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Case Study

DENTAL TRAUMATOLOGY-MEDICOLEGAL ASPECTS (INDIAN PERSPECTIVE)

[1]Ashok Chanana, [2]Shivangi Chanana & [3]Sanjay Kalra
[1]Department of Forensic Medicine and Toxicology, Govt. Medical college Amritsar.
[2]First year MDS Junior Resident, BRS Dental College, Panchkula (Haryana), India
[3]Deptt. of Prosthodontics, BRS Dental College, Panchkula, Haryana

ABSTRACT
This paper highlights the definition, mechanism of causation and classification of dental trauma. After sustaining dental trauma detailed examination of injured is done for extra oral and intraoral injuries in conjunction of other body injuries after eliciting the detail history. Evaluation of the injuries for medicolegal purpose is done in relation to the nature, kind of weapon used to inflict them and their probable duration. The evaluation report guides the investigating agency in applying the relevant section of Indian Penal Code to apprehend the accused. Emphasis is also laid on the first and periodic examination of the accused (who is in the State custody) not only for the presence or absence of general injures on his person but for dental trauma also, as per the direction of the apex court of the country .

KEY WORDS: Definition, Pathology, Classification, Examination, Evaluation and Medicolegal implication of dental trauma

INTRODUCTION

Traumatic injuries constitute unfortunate, painful and distressing events with multilevel consequences. Although the oral region comprises only 1% of total body area, oral injuries are very frequent observation after assault or scuffle and account for almost 5% of all injuries and for a higher proportion among children. This links the dental traumatology to the forensic Odontology. Unfortunately in India what to talk of forensic traumatology, forensic Odontology is in infantile stage. This chapter deals with the importance of dental trauma, its causation and examination by a team of forensic Odontologist and forensic physician to evaluate it from medico-legal point of view.Dental trauma is injury to teeth, gums and jaw bones. The most common dental trauma is a broken or displaced tooth though dental trauma includes teeth that are knocked out (dental avulsion), cracked (fractured), forced out of position (dental Luxation, lateral displacement, or extrusion), pushed up into the jawbone (dental intrusion), or loosened by impact (subluxation or dental concussion) [1].

Causes

The cause of dental trauma varies depending on the age. Toddlers are more likely to injure a tooth by falling, while older children are more likely to suffer dental trauma from a sports injury. Teenagers often present with dental trauma as the result of fights. The incisors in the upper jaw are the most commonly injured teeth. Dental trauma can be inflicted by;

1. Contact sports
2. Motor vehicle accidents,
3. Fights,
4. Falls,
5. Eating hard foods,
6. Drinking hot liquids,
7. Anesthesia related,
8. Forged/ Self inflicted/ fabricated injuries.
9. Dental torture
10. Child abuse

Dental trauma from Forensic medicine point of view

The examination should first include soft tissue wounds for the type of mechanical injury caused. The type of mechanical injury may be one or more than one type that is:

1. Abrasion
2. Bruise
3. Laceration
4. Incised wound
5. And sometimes firearm injuries.

If it's penetrating wound emphasis on the possible presence of foreign bodies embedded within it should be given. Thereafter, the hard tissues are examined for the presence of infractions and fractures.

Evaluating and reporting dental injuries (Andreasen's classification), based on a system adopted by the WHO[2]:-

Crown infraction
Incomplete fracture (crack) of enamel with loss of tooth substance

Uncomplicated crown fracture
Confined to enamel or enamel and dentin, pulp not exposed

Complicated crown fracture
Involves enamel and dentin, pulp is exposed
Uncomplicated crown-root fracture
Involves enamel, dentin, and cementum, but does not expose pulp
Complicated crown-root fracture
Involves enamel, dentin, cementum, and exposes pulp
Concussion
Injury to supporting structures without abnormal loosening or displacement of the tooth, but with marked reaction to percussion
Subluxation (loosening)
Injury to supporting structures with abnormal loosening, but without displacement of the tooth
Intrusive luxation
Tooth displaced into alveolar bone, injury accompanied by comminution or fracture of alveolar socket
Extrusive luxation
Tooth partially displaced out of its socket
Lateral luxation
Tooth displaced in a direction other than axially, with comminution or fracture of alveolar socket
Exarticulation (complete avulsion)
Tooth completely avulsed from socket
Comminution of alveolar socket
Crushing and compression of alveolar socket, found with intrusive and lateral luxation
Fracture of alveolar socket wall
Fracture confined to the labial or lingual socket wall
Fracture of mandible or maxilla
Involves the base of mandible or maxilla and often the alveolar process, may or may not involve alveolar socket
Laceration of gingiva or oral mucosa
Shallow or deep wound in mucosa resulting from tear, and normally produced by sharp object
Contusion of gingiva or oral mucosa
Bruise usually caused by blunt object, no break in mucosa, usually causes small sub mucosal hemorrhage
Abrasion of gingiva or oral mucosa
Superficial wound produced by rubbing or scraping mucosa, leaving raw, bleeding surface

