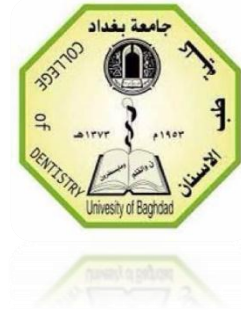


Republic OF Iraq  
Ministry of Higher Education  
And Scientific Research  
University of Baghdad  
College of Dentistry



# **DENTAL TRAUMA**

A Project Submitted to the Pedodontics and Preventive Dentistry  
department in the college of Dentistry / University of Baghdad in  
partial Fulfillment of the Requirement to Award the Degree of  
B.D.S.

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**2022**

**1444**

## *Dedication*

I am dedicate this project to my lovely mother, **father, mother, sisters**  
for their great support and for always believing in me.

To my supervisor who encourages me to keep go.

All , I could not do all this without you.

## Acknowledgment

First of all, I thank "**Allah**" almighty for granting me the will and strength to accomplish this research and I pray that his blessings upon me may continue throughout my life.

Deep thanks to Assist. **Prof. Dr. Raghad Abdulrazzaq AL Hashimi**, Dean of the College of Dentistry-University of Baghdad for his support to accomplish this review.

Deep thanks to **Prof Dr. Ali I. Al-Bustani**, the associate dean for scientific affairs I would like to thank Assist. Prof. Dr. Ahlam Taha, Head of the Department of Pedodontics and Preventive Dentistry for her Kindness and help.

I am indeed internally thankful to my supervisor Lecturer **DR.Muna Abdullah** for her continuous guidance, generous advice, and without their encouragement and wise supervision; the present dissertation would not see the light of the day. My great appreciation and thanks to all teaching staff in Department of Pedodontics and Preventive Dentistry. Finally, to all those whom I forgot to mention their names for their kind efforts helping me to compose this review of literature.

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## **Introduction**

Dental trauma is a public health problem in all societies that reaches a large number of people . The international association of dental traumatology reports that one out of every two children sustain dental injury .the traffic accident, fall, playing , sporting activities, has contributed to the establishment of traumatic dental injury as a public dental health problem, in addition, the remarkable decline of the prevalence and severity of dental caries amongst the children in many countries may have made a traumatic dental injury the most serious public dental health problem among youth in those countries.(Avery,2000 ; McDonald and Avery,2004).

Traumatic dental injury may vary in its severity from a simple enamel fracture which is the most prevalence type to multiple types of trauma affecting both soft and hard tissue, and even it may reach to complete avulsion of the tooth.(Noori, 2007).

Dental injury of primary teeth has been found to be responsible of complicated problems to underlying permanent teeth such as, hypoplasia, dilacerations, delay eruption time and tooth malformation . injury to the permanent teeth may cause long lasting cosmetic, functional problem, in addition to psychological defect for the parent and patient himself. (Whitworth, 2005; Sennhenn-Kirchner and Jacobs,2006).

Many studies have been conducted throughout the world concerning prevalence

and severity of traumatic injury which has been found to be affected by many variables as age, gender, cause of trauma, in addition to lip position , protrusion, type of occlusion, abnormal child behavior(Cortes,2000).

In Iraq , many studies had been conducted on the traumatized anterior teeth from the beginning of the 1980 , some of them were epidemiological studies (**Baghdadi et al ,1981;yagot et al ,1988; EL- Samarria , 1989 ; al-sayyab ,1992 ;al-hayali ,1998 ;al-obaidi and al- Geburi , 2002 ; AL-Kassab , 2005 ; Noori ,2007** ), other was clinical concerning management of emergency cases in hospital (**EL-Samarria , 1995**).



