK Sports Dentistry Association and established societies such as the British Endodontic Society and Dental Trauma UK improve education and care. Dental Trauma UK's pitch-side flashcard (Fig. 4) provides vital immediate care guidance, which should be championed.

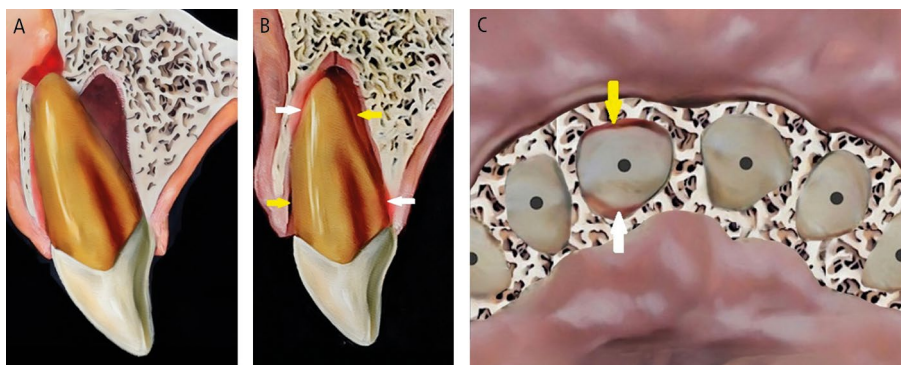


Fig. 1 Dental trauma injuries resulting in (A) fracture of bone, and compression (white arrows) and tearing (yellow arrows) of the periodontal ligament in the sagittal (B) and axial (C) planes



Fig. 2 Resorption localised to a canine tooth following dental trauma



Fig. 3 A boxing poster illustrating the results of a study¹⁸ used to educate boxers and their coaches on how to prevent and treat dental trauma and find a dentist (QR code) to treat them

It is important to verify website and app accuracy for dental trauma advice. Inconsistencies do exist,²⁹ though the International Association of Dental Trauma (IADT) endorsed apps are reliable.²⁹ Sports' governing bodies must also ensure accurate guidance.

A

www.dentaltrauma.co.uk

DentalTrauma UK
Saving injured teeth

Emergency management of dental trauma on-the-pitch

Injuries to adult teeth requiring immediate management

The injuries that require immediate emergency management are **AVULSION** (when a tooth is knocked completely out of its socket, figures 1 & 2) or is hanging loose, held in by soft tissues only and potentially an airway risk (Figure 3).

Figure 1 Socket with tooth dislodged out of position Figure 2 Tooth knocked out Figure 3 Teeth held in by soft tissues only

What to do as a matter of urgency within the first 5-10 minutes

- Find the tooth and keep it safe
- Clean the mouth, rinse with water if necessary
- If the tooth is dirty, rinse it with water or get the individual to lick it clean. Do NOT scrub the root
- Holding the tooth by the crown only (Figure 4), gently push it back into place
- If the tooth/teeth are held in by soft tissues only, gently push them back into position
- Get the individual to bite on a tissue, gauze or put the mouthguard back into the mouth
- Go and see a dentist immediately

Figure 4 Hand hold the tooth by the crown only Put tooth in milk or Save-A-Tooth

If it is not possible to reposition the tooth, put it in milk or Save-A-Tooth and seek dental advice immediately.

B

Other injuries that can be managed after the game

- Teeth displaced in other directions**

Intrusion
Tooth pushed into the gum
Tooth looks short and gum is swollen

Lateral luxation
Tooth pushed backwards into mouth
Patient cannot bite normally
- Fractured teeth**

For all injuries where tooth fractures and missing portions are seen:
- find the fragments!
- keep them safe
- book an appointment to see a dentist (they might be able to glue it back in place)
- Fractured jaws**

A fractured jaw should be suspected if the player has any of the following signs and symptoms from their jaw:

| | | | |
|----------|----------------------------|----------|--------------------|
| Swelling | Pain | Bruising | Bleeding |
| Ear pain | Difficulty biting together | | Difficulty opening |

Always seek dental advice as soon as possible after any dental trauma

Emergency management will focus on:

 - Pain relief and analgesia
 - Suturing soft tissue lacerations
 - Improving survival of teeth

Board members of Dental Trauma UK are always happy to help. For any queries email us at info@dentaltrauma.co.uk

DentalTrauma UK
Saving injured teeth

Fig. 4 (A, B) The Dental Trauma UK pitch-side dental trauma flashcard (image used with permission from Dental Trauma UK)

A 20:39

B 20:52

Sports dentists who treat dental trauma

C 20:54

If a tooth (or teeth) has been knocked out of the mouth, then pick up the tooth by its crown (not the root), rinse the root surface with water or milk for 10 seconds only, then replant the tooth. Bite on a handkerchief or tissue and attend a dentist straight away. If you cannot re-plant the tooth then store it in milk (first choice), saline (second choice), or as a last resort it can be kept wet with saliva by placing it in the mouth, between cheek and gum. Do not store dry or in water, as this will irreversibly damage the tooth (<https://iadt-dentaltrauma.org/prevention-and-emergency-care/>).

Emergency treatment:
Ring +44 20 7... Monday - Friday, 09:00-17:00, and on Saturdays (10:00-14:00).
Walk-in appointments may be available, but ring to confirm you can be seen.

Non-emergency treatment, including restorative

Fig. 5 A custom dental trauma map saved as an icon on a mobile phone (A), can be used to find local dental clinics able to treat dental trauma (B), and contains all the details to make contact in an emergency (C)

Artificial intelligence for dental trauma shows promise, but current accuracy is insufficient for clinical use³⁰ requiring further research.

Finding a dentist

Finding prompt dental care after trauma is challenging and stressful, especially away from home. For sports where injuries occur repeatedly, providing athletes with first aid and emergency care information prospectively greatly reduces stress.