MEDICO-LEGAL EXAMINATION
It comprises of three parts-
1. Preliminary Examination
2. Body of the Report
3. Conclusions / Opinion / Deductions/ Inference.

Preliminary examination-
- Name, Age, Sex, Caste, Residence, Occupation of the victim,
- Accompanying person's Name and address
- If brought by police then Name & Belt No. of the constable, with docket/ requisition letter of concerned police station,
- Date and Time of arrival, Date and Time of examination, place of examination,
- Consent,
- Identification marks
- And examination fees if required.

Body of the report-
In practice history plays an important role in arriving at clinical diagnosis, similarly brief medico legal history has a great role to play in forensic traumatology. When the patient is received with an acute trauma, the oral region is usually heavily contaminated. The first step in the examination procedure, therefore, is to wash the patient's face. While this is being done, it is possible to get an initial impression of the extent of injury. Thereafter, a series of questions must be asked. These questions include:

1. **How did the injury occur?** The answer will indicate the location of possible injury zones (e.g. crown-root fractures in the premolar and molar region after impacts under the chin).
2. **By whom the injuries are caused**? (Name and number of accused involved).
3. **Why the injuries are caused**? I.e. The motive behind assault.
4. **With what the injuries are inflicted**? i.e. the alleged weapon
5. .**Where did the injury occur?** This will also indicate the consistency of face and possibility of contamination of wounds.
6. **When did the injury occur?** i.e. date and time especially in case of avulsed or displaced teeth. Any inconsistency between the appearance of the wounds on a child and history supplied should raise suspicion.
7. **What he did after being assaulted**? i.e. whether he visited the police station or came back to home or took treatment from any other hospital?
8. **Was there a period of unconsciousness? If so, for how long? Is there headache? Amnesia? Nausea? Vomiting?** These are all signs of head injury and require medical attention.
9. **Has there been previous injury to the teeth?** Answers to this question may explain Darkened and/or non-vital teeth[3] (occur over a period of weeks, or even months[4]) with radiographic findings, such as pulp canal obliteration[4] and incomplete root formation in a dentition with otherwise completed root development. **Development of ankylosis** After avulsion could be diagnosed 10 weeks after injury by the percussion test, whereas radiographic diagnosis *could be* made after 4 month[5].
10. **Is there any disturbance in the bite?** An affirmative answer can imply one of the following conditions: tooth luxation, alveolar fracture, jaw fracture or luxation or fracture of the temporo-mandibular joint.
11. **Is there any reaction in the teeth to cold and/or heat?** A positive finding indicates exposure of dentin.

The history may reveal history of repeated assaults with the present injury as one of a series of injuries that the victim has experienced. Also the attendants may offer an explanation that may or may not be compatible with the mode of causation of injury. If the dental injuries resulted from a fall, for example, one would usually expect to also find bruised or abraded knees, hands, or elbows. When these additional injuries are not present, further inquiry is appropriate.

General Physical Findings-
Before examining the mouth, note general physical findings that are consistent with assault/scuffle.

- Mental status- whether conscious, cooperative and oriented?
- Nutritional status- poor / moderate/well built?
- Vitals-Blood pressure/Pulse rate /Respiration rate –if stable?

Extra oral injuries

There may be bruises or abrasions on chest, abdomen, back and extremities reflecting the shape of the offending Object, e.g., belt buckle, strap, and hand. They may be in various stages of healing, indicating the possibility of repeated trauma. Cigarette burns or friction burns may be noted, e.g., from ligatures on wrists, gag on mouth. Bite marks and bald patches (where hair has been pulled out) may be present. Both oral and facial injuries of assault may occur alone or in conjunction with injuries to other parts of the body.

Local examination-

Facial lesions-Injuries to the face may include trauma to the eyes, ears, and nose.