## **Aims of the study**

This project aimed to investigate the cause of occurrence and the types of trauma of anterior teeth between primary school age children

## Review of literature

**1. Tooth anatomy:** dental anatomy is important for optimizing management in patient with dental trauma.

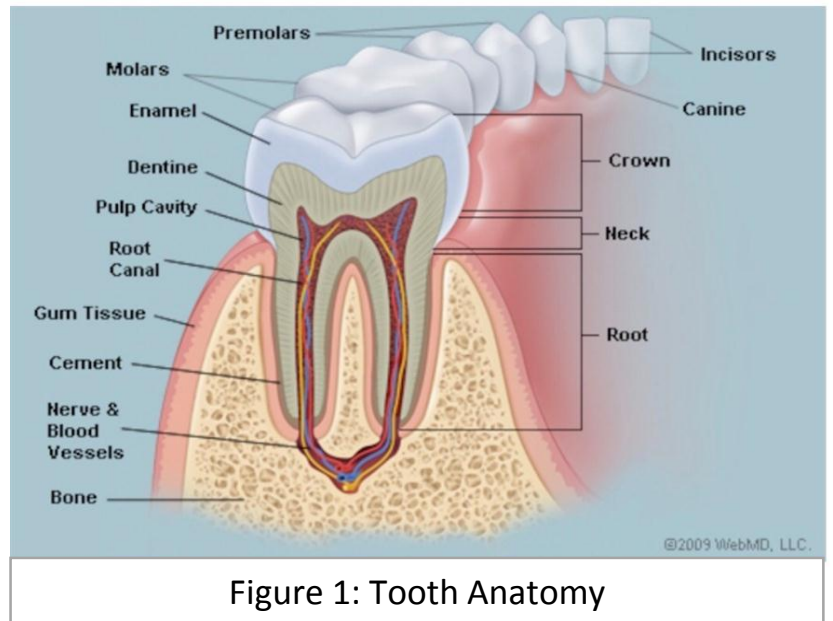


Figure 1: Tooth Anatomy

### Root

- **Root canal.** The root canal is a passageway that contains pulp.
- **Cementum.** Also called cement, this bone-like material covers the tooth's root.
- **Periodontal ligament.** The periodontal ligament is made of connective tissue and collagen fiber. It contains both nerves and blood vessels. .
- **Jaw bone.** The jaw bone, also called the alveolar bone, is the bone that contains the tooth sockets and surrounds the teeth's roots

### Neck

- **Gums.** Gums, also called gingiva, are the fleshy, pink connective tissue that's attached to the neck of the tooth and the cementum.
- **Pulp.** Pulp is the innermost portion of the tooth. It's made of tiny blood vessels and nerve tissue.
- **Pulp cavity.** The pulp cavity, sometimes called the pulp chamber, is the space inside the crown that contains the pulp.

### Crown

- **Anatomical crown.** This is the top portion of a tooth. It's usually the only part of a tooth that you can see.
- **Enamel.** This is the outermost layer of a tooth. As the hardest tissue in your body.
- **Dentin.** Dentin is a layer of mineralized tissue just below the enamel.

## **2. Terminology:**

### **2.1. Trauma:**

Means hurt, wound an injury damage, impairment, external violence producing bodily injury or degeneration. Injury which means insult, harm, or hurt applied to tissue ,may evoke dystrophic and/or inflammatory response from the affected part (Zwemer,1982).

### **2.2. Tooth injury:**

Is the damage to the tooth when an excessive force is placed on it. A tooth injury is a fracture, luxation, or avulsion, although a combination of injury may occur in the same tooth.( Karawani M)

### **2.3. Dental trauma:**

Refers to trauma (injury) to the teeth and/or periodontium (gums, periodontal ligament, alveolar bone), and nearby soft tissues such as the lips, tongue, etc. The study of dental trauma is called dental traumatology. (Wiley-Blackwell, Oxford, UK, 2007)

