Dropping the Hammer: An Uncommon Case of Right-Hand Pain in a Professional Hockey Player

Donald Kasitinon, MD,^{*,†} and Robert J. Dimeff, MD[‡]

A 26-year-old, right-handed male professional hockey player presented for a second opinion with dysesthesia of the tips of his right third, fourth, and fifth fingers after 2 previous incidents of hyperextension injuries to his right wrist while holding his hockey stick. Radiographs and computed tomography scans were negative for fracture. After magnetic resonance angiography and Doppler ultrasound imaging, the athlete was diagnosed with hypothenar hammer syndrome (HHS) with ulnar artery aneurysm and thrombosis. He underwent successful surgery with ligation and excision of the aneurysmal, thrombosed ulnar artery and was able to return to hockey 4 weeks after surgery. HHS is thought to be a rare posttraumatic digital ischemia from thrombosis and/or aneurysm of the ulnar artery and was traditionally considered an occupational injury but has been reported more frequently among athletes. There have only been 2 previous case reports of hockey players diagnosed with HHS, and in the previous 2 case reports, both involved repetitive trauma from the hockey stick, which resulted in thrombotic HHS. We present a case of a professional hockey player diagnosed with HHS also due to repetitive trauma from the hockey stick, but this time resulting in aneurysmal HHS with thromboembolism. This case report highlights the importance of keeping HHS in the differential diagnosis in athletes with pain, cold sensitivity, and paresthesia in their fingers with or without a clear history of repetitive trauma to the hypothenar eminence, as HHS is a condition with good outcomes after proper treatment.

Keywords: hypothenar hammer syndrome; repetitive hypothenar trauma; ulnar artery aneurysm; ulnar artery thrombosis; hockey

Hypothenar hammer syndrome (HHS) is a rare clinical condition that was first described by Von Rosen in 1934^{2,17} and then coined by Conn in 1970.^{2,3} The disorder is due to ulnar artery insufficiency caused by repetitive blunt trauma to the hypothenar region of the hand. This can lead to intimal dissociation of the ulnar artery in the Guyon canal resulting in thrombosis, vasospasm, and aneurysmal formation.⁵ HHS was initially reported as an occupational hazard due to overuse injury among manual laborers (as in those who use hammers),⁸ but it has been increasingly observed in athletes in sports such as baseball,¹² badminton,¹⁰ handball,¹² football,⁹ frisbee,¹² softball,¹⁸ karate,³ weight lifting,¹⁶ and hockey.^{9,13,15,20} There have only been 2 case reports of HHS in hockey players, both of which involved repetitive trauma from the hockey stick that resulted in thrombotic HHS.^{15,20} We present a case of a professional hockey player diagnosed with HHS also due to repetitive trauma from the hockey stick; however, this athlete was found to have posttraumatic aneurysmal HHS with thromboembolism rather than isolated thrombotic HHS. HHS is important to consider in hockey

players because of their multiple unique risk factors, including risk for repetitive trauma, constant stick use, noncompliant gloves that can put pressure on the hypothenar region, and the cold environment in which they play.

CASE REPORT

A 26-year-old, right-handed male professional hockey player with no significant past medical history was seen for evaluation of right-hand pain, numbness, and temperature change. Six weeks prior to presentation, he hyperextended his right wrist as he fell and went into the boards while holding his stick. The knob of his stick struck the base of his right hand. The player reported no pop or snap but developed mild swelling and bruising of the hypothenar eminence. He suffered a similar injury 2 weeks later but played the next 6 games without difficulty.

One week prior to presentation, the player noticed that his right hand became white and cool to the touch with numbness and tingling of the ulnar 3 digits during a game. Symptoms

From [†]Department of Physical Medicine and Rehabilitation, University of Texas Southwestern Medical Center, Dallas, Texas, and [‡]Texas Orthopaedic Associates, Dallas, Texas

*Address correspondence to Donald Kasitinon, MD, Department of Physical Medicine and Rehabilitation, University of Texas Southwestern Medical Center, 5323 Harry Hines Boulevard, Dallas, TX 75390 (email: donald.kasitinon@gmail.com) (Twitter: @DKasitinonMD).

The following author declared potential conflicts of interest: Robert J. Dimeff, MD, has received payment for serving on speakers bureaus for Ferring Pharmaceuticals.

DOI: 10.1177/1941738118816050

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Figure 1. Magnetic resonance angiography of the right wrist and hand with evidence of possible ulnar artery aneurysm (red oval) and thrombus (yellow arrow).

resolved after removing his glove after his shifts but recurred throughout the game. He was evaluated by the opposing team's physician and had a normal radiograph. The player was later evaluated by the team physician and had a computed tomography (CT) scan, which was unremarkable, and magnetic resonance angiography (MRA), which showed a possible ulnar artery aneurysm (Figure 1). The player was diagnosed with HHS and was initially treated with heat, oral prednisone, and hand padding with no significant improvement.