Despite awareness of athlete oral health issues^{31,32} and national body recommendations,³³ dental connections in sport could be better. The authors feel there is further scope to improve the standing of dentistry within sports medicine, by developing better links. Sporting groups should establish the following:

- A club dentist for comprehensive care (screening, education, trauma management and mouthguards)

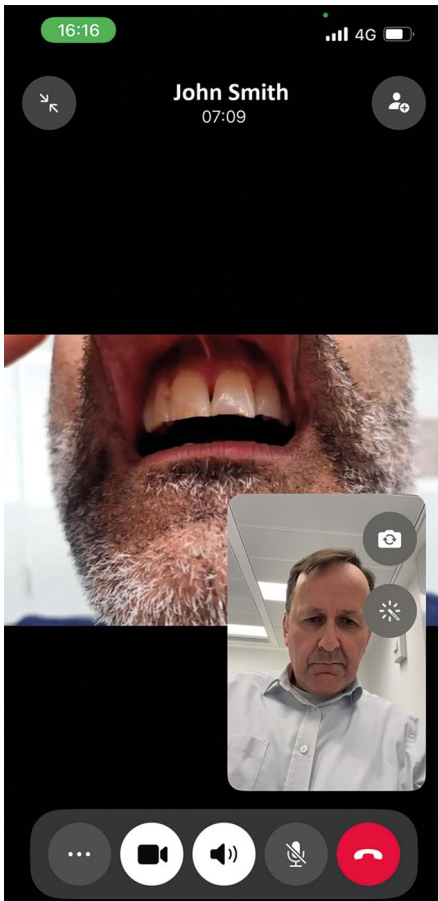


Fig. 6 A WhatsApp video call used to assess trauma injuries remotely

- An emergency action plan for dental trauma assessment and treatment during training and competition.

Sports medicine staff should keep a contact list of dental professionals for immediate trauma advice.

It is relatively straightforward to create an online Google map displaying clinics that provide treatment for dental trauma. It can have fellow sports dentists' practices mapped onto it who can treat acute trauma and semi-acute trauma, and provide reconstructive treatment of injured athletes, with ongoing updates. The map can be saved as a mobile phone icon (Fig. 5).

Even when distant from an injured athlete, video calls can be used to aid assessment (Fig. 6).

Home team medical and dental staff must provide medical and dental support to visiting teams. This is important to remember when taking up a role with a club. Pre-match medical briefings may include dental scenario discussions.

CRT6™

Concussion Recognition Tool

To Help Identify Concussion in Children, Adolescents and Adults

What is the Concussion Recognition Tool?
A concussion is a brain injury. The Concussion Recognition Tool 6 (CRT6) is to be used by non-medically trained individuals for the identification and immediate management of suspected concussion. It is not designed to diagnose concussion.

Recognise and Remove

Red Flags: CALL AN AMBULANCE

If ANY of the following signs are observed or complaints are reported after an impact to the head or body the athlete should be immediately removed from play/game/activity and transported for urgent medical care by a healthcare professional (HCP):

- Neck pain or tenderness
- Seizure, 'fits', or convulsion
- Loss of vision or double vision
- Loss of consciousness
- Increased confusion or deteriorating conscious state (becoming less responsive, drowsy)
- Weakness or numbness/tingling in more than one arm or leg
- Repeated Vomiting
- Severe or increasing headache
- Increasingly restless, agitated or combative
- Visible deformity of the skull

Remember

- In all cases, the basic principles of first aid should be followed: assess danger at the scene, check airway, breathing, circulation; look for reduced awareness of surroundings or slowness or difficulty answering questions.
- Do not attempt to move the athlete (other than required for airway support) unless trained to do so.
- Do not remove helmet (if present) or other equipment.
- Assume a possible spinal cord injury in all cases of head injury.
- Athletes with known physical or developmental disabilities should have a lower threshold for removal from play.

If there are no Red Flags, identification of possible concussion should proceed as follows:
Concussion should be suspected after an impact to the head or body when the athlete seems different than usual. Such changes include the presence of any one or more of the following: visible clues of concussion, signs and symptoms (such as headache or unsteadiness), impaired brain function (e.g. confusion), or unusual behaviour.

This tool may be freely copied in its current form for distribution to individuals, teams, groups, and organizations. Any alteration (including translations and digital re-formatting), re-branding, or sale for commercial gain is not permissible without the expressed written consent of BMJ.

Fig. 7 The CRT6, indicating red flags that should be recognised (image used with permission from Concussion in Sport Group [CISG])

CRT6™

Concussion Recognition Tool

To Help Identify Concussion in Children, Adolescents and Adults

1: Visible Clues of Suspected Concussion

Visible clues that suggest concussion include:

- Loss of consciousness or responsiveness
- Lying motionless on the playing surface
- Falling unprotected to the playing surface
- Disorientation or confusion, staring or limited responsiveness, or an inability to respond appropriately to questions
- Dazed, blank, or vacant look
- Seizure, fits, or convulsions
- Slow to get up after a direct or indirect hit to the head
- Unsteady on feet / balance problems or falling over / poor coordination / wobbly
- Facial injury

2: Symptoms of Suspected Concussion

| Physical Symptoms | Changes in Emotions |
|-------------------------|--------------------------|
| Headache | More emotional |
| "Pressure in head" | More Irritable |
| Balance problems | Sadness |
| Nausea or vomiting | Nervous or anxious |
| Drowsiness | |
| Dizziness | Changes in Thinking |
| Blurred vision | Difficulty concentrating |
| More sensitive to light | Difficulty remembering |
| More sensitive to noise | Feeling slowed down |
| Fatigue or low energy | Feeling like "in a fog" |
| "Don't feel right" | |
| Neck Pain | |

Remember, symptoms may develop over minutes or hours following a head injury.

3: Awareness

(Modify each question appropriately for each sport and age of athlete)
Failure to answer any of these questions correctly may suggest a concussion:

- "Where are we today?"
- "What event were you doing?"
- "Who scored last in this game?"
- "What team did you play last week/game?"
- "Did your team win the last game?"