### 3. Classification of dental trauma:

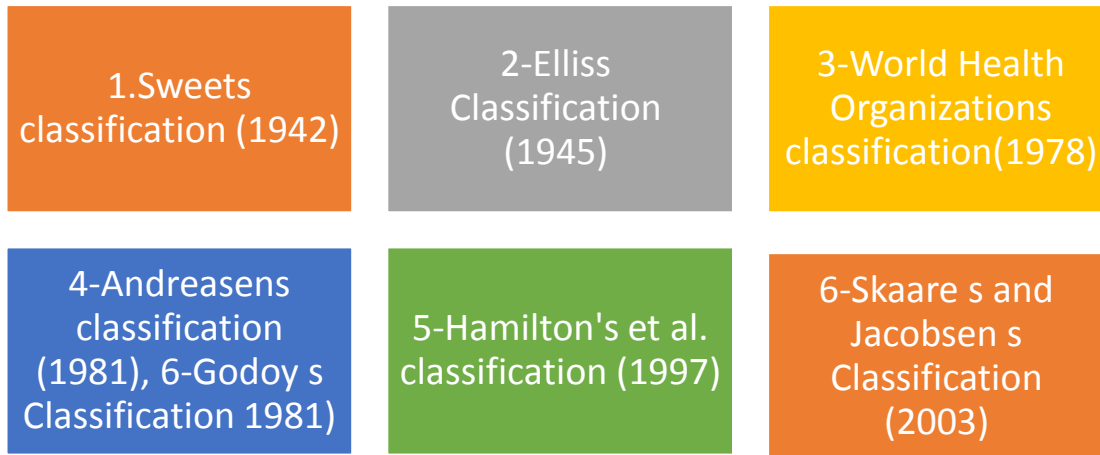


Table 1: Dental Injury (Andreasens classification)

Dental Injury	Clinical Findings	Treatment
<b>1) Enamel infraction</b>	A crack in enamel with no loss of tooth structure  Tooth is not tender	Generally no treatment needed  Discolouration of prominent cracks can be prevented by etching and sealing with resin
<b>2) Enamel fracture</b>	Fracture involving enamel only  Tooth not tender with normal mobility and pulpal response	<b>If available</b> , tooth fragment can be bonded back onto the tooth  <b>If not available</b> , tooth can be restored with composite resin
<b>3) Enamel-dentine fracture</b>	Fracture involving both enamel and dentine without pulp exposure  Tooth not tender with normal mobility and pulpal response	<b>If available</b> , tooth fragment can be bonded back onto the tooth  <b>If not available</b> , tooth can be restored with composite resin

<p><b>4) Enamel-dentine-pulp fracture</b></p>	<p>Fracture involving enamel and dentine with pulp exposure</p> <p>Tooth not tender with normal mobility</p> <p>Exposed pulp will be sensitive to stimuli</p>	<p><b>In developing teeth</b>, preserve pulp vitality by pulp capping or partial pulpotomy using calcium hydroxide</p> <p><b>In mature teeth</b>, root canal treatment is usually performed</p>
<p><b>5) Crown-root fracture without pulp involvement</b></p>	<p>Fracture involving enamel, dentine and cementum without pulp exposure</p> <p>Fracture extends below the gum margin</p> <p>Tender tooth with mobile crown fragment</p>	<p><b>Emergency:</b></p> <p>aim is to stabilise the loose fragment by splinting it to adjacent teeth</p> <p><b>Non-emergency:</b></p> <p>removal of loose fragment (following gingivectomy, surgery or via orthodontics), root canal treatment and restoration with post-retained crown</p> <p><b>In extreme cases:</b> (such as a vertical fracture), tooth may need to be extracted</p>
<p><b>6) Crown-root fracture with pulp Involvement</b></p>	<p>Fracture involving enamel, dentine and cementum with pulp exposure</p> <p>Tender tooth with mobile crown fragment</p>	<p><b>Emergency:</b></p> <p>aim is to stabilise the loose fragment by splinting it to adjacent teeth</p> <p><b>(1)</b>In developing teeth, preserve pulp vitality by pulp capping or partial pulpotomy using calcium hydroxide</p> <p><b>(2)</b>In mature teeth, root canal treatment is usually performed</p> <p><b>Non-emergency:</b></p> <p>removal of loose fragment (following gingivectomy, surgery or via orthodontics), root canal treatment and restoration with post-retained crown</p> <p><b>In extreme cases:</b> (such as a vertical fracture), tooth may need to be extracted</p>
<p><b>7) Root fracture</b></p>	<p>Mobile or displaced crown segment</p> <p>Tender tooth that may be bleeding from the gum</p> <p>Tooth may be discoloured (red or grey)</p>	<p>Flexible splint used to stabilise tooth for at least 4 weeks and then reassess tooth stability</p> <p>Root canal treatment will be needed if pulp necrosis develops (this occurs in ~20% of root fractures)</p>