He was referred to the medical staff of the major league club for evaluation and treatment. At presentation, his only complaint was mild dysesthesia of the tips of his third, fourth, and fifth fingers. He denied pain, swelling, discoloration, or temperature change. There was no change in symptoms with exercise or with neck, shoulder, elbow, wrist, or hand position. He had no complaints of neck or other upper extremity symptoms.

Examination revealed full, pain-free range of motion of his neck and both extremities with no swelling or discoloration. There was minimal tenderness to palpation of the pisiform but no tenderness of the distal radius, ulna, metacarpals, the Guyon canal, hook of hamate, radioscaphoid lunatic articulation, or anatomic snuffbox. The Watson test was negative for instability. No ulnar triquetral instability was appreciated. Upper extremity strength and coordination were normal. There was no reproduction of symptoms with passive or resisted active shoulder, elbow, wrist, or hand movements. Sensation to pain and light touch was normal with intact 2-point discrimination (3 mm). Pulses were normal with good capillary refill. The Allen test revealed normal vascular filling, and the Tinel test was negative throughout the right upper extremity. Skin temperature was normal, with a small callus at the hypothenar eminence.

Figure 2. Long axis of Doppler ultrasound of the right wrist and hand confirming tortuous ulnar artery with a 4.2×4.5 -mm aneurysm and thrombosis and neovascularization. The arrow indicates the area of the aneurysm.

A Doppler ultrasound confirmed the diagnosis, demonstrating a tortuous ulnar artery with a 4.2×4.5 -mm aneurysm with thrombosis and neovascularization (Figure 2). The final diagnosis was posttraumatic HHS with ulnar artery aneurysm and recurrent thromboembolism. He was referred to an orthopaedic hand surgeon and underwent successful surgery with ligation and excision of the aneurysmal, thrombosed ulnar artery. Postoperatively, the wrist was splinted for 10 days, and he skated as tolerated while continuing lower body resistance training. Occupational therapy was initiated after splint removal, including hand and wrist range of motion and strengthening exercises, modalities, edema control measures, and custom splinting and padding for his glove.

The player participated in full-contact practice 3 weeks after surgery, with the only complaints being mild hand fatigue and soreness during face-offs and slapshots. He returned to game participation with padding 1 week later. He did experience occasional soreness and dysesthesia while playing during the remainder of the season. The subsequent season, his only symptoms were numbness at the surgical site and soreness after back-to-back games, which did not limit his hand function or ability to play.

DISCUSSION

HHS is a rare posttraumatic disorder leading to digital ischemia from thrombosis or aneurysm of the ulnar artery at the Guyon canal. It typically occurs from repetitive blunt trauma on the

Figure 3. (a) Illustration displaying unique vascular anatomy of the hand that makes ulnar artery susceptible to repeated microtrauma. (b) Illustration displaying the most likely location of aneurysm (between the deep palmar branch and the beginning of the superficial palmar arch where the ulnar artery is only protected by the skin, subcutaneous tissue, palmaris brevis muscle, and superficial aponeurosis) along with thrombus that can form.

hypothenar eminence. Similar to the 2 previous case reports of HHS in hockey players,^{15,20} this case of HHS was also thought to be due to repetitive trauma from the hockey stick. Repeated microtrauma leads to ulnar artery thrombosis and/or aneurysm due to the unique vascular anatomy of the hand (Figure 3).¹⁴ The ulnar artery enters the hand through the Guyon canal, which is bordered by the pisiform and hook of hamate. Between the deep palmar branch and the beginning of the superficial palmar arch, the ulnar artery is only protected by the skin, subcutaneous tissue, palmaris brevis muscle, and superficial aponeurosis. Frequent blunt trauma to the hypothenar eminence may compress the unprotected ulnar artery against the hook of hamate, triggering vasospasm of the artery.^{1,19} The repetitive trauma damages the arterial intima leading to platelet aggregation and thrombus formation. Distal embolization to the digital arteries further exacerbates the ischemia. Although less common, repetitive trauma can also lead to ulnar artery aneurysm. Preexisting fibrodysplasia may also increase the risk of HHS.¹

