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Case Report

# A case of the management of Heterotopic ossification as the result of acetabular fracture in a patient with traumatic brain injury

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ABSTRACT

**Introduction:** The most common location of the heterotopic ossification is represented by the pelvic ring, followed by the elbow, shoulder, and knee. In the case of severe brain or spinal traumas resulting from a coma state, calcifications developed within three months from the trauma, and occurred more frequently in people between twenty and thirty years of age.

**Presentation of case:** We present a case report of a 29-year-old patient with heterotopic ossification of the left side hip soft tissue, as a result of traumatic brain injury (coma for ten days). The patient suffered by fracture of the iliac wing, acetabulum and left ischio pubic ramus, which were surgically treated. The patient came to our observation for hip stiffness six months prior to the study. XR performed in standard projections, wing and obturator, showed the formation of a grade 3 heterotopic ossification of Brooker's classification. From the post-surgery to sixth month after the demission, the patient was surgically treated by an anterolateral hip approach to remove calcifications. The patient was subjected to anti-inflammatory therapy and indomethacin, shock waves, and physiotherapy to improve the mobilization of the hip. He had good results.

**Discussion and conclusion:** Heterotopic ossification represents a disease which is not very common, but has particular characteristics with debilitating consequences. The disease is responsible for reduction of functionality of the affected joint. There are many different treatments available, but it is necessary to choose the most appropriate one, considering: responsible cause, location, Brooker's classification, the articular functionality.



## 1. Introduction

The most common location of the heterotopic ossification is represented by the pelvic ring, followed by the elbow, shoulder, and knee. The sopratrocanteric area of the pelvis is the most severely affected, with possible formation of bony bridges in more severe forms. Joint stiffness represents the pathogenetic characteristic of this often disabling disease, which can result from peri-articular fractures often associated with traumatic brain injury, repetitive microtraumas, fracture-dislocations, bruises, or prosthetic surgery. This condition can also derive from nontraumatic causes, such as diseases of a rheumatic syndrome, deposited crystals of calcium pyrophosphate, neurological diseases, and prolonged mechanical ventilation [1].

In the case of severe brain or spinal traumas resulting from a coma state, calcifications developed after two or three months, and occurred more frequently in people between twenty and thirty years of age [2].

Further causal factors that may influence the formation and precipitation of crystals are the type of trauma and individual predisposition [3]. According to some literature studies, the etiopathogenesis of the condition could be linked to an alteration of the gene ANKH on the chromosomal region 5p15, which encodes a transmembrane protein that transports the inorganic calcium pyrophosphate (Ppi) [1,2].

The direct consequence is an increase of extracellular Ppi and its deposition ectopic sites [1,2].

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Posttraumatic calcifications represent a problem that has greatly stimulated the study of the peculiar biomechanical features of this condition, in order to prevent its consequences and implement specific therapies where possible [4]. We reported a case of heterotopic ossification as the result of an acetabular fracture in a 29-year-old male with traumatic brain injury. At the moment of trauma, he did the perioperative prophylaxis with NSAIDs for heterotopic ossification.

## 2. Presentation of the case

A 29-year-old male treated two years ago for a fracture of the pelvis by fixation with plates and screws by ilioinguinal extended access. The patient came to our observation for hip stiffness six months prior to the study. XR performed in standard projections (Fig. 1a,b), wing and obturator, showed the formation of a grade 3 heterotopic ossification of Brooker's classification (Fig. 1c).

Orthopedic objective exam showed extreme functional limitation of the left hip (active mobility: flexion of the hip bending the knee extended 40°, flexion with the knee flexed60°, extension of the hip with the knee extended 20°, extension of the hip with knee flexed 5°, abduction15°, internal rotation15°, external rotation25°, 0°adduction) and severe difficulty in walking (Fig. 2).

The patient also felt pain when acupressure was exerted on the sopratrocanteric site.

