Clinical Observations on Surgical Details of Resection of Heterotopic Ossification at the Hip in Traumatic Brain-Injured Adult

P. Koulouvaris, MD, PhD, P. Tsailas, MD, PhD, K. Tsiavos, MD, and P. N. Soucacos, MD, PhD

Heterotopic ossification (HO) complicated with neurovascular bundle can be a very challenging operation. Preoperative planning before any HO resection is imperative. Plans to reconstruct nerve or artery should be in place. A case study is presented that involved a large bone mass of HO in hip joint which enclosed the sciatic nerve. Preoperative planning, microsurgical techniques, and equipment necessary for this complicated surgical procedure are reviewed. (Journal of Surgical Orthopaedic Advances 19(3):177–180, 2010)

Key words: heterotopic ossification, preoperative planning, surgical technique

Introduction

Heterotopic ossification (HO) is the pathologic bone formation as a consequence of many diseases and various forms of trauma (1). The most common diseases associated with HO are diseases of central nervous system and the most common forms of trauma are traumatic brain injury, spinal cord injury, and acetabulum and elbow fractures (2). The cause may be different but the clinical aspects of the forms of HO have similarities such as the natural history and treatment modality (3–5). Management of HO consists of a combination of surgery, radiation therapy, and nonsteroidal anti-inflammatory drugs (NSAIDs) (6–8). Although there are many reports regarding the medical management, few reports are available concerning the surgical management for the treatment of HO (5, 6). We believe that surgical resection of HO is a challenging problem for orthopaedic surgeons. The purpose of this case report is to describe the surgical details and to highlight the main steps for a successful resection of traumatic brain injury HO at hip joint.

Case Report

A 25-year-old male worker presented with a periarticular diffused HO in his right hip (Fig. 1). There were two distinctive patterns of HO. One was posterior to the femoral head and neck and the other was anterior from the anterior superior iliac spine to the greater trochanter. The patient had a severe flexion contracture and the hip posture was flexion and external rotation. There was no movement in hip joint and the patient had difficulty sitting on a chair. His main complaint was continued impairment in his daily life and mobility. The patient did not have findings consistent with an entrapment neuropathy, such as disturbance of sensibility. Two years ago the patient suffered a traumatic brain injury after a traffic accident and he was hospitalized in intensive care for 2 months. The HO was diagnosed 5 months after the brain injury. Surgical resection of HO was planned.

Standard roentgenograms, computed tomography (CT), and three-dimensional reconstruction were obtained and
The forms of HO are illustrated in Figure 2. The patient was placed in a semilateral position and a posterolateral approach was used. The gluteal maximus fibers were split and the proximal fascia latae were divided. The posterior form of HO was encountered in the fibrofatty tissue beneath the gluteus muscle (Fig. 3). The sciatic nerve was identified enveloped by the HO and use of microsurgical techniques and equipment for spine decompression was necessary to release it before HO resection (Fig. 4). The sciatic nerve was released with bipolar cautery for hemostasis, using loupe magnification and microsurgical instruments for spine decompression (Karyson) (Fig. 5, A–C). Thereafter, the HO was removed en block with the use of a saw (Fig. 6, A and B). At the same time, anterior soft tissue release was performed. After complete resection of HO, two drains were inserted. A cell saver machine was used and 250 mL of blood was collected.

The duration of surgery was 3 hours. Indomethacin was given for 2 weeks to prevent the recurrence. Twelve months after surgery the patient has free motion of hip joint and no restrictions on his moving.

Discussion

The patient with severe limitation of joint motion secondary to HO is one of the greatest challenges for the orthopaedic surgeon. In literature the results of surgical resection of HO have varied and severe complications have been reported (2). The most common complications are excessive blood loss, infection, fracture, and recurrence.

Meticulous preoperative planning with clinical examination, roengenograms, CT scan, and bone scan are the initials steps to approach the HO (5). A great concern is the maturity of HO because the risk of recurrence is higher when the HO is immature (9, 10). Immature components can be assessed with ⁹⁹ᵐTc-MDP bone scan (2). A decrease of activity is a sign of maturity. Generally optimal timing of surgical resection of HO seems to be 18 months after development (2).
FIGURE 5  (A) More than 10 cm of the sciatic nerve was enclosed by HO. (B, C) The nerve was released with karyson using microsurgical techniques.

Removal of a relatively small bridge of bone, even though it may cause ankylosis, has often a good outcome. However, when the mass of heterotopic bone is quite large with encircled nerve in it, surgery should be approached cautiously. The size of the HO has been the most important factor for complications (5, 6).

In this type of scenario, the surgeon’s goals are removing the HO, preserving the nerve or vessel, and preventing the recurrence. Preoperative imaging with CT should be reviewed in full detail to define anatomical relationships and the site of origin of the bone mass. It should be determined before surgery whether the bone mass involves a nearby joint or a neurovascular bundle, which can complicate total excision of the mass.

This type of surgery requires a bloodless field using a tourniquet where possible, cell saver, loupe magnification, bipolar coagulation, and most likely an intraoperative electrical stimulation, battery-operated device. Plans to reconstruct or repair the nerve or artery should be in place in the event there is injury to the nerve while removing the bone mass.

Another concern is the degree of osteoporosis, which is usually severe when large bone mass protects the joint from any stress circumferentially and fractures are
inevitable even with minimal manipulation. Cautious dissection and removing the HO only when it is fully exposed will minimize this complication. The HO should be removed en block. Partial weightbearing should be advised during the immediate postoperative period. Preventive measures for recurrence such as radiation, indomethacin, and etidronate disodium may be of benefit (8, 11–14).

The article’s intention is to highlight the surgical details of HO resection and to prepare the surgeons because various obstacles may be placed in their way when performing HO resection and the anatomy is distorted. The surgeon should have on hand a microsurgical instrument tray and he or she should be experienced in microsurgical techniques to repair any damage to nerve or artery secondary to HO or iatrogenic injury to these vital structures.

Summary

Heterotopic ossification complicated with neurovascular bundle can be a very challenging operation. Meticulous preoperative planning before any HO resection is imperative because reconstructing a nerve or artery is often needed. The surgeon should be familiar with microsurgical techniques and the appropriate equipment should be in place.

References