Heterotopic Ossification After the Arthroscopic Treatment of Lateral Epicondylitis

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Abstract

Background: Heterotopic ossification (HO) is a well-known complication following the surgical treatment of fractures and dislocations about the elbow but it is not commonly discussed as a complication following arthroscopy. We present a case of a young athlete who developed HO after the arthroscopic treatment of lateral epicondylitis. **Methods:** This is a case report chart review of a 24 year old male with lateral epicondylitis. After failing conservative measures, arthroscopic debridement of the extensor carpi radialis brevis (ECRB) origin ensued. The treatment and patient's final disposition were reported. **Results:** The patient developed heterotopic ossification of the elbow follow arthroscopic debridement of the ECRB origin. Further surgery was required to excise the heterotopic ossification. Good recovery of motion was achieved. **Conclusion:** To our knowledge, we present the first case of HO development after elbow arthroscopy for lateral epicondylitis. As the use of elbow arthroscopy continues to grow, there is a need for identification of the risk factors and primary prophylaxis for HO.

Keywords: heterotopic ossification, elbow arthroscopy, lateral epicondylitis, elbow, arthroscopy

Introduction

Heterotopic ossification (HO) is a well-known complication following the surgical treatment of fractures and dislocations about the elbow,^{3,5} but it is not commonly discussed as a complication following arthroscopy.⁶

To date, there are few reports of HO following elbow arthroscopy (Table 1).^{7,9,14} Of those patients, all have had either a history of prior local or distant HO or an arthroscopic osseous debridement. To our knowledge, there are no reports in the literature of HO following arthroscopic soft-tissue procedures such as extensor carpi radialis brevis (ECRB) debridement for lateral epicondylitis. The purpose of this report is to share our experience in the diagnosis and treatment of HO following arthroscopic debridement of lateral epicondylitis.

Case Report

A 24-year-old right-hand-dominant male former collegiate basketball player presented with an 8-month history of right lateral epicondylitis. He was limited in his ability to play basketball and many of his activities of daily living due to the pain. He was started on conservative treatment plan. The patient failed a total of 13 months of conservative measures (8 prior to presentation, 5 after presentation to our center) including occupational therapy, wrist and elbow

splinting, and a single corticosteroid injection. Radiographs revealed no degenerative changes, osseous deformity, or evidence of prior trauma. In addition, a well-circumscribed ossicle was seen adjacent the lateral epicondyle with unknown significance (Figure 1). The patient failed conservative management, and an arthroscopic debridement of the ECRB origin was performed.

Arthroscopy of the anterior joint through a proximal medial viewing portal and anterolateral working portal revealed moderate synovitis, which was excised. The origin of the ECRB was arthroscopically debrided from the lateral epicondyle using a full-radius synovial resector. No effort was made to decorticate the lateral epicondyle. The remaining posterior radiocapitellar and ulnohumeral articulations were inspected through the “soft-spot” portal and posterolateral portals, respectively, with no evidence of osteochondral defects, loose bodies, or synovitis. There were no intraoperative complications noted.

Postoperatively, the patient was placed in a soft dressing for the 3 days following the procedure. Range of motion

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Table 1. Summary of Reports of Heterotopic Ossification following Elbow Arthroscopy.

Study	Age Profession Relevant Hx	Surgical indication, surgery performed	Operative complications	Postoperative PT	HO discovery	HO course	HO treatment
Gofton et al ⁷	47 Farmer	Osteophytosis of coronoid process/ olecranon, loose bodies in coronoid and olecranon fossae Arthroscopic debridement and loose body removal, approach not specified	None	Independent active ROM Two PT sessions with active ROM	Limited ROM, stiffness Radiographs at 6 wk, involvement anterior and posterior to distal humerus	Removal at 4 y for worsening stiffness/joint locking Returned to farming	Surgical removal PODI, 600 cGy RT Indomethacin x 4 wk, 100mg PO BID for 48 h, then 25 mg PO TID Postoperative PT regimen
Hughes ⁹	57 Heavy machinery Prior HO after bilateral THAs	Osteophytes encompassing olecranon and coronoid tips, coronoid fossa, A/P radiocapitellar fossa Arthroscopic anterior debridement; open posterior capsule release, ulnar nerve decompression, osteophyte removal, posterior MCL removal	None	PT with active/ passive ROM started PODI	Stiffness at 3 wk with limited flexion Radiographs at 3 mo showed ankylosed anterior right elbow	Removal at 6 mo for continued symptoms and anterior progression Recurrence at 2 wk, with atraumatic collapse through medial column at 1 mo	Surgical removal 700 cGy RT on day before surgery PT on PODI with active ROM
Sodha et al ¹⁴	17 Pitcher	Olecranon bone spur Arthroscopic debridement through posterior/ posterolateral portals	None	Independent active- assisted ROM starting at 1 wk Formal PT started at 3 wk	Decreased ROM at 3 wk Radiographs at 3 mo, involvement of olecranon fossa	Removal at 22 mo for no improvement in ROM Returned to pitching	Surgical removal Indomethacin 75 mg PO BID x 6 wk PT at 3 wk
Present case	24 Basketball player	Lateral epicondylitis Arthroscopic debridement of ECRB origin	None	OT with Active wrist/elbow ROM at 3 days post- op	Decreased ROM at 7 wk Radiographs confirmed presence of anterolateral HO	Started on Indomethacin after diagnosis No improvement	Surgical excision at 18 wk Single 700 cGy RT treatment post-op

