Sapporo Medical Journal
Volume 56, Issue 06, June 2022

From Head to Elbow and Hip: Lesson Learned from Immobility.

Al Hafiz Ibrahim[1,2], Muhammad Hafiz Hanafi[1], Nur Fasihah Mat Nawi[1],WanMohdAiman Wan Ab Rahman[1], Chandran Nadarajah[3], MohdHadizie Din[2],Sahran Yahaya[2], Wan Faisham Nu'man[2]

[1]Rehabilitation Medicine Unit, School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian, Malaysia.
[2] Orthopaedics Department, School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian, Malaysia.
[3] Radiology Department, School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian, Malaysia.

Abstract— Heterotopic ossification (HO) is a rare preventable debilitating complication of immobility. We reported 2 cases of traumatic brain injured patients who has been bedridden and subsequently develop HO at bilateral hips for case number one and at unilateral elbow for case number two. Although they had a good cognitive recovery, the HO had hinder their everyday mobility and living activity potential. The interdisciplinary medical discussion with the patients had led to surgical removal of the heterotopic ossifications in both cases. Their quality of life improved tremendously following the intervention. This article illustrates the importance of a multidisciplinary approach and knowledge of various methods in the management of multiple disabilities that can help to achieve a realistic meaningful goal for the patients.

Keywords: Heterotopic ossification; Rehabilitation; Traumatic brain injury.

Introduction:

Heterotopic ossification (HO) is a common complication resulted from the abnormal bone formation in non-osseous tissues in an immobilized patient. HO is often characterised by soft tissue swelling and reduced in range of motion of affected joints, and commonly affecting the large joints of the body (hips, elbow, shoulder and knees).[1] The prevalence of HO in patients with traumatic brain injury (TBI) is approximately 20%, and increases as the higher severity of injury, longer length of immobility and duration of disorder of consciousness, and presence of spasticity and fractures.[1] It is believed that the osteo-inductive factors released from the site of the brain trauma promotes bone formation, however, the exact pathogenesis of HO after TBI remain to be clarified. [2] Although HO only affects a significant minority of the TBI patients, it can have long-lasting effects on rehabilitation and return to functional capacity.[3]

Case Presentation 1:

A 54-year-old man had presented to the hospital after getting involved in a motor vehicle accident. He had severe traumatic brain injury with subdural haemorrhage of frontal, temporal and parietal lobe. Emergency right decompressive craniectomy with evacuation of blood clot and intracranial pressure probe insertion were performed. During his hospital stay, he required a tracheostomy due to prolonged intubation, and had developed grade 2 pressure sore in the sacrum. He was discharged home after 60 days of admission, bedbound but hemodynamically stable. He was on normal diet, seizure-free and on Rancho Los Amigos Scale VI in cognitive functioning.(Confused, Appropriate, Moderate Assistance). However, a year later, he complained of having limited range of motion on bilateral hip joints.

Bilateral hip radiograph demonstrated HO around bilateral hip joints. (Figure 1). Computer Tomography (CT) scan was not able to be performed due to the severe abduction deformity of the left hip joint. Serum alkaline phosphate level and other laboratory data of the patient are shown in the Table 1. His serial serum alkaline phosphate showing an increasing trend which further supported the diagnosis of HO. His left hip was in 90 degrees abduction and 90 degrees flexion with severe contracture of both knees only allowing 45-80 degree motion, while the ankle was in fixed equinus position (Figure 2). Subsequently, orthopaedic team was involved to be part of the multidisciplinary management team.

The aims of surgical intervention were to correct the deformity for proper nursing and possible wheelchair ambulation. The medial approach was chosen for the hip joint superficial femoral artery exploration to get the best access to medially located HO. The proximal femur was reconstructed with proximal femur endoprosthesis and the hip joint was replaced with constraint cup total hip replacement (THR).

Post-operative rehabilitation took place as soon as the patient was hemodynamically stable. Two weeks after the operation, patient was able to sit properly on a wheelchair with hip extension ability up to 135 degrees. Radiation treatment was also given to the operated area to prevent the recurrence of HO.

