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شبكة المعلومات الجامعية التوثيق الالكتروني والميكرو فيلم



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Complications Of Epiphyseal Injuries around the elbow in children

Submitted for partial fulfillment of
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In

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By

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محضر

اجتماع لجنة الحكم على الرسالة المقدمة من

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إليها وكذلك الأسس العلمية التي قام عليها البحث .

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Introduction

Injuries of the epiphyseal cartilage plates are more common than is generally appreciated, they account for 15% of all injuries to the long bones during the of growth.

Injuries that involve the epiphyseal plate and the epiphysis cause cessation of growth, resultant angular deformities, and many other complications.

The epiphyseal injuries were classified by Aitken, 1956; Weber, 1980; Pollen, 1979; Ogden, 1982; and others, but the most commonly used classification that of Salter and Harris, 1963, which was based on the radiological appearance of the fracture.

Type 1: Salter & Harris fractures are, epiphyseal separation through the epiphyseal plate only with or without displacement.

Type 2: Fractures have a metaphyseal spike attached to the separated epiphysis.

Type 3: Is an epiphyseal plate separation with a fracture through the epiphysis into the joint.

Type 4: Is a fracture through the metaphysis, extending through the epiphyseal plate and epiphysis into the joint.

Type 5: Which can be diagnosed only in retrospect is a compression injury of the epiphyseal plate producing permanent damage to the plate.

Epiphyseal injuries around the elbow include

Fractures of distal humerus and proximal radial and ulnar epiphyses. Fractures involving the distal humerus include fractures of lateral condylar epiphysis, lateral and medial epicondylar epiphysis and fractures of the entire distal humerus epiphysis.

These injuries must be properly understood to:

- 1- Institute adequate treatment.
- 2- Predict and manage many complications such as failure of union, weakened function, deformities in the form of valgus, varus and flexion deformities, neurovascular complications and many other complications.

CHAPTER (1)

ANATOMY OF THE ELBOW

The Elbow Joint, although a single synovial cavity, is made up of three distinct articulations, which are:

- 1- The humero-ulnar, between the trochlea of the humerus and the trochlear notch of the ulna (a hinge-joint).
- 2- The humero- radial, between the capitulum and the upper concave surface of the radial head.(a ball and socket joint).
- 3- The superior radio-ulnar, between the head of the radius and the radial notch of the ulna, the head being held in place by the tough annular ligament (a pivot joint) (Ellis 1992).

Applied histology of epiphyseal cartilage plate (E.C.P.).

The cartilage of (E.C.P.) is formed of three functional zones fig. (1):

1) -Zone of growth :

- a)- Germinal or Resting zone : lies adjacent to the epiphyses. it contains few cells (chondrocytes) responsible for formation of the matrix .
- b)- Proliferating zone : chondrocytes are arranged in columns at right angles to long axis of the bone . it is rich in blood vessels essential for vitality of the germinal cells .

