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Case Report

Massive Hip Heterotopic Ossification in a Polytrauma Patient: A Case Report

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Abstract

Background: Heterotopic ossification (HO) around the hip joint is correlated with a dramatic reduction in hip range of motion (ROM) and quality of life (QOL).
Case Report: We report on a 45-year-old man with a massive right hip HO with intensive reduction in his right hip ROM. He underwent surgical resection via Smith-Petersen approach by an experienced hip surgeon, as well as a vascular surgeon. Neurovascular bundle was explored and protected. The mass was excised as much as possible. The ROM increased instantly to near full. After surgery, we used indomethacin in order to hinder the HO relapse.
Conclusion: The surgical resection of hip HO is a feasible treatment option; however, it is challenging.

Keywords: Hip; Heterotopic Ossification; Surgical Resection; Case Reports; Multiple Trauma

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Background

Heterotopic ossification (HO) is defined as the pathological formation of lamellar bone in soft tissue, which can severely affect the quality of life (QOL) due to pain and decreased range of motion (ROM) (1). The subtypes of HO are described as traumatic, neurogenic, and genetic. The traumatic subtype is a rare complication of traumatic bone injuries such as hip, elbow, and knee fractures and dislocations. The neurogenic subtype affects patients with neurological disorders, whether traumatic (e.g., traumatic brain injury) or non-traumatic [e.g., central nervous system (CNS) tumors, encephalitis] injuries. Genetic subtype occurs in patients suffering from congenital disorders such as fibrodysplasia ossificans progressiva (FOP) and progressive osseous heteroplasia (POH) (1, 2). Although the exact etiology is unknown, several pathophysiological pathways have been proposed that address the physiological fracture healing process pathways that go wrong (2).

The main risk factor is trauma, but there are other risk factors for different subtypes. Men are slightly more vulnerable to HO than women, and it is more common in adolescence ages (3, 4). Initial clinical features of HO may include joint and muscle pain, decreased ROM, tissue swelling, redness, and heat in the involved region, as well as a low-grade fever (5).

This case report highlights the diagnosis and management of severe hip HO in a patient with a history of polytrauma and coma.

Case Report

A 45-year-old Middle Eastern man presented to Taleghani hospital in Tehran, Iran. The patient has been practicing wushu martial arts since he was a teenager, which has resulted in a history of heavy impacts on various parts of his body during training. The patient's chief complaint was severe bulging, pain, tension, and a reduction in the passive ROM of his right hip. Since 2016, he has noticed the onset of progressive stiffness and a decrease in the ROM of his right hip joint, with the intensity of this progression accelerating since 2018.

The patient mentioned a history of accidents and multiple fractures over the years. In childhood, following a pedestrian car accident, he suffered a left proximal femur fracture, which was treated nonoperatively with traction.

In 2003, following a car rollover, he suffered a fracture of the right scapula, which was treated non-operatively. He also had an anterior cruciate ligament (ACL) tear in his left knee that was reconstructed through arthroscopic surgery. Additionally, he suffered head trauma and was in a coma for ten days but did not experience any permanent neurological defects.

In 2014, following a motor rollover accident, he suffered a left distal femur fracture, which was fixed with a plate and screws.

In 2018, in a motor rollover accident, he suffered a fracture of the upper thoracic vertebras as well as a spinal injury which was fixed via open reduction and internal fixation (ORIF) with pedicle screws and rods. Following this spinal injury, the patient had complete paralysis of the right lower limb and slight weakness of the left lower limb. The patient was able to walk with the help of a walker.

In 2019, he suffered a right distal femur fracture following non-standard occupational therapy; however, due to the spread of coronavirus disease (COVID), he was treated nonoperatively with a knee brace and close observation. No other significant past medical history was noted. He smoked 2 packs per year and was not taking any prescribed medications or illicit drugs. The patient also denied any family history of orthopedic diseases or syndromes, as well as any history of allergies.

During physical examinations, the dorsalis pedis and posterior tibialis pulses were detected symmetrically and regularly in both lower limbs. In the right lower limb, the sensory and motor functions of the right sciatic and

peroneal nerves were completely disturbed. Passive ROM in the right hip joint was significantly reduced in all directions, exhibiting tension and bulging without local tenderness. Passive flexion of the knee was approximately 100 degrees, with nearly full passive extension. Proximal and distal forces were rated at zero out of five. In the left lower limb, slight hypoesthesia in the left superficial and deep peroneal nerve was detected, but proximal and distal forces were about four out of five. Both passive and active ROM in the left hip and both knee joints were nearly full.

In the anteroposterior (AP) pelvic X-ray radiography, a massive lesion was detected around the right hip joint (Figure 1); therefore, a pelvic computed tomography (CT) scan with three-dimensional (3D) reconstruction was taken to assess the lesion more accurately (Figure 2 A, B, C, and D).

