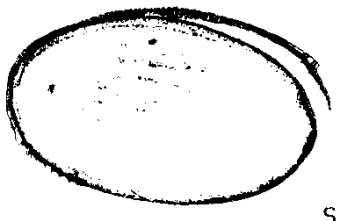
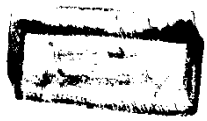
RADIOLOGICAL DIAGNOSIS OF WELL-DEMARCATED EROSION OF THE SURFACE OF A BONE





THESIS

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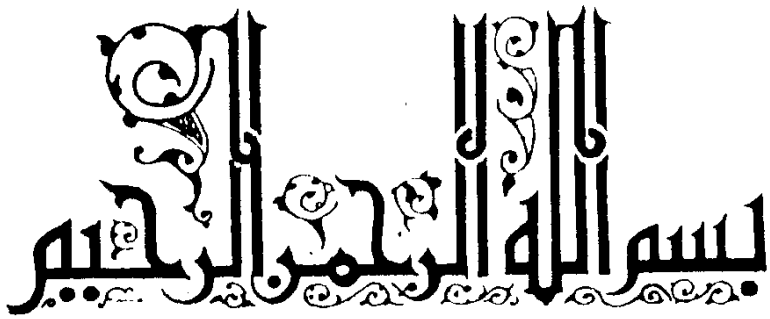