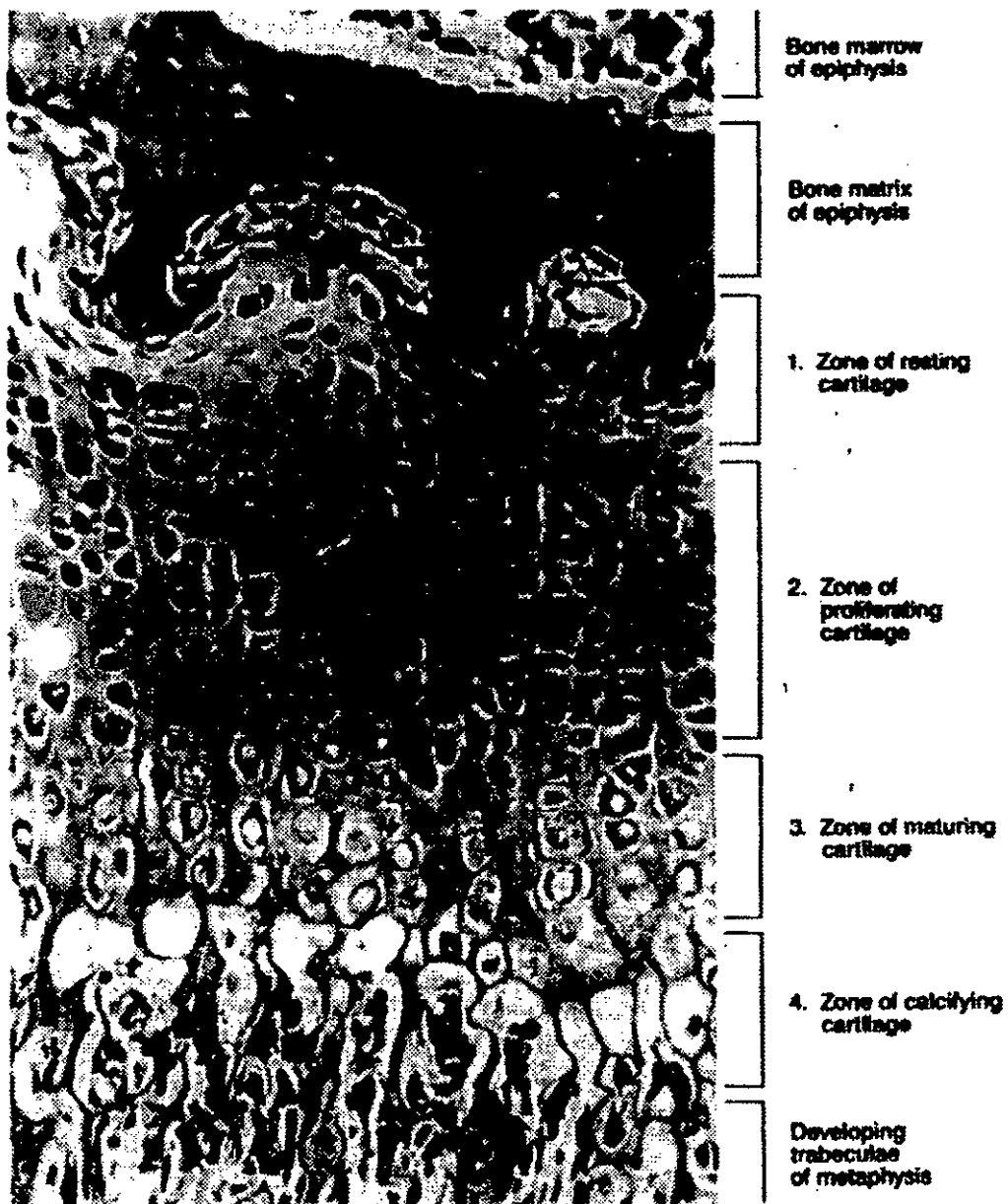


Fig. (1): Histology of epiphyseal cartilage plate (David, 1987)

2) -Zone of cartilage transformation: (hypertrophy, calcification, degeneration)

The chondrocytes expand, enlarge, become spherical. By reaching to bottom of this zone , the cells are five times the size they were. Then at the middle of this zone, they lose all glycogen and cells appear non-viable. By the bottom of the zone, lacunae are empty and chondrocytes are dead. The functions of this zone are :

a)-Expansion of (ECP) in the long axis together with the proliferating zone (Longitudinal growth).

b)- The cells of this zone produce alkaline phosphatase which is responsible for calcification in the next zone.

N.B., We must emphasize that it is the Inter-cellular substance and not the cells that provide the strength of ECP, particularly its resistance to shear, this inter-cellular substance is made up of collagen fibres embedded into an amorphous cement substance. In the first two layers of ECP, the matrix is abundant, here the plate is strong, in the third layer, the matrix is scanty, here the plate is weak (Gado, 1998).

3) -Zone of ossification:

It is the zone of vascular stasis. The capillaries invade the hypertrophic zone and osteoblasts follow. Osteoblasts lay down bone (Gado 1998).

Biomechanics Of The Elbow

A) - Stability of elbow joint in children: The Stability of the elbow joint is by virtue of the shape of the articular surfaces of the trochlea and the capitulum of the humerus, and the trochlear notch of the ulna and head of the radius. Without strong collateral ligaments and the muscular cuff of triceps, biceps, brachialis, brachioradialis, and the common tendons of the superficial flexors and extensors arising from the medial and the lateral epicondyles of the humerus, the elbow joint can not be considered as an inherently stable joint.