Fig. 8 The CRT6, indicating signs and symptoms of concussion (image used with permission from Concussion in Sport Group [CISG])

Emergency management of trauma

Current guidelines

Dentists most often follow the IADT guidelines^{34,35,36,37} when managing dental trauma injuries. These have been produced since 2001 and then updated in 2007, 2012 and 2020, based on evidence and consensus. The

2020 revision includes notable changes which will be discussed later.

Emergency management at the accident scene

Dental trauma, when it happens, may be managed by a dentist, team doctor, sports coach, other medical team member, or

even another team member. Therefore, it is important that everyone is aware of what to do. Dentists should be aware of current guidelines. If there are facilities for treatment at the venue, then this can be performed. However, the treatment possible may be limited due to a lack of facilities, equipment and materials.

The initial assessment, called the primary survey, involves evaluating vital signs and addressing any life-threatening conditions. After stabilisation, a thorough examination, known as the secondary survey, is conducted including checks for facial and dental injuries.³⁸

Assessment/treatment of general injuries

Patients should be screened for any serious injuries first, including head and neck, and other potentially life-threatening injuries. If suspected, medical staff should assess these. Otherwise, in the absence of medical staff, administer standard first aid³⁹ and call the emergency services if required.

Suspected head injuries can be assessed using one of the tools published in the *British Journal of Sports Medicine*. These include the sport concussion assessment tool (SCAT6)⁴⁰ (adolescents/adults) or child SCAT6^{4,41} (8–12 years), though dentists may prefer the layperson-friendly concussion recognition tool 6 (CRT6).⁴² The CRT6's 'red flags' (Fig. 7) necessitate immediate medical help, while its symptom checklist (Fig. 8) warrants removal from play and medical assessment.

Assessment/treatment of the mouth

Examine the mouth's hard and soft tissues, occlusion, and dental health either on-site or in a medical room. Use a standardised form (Fig. 9) for documentation to avoid oversights. In rugby and Gaelic football, a 15-minute blood substitute allows for temporary player replacement, enabling on-field dental assessment and stabilisation.

Specific dental injuries

This article will only focus on the injuries needing urgent help and those where guidelines have change recently. Further details can be obtained from the current IADT guidelines.^{34,35,36,37}

Delays in treatment may occur from athlete behaviour (late arrival, underestimating urgency, uncooperativeness) and healthcare factors (staff knowledge, accident and emergency department waits, triage). Effective care follows three phases: acute (within three hours), subacute (24 hours), and delayed (over 24 hours), as

Dental Trauma Assessment Proforma

Fig. 9 An example of a standardised dental trauma clinical assessment form

Table 3 Dental trauma injuries, treatment, urgency and splinting times

| Injury | Management | Urgency | Splinting time |
|--|---|---------|--|
| Uncomplicated enamel-dentine fracture (Fig. 10) | Recover tooth fragments and store in media for reattachment. If fragments are missing, restore the tooth with composite. | S D | Not applicable (NA) |
| Complicated enamel-dentine fracture (Fig. 11) | Pulp capping or partial pulpotomy. | S D | NA |
| Crown root fracture (Fig. 12) | Coronal fragment removed, vital pulp treatment/pulpectomy and root canal treatment completed. May involve orthodontic/surgical extrusion to be restorable. Alternatively extract. | S D | NA |
| Root fracture (Fig. 13) | Reposition, if needed, and splint. | A S | Flexible splint for four weeks to four months (cervical) |
| Dento-alveolar fracture (Fig. 14) | Reposition, if needed, and splint. | A | Flexible splint for two to four weeks |
| Concussion and subluxation | No treatment performed. Soft diet, pain relief. | NA | NA |
| Extrusion (Fig. 15) and lateral luxation (Fig. 16) | Reposition and splint. | A S | Flexible splint for four weeks |
| Intrusion (Fig. 17) | Monitor for re-eruption/ active repositioning. | S | Flexible splint for four weeks if surgically extruded. |
| Avulsion (Fig. 18) | Replant and splint. | S | Flexible splint for two weeks |
| Injury to primary teeth | Subacute to delayed approach unless tooth causes occlusal problems (acute). Various treatments. | S D A | Flexible splint for two and four weeks for alveolar fractures and root fractures |
| Soft tissue injuries (Fig. 17) | Suture, monitor and keep clean depending on whether it is a laceration, contusion or abrasion. | A | NA |

A, acute; D, delayed; NA, not applicable; S, subacute

categorised by Andreasen *et al.*,⁴³ to be followed alongside IADT guidelines^{34,35,36,37} for structured management (Table 3; Figures 10, 11, 12, 13, 14, 15, 16 and 17).

Replanting teeth

Avulsion requires immediate attention as the periodontal ligament and pulp rapidly become necrotic outside of the protection of the tooth socket.^{44,45} That is if they aren't already necrotic due to the physical damage (compression and tearing) they sustain (Fig. 1) as they are avulsed. While other injuries may be severe, the fact that teeth remain in their sockets with these other injuries is a huge blessing. Immediate replantation is the treatment of choice,³⁶ despite storage media options, due to the 'wet time' (time in physiological media) impacting on prognosis.⁴⁶ All versions of the guidelines have recommended the following (Fig. 18):

- Locate the avulsed tooth/teeth and pick it up by its crown
- Rinse the tooth briefly (ten seconds) to remove any debris
- Replant the tooth and bite on a handkerchief to maintain it in its position
- Visit the dentist immediately for treatment.

The 2020 guidelines³⁶ recommend rinsing avulsed teeth with milk, saline, or saliva, not water. Saline is recommended as it is easily stored, while milk's availability varies due to it needing refrigeration, unless ultra-high temperature (UHT) processed milk is used. Saliva's viscosity makes it a poor rinsing agent, potentially delaying replantation.

