

## A Review on the Orthodontic Consideration for the Management of Fractured Tooth

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### ABSTRACT

**Background:** This article reviews the orthodontic consideration for the proper management of luxation and avulsion injuries which requires an understanding of the immediate and short-term response to the involved tissues: the periodontal ligament (PDL), pulp, and alveolar bone. This paper seeks to present a short review of the guidelines for orthodontic management of traumatically injured teeth.

**Keywords:** Luxation, Avulsion, Trauma.

### INTRODUCTION

Traumatic injuries to teeth and their supporting tissues usually occur in young people of age 7-19 years and is mostly prevalent in boys. The maxillary incisors are the teeth most commonly involved in dental trauma accidents. In addition, patients with class2 Division 1 malocclusion with increased overjet and incompetent lip coverage are more at risk for dental trauma.<sup>8-11</sup> it is reported that an increase from 0-3mm to 3-6mm doubles the risk of traumatic dental injury and when the overjet is more than 6mm, the severity of this injuries triples.<sup>11</sup> insufficient lip closure that leaves the maxillary incisors unsupported is also reported to be one of the most important factors in increasing the risk of traumatic dental injuries.<sup>12,13</sup>

Guidelines, among other things should assist dentists, other healthcare professionals, and

patients in decision making. Also, they should be credible, readily understandable and practical with the aim of delivering appropriate care as effectively and efficiently as possible. The following guidelines by the International Association Of Dental Traumatology (IADT) represent an updated set of guidelines based on the original guidelines published in 2007 (6-8). The update was accomplished by doing a review of the current dental literature using EMBASE, MEDLINE and PUBMED searches from 1996 to 2011.

The IADT published its first set of guidelines in 2001 and updated them in 2007 (6-13). Guidelines undergo periodic updates. These 2012 Guidelines appear in three parts:

Part I : Fractures and luxations of permanent teeth  
Part II: Avulsion of permanent teeth  
Part III: injuries in the primary dentition.

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## CATEGORIES OF DENTAL TRAUMA:

Some categories of dental trauma include concussion, subluxation, lateral luxation, extrusion, intrusion, avulsion.<sup>2</sup>

## DENTAL TRAUMA AND ORTHODONTICS:

Dental trauma that occurs more than 1 year before orthodontic treatment can be strongly associated with a higher risk of root resorption during orthodontic treatment.<sup>4</sup> It is imperative that all patients be questioned about any previous dental trauma prior to commencing on a course of orthodontic treatment.<sup>14</sup> This will allow the orthodontist to anticipate any potential complications which may occur and to carefully monitor the traumatized tooth during orthodontic movement.<sup>12</sup>

### CONCUSSION

An injury to the tooth supporting structures, without abnormal loosening or displacement of tooth, but with increased reaction to percussion.<sup>13</sup>



Fig 1. Concussion injury.

### CLINICAL AND RADIOGRAPHIC FINDINGS:

The tooth has increased sensitivity to percussion without increased mobility. No radiographic abnormalities are formed.<sup>7-8</sup>

### CLINICAL PROTOCOL:

Monitoring of pulpal condition for at least 1 year.<sup>7</sup>

### ORTHODONTIC PROTOCOL:

Wait 3-5 months to start orthodontic movement, maintaining radiographic control during 1 year after trauma. Use of mild and intermittent forces.<sup>13-14</sup>

**SUBLUXATION:** An injury to the tooth supporting structures with abnormal loosening, but without displacement of tooth.<sup>2</sup>

### CLINICAL AND RADIOGRAPHIC FINDINGS:

The tooth has increased sensitivity to percussion with increased mobility. Bleeding from gingival crevice may be noted. No radiographic abnormalities are observed.<sup>7-13</sup>



Fig 2. Subluxation injury present in right central incisor.

### CLINICAL PROTOCOL:

Stabilization of the tooth with a flexible splint for 2 weeks. Monitoring of the pulpal condition for at least 1 year.<sup>2</sup>

### ORTHODONTIC PROTOCOL:

Wait 3-5 months to start the orthodontic movement, maintaining radiographic control during 1 year after trauma. Use of mild and intermittent forces.<sup>5</sup>

### EXTRUSIVE LUXATION (PERIPHERAL DISLOCATION, PARTIAL AVULSION):

Partial displacement of the tooth out of its socket.<sup>8</sup>



Fig 3. figure showing Extrusive Luxation of left central incisor and lateral incisor.

**CLINICAL AND RADIOGRAPHIC FINDINGS:**

The tooth appears elongated and is excessively mobile. Pulp revascularization may occur, especially in immature teeth. Radiographic examination reveals increased periodontal ligament space apically.<sup>12</sup>

**CLINICAL PROTOCOL:**

Gentle repositioning of the tooth into its socket, stabilization of the tooth for 2 weeks using a flexible splint, monitoring of pulpal condition and radiographic control for 5 years.<sup>14</sup>

**ORTHODONTIC PROTOCOL:**

Wait atleast 6 months to start the orthodontic movement.<sup>6</sup> Radiographic control should be performed every 3 months throughout the orthodontic treatment.<sup>7</sup> Use of mild and intermittent forces. The orthodontic treatment should be simplified if necessary.<sup>12</sup>

**LATERAL LUXATION**

Displacement of tooth in a direction other than axially.<sup>2</sup> This is accompanied by the comminution or the fracture of the alveolar socket.<sup>7</sup>



Fig 4. Lateral Luxation is seen in left central incisor.