In the child, because the head of the radius is small relative to the annular ligament, it is commonly dislocated by traction forces applied to the forearm and hand (Roger et al., 1990)

The elbow joint of children is not so stable owing to the late fusion of the epiphyses of the ends of the bones involved in the articulation. As a consequence, separation of epiphyses can occur during a fall on the elbow because the epiphyseal cartilagenous plate is weaker than the surrounding bone (Moore 1992)

B) - Contact areas fig. (2): because of the rounded ridge extending from the tip of the olecranon to the tip of the coronoid process, and the transverse ridge observable on the articular cartilage, the trochlear notch can be divided into four quadrants. Direct observation has revealed that the contact area on the humerus changes during flexion and extension.

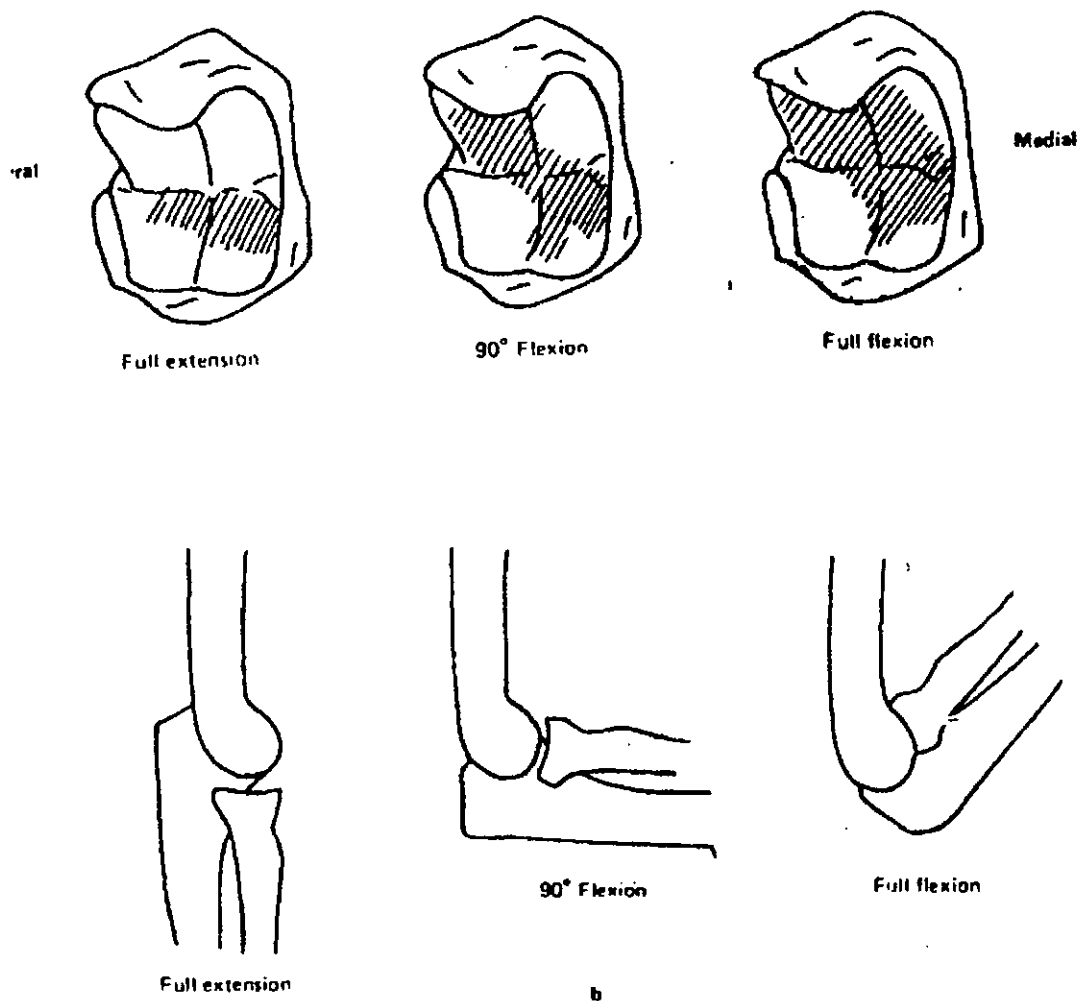


Fig. (2) : Contact areas at different elbow positions:
 a) Of the trochlear notch
 b) Of head of the radius (Nigel et al., 1990)