Table 2: periodontal Injury (Andreasens classification)

<b>periodontal Injury</b>	<b>Clinical Findings</b>	<b>Treatment</b>
<b>1) Concussion</b>	Tender tooth with no displacement and normal mobility	No treatment required
<b>2) Subluxation</b>	Tender tooth with no displacement but increased mobility May be bleeding from the gum	Usually no treatment required Can use a flexible splint to stabilise the tooth for up to 2 weeks
<b>3) Extrusion</b>	Tooth looks longer and is very mobile	Tooth is repositioned gently in the socket Tooth stabilised with a flexible splint for 2 weeks
<b>4) Lateral luxation</b>	displacement of the tooth other than axially	Reposition the tooth using fingers or forceps to remove its "bony lock" and gently reposition it in the socket Tooth stabilised with a flexible splint for 4 weeks.
<b>5) Intrusion</b>	Tooth is displaced into the alveolar bone	allow time for tooth to naturally erupt but if no movement after a few weeks then start orthodontic or surgical repositioning.
<b>6) Avulsion</b>	Tooth completely removed from socket	Treatment will depend on whether the tooth has an open or closed apex and how long the tooth has been out of the mouth.

## **4. Epidemiology study of dental injury:**

### **Prevalence:**

Is defined as the number, of event, in this case the number of children experiencing dental trauma in a giving population designated time point (Last, 1995).

It is inappropriate ,for instance , to compare figures found in clinic- and hospital based studies with population -based studies , since that clinic- and hospital based studies provide less epidemiological evidence than population based studies (Hennekens and Buring ;1987). As for studies that are based on sample derived from hospitals or private clinics , intrusion , extrusion and luxation injuries are the most common types of injury found (Harrington et al., 1989 ; Andreasen , 1994).

While , studies which are based on samples derived from normal population , a simple enamel fracture or enamel-dentin fracture were the most common types of injury reported (Hargreaves and matejka,1995).

### **4.1 Epidemiologic studies**

Epidemiological study was carried out among 400 children from various special schools of visually impaired children of **Chhattisgarh** followed by school dental checkup camps. All the children completed a questionnaire related history of trauma, cause, and place.

Results: The results showed that out of 400 children, 39% suffered from TDIs. Permanent maxillary central incisors were most commonly injured

teeth with injuries involving enamel (53%) being most frequently observed observed.

Another study in Brazil identify the occurrence of dental trauma in deciduous teeth. Over a period of 25 months, 85 children between 10 months and 6 years of age were assisted by the staff of the Pediatric Dentistry Clinic of the Federal University of Santa Catarina (UFSC) Florianópolis, Brazil.

The occurrence of trauma was higher in male patients (51.8%) and in children between 1 and 3 years old.

#### 4.1.1 Iraq studies

many Iraq studies had been conducted on the traumatized anterior teeth, some of them were epidemiological studies concerning prevalence, incidence, gender and age variation

<b>Name</b>	<b>Year</b>	<b>Sample</b>	<b>prevalence</b>
Al-baghdadi et al	1981	6090 students selected from Baghdad primary school	Found 7.7% traumatic injury 6-12 age groups
Al-sayyab	1992	Conducted a survey in rural area examined 306 children between 2-13 years	15.3% of the sample had dental injuries
Al-Hayali	1998	Performed his study in both urban and rural area in the central region of Iraq examining 7213 child of 4-15 years old	Found a prevalence of dental injuries 30% of the total sample with simple enamel fracture was most



			common type for both dentition
Al-Obaidi and Al-Mashhadani	2002	Carried out a survey in sheha village in Baghdad in a sample of 285 subjected of 5-30 years old	14% dental trauma
Noori	2007	Performed a study among 4015 , 6-13 years old children in different primary school in sulaimania city	6.1% and the highest prevalence of dental trauma was 11.5% among 12-13 years old