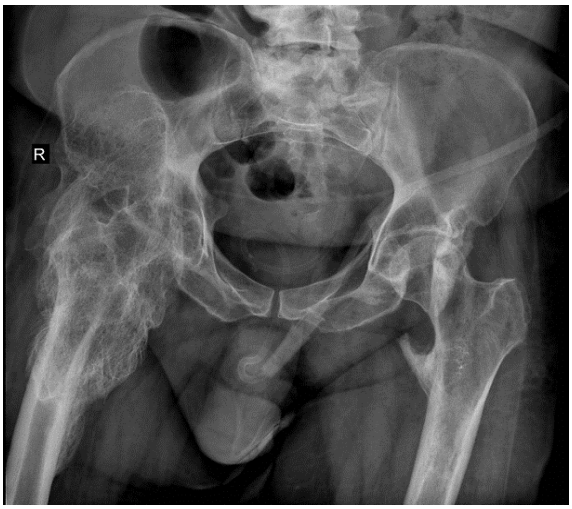

Figure 1. Anteroposterior (AP) pelvic X-ray showing a severe heterotopic ossification (HO) at right hip

It was a 120 × 89 × 25 mm bony mass anterior to the right iliac wing that extended inferiorly and encompassed the hip joint and femoral neck. Another bone mass about 36 × 65 mm was also found inferior to the left anterior superior iliac spine (ASIS) that extended to a lower level of the anterior inferior iliac spine (AIIS).

Figure 2. Pelvic computed tomography (CT): sagittal (A), axial (B), coronal (C), and three-dimensional (3D) reconstructed (D) perfectly showing the heterotopic ossification (HO) mass size

Intermediate ossification was present in the right knee around the previous distal femoral fracture and the joint, particularly inferior to the patella (Figure 3A). Additionally, there was ossification around the left knee joint, which was less prominent than that of the opposite knee (Figure 3B).

Figure 3. Right knee (A) and left knee (B) showing heterotopic ossification (HO) as well

Based on radiographic and physical examinations, along with the patient's history, he was diagnosed with severe hip HO. After providing the patient with detailed information about his medical condition and the available therapeutic options, surgery was performed by a surgical team consisting of a hip fellowship surgeon and a vascular surgery specialist via the anterior Smith-Petersen approach. The femoral neurovascular bundle was explored and protected throughout the surgery, which fortunately was not affected by the bone mass. The mass was excised as much as possible (Figure 4). The ROM increased instantly and dramatically to near full, especially in flexion and abduction (Figure 5).

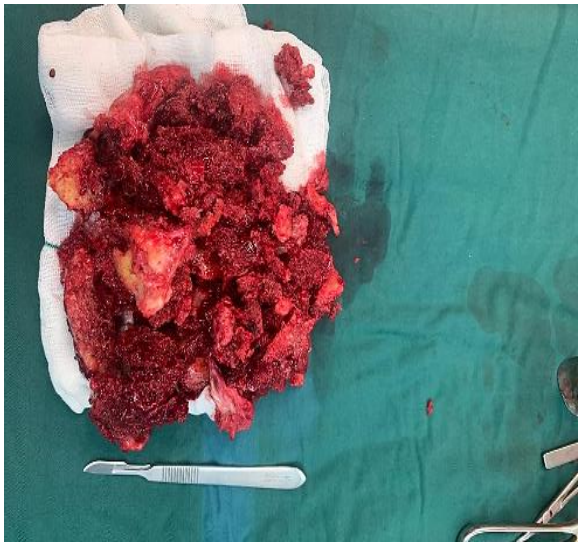

Figure 4. The mass was excised as much as possible in order to fully appreciate the surgical outcome

Figure 5. The range of motion (ROM) increased instantly and dramatically to near full, especially in flexion and abduction

The patient was dismissed after 3 days of post-operative hospitalization. To reduce the risk of relapse, oral non-steroidal anti-inflammatory drug (NSAID) (75 mg indomethacin per day) was prescribed to the patient for 3 weeks. Low-molecular-weight heparin (LMWH) (4000 IU daily) was employed for 4 weeks as prophylaxis against deep venous thromboembolism. Joint mobilization and muscle strengthening began the day after the operation. The follow-up period for the patient was about 2 years with acceptable outcome.

Discussion

Numerous cases of HO are reported worldwide. The combination of coma, spinal injury, and multiple blunt traumas from martial arts makes it nearly impossible to determine which factor predominantly predisposed the patient to HO. This case is particularly unique, especially since the onset of pain and reduction in right hip ROM occurred before his first accident.

