**Original article:**

**Assessment of gross and histopathology changes of fracture injuries**.

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***Abstract*Aim:** Medico legal autopsy is an important part of an examination for assessment of age of fracture. Our aim was to assess the gross and histopathology changes of fracture injuries.

***Methodology:*** 84 fracture injury cases of ante mortem and postmortem fractures of long bones in the body of both genders were included. The Study included gross & histopathological examination of long bone fractures. The formalin-fixed, paraffin-embedded samples of fracture ends and surrounding tissue were stained in hematoxylin and eosin & studied under microscope.

***Results:*** Age group 20-30 years had 11 males and 7 females, 30-40 years had 18 males and 8 females, 40-50 years had 20 males and 11 females and >50 years had 11 males and 8 females. Location was mid- shaft in 74 and peri articular in 10 cases. Pattern was comminuted in 16, transverse in 58 and oblique in 20. Type of fracture was simple in 60 and compound in 24 cases. The difference was significant (P< 0.05). Age of fracture was <24 hours seen in 34%, 24-72 hours in 26%, 4- 7 days in 11%, 8-14 days in 10%, 15-30 days in 5% and >30 days in 3%. A significant difference was observed (P< 0.05). Histopathological findings showed RBC’s infiltration into surrounding tissue in 30 cases, hematoma formation and fibrin deposition in 14, necrosis of ends of bone in 12, E/o granulation tissues in 11, E/o soft tissue callus in 9, E/o formation of capillaries, fibroblasts, osteoblasts, soft granulation tissue in 8 cases. A significant difference was observed (P< 0.05).

***Conclusion:*** Medico legal autopsy is an important part of an examination for assessment of age of fracture. Careful gross examination study of fracture site may be fruitful to arrive at conclusion about their antemortem or post-mortem nature in most of the cases.

***Key words:*** autopsy, Medico legal, hematoxylin and eosin

**Introduction**

Any sort of trauma lead to injury to soft and hard tissues of body. Depending upon the force and the impact of agent wound formation occur. It can lead to injury to skin and mucous membranes or may include deeper structures like bone resulting in fracture.1 Fracture is a complete or incomplete break in the continuity of a bone. Although in most fractures, there is a distinct history of trauma.2 Diagnosis of a Fracture can nearly always be inferred from the history and clinical examination. However, clinical evidence must always be confirmed or refuted by radiological examination.3

In all traumatic deaths where fractures were found over the body, it is important to find out whether these injuries were caused while alive and not after death of a person.4 Fracture age describes the time interval between the infliction of a fracture of bone and the time of death, and in living person till time of examination.5,6 Though it will not be possible to give exact time of infliction of injury, still approximate age of the injury can be made out from the reparative changes that occur after infliction of any injury; reaction to injury is immediate, and it continues until the repair is complete.7 Considering this, we attempted present study to assess gross and histopathologic changes of fracture injuries.

**Materials & Methods**

The present study comprised of 84 fracture injury cases of ante mortem and postmortem fractures of long bones in the body of both genders. The consent was obtained from and first blood relatives of victims.

Data such as name, age, gender etc. was recorded. In all the cases detailed history was collected from relatives and from the notes on indoor hospital papers by treating doctors in cases of hospital deaths. The Study included gross & histopathological examination of long bone fractures. The formalin-fixed, paraffin-embedded samples of fracture ends and surrounding tissue were stained in hematoxylin and eosin & studied under microscope. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

**Results**

**Table I Age & Gender wise distribution**

|  |  |  |
| --- | --- | --- |
| **Age group (Years)** | **Male** | **Female** |
| 20-30 | 11 | 7 |
| 30-40 | 18 | 8 |
| 40-50 | 20 | 11 |
| >50 | 11 | 8 |
| Total | 50 | 34 |

Age group 20-30 years had 11 males and 7 females, 30-40 years had 18 males and 8 females, 40-50 years had 20 males and 11 females and >50 years had 11 males and 8 females (Table I).

**Table II Assessment of parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameters** | **Variables** | **Number** | **P value** |
| Location | Mid- shaft | 74 | <0.05 |
| Peri articular | 10 |
| Pattern | Comminuted | 16 | <0.05 |
| Transverse | 58 |
| Oblique | 20 |
| Type | Simple | 60 | <0.05 |
| Compound | 24 |

Location was mid- shaft in 74 and peri articular in 10 cases. Pattern was comminuted in 16, transverse in 58 and oblique in 20. Type of fracture was simple in 60 and compound in 24 cases. The difference was significant (P< 0.05) (Table II).