## 5.Prevention

Prevention in general is relatively difficult as it is nearly impossible to stop accidents from happening, especially in children who are quite active. Regular use of a **gum shield** during sports and other high-risk activities (such as military training) is the most effective prevention for dental trauma. They are mainly being fitted on the upper teeth as it has higher risk of dental trauma compared to the lower teeth. Gum shields ideally have to be comfortable for users, retentive and odourless, tasteless. (McCrory, Paul 2001-04-01).

However, studies in various high-risk populations for dental injuries have repeatedly reported low complaine of individuals for the regular using of mouthguard during activities. Moreover, even with regular use, effectiveness of prevention of dental injuries is not complete, and injuries can still occur even when mouthguards are used .(Zadik Y, Levin L 2009).

## 5.1.Types of gum shield

- **Stock ready-moulded**
  - ❖ Not recommended as it does not conform the teeth at all
  - ❖ Poor retention
  - ❖ Poor fit
  - ❖ Higher risk of dislodging during contact sports and airway occlusion which may lead to respiratory distress
- **Self-moulded/ Boil and bite**
  - ❖ Limited range of sizes, which may result in poor fitting
  - ❖ Can be easily remoulded if distorted
  - ❖ Cheap
- **Custom-made**
  - ❖ Made with ethylene vinyl acetate
  - ❖ The most ideal type of gum shield
  - ❖ Good retention
  - ❖ Able to build in multiple layers/laminations

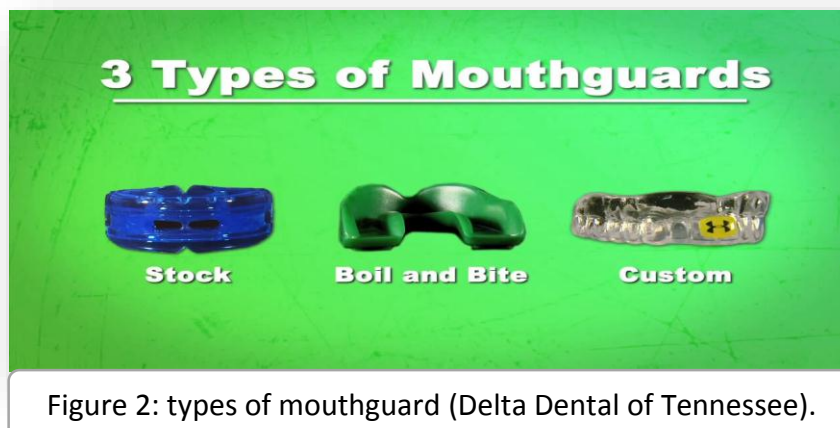


Figure 2: types of mouthguard (Delta Dental of Tennessee).

## 6. Complications of dental trauma

Not all sequelae of trauma are immediate and many of them can occur months or years after the initial incident thus required prolonged follow-up. Common complications are pulpal necrosis, pulpal obliteration, root resorption and damage to the successors teeth in primary teeth dental trauma. The most common complication was pulp necrosis (34.2%). 50% of the tooth that have trauma related to avulsion experienced ankylotic root resorption after a median TIC (time elapsed between the traumatic event and the diagnosis of complications) of 1.18 years. Teeth that have multiple

traumatic events also showed to have higher chance of pulp necrosis (61.9%) compared to teeth that experienced a single traumatic injury (25.3%) in the studies. (Lin S, Pilosof N, Karawani M, Wigler R)

## 6.1. Pulpal necrosis

Pulp necrosis usually occurs either as ischaemic necrosis (infarction) caused by disruption to the blood supply at the apical foramen or as an infection-related liquefactive necrosis following dental trauma (2). Signs of pulp necrosis include. (Love RM May 1997)

- Persistent grey colour to tooth
- Radiographic signs of periapical inflammation
- Clinical signs of infection: tenderness, sinus, suppuration, swelling

Treatment options will be extraction for the primary tooth. For the permanent tooth, endodontic treatment can be considered.

