Early resection of heterotopic ossification after total hip arthroplasty: A review of the literature

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ABSTRACT: Early excision of heterotopic ossification was performed in 8 patients at an average of 10.2 months after total hip arthroplasty. All patients received a single irradiation dose of 7Gy the day before the operation, followed by oral indomethacin (3x25mg/day) for six weeks. Continuous passive mobilization under epidural anesthesia was started immediately post-operatively. At an average follow-up of 2 years none of them had radiographic or clinical evidence of recurrence. Consequently we recommend resection as soon as there are severe clinical implications, even when bone scans indicate immaturity of the heterotopic ossification and provided that the resection is combined with proper non-surgical treatment consisting of irradiation and oral indomethacin and immediate extensive rehabilitation program. (Hip International 2002; 4: 383-7)

KEY WORDS: Heterotopic ossification, Resection, Total hip arthroplasty

INTRODUCTION
Currently resection of heterotopic ossification (HO) is generally suggested after complete maturation (between 14-18 months), since earlier intervention is thought to predispose to recurrence (1-3). Reliable indicators of maturation of HO are diminishing activity on serial bone scans and/or decreasing levels of alkaline phosphatase (1, 4). However, most literature reports deal with treatment of HO of the hip associated with traumatic brain injury or spinal cord injury, with an important correlation between the severity of the neurologic lesion and the recurrence of HO (5-9, 32-34). Nevertheless, HO after primary total hip arthroplasty (THA) is a relatively common complication occurring in 20 to 90 percent of all cases. Although usually asymptomatic, heterotopic bone formation can cause major disability consisting of pain and a decreased range of motion in up to 7 percent of patients undergoing THA (10). Therefore, it would be interesting to determine whether these patients would benefit from early resection of the peri-articular ossification with a proper and reliable postoperative strategy to prevent recurrence of HO with clinical implications.

METHODS
At the orthopedic department of Ghent University Hospital, a series of 8 patients (7 men, 1 woman) underwent resection of HO of the hip. All patients had previously undergone THA. There were no patients with traumatic brain or spine injury. Their mean age was 37.7 years, ranging between 31 and 75 years. All patients had pain and restriction of motion. Three hips were ankylosic with an average flexion contracture of 27 degrees (ranging between 20 and 30 degrees) and the other five were restricted with an average of 43 degrees of hip flexion (ranging between 30 and 50 degrees) and an average flexion contracture of 18 degrees (ranging between 0 and 20 degrees). Abduction veraged 14 degrees (ranging between 0 and 40 degrees), adduction 6 degrees (ranging between 0 and 0 degrees), external rotation 2 degrees (ranging between and 10 degrees) and internal rotation was 0 degrees in those 5 joints (Tab. I).
### TABLE I - AVERAGE HIP MOTION BEFORE AND AFTER RESECTION OF HO

<table>
<thead>
<tr>
<th>Flexion</th>
<th>Extension</th>
<th>Abduction</th>
</tr>
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<tbody>
<tr>
<td>Adduction rotation</td>
<td>Int rotation</td>
<td>Ext</td>
</tr>
<tr>
<td>pre-op</td>
<td>43</td>
<td>-18</td>
</tr>
<tr>
<td>14</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 wks post-op</td>
<td>92</td>
<td>31</td>
</tr>
<tr>
<td>0</td>
<td>26</td>
<td>19</td>
</tr>
<tr>
<td>2 yrs post-op</td>
<td>99</td>
<td>32</td>
</tr>
<tr>
<td>0</td>
<td>29</td>
<td>21</td>
</tr>
</tbody>
</table>

### TABLE II - AVERAGE HARRIS HIP SCORE BEFORE AND AFTER RESECTION OF HO

<table>
<thead>
<tr>
<th>HHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>pre-op</td>
</tr>
<tr>
<td>6 wks post-op</td>
</tr>
<tr>
<td>2 yrs post-op</td>
</tr>
</tbody>
</table>
As all patients underwent resection within 14 months post-operatively, we considered the HO to be immature in all cases, although some of them did not have a positive bone scan or elevated alkaline phosphatase. All operations were performed by the same senior surgeon. A combined anterolateral and posterolateral approach in lateral decubitus was used for all patients in order to obtain a good visualization of the HO. Full resection of the HO and capsule was performed up to normal anatomical landmarks which are more easily recognized because of the presence of the prosthesis, in contrast to when a wedge resection is performed after brain and spinal injuries. If necessary psoas and external rotators were sectioned. In some cases part of the HO was left in place to reduce the risk of fracture of the greater trochanter and to guarantee normal function of the abductor musculature.

There were no lesions of the ischial nerve post-operatively. All patients received a single dose of radiotherapy (7 Gy) the day before the operation and oral indomethacin was started post-operatively for 6 weeks (3 x 25mg/24hours). None of the patients had to discontinue the indomethacin because of side-effects. One patient received additional stomach protection. Rehabilitation was started the same day as the operation, consisting of continuous passive mobilization for up to 5 hours a day under continuous epidural anesthesia for several days to allow an immediate full range of motion.

