

Surgical Resection Combined with Adjuvant Radiotherapy and Non-Steroidal Anti-Inflammatory Drugs in the Treatment of Heterotopic Ossification Following Total Hip Arthroplasty

Tratamento da Ossificação Heterotópica Após Artroplastia Total da Anca: Excisão Cirúrgica Combinada com Radioterapia e Anti-Inflamatórios Não Esteróides

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ABSTRACT

Heterotopic ossification (HO) is a well-known complication following total hip arthroplasty (THA), with an average incidence of 30%. Patients are classified according to Brooker's staging system. In advanced stages (III and IV), HO may limit hip motion and cause intolerable pain. For these symptomatic stages, surgical excision is mandatory, usually combined with prophylaxis of recurrence with non-steroidal anti-inflammatory drugs (NSAIDs) and/or radiotherapy. We present the case of a 70-year-old woman who developed Stage IV HO after undergoing THA for left hip osteoarthritis. Surgical excision of the HO was performed eighteen months after THA, with adjuvant radiotherapy and indomethacin. After two years of follow-up, the patient had a good hip function with no recurrence of HO. Several authors have studied the effect of NSAIDs and radiotherapy in HO prophylaxis and in HO treatment but there is lack of reports concerning the combination of the two strategies with surgery in the postoperative period. We therefore report this successful case of post-THA HO treatment with surgical excision and post-operative radiotherapy and NSAIDs.

Keywords: Anti-Inflammatory Agents, Non-Steroidal; Arthroplasty, Replacement, Hip; Ossification, Heterotopic/drug therapy; Ossification, Heterotopic/radiotherapy

RESUMO

A ossificação heterotópica (OH) é uma complicação frequente após artroplastia total da anca (ATA), com uma incidência média de 30%. Os doentes são classificados de acordo com o sistema de estadiamento de Brooker. Nos estádios avançados (Brooker III e IV), a OH pode restringir a mobilidade da anca e causar dores insuportáveis. Nestes estádios sintomáticos, o tratamento indicado consiste na excisão cirúrgica combinada com profilaxia da recorrência com anti-inflamatórios não esteróides (AINEs) e/ou radioterapia. Apresentamos o caso de uma mulher de 70 anos que desenvolveu OH grau IV após ATA por osteoartrose da anca esquerda. Realizou-se excisão da OH um ano e meio após a ATA, com radioterapia e indometacina adjuvantes. Após dois anos de seguimento, não se verifica recorrência da OH e apresenta uma boa função da anca. O efeito dos AINEs e radioterapia adjuvante na profilaxia e no tratamento da HO está bem estabelecido, mas não há muitos relatos das duas estratégias combinadas com cirurgia no pós-operatório. Descrevemos, portanto, um caso de tratamento de OH pós-ATA com excisão das ossificações e radioterapia e AINEs no pós-operatório.

Palavras-chave: Anti-Inflamatórios não Esteróides; Artroplastia Total da Anca; Ossificação Heterotópica/radioterapia; Ossificação Heterotópica/tratamento farmacológico

INTRODUCTION

Heterotopic ossification (HO) is a well-known complication following total hip arthroplasty (THA). Although the literature is not totally consistent, it is thought to be more frequent with the lateral approach.¹⁻³ Its reported incidence varies widely, with values ranging from 1% to almost 90%.¹⁻⁴ Zhu *et al* reported a cumulative mean incidence of 30% in their recent meta-analysis.¹ Overall, 9% of patients with HO are symptomatic, which can hinder the results achieved with THA.²

Several risk factors have been proposed for HO, with the most important being previous HO, ankylosing spondylitis, bilateral hip replacement, cemented technique, male gender and hip ankylosis.^{1,3} Table 1 outlines the four types of HO, according to Brooker.⁴

HO can be well tolerated in its less severe stages. However, in more advanced stages, patients can become symptomatic and develop groin pain and loss of range of motion.³ Surgical excision is the only treatment available, and pro-

phylaxis of recurrence with non-steroidal anti-inflammatory drugs (NSAIDs) and/or radiotherapy (RT) has been suggested as the most effective regimen.⁵⁻⁷

There are few reports describing the association of surgery, NSAIDs and radiotherapy to treat HO after THA. The case we present illustrates the successful outcome of a protocol combining these three methods in the treatment of post-THA HO.

CASE REPORT

We report the case of a 70-year-old woman with a medical history of arterial hypertension, obesity, and degenerative lumbar spine disease. The patient was referred to the outpatient clinic due to hip osteoarthritis in 2017 (Fig. 1A), for which she underwent left hip uncemented THA through a posterior approach (Fig. 1B).

Three months after surgery, the patient started experiencing pain, decreased left hip motion and a flexion

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Table 1 – Brooker's grading system for HO around the hip joint⁴

Class	Definition
I	Islands of bone within the soft tissues about the hip
II	Bone spurs from the pelvis and/or proximal end of the femur; > 1 cm of space
III	Bone spurs from the pelvis and/or proximal end of the femur; < 1 cm of space
IV	Apparent bone ankylosis of the hip

contracture of the left hip. The radiograph (Fig. 1C) showed abnormal ossifications. One year after surgery the symptoms increased, and the patient had already developed Stage IV HO (Fig. 1D) with apparent bone ankylosis of the hip joint. She had no motion of the left hip and was not capable of walking without crutches. The Harris Hip Score (HHS) was 44 (0 - 100) and the Visual Analogue Scale (VAS) 1 (0 - 10).