Note. HO = heterotopic ossification; ROM = range of motion; RT = radiation therapy; ECRB = extensor carpi radialis brevis; Hx = history; PT = physical therapy; POD = post-operative day; PO = by mouth; BID = twice daily; TID = three times a day; THA = total hip arthroplasty; A/P = anterior/posterior; MCL = medial collateral ligament; OT = occupational therapy.

(ROM) was encouraged immediately. The patient was seen by an occupational therapist 3 days following the procedure, and a regimen of elbow ROM and wrist flexion and pronation was initiated. For the first 6 weeks, the patient was provided with a 1-pound lifting restriction. Per our protocol, strengthening would begin 8 weeks postoperatively.

Seven weeks postoperatively, the patient reported increasing stiffness in the elbow. Flexion-extension ROM had decreased from 0° to 145° to 45° to 100° with maintained

70° pronation and 75° supination. Anteroposterior (AP) and lateral radiographs were obtained, which revealed early HO anterior to the lateral epicondyle of the humerus (Figure 2a). A 10-day course of 75 mg of indomethacin daily was prescribed, and active assisted ROM was continued. Four months postoperatively, the patient's ROM decreased to 30° to 90° of flexion with a firm block to elbow flexion. The radiographs revealed a 2×3-cm anterolateral ossific density consistent with HO.

Figure 1. Preoperative anteroposterior, lateral, and oblique radiographs of the right elbow.

Figure 2. (a) Anteroposterior (AP) and lateral elbow films demonstrating early heterotopic ossification (HO) anterolateral to the lateral epicondyle 7 weeks postoperatively. (b) AP, lateral, and oblique radiographs 18 weeks after HO excision and repair of the common extensor origin.

The patient underwent open HO excision 18 weeks postarthroscopy, which is likely prior to full maturation. Using a lateral incision, the heterotopic bone was excised and noted to involve the common extensor origin, which was reattached to the lateral epicondyle using suture anchors. The small ossicle seen preoperatively was noted to be well corticated within the common extensor tendon and was excised as well. It did not appear to be associated with the HO, which was located anterolaterally. The patient received a single 700 cGy dose of radiation therapy (RT) to the right

elbow the day of surgery. Aggressive ROM was initiated on the second postoperative day followed by 2 months of formal occupational therapy. His intraoperative ROM was 0° to 145°. At his 2-, 6-, and 12-week follow-up appointments, his ROM was 20° to 100°, 10° to 130°, and 10° to 145°, respectively. Fourteen months after HO excision and 19 months after the initial arthroscopy, the patient's ROM was stable at 10° to 145° of flexion with no radiographic evidence of HO recurrence (Figure 2b).

Discussion

Development of HO after elbow arthroscopy is a rare complication, with few reports in the literature (Table 1). In fact, in a retrospective study of 200 single-surgeon elbow arthroscopies performed over a 10-year span, no cases were reported.⁴ While much attention is being paid to neurovascular complications following elbow arthroscopy, HO is an apparently uncommon but potentially debilitating complication as evidenced by this report. Our patient developed HO after an arthroscopic ECRB debridement and required an open excision of the heterotopic bone. Ultimately, his ROM did improve after the secondary procedure and a single dose of radiation. We are unsure as to the true cause of his HO but it may be due to the use of a shaver for a lateral epicondylar decortication during the debridement.

