Avulsion in Paediatric Dentistry: Management of a Double Dental Emergency in a Child

By Dr Ghada Hussain & Dr Iyad Hussein, UAE

Introduction
General dental practitioners and paediatric dentists face real dental emergencies that effect children, especially dental trauma. Avulsion is considered, in terms of severity, the worst of all dental avulsion injuries. This is when the tooth is completely displaced out of its socket and the socket is found empty or filled with a blood coagulum. We report a case that describes the management of an avulsed maxillary central incisor (21) in a fit and healthy 8-year-old boy, accompanied by a lower lip laceration. The management of 21 took place over a period of 12 months.

Case Report
An 8-year-old child presented to the department of paediatric dentistry at the Hamdan Bin Mohammed College of Dental Medicine (HBMCMD) at the Hamdan Bin Rashid University (MBRU) in Dubai Healthcare City. He allegedly fell off a climbing wall, and knocked out his upper left central incisor (21) while he was two years old and had multiple primary teeth extractions under general anaesthesia (GA) four years ago.

Extraoral examination
- No TMJ, alveolar or facial bone fractures detected.
- Lower lip thread-through and through lagged laceration of the lower lip (Figure 1).
- Class 2 skeletal profile.

Intraoral Examination
- 21 empty socket with coagulum
- Laceration of the buccal gingiva near 21.
- Incisor relationship Class 2 Division 1 (6–6) corrected
- Mand informed us of her son having procined incision prior to the injury.

Radiographic examination
Periapical views of the upper maxillary incisors were obtained to rule out any root fractures (see Figures 4 a & b) revealed immature roots of teeth # 12, 11, 21, no root fractures and an inverted supernumerary apical to 21 and an empty socket of 21. There was no need for soft tissue radiographs as no tooth fragments were missing and the tooth was accounted for.

Diagnostic summary
- 21 avulsed with immature root.
- Concussion 12, 11, 22.
- Through and through lower lip laceration involving the vermilion.
- Inverted conical supernumerary/ mesiodens.
- Behaviour mildly anxious at initial presentation, very cooperative through the treatment visit.
- Aims and objectives of treatment
- Management of acute traumatic injury and replant the avulsed 21
- Suture the lacerated lip
- Monitor the vitality and periodontal healing of 21
- Preserve 21 in the short and medium term aiming to maintain the bone level in the long term.
- Inform patient and parents about the poor long-term prognosis of 21 and the available definitive future treatment options.

Treatment Plan
After the patient’s initial assessment, we administered LA to his upper anterior sextant and lower lip. During this time, both the tooth and socket were gently irrigated with physiological saline. 21 was found to have an immature root and open apex (Figures 5 a & b).

Within the hour, tooth 21 was gently replanted into the socket (Figure 6) and a flexible 0.035” wire was composited passive splint of teeth #12, 11, 21, 22 was secured (Figure 7). We suramined the lacerated lower lip in multiple layers (mucoza, deep and superficial) using Vicryl® (Sizes 4-0 and 6-0) resorbable fine sutures (Figure 8 and 9). This took place after thorough debridement of the wound with physiological saline. Care was taken to assure alignment of the lip’s vermilion involved in the laceration.

The patient was advised to maintain a soft diet, and analgesics (Paracetamol 500mg PRN) and antibiotics (Amoxicillin 25mg TDS for 5 days) were prescribed. Chlorhexidine glaconate 0.2% to milk BD mouth rinse was advised. After discussing the short and long-term consequences, a follow-up appointment was arranged in one week, and the patient was discharged. We advised the patient to attend his general medical practitioner (GMP) to obtain a Tetanus booster injection straight after the appointment.

A second trauma within two hours
Within two hours of leaving our clinic, the patient suffered another trauma affecting the injured area. This happened at the GMP receptionist’s office. As the receptionist was asking the patient’s mother where her son was, she pointed to him (he was standing behind her) and accidentally hit her in the mouth. There was no LOC, nausea, vomiting or disorientation. This caused the GMP concern so she sent the patient back to us for a reassessment. To our surprise, the patient showed up in our clinic (at 18:20 hours) with renewed bleeding from his mouth (Figure 10 a & b).

After obtaining a new history and carrying out an assessment, the wound was debridged. The splint and sutures were examined and were found to be intact. Although the splint was slightly mobile (Grade 1), it was securely bonded to the tooth. No new radiographs were indicated. The patient and family were reassured and the above advice was reiterated. They went back to the GMP for the...
Figure 11: A periapical radiograph taken one week post-op showed the correct positioning of the replanted tooth. Note the open apex.

Figure 12: Healing of the lip one month post-op. Some oedema and scarring were noted.

Figure 13: One-month post op after removal of the splint. The tooth was responsive to EC & EPT.

Figure 14: One year follow up. The patient and parent were pleased with the aesthetic result. 21 was vital and positively responsive to EC & EPT. The tooth was non-mobile and produced a metallic sound indicative of ankylosis.

Trauma follow-up appointment (one-week post op)

The aim of the visit was to review 12, 13, 21, 22 and to assess soft tissue healing. The patient had no complaint whatsoever. Observations revealed a slight mobility of 21 and good healing lower lip and buccal gingiva of 21 with good oral hygiene but some visible plaque on 22. The splint was intact. We obtained a periapical radiograph of 21, which showed it to be in a favourable position (see Figure 10) with a large wide-open apex.

At this appointment, and in the subsequent appointments (3, 6, 9 and 12 months post-op) we completed a ‘Dental Trauma Stamp’ (see Table 1 for an example) which included assessment for mobility, tooth colour (direct and transillumination), tenderness to percussion (TTP), sinus presence, swelling presence, percussion sound, electric pulp tester (EPT), ethyl chloride (EC) and radiographic assessment. The latter was essential to assess for apical pathology, root resorption (internal and external), arrested/continued root development, pulp obliteration and replacement resorption/ankylosis. The dental trauma stamp was repeated at every visit. It helps in assessing periodontal ligament (PDL) and pulpal healing.

