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Case Report

Codman's Triangle: the Typical Radiographic Appearance in A Child with Features of Chronic Osteomyelitis: A Case Report

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Abstract

Codman's triangle (CT) is defined as a triangular shaped area of new subperiosteal bone formed when a rapidly growing bone lesion either from tumour, infection or trauma lifts the periosteum away from the bone. Regarding formation of CT; the lesion grows too fast, the periosteum cannot form smooth new bone, instead, only the edges ossify and creating a triangular shadow.

This is a 2-year-old child that had a fall on the right upper limb for more than 4-weeks, presented for plain radiograph of the arm on account of increasing pain, swelling, and persistent fever. He was referred from a peripheral health care centre for plain radiograph of the arm in anterior-posterior and lateral projections.

The plain radiograph demonstrated minimally displaced and complete fracture of the distal metadiaphysis of the right humerus with associated mixed sclerotic and lytic foci, areas of medullary sclerosis and lucency, with extensive periosteal reactions having triangular appearance on both cortices; the characteristic Codman's triangle were noted.

We present a case of a 2-year-old male child with fractured right humerus and associated features of chronic osteomyelitis with typical radiographic appearance of Codman's triangle.

Keywords: codman's triangle, chronic osteomyelitis, fracture, humerus

Introduction

Codman triangle is termed as a radiologic feature demonstrated on most musculoskeletal plain radiographs, it is a periosteal reaction and occurs when bone lesions grow aggressively and lift the periosteum from the bone and prevent the periosteum to lay down new bone[1,2].

The term CT was first described by a surgeon in an article in 1926; he is called Ernest Amory Codman, this reaction happens to be a classical radiologic sign associated with aggressive primary bone tumours like osteosarcoma, Ewing sarcoma, chondrosarcoma, metastasis, malignant giant cell tumour and non-malignant lesions like osteomyelitis, trauma and hematoma[1,3,4].

Periosteum is the external coating of the bone, and regarded as a fibrous sheath attached to all portions of the bone except in the articular surfaces, tendon insertions and sesamoid bone surface, the periosteum on the other hand is firmly connected to the cortex of the bone by Sharpey's fibers[5,6,7].

Periosteal reaction means reaction of the periosteum of bone cortex to insults of all kind, the aggressiveness of which is often suggested by its radiological aspect and appearances, with the child's periosteum appearing looser when compared to adults and responsible for earlier and exuberant reaction in this group of individuals[5,8].

Osteomyelitis is an infection of the bone, bone marrow and surrounding soft tissue; this can occasionally follow trauma in which hematoma from the metaphysis functions as a focus of infection[9-11].

Chronic osteomyelitis (CO) is defined as bone inflammation presenting six or more weeks after bone infection and often characterized by the presence of bone destruction and formation of sequestra[12-14]. The diagnosis of CO is often challenging, needs a combination of clinical symptoms, imaging and laboratory investigations to accomplish[12,13].

Case Report

This is a 2-year-old child that had a fall on the right upper limb for more than 4-weeks, presented for plain radiograph of the arm on account of increasing pain, swelling, and persistent fever. He was referred from a peripheral health care centre for plain radiograph of the arm in anterior-posterior and lateral projections.

The child is conscious and alert, highly irritable, in painful distress, mildly pale, febrile, mildly dehydrated, has a tender, swollen right upper arm with a discharging sinus.

The plain radiograph demonstrated minimally displaced and complete fracture of the distal metadiaphysis of the right humerus with associated mixed sclerotic and lytic foci, areas of medullary sclerosis and lucency more on the fractured segment, with extensive periosteal reactions having triangular appearance on both cortices; the characteristic Codman's triangle were noted. The presence of the periosteal reactions bilateral also presented the so-called bone-in-bone appearance of chronic osteomyelitis. The lucent foci in the medullary cavity of the humerus are the cloaca. There is associated marked soft tissue swelling more at the affected area with marginal irregularities especially postero-laterally; the discharging sinus. There is a suggestion of dislocation of the elbow joint but with preservation of the shoulder joint (figures 1&2).

Microscopy and histopathologic assessment of the obtained specimen ruled out presence of malignant cells and presence of inflammatory cells.

The parents were advised to consult a paediatric surgeon for expertise management to reduce associated morbidity and mortality.

The combination of clinical symptoms, plain radiographic features with histipathologic findings prompted the diagnosis of chronic osteomyelitis in a 2-year-old male child.

We present a case of a 2-year-old male child with fractured right humerus and associated features of chronic osteomyelitis with typical radiographic appearance of Codman's triangle.

Figure 1: Plain radiograph of the right humerus demonstrating complete and displaced fracture of the distal metadiaphysis, cortical thickening, and medullary sclerosis with lucent foci with triangular shaped periosteal reaction (Codman Triangle) attached to both cortices giving the so-called bone-in-bone appearance of chronic osteomyelitis.

Figure 2: Plain radiograph demonstrating the Codman Triangle periosteal reaction attached to the cortices, multiple cloacae, bone-in-bone appearance, dislocation of the right elbow joint, marked soft tissue swelling with marginal irregularities.

Discussion

Codman triangle (CT) along with other aggressive periosteal reactions such as lamellated and sunburst patterns happens to clinically denote aggressive lesion within the bone sometimes may also denote aggressive non-malignant lesions like chronic osteomyelitis[1,15]. The case under review had CT on both cortices in a setting of chronic osteomyelitis thereby agreeing with these literatures.

Codman triangle is termed as a radiologic feature demonstrated on most musculoskeletal plain radiographs, it is a periosteal reaction and occurs when bone lesions grow aggressively and lift the periosteum from the bone and prevent the periosteum to lay down new bone[1,2]. The case under review had the characteristic CT demonstrated on the cortices of the right humerus following plain musculoskeletal radiograph with above characteristics thereby agreeing with these literatures.

Osteomyelitis is an infection of the bone, bone marrow and surrounding soft tissue; this can occasionally follow trauma in which hematoma from the metaphysis functions as a focus of infection[9-11]. The index case had features of osteomyelitis and had history of trauma weeks before onset of symptoms, thereby agreeing with these literatures.

Chronic osteomyelitis (CO) is defined as bone inflammation presenting six or more weeks after bone infection and often characterized by the presence of bone destruction and formation of sequestra12-14. The case under review had onset of symptoms more than four weeks after the trauma, he also had features of sequestra on imaging; the bone-in-bone appearance, thereby agreeing with these literatures.

The diagnosis of CO is often challenging, needs a combination of clinical symptoms, imaging and laboratory investigations to accomplish12,13. The case under review is not an exception; was diagnosed following clinical symptoms, imaging and histopathologic findings, thereby conforming to these literatures.

Imaging plays a role in the diagnosis of CO; it demonstrates soft tissue swelling, periosteal reaction, loss of definition, loss of bone density and osteolysis as early as 10-21 days following bone infection, though may not be able to detect these features until there is loss of 30-50% of bone mineral content[12,16-18]. The case under review also had plain radiograph and also demonstrated periosteal reaction (Codman's triangle), cloacae, cortical and medullary sclerosis with soft tissue swelling, thereby agreeing with these literatures.

Conclusion

Codman's triangle clinically denotes an aggressive lesion within the bone and appears as a characteristic finding on plain radiograph; this periosteal reaction may also be demonstrated following non-malignant lesions like chronic osteomyelitis, therefore it is of note that its presence shouldn't be ignored or missed by clinicians for further evaluation in effective institution of appropriate management.

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