Heterotopic Ossification in Neurological Injury: A Pictorial Review

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INTRODUCTION

Heterotopic ossification (HO) is a condition whereby bone formation in a non-skeletal site—typically soft-tissue—occurs in the context of traumatic (often post-surgical) or neurological injury (post spinal cord and traumatic brain injury), although very rarely it may be of genetic origin. It develops in large joints below the neurological lesion, mainly the hips (over 90%) and knees. It is common in young to middle-aged individuals, mostly males, and in the rehabilitation setting where it can be a major source of disability. The incidence of HO following Spinal Cord Injury is estimated at 20–30%, and for Traumatic Brain Injury even higher at 20–40%.

The aetiology of HO is not well understood but appears to be in part related to an imbalance between bone formation and resorption, and often initiated by muscle damage (traumatic or ischaemic). It usually presents clinically before being visible radiographically. Management in the first instance comprises NSAIDs (typically Indomethacin) and Bisphosphonates (Etidronate), which inhibit osteoclastic activity initially leading to a relatively greater decrease in bone resorption. If HO is intact (i.e. hard and solid) patients may ultimately need surgery or radiation, despite outcomes being invariably poor.

For this presentation we reviewed four of the best available cases of patients previously discussed at the NRH Radiology MDR. The imaging findings across various modalities are discussed, along with recommendations.

CASE 1

A 64 year old male with M.D.M, A.S.O.D.A., A.C.L.D. and N.A. S.K.A. was referred after a Fall with Left Hip pain and swelling. The patient had a history of a left total hip replacement 10 years prior. He was referred to the NRH Radiology MDR for a review of imaging to further elucidate the clinical situation.

Figure 1. A. Anterior-posterior radiograph of the left hip showing soft tissue swelling and a mixed lytic-sclerotic lesion. B. Coronal T1WI and sagittal T2WI of the hips demonstrating an extra-skeletal lesion at the left acetabulum and femoral head consistent with HO. C. Coronal reformatted CT Scan illustrating the extent of the HO at the left acetabulum and femoral head.

CASE 2

A 55 year old female with a history of history of Rheumatoid arthritis. She was referred to the NRH Radiology MDR after a fall on ice with left hip pain and swelling. The patient was referred to further elucidate the clinical situation.

Figure 2. A. Anterior posteroirradiograph of the left hip showing soft tissue swelling and a mixed lytic-sclerotic lesion. B. Coronal T1WI and sagittal T2WI of the hips demonstrating an extra-skeletal lesion at the left acetabulum and femoral head consistent with HO. C. Coronal reformatted CT Scan illustrating the extent of the HO at the left acetabulum and femoral head.

CASE 3

A 58 year old male with a history of left thigh pain and swelling. The patient was referred to the NRH Radiology MDR after a fall on ice with left hip pain and swelling. The patient was referred to further elucidate the clinical situation.

Figure 3. A. Anterior-posterior radiograph of the left hip showing soft tissue swelling and a mixed lytic-sclerotic lesion. B. Coronal T1WI and sagittal T2WI of the hips demonstrating an extra-skeletal lesion at the left acetabulum and femoral head consistent with HO. C. Coronal reformatted CT Scan illustrating the extent of the HO at the left acetabulum and femoral head.

CASE 4

A 42 year old male with history of History of Paraplegia and Traumatic Brain Injury. He was referred to the NRH Radiology MDR after a fall on ice with left hip pain and swelling. The patient was referred to further elucidate the clinical situation.

Figure 4. A. Anterior-posterior radiograph of the left hip showing soft tissue swelling and a mixed lytic-sclerotic lesion. B. Coronal T1WI and sagittal T2WI of the hips demonstrating an extra-skeletal lesion at the left acetabulum and femoral head consistent with HO. C. Coronal reformatted CT Scan illustrating the extent of the HO at the left acetabulum and femoral head.

REFERENCES


TEACHING POINTS

As we have seen Heterotopic Ossification (HO) is a process whereby ectopic bone forms around joints or characteristic pathological sites, and causes pain and restrictions most commonly at the hip joints.

Awareness of HO in the acute setting prior to transfer to rehabilitation services may facilitate earlier diagnosis of this condition which has potentially serious consequences including contracture, cortical limb tract infarction, pressure sores and infection.

Once HO has developed it responds poorly to prophylactic medical therapies. Early diagnosis of HO allows early management and reduces progression and complications.

HO should be always be considered in the differential for patients with spinal cord injury and leg swelling. In those referred for Doplhper ultrasound, HO should be sought for in the soft tissue around the hips. D. Dimers may be also be raised in HO which can be the diagnosis of a condition.

In patients with Polytrauma and ischaemic muscular injuries HO should be considered to be a subsequent imaging of large joints. Characteristic features of HO are seen on ultrasound and plain radiography, but are often present on US earlier. Other imaging modalities (e.g. CT and bone scintigraphy) may be needed.

Given its high prevalence among Traumatic Brain and Spinal Cord injury one should always be aware of this potentially relevant finding when reporting imaging and in some specialty patients, as the are rehabilitation and management issues to be considered.