Trauma follow-up appointment (one-month post op)

The healing of the lip appeared satisfactory (Figure 12). We gently removed the dental splint (Figure 13) and a new dental trauma stamp was completed. Tooth 21 was +ve to EC & EPT suggesting possible revascularization, although this was not absolute.

Subsequent appointments (at 3, 6, 9 and 12 months post op)

Healing of the lip and periodontal soft tissues continued satisfactorily and the patient and mother were happy with the aesthetically pleasing result (one year follow up- see Figures 14, 15 & 16). A mouth guard was made to prevent further dental injuries to the same area. Dental caries was treated appropriately.

However the dental trauma stamp revealed that tooth 21, despite remaining vital (veo to EC and EPT), non-discoloured and asymptomatic, became ankylosed. At 6 months, a decision whether to initiate root canal treatment or not was debated, but no intervention was decided upon, as the tests suggested its vitality. The tooth was non-mobile and was producing a "crack plate metallic" sound on percussion. At 6 months, radiographically, there was evidence of replacement resorption (Figure 17 a, b & c). This worsened at 12 months. This tooth will inevitably be lost.

Discussion

Traumatic dental injuries are common, with between 6-34% of children aged 8-15 experiencing damage to their permanent teeth. Over ¾ of all traumatic oral injuries occur in childhood, and in the United Kingdom, the proportion of 12 and 15 year olds with any traumatic damage was recently found to be 12% and 10% respectively. Traumatised teeth can have a significant clinical, aesthetic and social impact on a child as an individual. Treatment of traumatised teeth usually requires extensive management, carrying a burden for the patient as well carers and health authorities in the long term. Avulsion is the complete displacement of tooth out of its socket and the socket is found empty or filled with a blood coagulum. Avulsion accounts for between 0.5 to 3% of dento-alveolar trauma to permanent teeth. About 90% of replanted avulsed teeth will undergo ankylosis.

For more information, please visit: http://events.dhcc.ac For inquiries please contact Email: CPEvent@dhcc.ac
Office No. +971 4 9522861

For online registration please visit: http://events.dhcc.ac
According to British Society of Paediatric Dentistry (BSPD) guidelines, factors to take into account in avulsed teeth are dry time (DT) and total extra alveolar time (EAT). In cases with less than 30 minutes DT and less than 90 minutes EAT, when stored in appropriate storage medium, replantation without disturbing the PDL is recommended plus splinting with flexible wire for 7-14 days. This case falls under this condition, where the DT was 10 minutes and EAT was 60 minutes. There is limited evidence regarding the benefit of systemic antibiotics on pulp healing. Prescription should be governed by clinical judgment. After evaluation of this patient’s type of trauma with the associated soft tissue injury and contamination, an antibiotic was prescribed as per International Association of Dental Trauma (IADT) guidelines. The GMP guidelines include loss due to the environmental contamination of the tooth. For immature teeth like this case, no endodontic treatment was electively recommended due to an open apex, favorable DT and EAT, as we were hoping for continued tooth growth and 21 with pulpal regeneration. However, we must not forget that the tooth was traumatised for a second time with two hours, thus this may have had an impact on the reduction of its prognosis. The tooth was carefully monitored to assess pulpal regeneration or necrosis. The tooth remained vital, however, it underwent ankylosis. Therefore, its prognosis was deemed poor, and its loss was expected. In children and adolescents, ankylosis is frequently associated with infractionation. Decompression may be necessary later when infractions (1 mm) compared to its counterpart is seen. The outcomes available in the long term, to replace 21 are highlighted below.

### Long term treatment plan and future considerations

#### Tooth 21 future treatment options available will be:
- Decompression: Removal of the crown and retention of the root.
- Extraction and partial removable denture.
- Extraction and resin bond bridge.
- Auto-implantation of a premolar (if crowding occurs).
- Osseointegrated implant (after the age of 18 years)

As he was a very active boy and loves playing football, and due to his dental history where he had a repeated history of trauma in the same tooth, as he was a very active boy and loves football, and due to his dental history where he had a repeated history of trauma in the same tooth, the patient and his parents were warned about the poor long-term prognosis of 21 and alternative long-term treatment options were discussed.

### Summary and conclusion

21 was avulsed with a lip laceration. The tooth was replanted, splinted and the lip was sutured. The tooth suffered another trauma after two hours. Radiographic findings showed signs of replacement resorption from 6 months post trauma. Clinically, 21 responded positively to EPT and EIC tests, no other signs of inflammation. Decompression (removal of the crown and retention of the root with surgical coverage) will be implemented. The lip healed favorably. The patient and his parents were warned about the poor long-term prognosis of 21 and alternative long-term treatment options were discussed.

### References


---

**Table 2. Example of the “dental trauma stamps”:** This was taken at one week post op.

<table>
<thead>
<tr>
<th>Tooth No (10)</th>
<th>Diagnosis</th>
<th>DT6</th>
<th>EAT6</th>
<th>Observer (1)</th>
<th>Observer (2)</th>
<th>Observer (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>concision</td>
<td>+</td>
<td>+</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Figure 15:** Palatal view of 21 one year on. Notice the excellent gingival healing.

**Figure 16:** Lip healing one year on showed excellent soft tissue healing and an aesthetically good outcome following the suturing of the lip.

**Figure 17 (a, b and c):** Post op radiographs taken at 3, 6 and 12 months. They show lack of PDL some pulpal obliteration and replacement resorption.