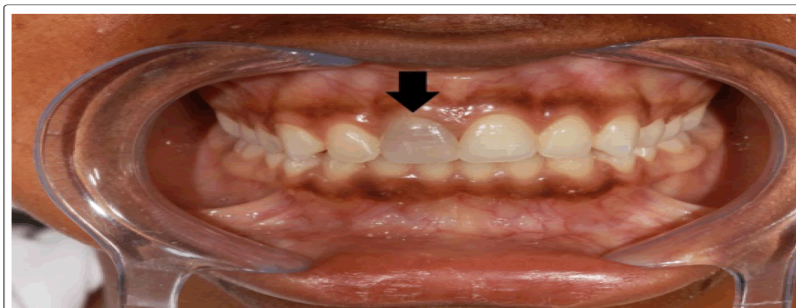


Figure 1: Aseptic necrosis

Figure 3: pulp necrosis (Journal of Interdisciplinary dental science)

## 6.2. Root resorption

Root resorption following traumatic dental injuries, whether located along the root surface or within the root canal appears to be a sequel to wound healing events, where a significant amount of the PDL or pulp has been lost due to the effect of acute trauma.

(Andreasen JO, Andreasen FM 1992)

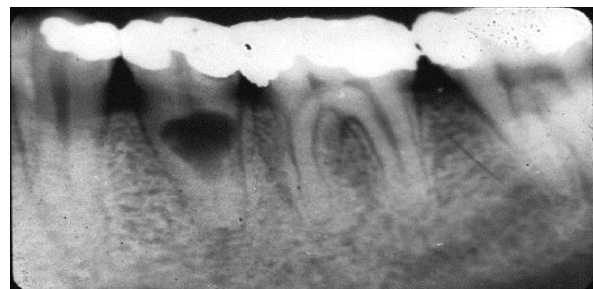


Figure 4: root resorption (DC Dental Spa).

### 6.3. Pulpal obliteration

4-24% of traumatized teeth will have some degrees of pulpal obliteration that is characterized by the loss of pulpal space radiographically and yellow discolouration of the clinical crown. No treatment is needed if it is asymptomatic. Treatment options will be extraction for symptomatic primary tooth. For symptomatic permanent tooth, root canal treatment is often challenging due to pulp chamber is filled with calcified material and the 'drop off' sensation of entering a pulp chamber will not occur. (McCabe PS, Dummer PM ,February 2012)

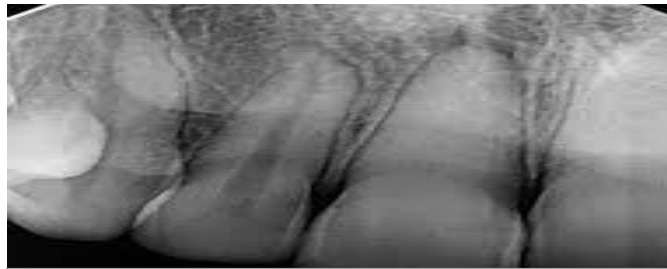


figure 5: pulpal obliteration  
(soniachopradds.com)

### 6.4. Damage to the successor teeth

Dental trauma to the primary teeth might cause damage to the permanent teeth. Damage to the permanent teeth especially during development stage might have following consequences. Mahesh R, Kanimozhi IG, Sivakumar M (May 2014)

- Crown dilaceration
- Odontoma-like malformation
- Sequestration of permanent tooth germs
- Root dilaceration
- Arrest of root formation

## 7. Premature loss of primary anterior teeth due to trauma

premature loss of primary anterior teeth due to trauma can be the outcome of an avulsion, extraction after the injury because of poor prognosis, late complications of the injury, or early exfoliation because of accelerated resorption of the root. Avulsion occurs more often in 2-4 year-old children and it affects boys 1.2–1.5 times more often than girls. The maxillary primary central incisor is involved more than any other tooth. (Holan G, Ram D.)