Known risk factors for HO about the elbow include the degree of trauma, extent of surgery, hematoma formation, operative time, and the presence of hypertrophic arthritis.^{1,17} Nelson et al performed a retrospective review of 417 elbow arthroscopies examining the early complications and potential risk factors for these complications.¹² They reported 6 instances of HO, all requiring secondary open procedures. In their series, all instances of heterotopic bone formation developed after osteocapsular arthroplasty. The authors concluded that this particular procedure may predispose the elbow to HO given the extensive bone debris generated by removal of osteophytes. Of the previous case reports of HO, all occurred in older patients with existing elbow arthritis,^{7,9} with concomitant open capsular release,⁹ or with osteophyte debridement.¹⁴

While the literature is limited to case reports such as this, there appears to be a spectrum of HO development after elbow arthroscopy (Table 1). The reports would suggest that osteocapsular arthroplasty or osteophyte debridement with the generation of small bone fragments may be risk factors in the development of HO following elbow arthroscopy.^{7,9,12,14} In the present case, no true osseous debridement was performed, contrary to what would be expected based on the previous reports. At our institution, we have been doing arthroscopic releases for lateral epicondylitis for nearly 15 years. Although this is the only case of HO occurring after arthroscopic surgery for lateral epicondylitis, we have changed our technique to avoid this significant complication. Instead of directing the

arthroscopic shaver to the lateral cortex and peeling the common extensor off of the lateral epicondyle, we now use radio frequency cautery to release the common extensor without decorticating the lateral epicondyle. We have not had any issues with HO or failed ECRB debridement and release with this technique. This report highlights the fact that the risk factors for HO formation following elbow arthroscopy are poorly understood.

If the risk factors can be determined for HO after elbow arthroscopy, primary prophylaxis could be considered for an at-risk subgroup. HO prophylaxis, in the form of RT and indomethacin, is commonly used after acetabular surgery and elbow fracture dislocations, and also in high-risk central nervous system trauma.^{11,16} Gofton et al advocates the use of 2 weeks of indomethacin prophylaxis in patients after extensive arthroscopic surgery.⁷ Nonsteroidal anti-inflammatory drugs (NSAIDs) such as indomethacin have been used effectively to prevent formation of HO around the hip, but further investigation is required to elucidate the role of NSAIDs in preventing elbow HO.¹⁰

Despite the relative lack of information examining the role of NSAIDs to prevent HO about the elbow, several studies have evaluated the use of RT. In a cohort of 36 patients with single-dose RT following HO excision, Robinson et al reported 11% of patients had enlargement of unresected HO and 8% had developed new HO. However, none required further surgery, and all patients demonstrated an improvement in ROM.¹³ Strauss et al reported a cohort of 44 patients treated with single-dose RT and 10 days of indomethacin following high-risk elbow surgery.¹⁵ Although 48% of patients had evidence of HO at final follow-up, this was not functionally limiting in any patient. No patients required repeat surgery. The authors concluded that RT in combination with indomethacin is safe and efficacious in preventing clinically relevant elbow HO.¹⁵

In the only randomized trial regarding prevention of elbow HO, Hamid et al used single-fraction RT acutely following fixation of elbow fractures. The study was terminated early due to an unacceptably high rate of nonunion (38%; 8 of 21 patients) in the treatment group.⁸ Although the trial was terminated early, the elevated nonunion rate demonstrates that RT most likely has an effect on the formation of bone about the elbow and, thus, may have a role in the prevention of HO when fracture healing is not a concern.

In addition to RT and NSAIDs, newer therapies are being studied, including the use of the bone morphogenetic protein (BMP) antagonist Noggin to prevent BMP-induced HO formation, and the use of pulsed electromagnetic fields and free radical scavengers like *N*-acetylcysteine to prevent hypoxia-associated HO formation.²

While physical therapy is already an integral aspect of postoperative rehabilitation, the use of physical therapy specifically to prevent HO still requires more study. Our patient and those previously reported all received early

physical therapy emphasizing improved ROM after the initial arthroscopic surgery, yet HO development was not prevented. Notably, some initial work in animal models has been done: Forceful manipulation after immobilization in rabbits can actually induce HO, indicating that more gentle passive/active motion without prolonged immobilization in the postoperative period may be best.¹⁸

Conclusion

To our knowledge, we present the first case of HO development after elbow arthroscopy for lateral epicondylitis. As the use of elbow arthroscopy continues to grow, there is a need for identification of the risk factors and primary prophylaxis for HO.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008.

Statement of Informed Consent

Informed consent was obtained from the individual participant included in the study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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