1. Blunt force trauma to the **eye** may cause periorbital bruises (black eyes), acute hyphema (blood in the anterior chamber of the eye), retinal and subconjunctival hemorrhage, ruptured globe, dislocated lens, optic atrophy, traumatic cataract, and detached retina[6].
2. Direct trauma to the **nose** may cause deviated septum due to cartilage injury or hematoma formation. Such trauma may also cause nasal fractures, with accompanying bilateral periorbital ecchymosis[7].
3. Injuries to the **ear** may be associated with twisting and bruising, while repeated blows may eventually result in a "cauliflower ear". Blows to the ear can also rupture the tympanic membrane or cause hemorrhage and hematoma formation[7].

Bruises from hand slapping are not uncommon. In such cases the bruise may reproduce the outline of the hand. Injuries may take the shape of the object used to inflict the injury, such as a belt buckle or looped electric cord. Whenever bruises occur on both sides of the mouth or face at once, or if there is scarring of the lips, child abuse should be suspected. Also, the presence of injuries on multiple body surfaces suggests abuse. Multi-planar injuries can occur accidentally only as a result of tumbling falls (e.g., falling down stairs) or trauma incurred during automobile accidents[7].

The lips and corners of the mouth may show contusions, lacerations, burns, or scars due to frequent attack. Bite marks on the face are most commonly found on or around the cheeks. However, they may occur on the ear, nose, chin, or elsewhere.

Changes in the injury after trauma-

Examine for: -

i. Pain/tenderness
ii. Redness and other colour changes-
iii. Swelling
iv. Bleeding
v. Clot
vi. Wound margins and its changes i.e. reddish or swollen
vii. Fracture
viii. Pus
ix. Granulation tissue

Knowledge of the color changes associated with bruising may be important in determining when the injury occurred, and in determining whether other injuries occurred during the same event or at different times

Intra oral examination

A victim with rampant, untreated dental decay and poor oral hygiene may be suffering from pain, infection, and a threat to the general health and well-being. Health professionals should make a note of dental caries; any life-threatening systemic conditions if present (such as sub acute bacterial endocarditis, glomerulonephritis, or juvenile-onset diabetes); Presence of untreated traumatic injuries as indicated by non-vital teeth, avulsed permanent teeth, and injuries to soft tissues (with signs of scarring); Severe mal-relationships of the maxilla and mandible, including craniofacial anomalies, which may result in deficient speech, esthetic deformities, and psychological disturbances.

Typical Oral Lesions

Contusions or lacerations of the labial or lingual frenula, gingival mucosa, lips, Tongue and other intraoral soft tissue injuries like ulceration of the palate or uvula results from blunt force trauma e.g. in forced feeding, A forceful slap, from efforts to gag or silence a child, falls etc. The location and extent of the injury will depend on the magnitude of force and the location and direction of the blow. Burns on the lip, as well as burns on the face or tongue, may be signs of physical punishment[7] and may exhibit abnormal anatomy or function due to scarring.

Findings on Dental Examination

Examination of dental injuries includes;-

1. Thorough clinical examination
2. Manipulation of the jaws,
3. Percussion,
4. Pulp vitality tests,
5. Radiographic studies,

Loosened, fractured, or avulsed teeth

Severe trauma to the lower face may loosen teeth, completely displace them from their alveolar sockets, and/or cause dental fractures. The diagnosis of *infractions* is facilitated by directing the light beam parallel to the labial surface of the injured tooth. In the case *of crown fractures a*ll possible pulp exposures should' be detected and their size noted, as well as the vascularity of the pulp (whether there is fresh hemorrhage, cyanosis or ischemia). Detection of pinpoint perforations is facilitated by thorough cleansing of the fracture

Mobility testing should determine the extent of loosening, especially in axial direction of individual teeth (an indication of a severed vascular supply) and mobility of groups of teeth (an indication of fracture of the alveolar process).

Percussion testing, with a finger in small children or the handle of a metal instrument, has two functions.

Tenderness to percussion in an axial direction (i.e., from the incisal edge) will indicate damage to the periodontal ligament- Percussion of the labial surface will yield, either a high or low percussion tone, A high, metallic percussion tone is an indication that the injured tooth is locked into bone (as in lateral luxation or intrusion). At the follow-up periods, this tone indicates ankylosis. This finding can be confirmed if a finger is placed on the oral surface of the tooth to be tested- It is possible to feel the tapping of the instrument in a tooth with a normal periodontal ligament. In the case of intrusion, lateral luxation or ankylosis, percussion cannot be felt through the tooth tested.