According to the last studies, the treatment of choice for symptomatic severe cases of HO causing pain and severe reduction in ROM (more than 20%) is surgical removal of the lesion (1, 2, 4). One of the most important steps in managing these cases is prophylaxis along with the resection, which can be done using NSAIDs or radiotherapy (1, 6).

Nóbrega et al. reported a case of a 13-year-old boy with severe bilateral hip HO and sciatic nerve compression. The patient had a history of a right frontotemporal hemorrhagic stroke; thus, this case is categorized as neurogenic HO. There was a six-week interval between the surgeries on the left and right hips, and the second pre-operative radiograph showed a limited relapse of the previously removed lesion. After one year of follow-up, there were no signs of further development of HO on either side of the hip joint (5).

Kesikburun et al. described the case of a 25-year-old male patient with a history of hemicraniectomy and frontal, parietal, and temporal lobectomy. The patient also remained in a coma for 2.5 months. Based on physical examination and laboratory findings, HO was suspected. Following plain radiography, the diagnosis of severe HO in both hip joints and the right knee was confirmed (7).

Brumat et al. reported significant HO in the tensor fascia lata and rectus femoris of a 42-year-old male bodybuilder with no prior medical history. The patient experienced persistent right hip pain and limited ROM. After confirming the diagnosis, the patient underwent surgery to remove the lesion in the tensor fascia lata while preserving the femoral region to minimize potential damage to the surrounding tissue. Prior to the surgery, the patient received single-fraction irradiation for HO prophylaxis. There was no indication of relapse or pain during follow-up visits (8).

Kinoshita et al. evaluated a severe case of HO in a 78-year-old male patient diagnosed with periprosthetic joint infection (PJI) due to a Staphylococcus caprae infection following a left total hip arthroplasty (THA). The patient underwent revision THA and removal of the HO lesion, followed by antibiotic therapy. However, 1.5 years after the second THA, the patient reported recurrent left hip pain, and thus underwent another surgery to remove the remaining HO and a third THA. During follow-up visits, the patient reported no hip pain, and no signs of relapse were noted (9).

Wu et al. evaluated a series of 18 patients who underwent surgical resection of severe HO following ORIF of an acetabular fracture, followed by radiotherapy or NSAIDs as prophylaxis. Complications reported included intraoperative femoral neck fracture, sciatic nerve injury, femoral head avascular necrosis (AVN), and mild HO recurrence. There were no instances of severe HO recurrence (10).

Although the complication rate was relatively high, the authors concluded that early resection of HO after acetabular fracture ORIF can yield satisfactory outcomes (Table 1).

HO or ectopic ossification is associated with several medical conditions, including spinal cord injuries (SCIs), traumatic brain injuries, and hip arthroplasties (1). The acquired form of HO is most frequently seen with either musculoskeletal trauma, SCI, or CNS (11). The reported incidence varies greatly in the SCI population, ranging from 10% to 53%, and occurs below the level of paralysis, usually at the hip (70%-97%) and followed by the knee (2, 3). NSAIDs, warfarin, and pulse low-intensity electromagnetic field (PLIMF) therapy are used for prophylaxis, while bisphosphonates and surgical excision are utilized for treatment (12-15).

Table 1. Summarizing previous studies

Study	Cases	HO site	Risk factor	Treatment
Nóbrega et al. (5)	1	Severe bilateral hip HO and sciatic nerve compression	Right frontotemporal hemorrhagic stroke	Surgical resection
Kesikburun et al. (7)	1	Both hip joints and the right knee	Hemicraniectomy and frontal, parietal, and temporal lobectomy	Surgical resection
Brumat et al. (8)	1	Tensor fascia lata and rectus femoris	Unknown	Surgical resection
Kinoshita et al. (9)	1	Periprosthetic joint infection	Staphylococcus caprae infection	Revision arthroplasty and resection of the HO lesion
Wu et al. (10)	18	Following ORIF of an acetabular fracture	Unknown	Surgical resection

HO: Heterotopic ossification; ORIF: Open reduction and internal fixation

Conclusion

In this study, we describe the surgical excision of severe hip HO of unknown origin with postoperative indomethacin. Possible causes may include repeated trauma in combat sports, multiple traumas such as car accidents, and a history of coma due to head trauma. Excision of hip HO is a technically demanding procedure that requires surgical expertise and should be carried out at tertiary referral centers. Surgeons must occasionally be prepared to address vascular injuries, femoral neck fractures, and potentially replace the joint. Careful evaluation of the preoperative CT scan provides valuable information, and wide exposure is necessary to identify all involved neurovascular structures. Further studies are needed to fully assess the results of HO resection, avoid complications, and identify risk factors for HO recurrence.

Conflict of Interest

The authors declare no conflict of interest in this study.

Acknowledgements

Ethical approval was granted by the Ethics Committee of Shahid Beheshti University of Medical Sciences, Tehran, Iran.

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