**7.1. esthetic and life quality:** The outcomes of traumatic dental injuries (TDI) to permanent teeth can affect one's self-image and thus one's quality of life TDI such as avulsion of a maxillary primary incisor results in a sudden change in the appearance of the child. It is therefore not surprising that parents often demand replantation of avulsed teeth to allay any concerns they have about how this will affect their child's appearance and thus the parents' view of the child. (Giannetti L, Murri A.)



Figure 6: avulsed tooth

## 7. Speech impairment:

In 1995, Gable et al. **43** performed a controlled study with 26 children with premature extraction of the maxillary incisors and 26 children with normal exfoliation of their primary maxillary incisors. All subjects were subsequently tested for speech impairment after the eruption of their permanent incisors. Interestingly, at least half of the subjects tested in both groups had articulation impairments with no statistical difference between the groups. Both groups demonstrated a maturation effect with the number of articulation errors decreasing with age (Riekman GA, ElBadrawy HE.)

### 7.3. Space loss:

When traumatized primary teeth are lost prematurely, an important concern is the potential for space loss as a result of spontaneous drifting of the adjacent teeth into the edentulous. This loss of space can cause intra-arch discrepancies during the primary, mixed, and/or permanent dentition, which include delay or ectopic eruption of the succedaneous teeth with a resultant malocclusion. (Gable TO, Kummer AW.)



figure 7: space loss (2019 DENTAL IMPLANT MISSING TEETH.com)

## Space loss is greater:

1. in the maxilla than in the mandible,
2. in crowded compared with spaced dentitions,
3. the earlier the tooth is lost,
4. the more posterior the tooth is in the dental arch

## 7.4. Acquired and prolonged oral habits

The premature loss of primary anterior teeth could possibly have an acute or chronic effect on the initiation, cessation, or prolongation of common non-nutritive childhood oral habits such as pacifier use, digit sucking, or tongue thrusting. (Wright GZ, Friedman CM 1985)

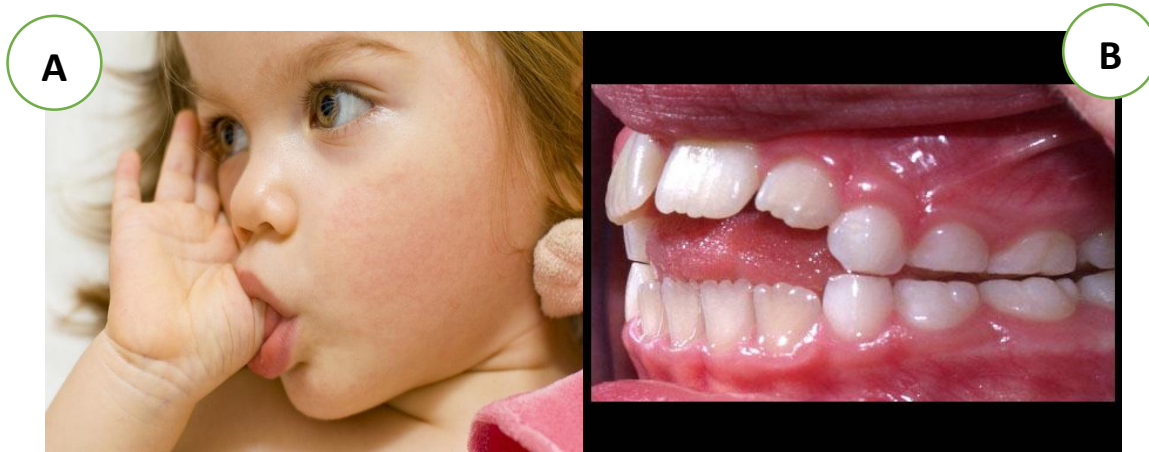


figure 8: A show digit sucking. B show tongue thrust.

## **Conclusion**

Traumatic dental injury is considered a serious public health problems especially in children; parents and teachers should be informed on prevention and emergency management of traumatic dental injuries. In addition, the findings showed that initial treatment after dental trauma should be as quick as possible.



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