Electrometric sensibility testing should be carried out if at all possible, as it gives important information about the neurovascular supply to the involved teeth. The most reliable response is obtained when the electrode is placed upon the incisal edge or the most incisal aspect of enamel in the case of crown fractures, It should be noted that young teeth with incomplete root formation do not respond consistently to sensibility testing; but the response at the time of injury provides a baseline value for comparison at later follow-up examinations. Finally, sensibility testing in the primary dentition may yield inconclusive information due to lack of patient cooperation.

The radiographic examination

The clinical examination should now have determined the area of injury that is the area to be examined radio-graphically. In the presence of a *penetrating lip lesion* as soft tissue radiograph is indicated in order to locate eventual foreign bodies. It should be noted that the orbicularis oris muscles close tightly around foreign bodies in the lip, making them impossible to palpate; they can only be identified radio-graphically. This is accomplished by placing a dental film between the lips and the dental arch and using 25% of the normal exposure time. An occlusal exposure (using a size 2 film) of the traumatized anterior region gives an excellent view of most *lateral luxations, apical and mid-root root fractures* (missed unless the radiographs are examined carefully) and *alveolar fractures.*

During normal healing the fracture line increases in width about 2 weeks after reduction of the fracture. This results in the resorption of the fractured ends and small sequestered fragments of bone. Evidence of re-mineralization usually occurs 5 to 6 weeks after treatment. Unlike the long bones of the skeleton, rarely is a callus formed in healing jaw fractures. The complete remodeling of the fracture site with obliteration of the fracture line may take several months. On rare occasions, fracture lines may persist for years, even when the patient has made complete recovery.

Fractures of jaws and associated structures

Fractures of the maxilla, mandible, and other cranial bones may be found in some cases. The diagnosis of fractures of the jaws is made primarily on the basis of clinical and radiographic findings[8]. The clinical examination includes both extra oral and intraoral palpation. One should suspect fracture of the mandible if there is;-

- Swelling or ecchymosis in the lower face
- An abrupt change in the occlusal level of the teeth (may be associated with open bite).
- Difficulty in opening the mouth and facial asymmetry.
- Abnormal mobility of bony structures, or the ability to move the mandible beyond its normal excursion in any direction.
- Crepitation and deviation of the midline on closing.
- Painful movements at the temporo-mandibular joints.

The medical practitioner who observes dental trauma is well advised to seek consultation with a dentist, or oral and maxillofacial surgeon. This added expertise is important, not only to care for the present injury, but also to help evaluate previous trauma[2].

If the victim brings with him the avulsed tooth or broken tooth then the examination of the tooth should be done for matching it with its retained stump in the socket .And it should be preserved for DNA profiling if need arises in future. Natural sterility and stability of dental pulp is near about 400 yrs i.e. 400yrs old teeth can be taken for DNA analysis. The DNA concentration which is extracted from the teeth exposed to ground soil for 6 weeks is not contaminated and degraded is sufficient for DNA analysis by PCR technique[12].

Nature of Injury/Hurt:

It comprises two words Injury and its Nature.

Under **section 44 IPC** the word injury denotes any harm whatever illegally caused to any person in body, mind, reputation or property.

While in medical world word injury means breach in the anatomical continuity of body tissue.

As per **section 319 IPC** whoever causes any bodily pain, disease or infirmity to any person is said to cause hurt.

Nature of injury means severity of harm. In medico legal terminology it can be simple, grievous or dangerous to life. Under Section 320 of IPC the following kinds of hurt only are designated as "grievious"[10]:-

First: - Emasculation.
Secondly:-Permanent privation of the sight of either eye.
Thirdly: - Permanent privation of the hearing of either ear.
Fourthly:-Privation of any member or joint
Fifthly: - Destruction or permanent impairing of the powers of any member or joint.
Sixthly: - Permanent disfiguration of the head or face.
Seventhly:-Fracture or dislocation of a bone or tooth.
Eighthly:-Any hurt which endangers life or which causes the sufferer to be during the space of twenty days in severe bodily pain, or unable to follow his ordinary pursuits.

Under clause fifth / seventh of the above mentioned section, dental injury may be declared as "Grievous"

Injury/Hurt which is neither extensive nor serious heals rapidly without causing any permanent deformity or disfiguration is said to be simple in nature.