Since there was no progression of HO in sequential radiographs, surgical excision of the ossifications was performed (Fig. 2) 18 months after the THA. A similar surgical approach was used, resulting in the immediate recovery of hip range of motion intra-operatively, after debriding and clearing the surrounding tissues of any residual heterotopic bone.

Adjuvant radiotherapy was initiated the day after surgery, according to the following protocol: after computed tomography (CT) scan planning to define the isocentre, the isocentric technique (using a common focus point to all ra-

diation beams) was used in order to minimize damage to healthy tissues, with 15 MV photon beams. The left proximal femur and the surrounding tissues were irradiated with a dose of 2 Gray (Gy)/session/day, five days per week, with a total cumulative dose of 20 Gy after two weeks. The patient was also given indomethacin 75 mg/day for six weeks.

One month after surgery, the patient reported a relief of symptoms and was able to walk without crutches. The radiograph (Fig. 1E) showed evidence of improvement when compared to the one before excision (Fig. 1D), with only some minor residual HO.

Two years after revision surgery, the patient was asymptomatic, had a left hip motion of 85° of flexion, 25° of internal rotation, 20° of external rotation and 30° of abduction. The HHS was 87 and the VAS was 1. The radiograph (Fig. 1F) did not present evidence of HO recurrence. No adverse effects from either radiotherapy or Indomethacin were noticeable nor have been reported by the patient.

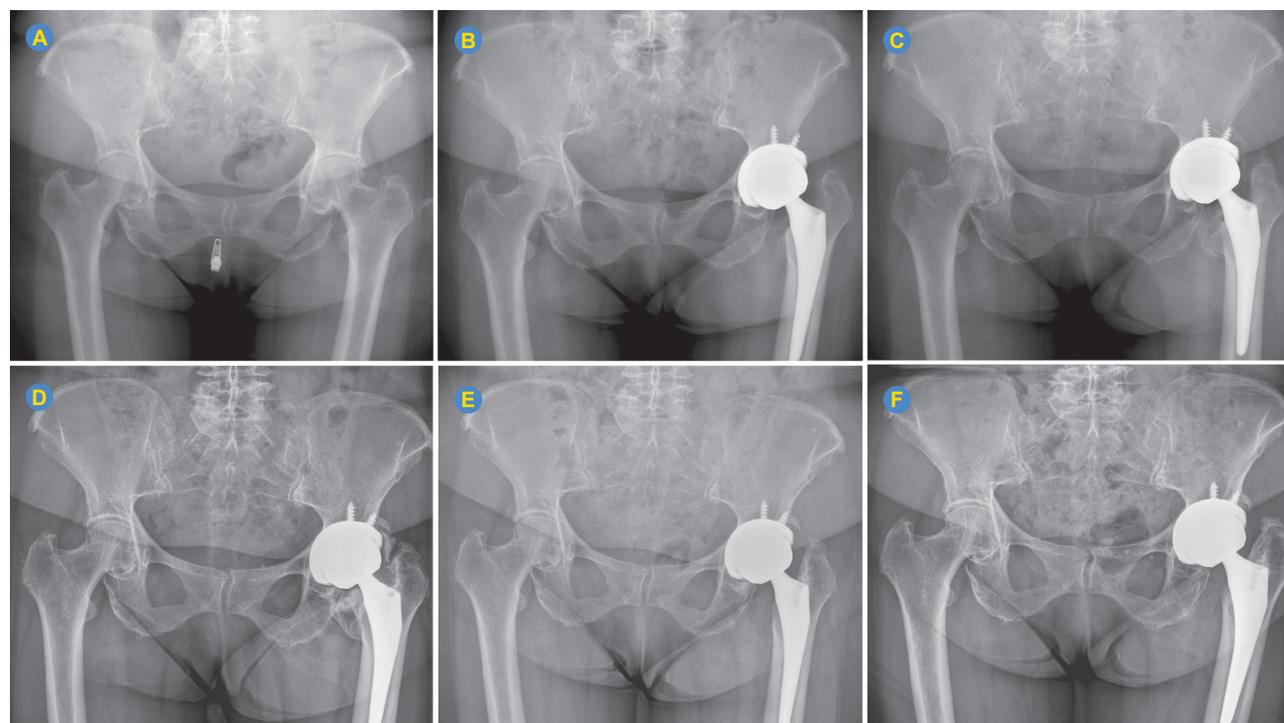


Figure 1 – Radiographic evolution: pelvis antero-posterior radiographs of the patient in different treatment phases; (A) Presentation with left hip osteoarthritis; (B) Post-operative control after total left hip arthroplasty; (C) Three months after THA, HO Brooker Grade II; (D) One year after THA, HO Brooker Grade IV; (E) One month after HO excision and RT; (F) Two years after HO treatment.