Blood tests were performed for the patient to determine any subjective predispositions (calcium concentration in plasma, serum and urine phosphate, PTH and vitamin D). The blood parameters were included in the benchmarks.

The patient was subjected to Harris Hip Score [5] and the general health SF-36 [6].

The patient was surgically treated by an anterolateral hip approach to remove calcifications, which intraoperatively (Fig. 3) resulted in a good recovery of the ROM (passive mobilization: flexion of the hip, bending the knee extended 90°, flexion with the knee flexed 100°, extension of the hip with the knee extended 85°, abduction 35°, internal rotation 30°, external rotation 50°), which was also confirmed by postoperative RX (Fig. 4) and clinical exam (Fig. 5).

For the next two months, the patient was subjected to anti-inflammatory therapy with a second dose of indomethacin (started within 24 hours post-surgery), shock waves, and physiotherapy to improve active and passive mobilization of the hip [7]. At six months follow-up, we noticed a significant improvement of mobility with significant reduction in stiffness (as evidenced by the clinical picture and the Harris Hip score: value of 51 preoperatively to 87 postoperatively). The patient walked without a limp and with considerable satisfaction, which is shown by the rating scale SF-36 (Fig. 6) subjected to the same before and after the treatment.

The recovery of hip mobility and functionality appears complete (active mobility: flexion of the hip bending the knee extended