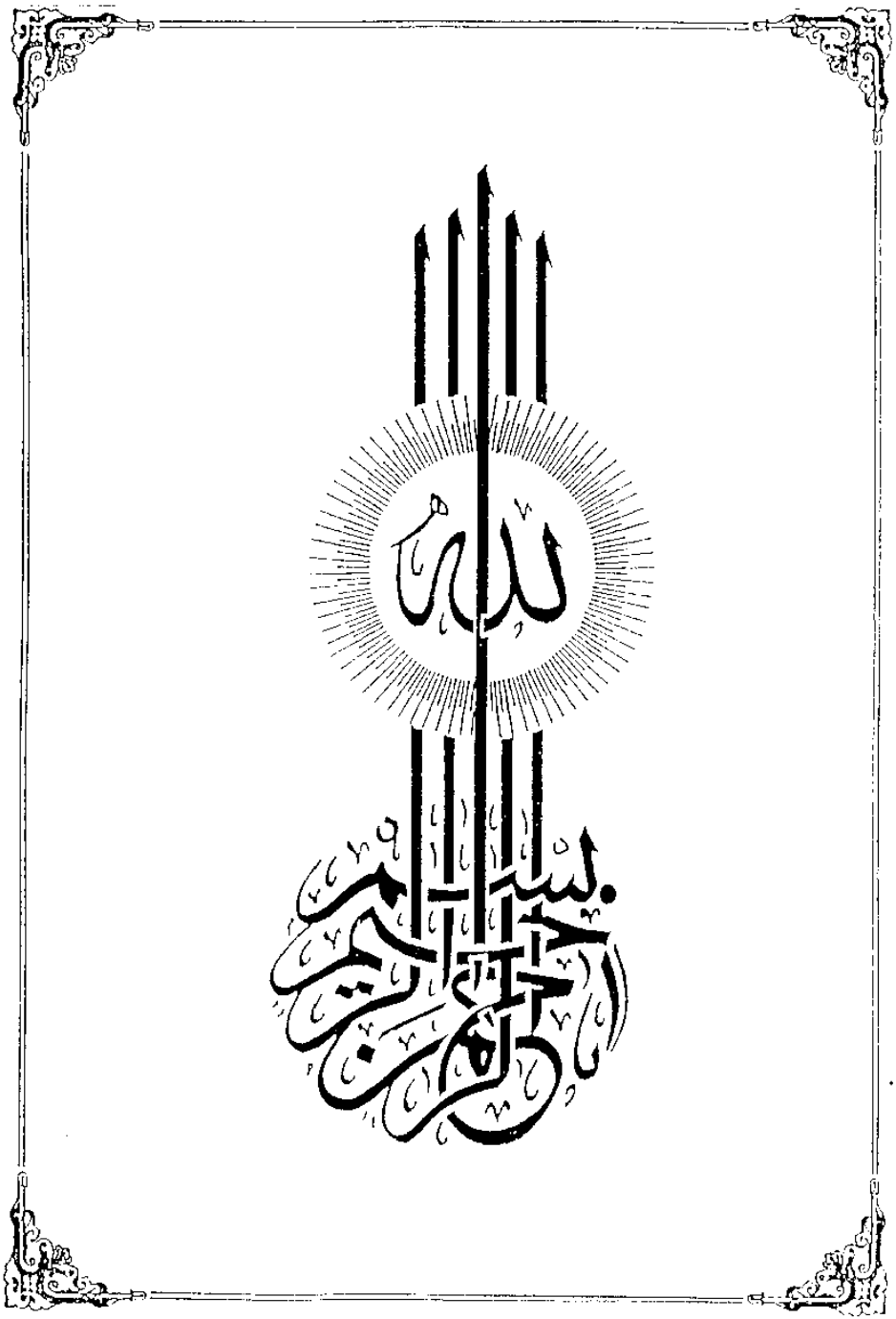

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INTRODUCTION AND AIM OF WORK

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Erosion means circumscribed area with loss of bony trabecular pattern i.e. local transradiant area. These erosions can be grouped radiologically into (1) those which are well demarcated from adjacent bone, some deep in the cancellous bone and some on the surface of the bone (2) those that are poorly demarcated and lie within or on the surface of the bone.

There are a wide variety of pathological conditions that may lead to a well-demarcated erosion of the surface of a bone. Detection of such erosion in the plain radiograph of a bone may be the initial clue for the diagnosis of one of those lesions.

The aim of this study is to describe the pathology, radiological manifestations and differential diagnosis of the various lesions that cause a well-demarcated erosion of a surface of a bone.

PATHOLOLGY

Causes of well-demarcated erosion of the surface of a bone:

I - Pressure erosion:

A - Pressure from occupation or nearby tumour:

1 - Osteochondroma .

2 - Fibrosarcoma.

3 - Villo- nodular synovitis and malignant synovioma.

B - Pressure from an aneurysm.

C - Pressure from neurofibroma or ganglioneuroma .

D - Rib erosion :

1 - Aortic coarctation.

2 - Subclavian obstruction.

3 - Blalock Taussig operation.

4 - Pulmonary artery atresia.

5 - Pulmonary artery stenosis.

6 - Truncus arteriosus.

7 - Superior vena caval obstruction .

8 - Arteriovenous Fistula.

E - Intervertebral disc intrusion (Schmorl's node).

II - Developmental defect and implantation dermoid :

1 - Enchondromatosis (Ollier's disease).

2 - Maffucci's syndrome.

3 - Implantation dermoid cyst.

4 - Dermoids and epidermoids of the orbit .

III- Hyperparathyroidism.

IV - Gout .

V - Rheumatoid arthritis.

VI - Psoriatic arthritis .

VII- Surface erosion of the articular cortex- Osteochonaritis dissecans.

VIII-Surface absorption of the tip of a terminal phalanx:

A - Dysplastic :

I- Cleidocranial dysostosis.

2- Acro- osteolysis.

B - Infective :

I- Pyogenic infection.

2- Leprosy.

3- Sarcoidosis.

C - Trauma :

I- Frostbite.

2- Electric injury.

D - Poisons :

I- Ergot.

2- Polyvinyl tank cleaners .

E - Vascular :

I- Primary Raynaud's phenomenon.

2- Scleroderma with secondary Raynaud's phenomenon.

F - Neurotrophic :

I- Tabes dorsalis.

2- Syringomyelia.

3- Diabetic neuropathy.

is a disturbance of the growth of cartilage and bone in the course of which multiple tumours of bone and cartilage develop, leading to pressure manifestations on the surrounding structures including adjacent bone. The two chief changes are deformities from retardation of growth and multiple exostoses. Malignant changes may supervene in as many as 5 percent of cases, giving rise to chondrosarcoma (Anderson, 1980 and Sherif, 1984).

2) Fibrosarcoma :

It is a spindle cell sarcoma arising from the fibroblast cells of the connective tissue of bone and muscles. There are two types of fibrosarcoma of bone, intramedullary and periosteal. The intramedullary type is the more common, it destroys and infiltrates the affected bone which becomes expanded. The periosteal type arises from the periosteum forming a slowly growing tumour which erodes the bone but does not usually infiltrate it except very late. It has a more widespread distribution, but still shows a predilection for long bones where it may involve any portion of the shaft. Fibrosarcoma of the muscle may produce pressure erosion of an adjacent bone. The tumour tissue of both types is firm, greyish in colour and shows many whorls of whitish collagen fibres. Microscopically, it is a cellular tumour with many fusiform cells showing variable degree of anaplasia and some

tumour giant cells. The nuclei are large, darkly stained and with many mitotic figures. The stroma is formed of collagenous bundles which may show myxomatous degeneration (Anderson 1980 and Sherif, 1984).