**CLINICAL AND RADIOGRAPHIC FINDINGS:**

The tooth is buccally or lingually/palatally displaces, is immobile, and percussion gives a metallic sound.<sup>13</sup> Pulp revascularization may occur, especially in immature teeth.<sup>14</sup> The periodontal ligament space is widened in a occlusal radiographic view.<sup>12</sup>

**CLINICAL PROTOCOL:**

Gentle repositioning of the tooth, stabilization of the tooth for 4 weeks using a flexible splint, monitoring of pulpal condition and radiographic control for 5 years.<sup>7</sup>

**ORTHODONTIC PROTOCOL:**

Wait atleast 6 months to start the orthodontic movement.<sup>2</sup> Radiographic control should be performed every 3 months throughout the orthodontic treatment.<sup>4</sup> Use of mild and intermittent forces.<sup>8</sup> The orthodontic treatment should be simplified if necessary.<sup>8</sup>

**INTRUSIVE LUXATION (CENTRAL DISLOCATION)**

The least common displacement injury in the permanent dentition is intrusive luxation, a displacement of tooth into the alveolar bone. This injury is associated with the comminution or fracture of alveolar bone.<sup>10</sup>



fig 5. Intrusive Luxation is seen in left central incisor.

**CLINICAL AND RADIOGRAPHIC FINDINGS:**

The tooth is displaced axially into the alveolar bone, is immobile, and percussion gives a metallic sound.<sup>14</sup> Pulp revascularization may occur in immature teeth, while pulp necrosis is seen in fully developed roots. Radiographically, the periodontal ligament space may be either completely or partially absent.<sup>7</sup>

**CLINICAL PROTOCOL:**

Watchful waiting of spontaneous re-eruption during 3 weeks is indicated only for immature teeth with intrusion <3mm. cases of intrusion >3mm and <6mm may be treated by orthodontic repositioning, while surgical repositioning is recommended for teeth with intrusion >6mm. Monitoring of pulpal

condition and radiographic control should be performed for atleast 5 years.<sup>6-9</sup>

#### ORTHODONTIC PROTOCOL:

After spontaneous eruption, orthodontic repositioning or surgical repositioning, wait atleast 6 months to start orthodontic movement. Radiographic control should be performed every 3 months throughout the orthodontic treatment. Use of mild and intermittent forces. The orthodontic treatment should be simplified if necessary.<sup>7-9</sup>

#### AVULSION (EXARTICULATION)

Avulsion injury is seen in 0.5% to 3% of all dental injuries and is characterized by a complete displacement of the tooth out of the socket. This injury is accompanied by comminution or fracture of alveolar socket.<sup>6-7</sup>



Fig. 6: Showing Avulsion of left central incisor.

#### CLINICAL AND RADIOGRAPHIC FINDINGS:

Complete displacement of the tooth from its socket.<sup>14</sup>

#### CLINICAL PROTOCOL:

Tooth replantation is the treatment of choice, but the prognosis depends on the measures taken at the site of accident, tooth storage conditions, alveolar wound care and extra-alveolar time elapsed before replantation. Immobilization for 2 weeks, monitoring of the pulpal conditions and radiographic control for 5 years. Prescription of antibiotics and anti-tetanic vaccination.<sup>8-14</sup>

#### ORTHODONTIC PROTOCOL:

If normal periodontal conditions are observed, wait atleast 1 year to start the orthodontic treatment.<sup>7-9</sup> Radiographic control should be performed every 3 months throughout the orthodontic treatment. Use of mild and intermittent forces. The orthodontic treatment should be simplified if necessary.

#### ORTHODONTIC CONSIDERATION:

The control of stress, or even of forces acting on the teeth, becomes fundamental to avoid or reduce the continuation of root resorption. In orthodontic treatment, this control can be achieved through the amount of force applied, by the type of movement, and by the type of force.<sup>12-14</sup>

The amount of force must be smooth, and induce movement of tooth. More important than the amount is the distribution of force in the periodontal ligament and in the root surfaces.<sup>11</sup> It should be noted that the installation of rectangular wires to control torque provides a distribution of force or stress over a larger area of the periodontal ligament and root surface.<sup>2-5</sup>

During the movement of the teeth, interruption of the force, for dissipation of stress in the ligament and recovery of the tissues, is important for maintaining the vitality of tissues and preventing root resorption.<sup>12</sup> In 2003, Weiland found that by using super-elastic wires that apply continuous force and, thus, without interrupting the stress, the possibility of root resorption is 140% greater than with the steel wires that permit interruption of force, thus making tissue repair possible.<sup>14</sup>

#### CONCLUSION

It is very important to carefully evaluate the traumatized teeth on a regular basis. It is recommended that the root and the pulp status of the traumatized teeth be monitored every 3 months. Depending on the severity and type of traumatic injury, it is recommended to wait 3-24 months before continuing with orthodontic treatment, and when treatment does resume, there should be biological consideration and only light forces should and individualized biomechanical modifications should be used in the orthodontic force systems.



## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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