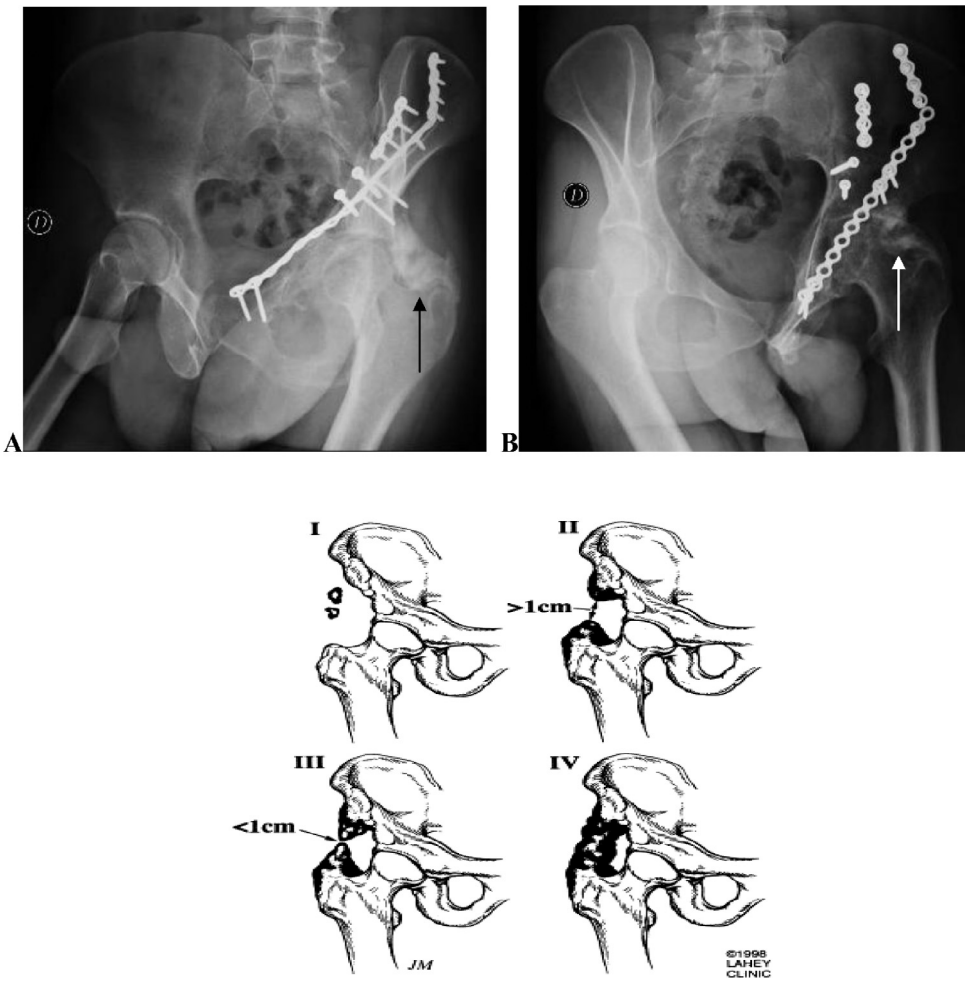


**Fig. 1.** The preoperative XRs in the two projections (A, B) show the heterotopic calcifications (arrow). (C) The Brooker classification (great trocanter's calcification) is divided in: Class 1: Islands of bone within the soft tissues surrounding the hip; Class 2: Bone spurs from the pelvis or proximal femur with about 1 cm between the two ends; Class 3: Bone spurs from the pelvis or proximal femur far less than 1 cm; Class 4: Ankylosis of the hip bone.

**Fig. 2.** Preoperative clinic photos. There is a strong limitation of hip ROM, in extension and flexion.

100°, flexion with knee flexed 120°, extension with the knee extended 90°, extension with the knee flexed 25°, abduction 40°, internal rotation 30°, external rotation 45°, (Fig. 5)) with great satisfaction of the patient. There were no complications after the surgical treatment.

## 3. Discussion

In pelvic injuries, the incidence of the formation of heterotopic ossification depends on the surgical access route used. This condition is more prevalent with an extended access route, such as muscle dissection for the disconnect of iliac bone [8].

In fact, the access most frequently burdened with this complication is the ilio femoral extended route, followed by the Kocher–Langenbeck route, the iloinguinal (in case of acetabular fractures),

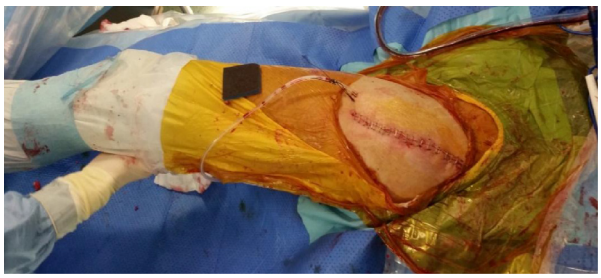

**Fig. 3.** Intraoperative photo with good mobility after removing the calcification.

**Fig. 4.** Rx postoperative. Great trocanter is free from heterotopic ossification.

front access, back access, and finally access for the fixation of fractures of the femoral head [8].

Some studies show a lower incidence of calcification with ilioinguinal access [8].

Knowledge of plasma calcium concentrations, serum and urine phosphate, PTH, and vitamin D are essential for the differential diagnosis among the different causes of accumulation of calcium salts, but it is very difficult to differentiate them radiographically and histologically [1–3]. From the morphostructural point of view, we witnessed the sedimentation of calcium salts in nodular or laminar formations, sometimes aggregated in small or large masses, in the context of connective fascial-fat, and periarticular, muscular, and subcutaneous tissues [1–3]. In the literature, there are no validated therapeutic algorithms or treatment guidelines clearly defined, which is why there is a heavy reliance on personalized choice for some cases [9–11].

Treatments such as indomethacin (25 mg 3 times a day), radiation therapy (700cGy) and shock waves, decrease the incidence of this complication by 10% [9–12].

However, there is no clear form of treatment. Originally, bisphosphonates were expected to be of value after hip surgery. To date, there has been no convincing evidence of their benefit despite being used prophylactically [9–11]. Depending on the growth's location, orientation, and severity, surgical removal may be possible.

Heterotopic ossification is seldom excised, because pain relief is often inadequate and improvement in range of motion may not last [13]. In established cases of heterotopic ossification following total hip arthroplasty, excision may be performed [13]. The results of this procedure are varied. Patients may find that their range of movement improves, but pain relief is likely to be limited.