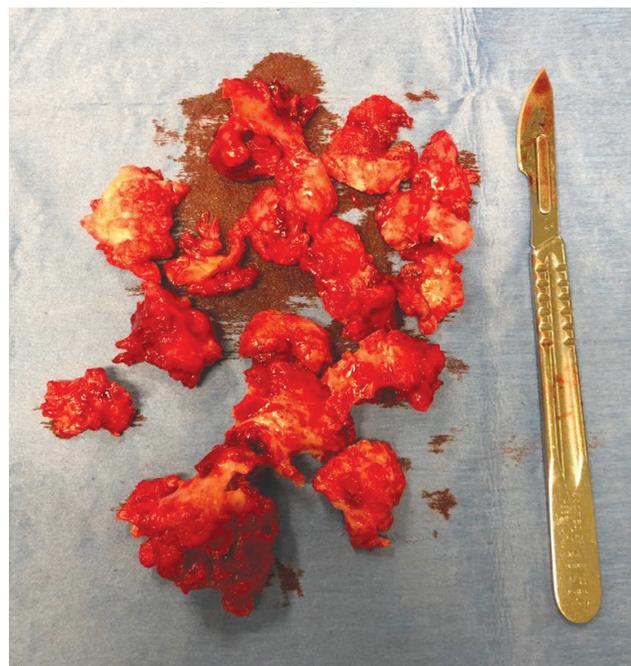


Figure 2 – Heterotopic ossification excision

DISCUSSION

This case highlights the synergistic effects of three different treatment methods in treating HO and preventing its recurrence after a THA performed through the posterior approach.

Surgical excision is the only method to remove HO once it becomes established. The surgical procedure is technically demanding, and complications include sciatic nerve injury, iatrogenic femoral fracture, and infection.⁵ A wide surgical exposure is needed, and care must be taken to protect the sciatic nerve and avoid damaging the original bone. In this case, no complication was registered.

Since it prevents HO formation by inhibiting osteoblast activity, the inclusion of adjuvant RT has been reported by many authors with good results, using many different schemes.⁵⁻⁸ Chao *et al* compared the efficacy of several different RT regimens (cumulative doses of 6 to 20 Gy and single-dose *versus* fractionated) and found there were no statistically significant differences between the different schemes.⁶ We used the dose of 20 Gy fractionated 10 times, which achieved a good result without recurrence or adverse effects.

NSAIDs are also used to prevent HO after THA and to prevent its recurrence after HO excision as they decrease the inflammatory status around the hip joint, thus decreasing the number of mesenchymal cells that would further differentiate into osteoblasts. Indomethacin has been used as the main NSAID in HO prophylaxis due to its cost effectiveness and good results. In a recent meta-analysis, Joice *et*

al found similar results with indomethacin and other non-selective NSAIDs as well as selective NSAIDs decreasing the prevalence of HO after THA.⁹ Our patient took 75 mg of indomethacin daily, for six weeks, without complications.

The three methods have been described by many authors, with clinical reports consisting mainly of combinations for prophylaxis of HO after THA with RT and NSAIDs and treatment of installed HO with surgery and either RT or NSAIDs.^{7,9-11} In a prospective study, Pakos *et al* compared the results of post-operative prophylaxis of HO with either indomethacin alone or with combined post-operative single dose radiotherapy of 7 Gy and indomethacin. They found that the combined radiotherapy and indomethacin regimen was more effective in preventing HO after THA.¹¹ Macheras *et al* reported a recent case series using the three methods for the treatment of HO (only 23% after THA), with no severe HO recurrence.⁵ However, RT was performed pre-operatively whereas in this case we used a combined post-operative treatment regimen.

The gain in the HHS obtained (from 44 to 87 points) suggests that this approach has obtained the desired endpoint. The patient had a good hip function for someone who underwent the two aforementioned surgeries and who suffers from lumbar spine disease which prevents her from achieving a higher HHS score.

In conclusion, this case report illustrates the positive results of a therapeutic scheme that combines RT, NSAIDs and surgical excision, which has been well tolerated by the patient. There are no widely accepted guidelines for the treatment of HO after THA. Since NSAIDs and RT inhibit the formation of HO in different phases of its pathogenesis, we believe it is a good option to combine these two techniques with the surgical excision. A limitation of this article is that it reports a single, retrospective, case. Further studies are necessary to define a universally applicable scheme that should encompass efficacy, cost-effectiveness, and patient tolerance in order to decrease the rate of HO after THA and to decrease the occurrence of complications from its treatment.

AUTHOR CONTRIBUTIONS

TO: Literature review, draft of the manuscript.

JL, OT: Literature review, draft of the manuscript.

RS: Critical review of the manuscript.

AV: Draft and critical review of the manuscript.

PROTECTION OF HUMANS AND ANIMALS

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the Helsinki Declaration of the World Medical Association updated in 2013.

DATA CONFIDENTIALITY

The authors declare having followed the protocols in use at their working center regarding patients' data publication.

PATIENT CONSENT

Obtained.

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COMPETING INTERESTS

All authors report no conflict of interest.

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