The reason for excluding water, the most accessible liquid, is unclear. Despite the 2020 guidelines favouring milk, saline, or saliva, at the time of writing this article the IADT website (<https://iadt-dentaltrauma.org/prevention-and-emergency-care/>) and their SOS Tooth app, which can be viewed online (<https://iadt-dentaltrauma.org/knocked-out/>), recommend water. Supporting references from the guidelines recommend water⁴⁷ or relate to longer term storage media.⁴⁸ Author correspondence also supported water. For a ten-second rinse, water remains a viable option if nothing better is available.

After replantation, teeth need dental splinting and ideally in a surgery, but possibly on-site if facilities allow. Common splinting techniques are described from composite and orthodontic wire (<0.4 mm diameter) to novel approaches using fishing line or suturing



Fig. 10 An uncomplicated enamel-dentine fracture



Fig. 11 A complicated enamel-dentine fracture



Fig. 12 A complicated crown root fracture (21) and enamel-dentine fracture (22)

across teeth.⁴⁹ Splints should be easy to apply and remove, not interfere with occlusion, and allow access for endodontic treatment and oral hygiene measures (Fig. 19).

Ideal splinting may be difficult or impossible due to limited resources. Temporary options have included mouthguards, damp gauze shaped

over the teeth, or clear orthodontic retainers until professional care is available. No commercially available splint exists, which can be attached to the teeth without the use of dental materials and equipment. However, as a last resort, a trimmed Steroplast Premium waterproof plaster (latex-containing) can temporarily secure avulsed

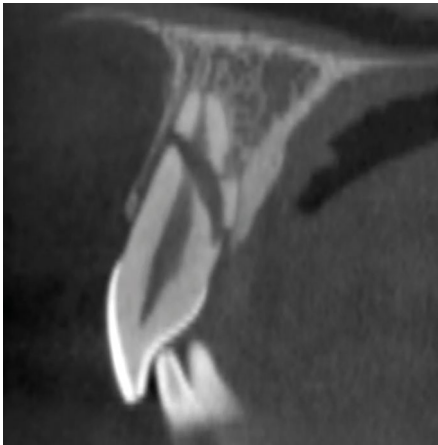


Fig. 13 A CBCT scan of a root fracture, seen in the sagittal plane

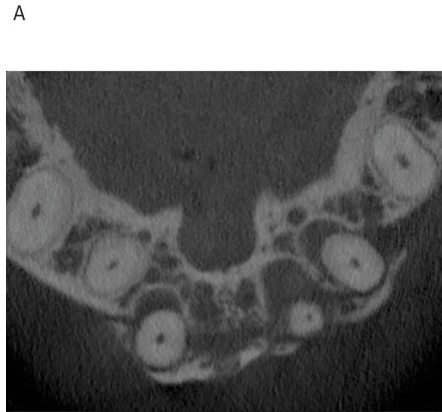


Fig. 14 A CBCT scan of a dento-alveolar fracture extending over three maxillary incisor teeth, seen in the axial (A) and sagittal (B) planes



Fig. 15 Extrusion of 21



Fig. 16 Lateral luxation of 11 and the resulting discoloration of the posterior teeth

teeth (Fig. 20) for several hours, but it is not a substitute for professional splinting.

If replantation is impossible (athlete is unconscious, concussed, uncooperative or when the socket wall is incompletely fractured), store the tooth in a suitable media.⁵⁰ Commercial media (Save-A-Tooth, Dentosafe) are costly and difficult to obtain. Milk is readily available, but it needs refrigerating and allergy is possible,⁵¹ but rare. UHT milk, stored at room temperature, is a promising, affordable alternative (Fig. 21).^{52,53} Typically three 10–12 ml pots poured into a small container are normally sufficient to cover several teeth. If other media are unavailable, store the avulsed tooth in the athlete's saliva.

Two other IADT guideline changes in relation to avulsed teeth include tetracycline soaking⁵⁴ for incompletely formed teeth (to increase the chances of pulp revascularisation and decrease the occurrence of resorption) and periodontal ligament removal^{15,56} for improperly stored or dry-stored teeth (to reduce the rate of replacement resorption). Both are no longer recommended due to lack of clinical benefit.

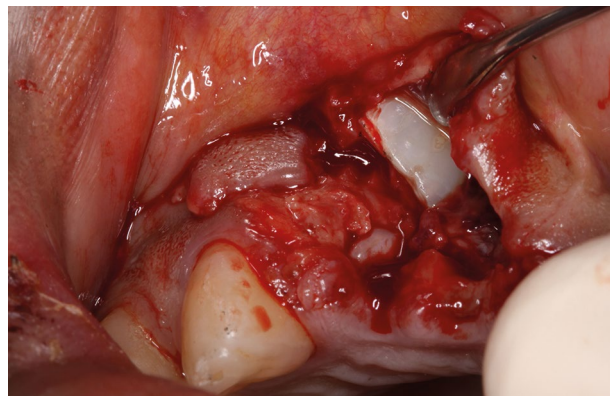


Fig. 17 Intrusion of a central incisor, loss of a lateral incisor and laceration of the gingivae following trauma

While dentists replant teeth easily, athletes and sports staff may face challenges when:

- Identifying multiple, avulsed teeth (Fig. 22)
- Distinguishing deciduous from permanent teeth (treat as permanent if unsure and remove the tooth in the surgery if found to be a deciduous one)

- Managing loose teeth in mouthguards (leave in place until the mouthguard can be removed safely; translucent mouthguards facilitate this).