After trauma to the joint, surgical excision may be indicated on the basis of pain and stiffness. In such cases, the surgical procedure may be beneficial in that associated contractures are released, and this release can be as important as removal of the heterotopic ossification itself. The timing of surgery is controversial [13]. Heterotopic ossification is often thought to take approximately 12 months to mature [13].

The pearls for surgical treatment of heterotopic ossification are to handle tissue carefully, avoid excess bleeding, achieve good hemostasis, and to be aware of lesions that span inter-nervous tissue planes.

Because removal of heterotopic ossification may involve substantial blood loss and incomplete excision, and because the risks of recurrence are high, surgeons attempting surgical removal of heterotopic ossification need to be familiar with the relevant surgical approaches to the affected region and know-how to enlarge and

**Fig. 5.** Clinical photos at six months follow-up. Good hip mobility of the patient, with good recovery of the flexo-exentension of the hip is noticeable.

extend the wounds safely [13]. In fact, we used anterolateral hip approach for tissue sparring.

The literature on the surgical excision of heterotopic ossification in the hip, knee, and elbow with secondary prophylaxis demonstrates significant improvements in pain and ROM with low rates of recurrence (0–19%) and acceptable rates of peri-operative complications (0–25%) [12,13].

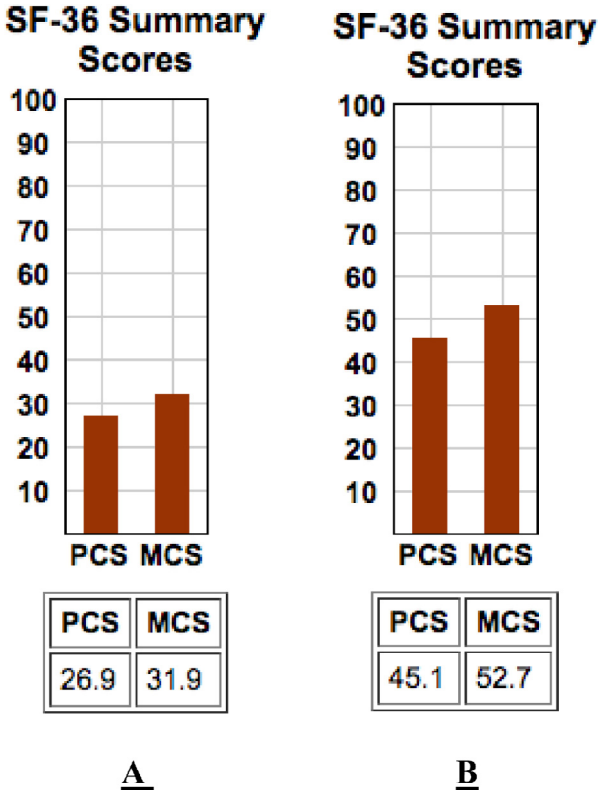


**Fig. 6.** (a) SF36 preoperative (26, 9–31, 9); (b) SF36 postoperative (45, 1–52, 7). There was a great improvement of the score with satisfaction of the patient. MCS: Mental Component Summary; PCS: Physical Component Summary.

## 4. Conclusion

Heterotopic ossification represents a disease which is not very common, but has particular characteristics with debilitating consequences. The disease is responsible for severe stiffness, reduced range of movement, and severe reduction of functionality of the affected joint. There are many different treatments available, but a patient's global assessment is necessary in order to choose the most appropriate one, by considering location, degree of Brooker's classification, comorbidities, and the responsible cause and degree of articular functionality. Prevention is the first therapeutic step, since the onset of the heterotopic bone can be prevented by adopting appropriate treatments, such as indomethacin, radiation therapy and shock waves. When we find well organized, mature, and high grade heterotopic ossification, the most effective treatment with better results in recovery of joint function is represented by surgery. For this reason, in this clinical case report we present the surgical choice proven to be the most suitable.

## Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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