HHS tends to be slowly progressive, with ischemic symptoms developing over weeks to months after thrombus formation.⁴ Patients often present with pain, cold sensitivity, and paresthesia over the hypothenar eminence and ring finger. The thumb is usually spared due to its radial blood supply. Examination typically shows blanching, tenderness, and a prominent callus over the hypothenar eminence.¹⁴ The Allen test is a clinical examination technique used to evaluate for possible

compromise of the hand vasculature. The modified Allen test has replaced the original technique. The patient makes a fist for 30 seconds while the examiner applies pressure over the radial and ulnar arteries. The patient then opens his/her fist, and the examiner releases the pressure on the ulnar artery and observes the color change in the palm. The hand should initially appear blanched, and the color should return within 5 to 15 seconds. A delay in color change suggests that the ulnar artery supply to the hand is insufficient.^{7,11} Although the modified Allen test is helpful, its sensitivity and specificity are only 54.5% and 91.7%, respectively, at the conventional cutoff of 6 seconds.⁶ This athlete did have a negative Allen test, but given its low sensitivity, this test cannot be used reliably to rule out HHS.

The differential diagnosis in patients with pain and dysesthesia in the ulnar distribution of their hands includes fracture, contusion, Guyon canal syndrome, ulnar nerve contusion or entrapment, Raynaud disease or phenomenon associated with a connective tissue disease, and thoracic outlet syndrome.^{4,14} HHS is often confused with Raynaud disease or phenomenon, so other causes of Raynaud phenomenon such as scleroderma, systemic lupus erythematosus, and rheumatic disease should be excluded. Characteristics that distinguish HHS from classic Raynaud phenomenon include male predominance, appropriate history of hand and wrist trauma, asymmetric distribution,¹ and sparing of the thumb.¹⁴

Noninvasive diagnostic testing includes Doppler ultrasound, CT angiography (CTA), and MRA.²⁰ A tortuous “corkscrew”

ulnar artery is often described on arterial imaging.¹³ Angiography is still the gold standard¹⁴ but is rarely used because of its invasive nature and the accuracy with which diagnosis can be achieved with the noninvasive methods. In this case, both MRA and Doppler ultrasound were able to confirm the diagnosis.

Various methods of treatment have been recommended. Conservative measures include observation, smoking cessation, intravenous thrombolysis, antiplatelets or anticoagulants, steroids, and calcium channel blockers. Possible surgical interventions include resection and anastomosis or excision and ligation of the involved segment.¹⁵ There is no consensus on treatment. Conservative treatment is usually recommended for thrombotic HHS, while surgical intervention is recommended for thrombotic HHS that fails conservative measures, is associated with aneurysmal HHS, or has evidence of ischemia.¹⁴ Both previous cases of hockey players with HHS had the thrombotic variant. One was treated nonoperatively with intravenous thrombolysis (a 1-mg bolus of alteplase followed by an infusion at 0.5 mg/kg/h as well as an infusion of heparin at 500 units/h). The athlete was placed on warfarin for 3 months followed by aspirin 81 mg daily. He resumed professional hockey soon after being transitioned off of the warfarin.²⁰ The second was treated surgically with excision of the thrombosed artery followed by daily aspirin 325 mg and dipyridamole 100 mg for 6 weeks. On follow-up examination 12 months postoperatively, the patient denied any symptoms and subsequently resumed normal activities.¹⁵

This case report is the first to present aneurysmal HHS with thromboembolism in a hockey player. The athlete was treated surgically with ligation and excision of the aneurysmal, thrombosed ulnar artery. He was able to return to professional hockey competition 4 weeks after surgery. Return to participation is often based off of player tolerance, and the only supportive care that may minimize the issue going forward is donut padding to the hypothenar eminence to decrease compression. However, a firm splint placed under the athlete's glove is not typically used, as it would interfere with the ability to shoot and perform face-offs. Because of the extensive collateral circulation provided by the superficial and deep palmar arches and a patent radial artery as well as neovascularization that develops after injury and after surgery, vascular ischemia is not usually an issue postoperatively. Additionally, thrombotic episodes should not recur after ligation.

CONCLUSION

HHS should be on the differential diagnosis when examining athletes who present with pain and symptoms of vascular insufficiency in the setting of repetitive trauma to the hypothenar eminence. Although previously thought to be an occupational injury, HHS has been reported increasingly within

the sports medicine world. Diagnosis can often be established with noninvasive imaging studies, including Doppler ultrasound, CTA, and/or MRA. There is no consensus on treatment, but nonoperative management is typically indicated in asymptomatic patients with thrombosis without aneurysm and no threat of digital loss. Operative management is favored in those with evidence of ischemia, aneurysm, or prolonged or significant symptoms. Athletes generally make complete recovery, but the time to return to sports after treatment can vary from weeks to many months.

ACKNOWLEDGMENT

The authors would like to thank Alexandra Dimeff for her work in creating Figures 3a and 3b, as well as Stacy Kasitinon who created the initial draft of those images.

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