Nature of injury may be declared immediately after the medico-legal examination of the injured or later on after taking into consideration the clinical notes and the investigation reports especially so when there is suspicion that the injury may be "grievous" or "dangerous to life".

Can dental trauma be dangerous to life?

If the mechanical impact inflicted on the face and the force of impact is transmitted to the intracranial contents with or without fracture of the skull/facial bone or due to fulminant infection as a result of which the vital functions of the brain are affected or due to entry of blood or broken tooth in the respiratory passage(aspiration) or due to shock thereby endangering the life of the patient/victim then the dental injury may be declared as "Dangerous to life" and the assailant may be charged u/s 307 IPC.

Probable duration of injury

Ascertaining the age of dental trauma is important to know whether all the injuries are of the same duration or of different timings. By ascertaining the age of injuries the examining doctor is guiding the Investigating officer that injuries are not as a result of single scuffle/incidence or different persons may be involved in causing the trauma at different time. Age of injuries is assessed from the different durations of parameters which appear when there is healing and repair of injuries.

MANNER OF INFLICTION

It can be-

1. Natural
2. Unnatural (accidental/ homicidal /suicidal)

Though primarily it's the job of I.O. to ascertain the manner of infliction but sometimes the forensic physician opinion is sought. Manner of infliction is usually opined after examination of the injuries, wearing apparels, inflicting weapon and after going through the circumstantial evidences submitted by the I.O. along with the report of scene of crime. In cases of dental trauma most of the times the role of doctor usually comprises in ascertaining whether trauma is as a result of unnatural manner or due to disease. When on examination he finds mechanical injury to the tooth, sockets, gums, cheeks, lips etc than he should not hesitate in opining as it is unnatural, but if no associated trauma presents along with poor oral hygiene and no fracture of thin alveolar bone (when the tooth is said to be fractured) than it may go in favors of fabricated story of trauma furnished by the patient and detailed clinical examination may be helpful in diagnosing the dental disease from which he is suffering.

Type or kind of weapon used and the criminal charges thereof

Whoever does any act with the intention of thereby causing hurt (321 IPC) or grievous hurt (322 IPC) then the assailant may be punished u/s 323(imprisonment for 1 yr, or fine of 1000 rupees, or both-Bailable offence) or 325 IPC (imprisonment for 7 yrs, and fine –Bailable offence). If dental trauma is as a result of voluntarily causing hurt/grievous hurt **by dangerous weapon** (any instrument for shooting, stabbing or cutting) then the assailant may be punished u/s **324 IPC** (imprisonment for 3 yrs, or fine, or both-Non Bailable offence) or **326** IPC (imprisonment for life, or for 10 yrs and fine- Non Bailable). If after police investigation assisted by medical expertise it is found that that dental trauma is not as a result of scuffle but as a result of fabrication of trauma then the fabricators may be punished u/s **182 IPC (**i.e. giving false information with intent to cause public servant to use his lawful power to the injury of another person) with imprisonment of either description for a term which may extend to six months, or with fine which may extend to one thousand rupees, or with both..

CONCLUSIONS & SUGGESTIONS

Dental trauma is not uncommon in India. The liberty of an innocent person and punishment to a guilty largely depends upon the meticulous medico legal examination of dental trauma case and its appropriate medico legal evaluation.

1. The Supreme Court of India (DK Basu vs. state of West Bengal AIR 1997) has instructed that if the arrested person demands, his injuries should be recorded. Every 24 hours a person under arrest shall be medically examined from approved panel. If one goes by the letter and spirit of this instruction, medical examination also includes the examination for dental trauma, because dental torture may not be uncommon in the custody/arrest[11].
2. In the present setup practically there is no full fledged department in medical / dental colleges which may carry out the complete work of forensic dentistry except the forensic science laboratories of Centre and State and some forensic science departments of the teaching institutes where usually some procedures for identification may be done (superimposition technique). The routine medico-legal cases of dental trauma are required to be handled by experts but forensic physicians/dentists are doing the routine conventional methods of examination (routine dental x-rays and clinical examination of teeth and related structures) and no specialized procedure is adopted.
3. The medico legal examination should be done jointly by the team of Forensic Physician/GDMO and Forensic Odontologist. As per the policy of Health Department of Government of India, nowadays every CHC/PHC is having a post of Dental doctor. So even in the far flung areas of India this service can be provided easily.

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