RESULTS

The mean interval between the previous hip surgery and the resection of HO was 10.2 months, ranging between 7 and 14 months. According to Brooker's classification, 5 joints were classified as Class III and 3 joints as Class IV. Although none of the patients underwent serial bone scans, the single bone scan showed an increased uptake in 6 patients. At the time of resection, alkaline phosphatase was elevated in 3 patients. The functional results were evaluated by means of the Harris Hip Score (HHS) (11). The mean HHS (Tab. II) was 54 (ranging between 40 and 67) preoperatively and 91, six weeks post-operatively ranging between 81 and 100. The average motion postoperatively (Tab. I) was 92 degrees of flexion (ranging between 80 and 105 degrees), 0 degrees of extension in all patients, 31 degrees of abduction (ranging between 30 and 40 degrees), 26 degrees of adduction (ranging between 15 and 30 degrees), 26 degrees of external rotation (ranging between 20 and 45 degrees) and 19 degrees of internal rotation (ranging between 10 and 30 degrees). At an average followup of 2 years (6 months up to 3 years), the mean HHS (Tab. II) was 91 (ranging between 81 and 100) with an average motion (Tab. I) of 99 degrees of flexion (ranging between 70 and 125 degrees), 0 degrees of extension in all patients, 32 degrees of abduction (ranging between 30 and 40 degrees), 25 degrees of adduction (ranging between 20 and 30 degrees), 29 degrees of external rotation (ranging between 20 and 40 degrees) and 21 degrees of internal rotation (ranging between 15 and 25 degrees). No important clinical or radiographic recurrence of periarticular ossification has been seen up to now (Fig. 1, 2, 3). One patient even had a dislocation one year after resection caused by squatting during gardening as he had over 125 degrees of hip flexion!

DISCUSSION

Despite early resection of the HO, none of our patients have had a recurrence so far. Although a longterm follow-up is lacking and our series is small, we believe that early resection of HO after THA is likely to be successful without recurrence provided that it is combined with appropriate non-surgical treatment. In our series this consisted of a single irradiation dose pre-operatively, complemented with oral indomethacin therapy for six weeks after the excision. At an average follow-up of two years after resection, there seems to be no loss of the initially gained motion and functional result. The risk of severe HO after THA is higher in patients who have developed HO.
after previous surgery, in men with hypertrophic osteoarthrosis and in patients with ankylosing spondylitis or diffuse idiopathic skeletal hyperostosis (12-14). Other possible predisposing factors include extensive intra-operative bleeding with hematoma, postoperative infection, operative approach with trochanteric osteotomy, or dislocation of the prosthesis during the first post-operative week (15-17). According to the critical review by Shaffer, most of the present concepts regarding the time of HO resection arise from studies of spinal cord injured patients, suggesting a minimum of 14 months for maturation, with most patients requiring 18 months or longer (2). Concerning HO after THA, most authors agree that it will be radiographically evident by 3 months postoperatively but may be visible as early as 2-3 weeks (18, 16, 19, 20). Although the ectopic bone continues to mature, many reports suggest that there is no change in either the volume or the distribution of HO after 6 months (16, 18). Others describe HO formation as an ongoing dynamic process, with changes in the amount and distribution occurring up to one year, and in one study, up to 5 years (20-23). Serial 99m-Tc-MDP bone scans are felt to be the most sensitive instrument for diagnosing early HO and assessing HO maturity (1, 5, 24).

The correlation between post-operative alkaline phosphatase levels and maturity of HO in THA remains unclear (1, 5, 18, 25). Garland's study on resection of HO showed that normal bone scans, alkaline phosphatase levels, and mature roentgenographic appearance of HO were unreliable predictors of recurrence (26). Radiation in combination with resection has been reported to reduce the risk of recurrence (27). The success of irradiation lies in the inhibition of cellular proliferation and differentiation in the formation of osteoid (28). Schmidt et al emphasized the prophylactic effect of indomethacin in a placebo-controlled clinical study (29). According to the studies by Sodemann et al, NSAIDs inhibit the migration and differentiation of mesenchymal cells which are responsible for HO formation (30). Commonly reported postoperative complications are delayed wound healing, excessive bleeding, superficial and deep infection, fractures, injuries to the ischial nerve and recurrence of HO (27, 32-34). Frischhut et al (31) and Freebourn et al (5) reported good results following early removal of HO without waiting for bone maturation. Wick et al reported on their series of 21 patients who underwent surgical excision of HO at an average of 5.5 months after primary hip surgery, followed by oral indomethacin therapy. They did not find a higher recurrence rate of HO and therefore concluded that it is not absolutely necessary to use bone scans to assess the maturity of HO (15). In summary we think that resection of HO after THA is recommended as soon as there is important disability, provided that surgery is preceded by a single irradiation dose and followed by oral indomethacin therapy for several weeks in order to prevent recurrence of HO. Obviously, further study on larger series and longer follow-up periods are mandatory.

REFERENCES


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