3) Villo-nodular Synovitis and Malignant Synovioma :

a) Villo-nodular Synovitis :

It is a rare disease of the synovial membrane of joints and synovial sheaths. The cause is obscure, but it might be a reaction to an irritant, most probably haemosiderine, which accumulates in the tissues, mainly due to trauma. The commonest sites are the palmar surface of the fingers, wrist, toes and knees. The synovial membrane affected, shows marked proliferation in the form of villous and/or nodular brownish tumour-like masses, which may lead to erosion of the articular surface of the joint affected. Microscopically, there are many polygonal cells, many histeocytes and some multinucleated giant cells, amidst a vascular fibrous stroma, containing many fibroblasts and numerous haemosiderine granules (Sherif and Ghaly, 1984).

b) Malignant Synovioma :

It is a rare tumour arising from the synovial membrane of the joints, tendon sheaths and bursae. The commonest site is the knee joint. It grows slowly forming

a soft or firm mass having greyish cut surface and is liable to haemorrhage and necrosis. It may cause secondary erosion of adjacent bone. Microscopically, it takes either a sarcomatous or pseudoepithelial appearance (Sherif and Ghaly, 1984).

B - Pressure from An Aneurysm :

An aneurysm is a localised abnormal persistent dilatation of a vessel, usually an artery. It is caused by weakening of the arterial wall, usually the media, due to a variety of causes. The aorta is the commonest site of aneurysms. The three most important causes that predispose to aortic aneurysms are atherosclerosis, syphilis and cystic medial necrosis (Robbins and Cotran, 1979).

An erosion of adjacent bone may be produced by pressure from a pulsatile aneurysm, it is commonly seen in the sternum or vertebrae with an aortic aneurysm (Simon, 1973).

C - Pressure from Neurofibroma or Ganglioneuroma :

A neurofibroma or a ganglioneuroma may cause pressure erosion in a vertebral body or a shallow cortical pressure erosion in a rib (Simon, 1973).

1) Neurofibroma or Von Recklinghausen Disease :

It is a congenital, often familial disease with many small firm nodules in the skin, arising from the non specific nerve sheath of the cutaneous nerves as well as from other nerves allover the body as visceral and spinal nerves. It is a benign tumour, which may be single or multiple. Patches of excessive melanin pigmentation of the skin, pigmented moles, and soft fibromas of the skin are common stigmas accompanying Recklinghausen's disease. A neurofibroma cannot be enucleated from the parent nerve, since the nerve fibres run through the center of the tumour instead of around it. Neurofibromas may undergo malignant change. Microscopically, it is less cellular with excess fibrous stroma. The cells are fusiform with tapering ends which are often curved (Anderson, 1980).

2) Ganglioneuroma :

It is a rare benign tumour occuring both in children and in adults which arises from the ganglion cells. Grossly, it appears as a fleshy mass. Microscopically, it shows mature nerve cells in a profuse stroma of sheath cells, fibrous tissue and varying amounts of neurofibrils and myelin (Anderson, 1980).

D - Rib Erosion :

1) Aortic Coarctation :

It develops as an extension of the mechanism of anatomic closure of the patent ductus arteriosus (Silber and Katz, 1975).

It has two types, the infantile form and the adult form. The infantile form is characterised by diffuse involvement of the isthmus of the aorta. The adult form is characterised by more localised constriction at or below the insertion of the isthmus.

Coarctation occurs more in males with a ratio of 4 : 1. When, it occurs in females, it is commonly associated with other anomalies as primary ovarian agenesis (Turner's syndrome) (Friedberg, 1969).

The characteristic lesion in coarctation of aorta is a deformity of the media of the aorta at the origin of the descending portion. The deformity involving the anterior, superior and posterior walls, is represented by a curtain like infolding of the wall which causes the lumen to be narrowed and eccentric (Edwards et al., 1965).

In presubclavian coarctation the left arm may be under-developed, palpable collateral vessels and rib notching if present, occurs only on the right side (Wood, 1969).

The blood flow to the head and upper extremities is normal but that to the lower half of the body is reduced so that collateral circulation develops around the constriction (Friedberg, 1969).