Case Presentation 2:

A 29-year-old man was brought to the hospital after a motor vehicle accident. He had severe traumatic brain injury involving his right temporal and parietal lobe with acute subdural haemorrhage. Emergency right decompressive craniectomy and blood clot evacuation and tracheostomy were conducted. His cognitive functioning was Rancho Los Amigos Scale V (Confused, Inappropriate, Non-agitated). He was on prolonged ventilation and sedation, and at 4^{th} weeks of admission, his right elbow was noted to have flexion deformity with Modified Ashworth Scale 4.

Elbow radiograph showed HO around his right elbow joint. (Figure 3). His serial serum alkaline phosphate also revealed an increasing trend. His right elbow was fixed in 90 degrees extension and this limitation affect his rehabilitation. (Figure 4) Orthopaedic team was called to manage this condition and decided to operate the disability once the HO matured.

The lateral approach was preferred for the elbow joint surgery as it is easier for the surgeons to reach HO over the olecranon fossa and over the lateral aspect at posterior aspect of distal humerus.

Three weeks after the operation, patient was able to extend his elbow up to 140 degrees and he was able to actively participate in the rehabilitation therapy. During discharge, patient had better hand function, thus allowing him to do some of his personal activities of daily living such as eating and taking bath independently. Radiation treatment was given to minimize the occurrence of HO.

Discussion:

The main goal of treatment for patient with HO following traumatic brain injury is to improve patient functionally as normal as possible and prevention of other following complications that can arise from prolonged immobilisation. Treatment for heterotopic ossificans and spasticity includes aggressive range of motion exercise and pharmacological intervention. Surgery is usually performed in combination of radiation of the involved area in the hope of regaining range of motion and arresting further unwanted bone development.[1]

Resection of the HO is preferred if the HO disturbed the patient's quality of life and to prevent recurrent.[4] In the first case, the aim of the surgery is to sit the patient properly on a wheelchair. Due to massive HO at presentation with hip abduction deformity, the best option was to resect the proximal femur and allow shortening of the limb to reduce the muscle action and hence will help in deformity correction. For this reason and the complicated nature of the highly vascularized hip area, the patient went for total hip replacement instead of selective HO removal only.

As for the second case, the aim of surgery is only to improve his elbow range of motion and let him be more independent of his daily activities. Thus, selective excision and clearance of HO alone is sufficient. Post-operative radiotherapy is another important management to minimise the recurrent, as with aggressive physiotherapy.[5]

In summary, multidisciplinary collaboration is important so that all the teams can work together to improve patient's quality of life.