Most sports dentists will have tales of treatment being prevented by coaches or

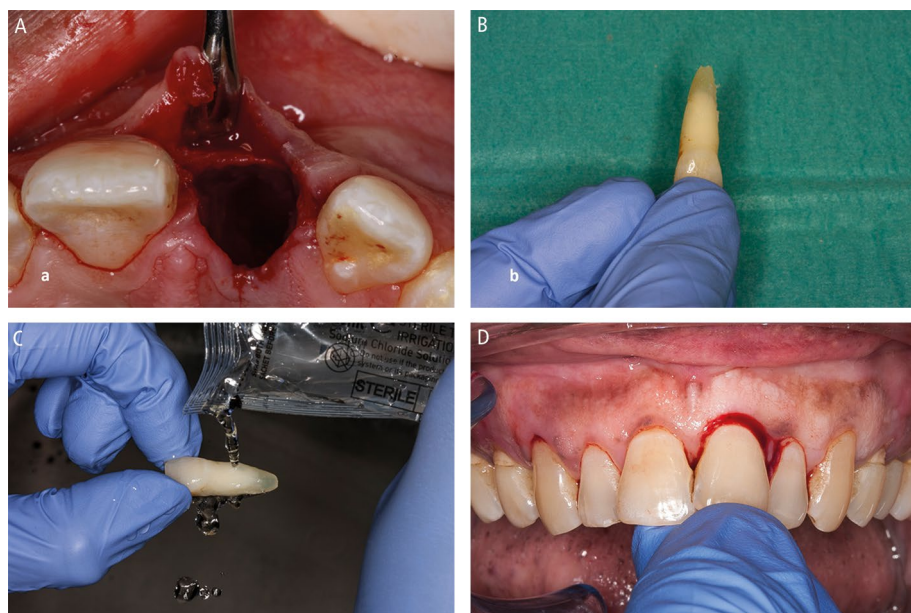


Fig. 18 Replanting an avulsed tooth by (A) checking its socket contains no interferences to replantation, (B) picking it up by its crown, (C) rinsing it and (D) replanting it



Fig. 20 A Steroplast Premium waterproof plaster cut to size (A) and used as a temporary dental splint (B)

athletes, especially in professional sports, where winning pressures prioritise immediate play over proper dental care. This can lead to delays in replanting avulsed teeth, risking tooth loss or complications from improper storage. While storage solutions exist, prompt replantation is crucial, and athletes and medical staff must understand the risks of delaying treatment.

Collecting fractured teeth

Any teeth fragments should be accounted for, to confirm they are not embedded in lips, swallowed or inhaled. These should be stored wet and can be reattached to broken teeth in the dental surgery.

Complicated crown fractures

Partial pulpotomy and restoration of the tooth is the treatment of choice when a dental pulp

is exposed. The classic study by Cvek⁵⁷ has often been interpreted as time between pulp exposure and treatment, or the size of the pulp exposure not impacting on the success of the partial pulpotomy. However, optimal success depends on treating teeth quickly (less than nine days), and when the exposure is less than 4 mm².⁵⁸ It is also more successful in teeth with open apices.⁵⁸ As long as the treatment is performed following these guidelines, then immediate treatment at the athletic site is not required.

All the above treatment assumes that the injured athlete will receive further, definitive care from their dentist shortly after the emergency treatment.

A few other injuries have undergone revision of their guidelines by the IADT and the evidence for and against these have been appraised in other journal articles.^{59,60}



Fig. 19 An orthodontic wire and composite dental trauma splint



Fig. 21 UHT milk can be used as a storage medium

Complicated crown-root fractures

While 2012 guidelines⁶¹ favoured partial pulpotomy for exposed pulps, 2020 guidelines³⁵ suggest pulpectomy followed by root canal treatment. This contrasts with growing evidence supporting vital pulp therapy, even in teeth with caries, and partial pulpotomy success in crown fractures.⁵⁷

Intrusion injuries of immature teeth

Guidelines for intruded immature teeth have changed. The 2012 guidelines⁶¹ recommended monitoring minor intrusions (<7 mm) and active repositioning for severe cases (>7 mm). The 2020 guidelines³⁵ suggest monitoring all intrusions, regardless of severity. A recent review⁵⁹ advocates case-by-case management based on intrusion severity, reflecting a lack of consensus in the literature regarding monitoring⁶² versus active repositioning.⁶³

Lateral luxation

The 2020 IADT guidelines³⁵ recommend immediate root canal treatment in teeth with complete root formation that have been laterally luxated, assuming pulp necrosis will occur ('the pulp will likely become necrotic' and that 'root canal treatment should be started'). This contrasts with the 2012 guidelines⁶¹ that state 'if the pulp becomes

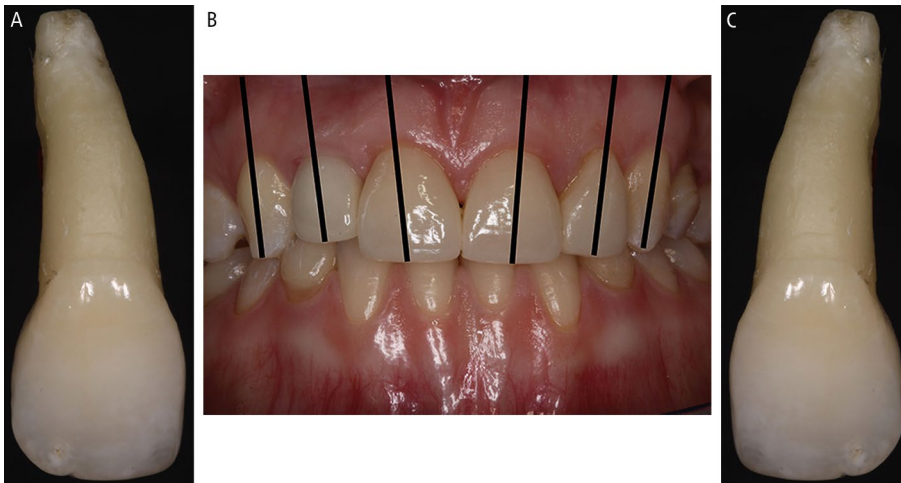


Fig. 22 (A, B, C) To identify multiple avulsed teeth: maxillary centrals are largest, canines are 'pointed', and root inclination distinguishes left from right

necrotic, root canal treatment is indicated to prevent root resorption'. However, a recent systematic review⁶⁰ showed pulp necrosis can be less than 60% in teeth with mature apices, and suggested diagnosis and then treatment should be based on discoloration, negative pulp testing, and radiographic changes, rather than pre-emptive treatment.⁶⁴

Medical room and match day dental kit

Elite sports require a private standardised medical room (Fig. 23) with hygienic space, proper lighting, a clean examination table, and essential supplies like gloves and sharps disposal.⁶⁵ On match days, dental personnel must assess their ability to treat injuries in unfamiliar settings, considering environment, time, and equipment. If inadequate, they should stabilise and refer the athlete. A matchday dental first aid kit is essential and Figure 24 shows some suggested materials and instruments; but this is not an exhaustive armamentarium.