**Graph I** **Assessment of parameters**

**Table III Age of fracture**

|  |  |  |
| --- | --- | --- |
| **Age of fracture** | **Percentage** | **P value** |
| <24 hours | 34% | <0.05 |
| 24-72 hours | 26% |
| 4- 7 days | 11% |
| 8-14 days | 10% |
| 15-30 days | 5% |
| >30 days | 3% |

Age of fracture was <24 hours seen in 34%, 24-72 hours in 26%, 4- 7 days in 11%, 8-14 days in 10%, 15-30 days in 5% and >30 days in 3%. A significant difference was observed (P< 0.05) (Table III, graph II).

**Graph II** **Age of fracture**

**Table IV Histopathological examination findings**

|  |  |  |
| --- | --- | --- |
| **Histopathological findings** | **Number** | **P value** |
| RBC’s infiltration into surrounding tissue | 30 | <0.05 |
| Hematoma formation and fibrin deposition | 14 |
| necrosis of ends of bone | 12 |
| E/o granulation tissues | 11 |
| E/o soft tissue callus | 9 |
| E/o formation of capillaries, fibroblasts,  osteoblasts, soft granulation tissue | 8 |

Histopathological findings showed RBC’s infiltration into surrounding tissue in 30 cases, hematoma formation and fibrin deposition in 14, necrosis of ends of bone in 12, E/o granulation tissues in 11, E/o soft tissue callus in 9, E/o formation of capillaries, fibroblasts, osteoblasts, soft granulation tissue in 8 cases. A significant difference was observed (P< 0.05) (Table IV, graph III).

**Graph III** **Histopathological examination findings**

**Discussion**

Post-mortem changes introduce artifacts to the body that a forensic pathologist must distinguish from trauma.8 Also, these post-mortem changes can mask actual trauma.9,10 Although it may seem counterintuitive, one area of the body where post-mortem changes affect the accurate assessment of injury is the skeleton; specifically, the timing of fractures.11 Determination of hemorrhage in the surrounding soft tissue assists a forensic pathologist in helping to determine the time frame for the occurrence of a fracture in relation to the time of death (i.e., antemortem or postmortem).12 A fracture sustained just before the time of death or at the time of death will have hemorrhage in the surrounding soft tissue, while a fracture sustained even shortly after death (e.g., fracture of the hyoid bone caused by removal of the neck organs at autopsy or infant rib fractures caused by cardiopulmonary resuscitation) will have an absence of hemorrhage in the surrounding soft tissue.13,14 We attempted present study to assess gross and histopathologic changes of fracture injuries.

Our results showed that age group 20-30 years had 11 males and 7 females, 30-40 years had 18 males and 8 females, 40-50 years had 20 males and 11 females and >50 years had 11 males and 8 females. Identifying the origin of forces that has caused a long bone fracture in a young child can be extremely difficult. When a child sustains a fracture that has occurred in a public setting and is witnessed by a non-caretaker, the nature of the mechanism and origin of forces is known and the focus is the actual injury.15 When a young child or infant presents with a long bone fracture where the injury occurred in the privacy of the home, or with only caretaker witnesses, an additional focus must be on clarification of the mechanism.16

Our results showed that Location was mid- shaft in 74 and peri articular in 10 cases. Pattern was comminuted in 16, transverse in 58 and oblique in 20. Type of fracture was simple in 60 and compound in 24 cases. Age of fracture was <24 hours seen in 34%, 24-72 hours in 26%, 4- 7 days in 11%, 8-14 days in 10%, 15-30 days in 5% and >30 days in 3%. Borden17 was the first to report the clinical and radiographic findings of traumatic bowing of the forearm bones in children. His initial report described eight cases and the latter an additional nine. Of these 17 children, 13 had an angulated midshaft fracture of one bone and bowing of the other. Four children had bowing of both bones without fracture.

**Conclusion**

Medico legal autopsy is an important part of an examination for assessment of age of fracture. Careful gross examination study of fracture site may be fruitful to arrive at conclusion about their antemortem or post-mortem nature in most of the cases.

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