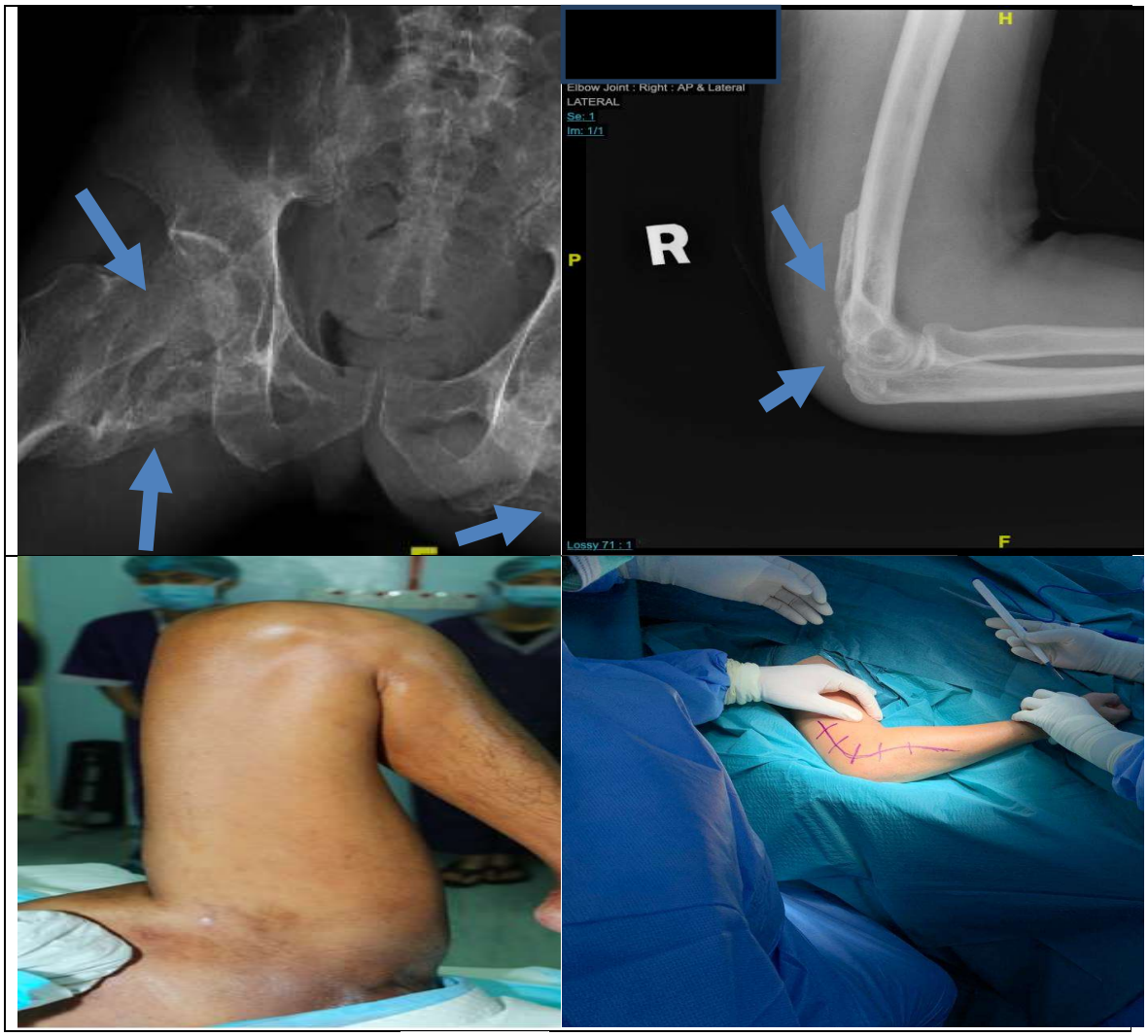

Figure 1: Plain X-ray of the first case showing Heterotopic Ossification (HO) of bilateral hip (figure 1a) and elbow (figure 1c). The HO location on the respective X-rays are showed by the blue arrows. Figure 1b and 1d showed the pre-operative condition of the respective cases.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

References:

[1] Mysiw WJ, Fugate LP, Clinchot DM. Assessment, earlyrehabilitationintervention, andtertiaryprevention. *Braininjurymedicine: principlesandpractice*. 2007;293.

[2] Huang H, Cheng WX, Hu YP, Chen JH, Zheng ZT, Zhang P. Relationshipbetweenheterotopicossificationandtraumaticbraininjury: whyseveretraumaticbraininjuryincreasestheriskofheterotopicossification. *Journaloforthopaedictranslation*. 2018;12:16-25.

[3] Hudson SJ, Brett SJ. Heterotopicossification–a long-term consequenceofprolongedimmobility. *CriticalCare*. 2006;10(6):1-2.

[4] Chalidis B, Stengel D, Giannoudis PV. Early excisionandlateexcisionofheterotopicossificationaftertraumaticbraininjury are equivalent: a systematicreviewoftheliterature. *Journalofneurotrauma*. 2007;24(11):1675-86.

[5] Lee A, Amin NP. RadiationTherapy For HeterotopicOssificationProphylaxis.*StatPearlsPublishing*; 2020. https://www.ncbi.nlm.nih.gov/books/NBK493155/