Fig. 23 A typical sports medical room, where patients can be examined

Return to play considerations

For elite athletes, sport is both a passion and an income, tied directly to performance. They face packed schedules and may rush recovery post-injury, fearing lost performance or position. A crucial question they may ask is 'how soon can I play again?' While athletes may seek a quick return to play, dental professionals should prioritise their wellbeing, resisting external pressures.



1. Disposable dental examination kit 2. Disposable flat plastic/plugger/tweezers 3. Topical/local anaesthetic syringe and needles 4. < 0.4 mm stainless steel arch wire 5. Endodontic files/barbed broaches 6. Orthodontic wire cutters and pliers 7. Packable and flowable composite resin with dispensing gun 8. 37% phosphoric acid gel 9. Micro-brushes 10. Calcium hydroxide/Ledermix 11. Cotton wool rolls/pledgets 12. Hand disinfectant gel 13. Cavit or IRM 14. Combined primer and adhesive 15. Curing light 16. Emery paper/finishing strips 17. Save-A-Tooth kit (or another interim storage media) if unable to bond/reposition on site 18. Spatula/mixing pad 19. Head torch/pen torch 20. PTFE tape 21. Glass ionomer 22. Gauze 23. Saline/chlorhexidine 24. Suture kit 25. Gloves and masks 26. Keys to the dental surgery if more advanced treatment is required.

No return-to-play guidelines exist for dental trauma in elite sports. Spinas *et al.*⁶⁶ found timely returns didn't increase long-term complications, varying by sport and injury. Sports dentistry associations should create consensus guidelines. Anecdotally, many elite rugby players return within a week of luxation, root, or alveolar fractures, following repositioning, splinting, and use of a triple laminate mouthguard.

We should consider the consensus papers by Fardy, Fowell, Hayton and Scott *et al.* on return-to-play timeframes for elite athletes with maxillofacial injuries, recognising that their management differs from that of the general public.^{67,68,69,70}

Individualised player risk assessments are crucial before return to play, ensuring safety and reducing injury risk. Key questions include sport-specific risks, athlete's role and demands, treatment type, recovery plan, impact of pain/swelling, championship context, and concurrent injury management.

Fig. 24 Typical dental equipment and materials that need to be available on a competition day

Collaborative discussions with the athlete and sports medicine team regarding early return risks are crucial. The dentist shares responsibility and must prioritise athlete health. Discuss adjunctive roles with indemnity providers. Adherence to General Dental Council standards is mandatory.

Conclusion

The management of dental trauma in athletes can be very rewarding, but there are a number of challenges. However, many of these can be overcome by forward planning and ensuring you keep up to date with this continually evolving area of dentistry. When challenges can't be overcome, then athlete and dentist health should be prioritised to ensure successful outcomes.

Ethics declaration

There are no conflicts of interest that the authors are aware of.

Author contributions

GSG, LM and SMC prepared the initial manuscript. The same authors commented on and edited revised versions of the manuscript before submitting for publication, and in addition SMC provided several illustrations for the manuscript.

Acknowledgements

The authors wish to acknowledge Dental Trauma UK for granting permission to reproduce their pitch-side flash card (Fig. 4) and the British Journal of Sports Medicine/Concussion in Sport Group (CISG) for reproduction of the Concussion Recognition Tool 6 CRT6 (Fig. 7, Fig. 8).

References

- Petti S, Glendor U, Andersson L. World traumatic dental injury prevalence and incidence, a meta-analysis-one billion living people have had traumatic dental injuries. *Dent Traumatol* 2018; **34**: 71–86.
- Petersson EE, Andersson L, Sörensen S. Traumatic oral vs non-oral injuries. *Swed Dent J* 1997; **21**: 55–68.
- Black A M, Eliason P H, Patton D A, Emery C A. Epidemiology of facial injuries in sport. *Clin Sports Med* 2017; **36**: 237–255.
- de Lima L G H, Dos Santos C S, Rocha J S, Tanaka O, Rosa E A R, Gasparello G G. Comparative analysis of dental trauma in contact and non-contact sports: a systematic review. *Dent Traumatol* 2024; **40**: 499–510.
- Ilia E, Metcalfe K, Heffernan M. Prevalence of dental trauma and use of mouthguards in rugby union players. *Aust Dent J* 2014; **59**: 473–481.
- Caglar E, Kargul B, Tanboga I. Dental trauma and mouthguard usage among ice hockey players in Turkey premier league. *Dent Traumatol* 2005; **21**: 29–31.
- Ferrari C H, Ferreria de Medeiros J M. Dental trauma and level of information: mouthguard use in different contact sports. *Dent Traumatol* 2002; **18**: 144–147.
- Azodo C C, Odai C D, Osazuwa-Peters N, Obuekwe O N. A survey of orofacial injuries among basketball players. *Int Dent J* 2011; **61**: 43–46.
- Dursun E, Ilarslan Y D, Ozgul O, Donmez G. Prevalence of dental trauma and mouthguard awareness among weekend warrior soccer players. *J Oral Sci* 2015; **57**: 191–194.
- Fasciglione D, Persic R, Pohl Y, Filippi A. Dental injuries in inline skating-level of information and prevention. *Dent Traumatol* 2007; **23**: 143–148.
- Gass M, Kühl S, Connert T, Filippi A. Dental trauma in showjumping a trinational study between Switzerland, France and Germany. *Dent Traumatol* 2016; **32**: 174–179.
- Schmid M, Schädelin S, Kühl S, Filippi A. Head and dental injuries or other dental problems in alpine sports. *Clin Exp Dent Res* 2018; **4**: 125–131.
- Persic R, Pohl Y, Filippi A. Dental squash injuries – a survey among players and coaches in Switzerland, Germany and France. *Dent Traumatol* 2006; **22**: 231–236.
- Gülses A, Klingauf L, Emmert M *et al*. Injury patterns and outcomes in bicycle-related maxillofacial traumata: A retrospective analysis of 162 cases. *J Craniomaxillofac Surg* 2022; **50**: 70–75.
- Bolhuis J H, Leurs J M, Flögel G E. Dental and facial injuries in international field hockey. *Br J Sports M* 1987; **21**: 174–177.
- Pueringer J, Cohn J E, Othman S, Shokri T, Ducic Y, Sokoya M. Tennis-related adult maxillofacial trauma injuries. *Phys Sportsmed* 2021; **49**: 64–67.
- Ineichen J, Connert T, Kühl S, Filippi A. Dental trauma and tongue injuries in professional alpine ski racing – a worldwide survey. *Dent Traumatol* 2021; **37**: 414–418.
- McCarthy S, Gulabivala K, St George G, Harvey S, Ng Y L. Endodontic sequelae associated with repetitive impacts to the dentofacial region during boxing activities. *Int Endod J* 2024; **57**: 1380–1394.
- Shirani G, Kalantar Motamedi M H, Ashuri A, Eshkevari P S. Prevalence and patterns of combat sport related maxillofacial injuries. *J Emerg Trauma Shock* 2010; **3**: 314–317.
- Emerich K, Nadolska-Gazda E. Dental trauma, prevention and knowledge concerning dental first-aid among Polish amateur boxers. *J Sci Med Sport* 2013; **16**: 297–301.
- Ikfovits T, Kühl S, Connert T, Krastl G, Dagassan-Berndt D, Filippi A. Prevention of dental accidents in Swiss boxing clubs. *Swiss Dent J* 2015; **125**: 1322–1335.
- Ahmed I, Gallagher J, Needleman I *et al*. Mouthguards for the prevention of orofacial trauma in sport: the Faculty of Sport and Exercise Medicine (UK) position statement. *Br J Sports Med* 2024; **58**: 1475–1477.
- Zhao Y, Gong Y. Knowledge of emergency management of avulsed teeth: a survey of dentists in Beijing, China. *Dent Traumatol* 2010; **26**: 281–284.
- Yeng T, O'Sullivan A, Shulruf B. Dental Trauma facilitators for medical doctors: a viewpoint. *Dent Traumatol* 2020; **36**: 212–214.
- Azizadeh A, Mohebbi S Z, Esmailipoor A, Moghadam N, Khami M R, Razeghi S. Impacts of educational interventions on the knowledge of prevention and emergency management of traumatic dental injuries in 11–17-year-old martial arts athletes: a randomized controlled trial. *Eur Arch Paediatr Dent* 2023; **24**: 263–272.
- Tewari N, Johnson R M, Mathur V P *et al*. Global status of knowledge for prevention and emergency management of traumatic dental injuries in sports persons and coaches: a systematic review. *Dent Traumatol* 2021; **37**: 196–207.
- Niviethitha S, Bhawarlal C, Ramkumar H, Dhakshanaamoorthy S, Shanmugam H. Effectiveness of an audio-visual aid on the knowledge of schoolteachers regarding the emergency management of dental injuries. *Dent Traumatol* 2018; **34**: 290–296.
- Lieger O, Graf C, El-Maaytah M, Von Arx T. Impact of educational posters on the lay knowledge of schoolteachers regarding emergency management of dental injuries. *Dent Traumatol* 2009; **25**: 406–412.
- Djermal S, Singh P. Smartphones and dental trauma: the current availability of apps for managing traumatic dental injuries. *Dent Traumatol* 2016; **32**: 52–57.
- Ozden I, Gokyar M, Ozden M, Ovecoglu H. Assessment of artificial intelligence applications in responding to dental trauma. *Dent Traumatol* 2024; **40**: 722–729.
- Needleman I, Ashley P, Petrie A *et al*. Oral health and impact on performance of athletes participating in the London 2012 Olympic Games: a cross-sectional study. *Br J Sports Med* 2013; **47**: 1054–1058.
- Needleman I, Ashley P, Meehan L *et al*. Poor oral health including active caries in 187 UK professional male football players: clinical dental examination performed by dentists. *Br J Sports Med* 2016; **50**: 41–44.
- Stamos A, Mills S, Malliaropoulos N *et al*. The European Association for Sports Dentistry, Academy for Sports Dentistry, European College of Sports and Exercise Physicians consensus statement on sports dentistry integration in sports medicine. *Dent Traumatol* 2020; **36**: 680–684.
- Levin L, Day P F, Hicks L *et al*. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: General introduction. *Dent Traumatol* 2020; **36**: 309–313.
- Bourguignon C, Cohenca N, Lauridsen E *et al*. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations. *Dent Traumatol* 2020; **36**: 314–330.
- Fouad A F, Abbott P V, Tsilingaridis G *et al*. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 2. Avulsion of permanent teeth. *Dent Traumatol* 2020; **36**: 331–342.
- Day P, Flores M T, O'Connell A *et al*. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 3. Injuries in the primary dentition. *Dent Traumatol* 2020; **36**: 343–359.
- World Rugby Passport. Immediate care in rugby. 2026. Available at <https://passport.world.rugby/player-welfare-medical/immediate-care-in-rugby/immediate-care-in-rugby/> (assessed 1 February 2026).
- St John's Ambulance. *First Aid Manual*. 11th edition. London: Dorling Kindersley Ltd, 2021.
- Echemendia R J, Brett B L, Broglio S *et al*. Introducing the sport concussion assessment Tool 6 (SCAT6). *Br J Sports M* 2023; **57**: 619–621.
- Davis G A, Echemendia R J, Ahmed O H *et al*. Child SCAT6. *Br J Sports Med* 2023; **57**: 636–647.
- The Concussion in Sport Group. The Concussion Recognition Tool 6 (CRT6). *Br J Sports Med* 2023; **57**: 692–694.
- Andreasen J O, Andreasen F M, Skieie A, Hjorting-Hansen E, Schwartz O. Effect of treatment delay upon pulp and periodontal healing of traumatic dental injuries a review article. *Dent Traumatol* 2002; **18**: 116–128.
- Andreasen J O, Borum M K, Jacobsen H L, Andreasen F M. Replantation of 400 avulsed permanent incisors. 2. Factors related to pulpal healing. *Endod Dent Traumatol* 1995; **11**: 59–68.
- Andreasen J O, Borum M K, Jacobsen H L, Andreasen F M. Replantation of 400 avulsed permanent incisors. 4. Factors related to periodontal ligament healing. *Endod Dent Traumatol* 1995; **11**: 76–89.
- Gul A, Lauridsen E, Gerds T A, Andersson L. Risk of ankylosis of avulsed teeth immediately replanted or stored under favorable storage conditions before replantation: a long-term clinical study. *Dent Traumatol* 2024; **40**: 137–143.
- Flores M T, Al Sane M, Anderson L. Information to the public patients and emergency services on traumatic dental injuries. In Andreasen J O, Andreasen F M, Andreasen L (ed) *Textbook and Color Atlas of Traumatic Injuries to Teeth*. pp 992–1008. Oxford: Wiley Blackwell, 2019.
- Adnan S, Lone M M, Khan F R, Hussain S M, Nagi S E. Which is the most recommended medium for the storage and transport of avulsed teeth? A systematic review. *Dent Traumatol* 2018; **34**: 59–70.
- Kahler B, Hu J, Marriot Smith C, Heithersay G. Splinting of teeth following trauma: a review and new splinting recommendation. *Aust Dent J* 2016; **61**: 59–73.
- Malhotra N. Current developments in interim transport (storage) media in dentistry: an update. *Br Dent J* 2011; **211**: 29–33.

51. Potter R, Granger C. An anaphylactic replantation: milk allergy, tooth avulsion and appropriate storage media. *Dent Update* 2025; **50**: 707–709.
52. Setyawan A, Fajriyany FR, Sumarta NP. A comparison of the effectiveness of packaged coconut water and UHT milk as a storage media for avulsion tooth. *Biochem Cell Arch* 2019; **19**: 4883–4887.
53. Smith T M. *Influence of Media used for the Storage of Avulsed Teeth on the Viability of Periodontal Ligament Fibroblasts*. Queensland: University of Queensland, 1995. Thesis.
54. Tsilingaridis G, Malmgren B, Skutberg C, Malmgren O. The effect of topical treatment with doxycycline compared to saline on 66 avulsed permanent teeth: a retrospective case-control study. *Dent Traumatol* 2015; **31**: 171–176.
55. Lauridsen E, Andreasen J O, Bouaziz O, Andersson L. Risk of ankylosis of 400 avulsed and replanted human teeth in relation to length of dry storage: a re-evaluation of a long-term clinical study. *Dent Traumatol* 2020; **36**: 108–116.
56. Maslamani M, Joseph B, Gabato S, Andersson L. Effect of periodontal ligament removal with gauze prior to delayed replantation in rabbit incisors on rate of replacement resorption. *Dent Traumatol* 2018; **34**: 182–187.
57. Cvek M. A clinical report on partial pulpotomy and capping with calcium hydroxide in permanent incisors with complicated crown fracture. *J Endod* 1978; **4**: 232–237.
58. Bimstein E, Rotstein I. Cvek pulpotomy – revisited. *Dent Traumatol* 2016; **32**: 438–442.
59. Philip N, Nazzal H, Duggal M S. Critical appraisal of the 2020 IADT Guidelines: a personal commentary. *Dent Traumatol* 2023; **39**: 509–516.
60. Tewari N, Lauridsen E, Atif M *et al*. Risk of pulp necrosis and related complications in the permanent anterior teeth with lateral luxation: a systematic review and meta-analysis. *Dent Traumatol* 2024; **40**: 482–498.
61. Diangelis A J, Andreasen J O, Ebeleseder K A *et al*. International association of dental traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations of permanent teeth. *Dent Traumatol* 2012; **28**: 2–12.
62. Tsilingaridis G, Malmgren B, Andreasen J O *et al*. Scandinavian multicenter study on the treatment of 168 patients with 230 intruded permanent teeth—a retrospective cohort study. *Dent Traumatol* 2016; **32**: 353–360.
63. Kinirons M J, Sutcliffe J. Traumatically intruded permanent incisors: a study of treatment and outcome. *Br Dent J* 1991; **170**: 144–146.
64. Krastl G, Weiger R, Filippi A *et al*. Endodontic management of traumatized permanent teeth: a comprehensive review. *Int Endod J* 2021; **54**: 1221–1245.
65. UEFA. Medical regulations. 2024. Available at <https://documents.uefa.com/r/Technical-Regulations/UEFA-Medical-Regulations-Online> (assessed 1 February 2026).
66. Spinass E, Mameli A, Giannetti L. Traumatic dental injuries resulting from sports Activities; immediate treatment and five years follow-up: An observational study. *Open Dent J* 2018; **12**: 1–10.
67. Fardy M J. 'Return to play' after facial injuries: is it time for a consensus view. *Br J Oral Maxillofac Surg* 2019; **57**: 193–195.
68. Fowell C J, Earl P. Return to play guidelines following facial fractures. *Br J Sports Med* 2013; **47**: 654–656.
69. Hayton M J, Stevenson H I, Jones C D, Frostik S P. Management of facial injuries in Rugby Union. *Br J Sports Med* 2004; **38**: 314–317.
70. Scott N, Hughes J, Forbes-Haley C *et al*. Management of facial injuries in elite and professional sports- a consensus report. *Br J Oral Maxillofac Surg* 2020; DOI: 10.1016/j.bjoms.2020.08.046.



Open Access.

This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0>.

© The Author(s) 2026.