

Double Major for Slashing: Management of Blunt Popliteal Fossa Trauma in Ice Hockey in the Setting of Popliteal Artery Entrapment Syndrome

Brij M. Singh, BBA,* Irina Galimova, MS, ARDMS, RVT,† and Tej M. Singh, MD, ARDMS, MBA†

Abstract: Popliteal artery entrapment syndrome (PAES) is a rare condition that produces calf claudication in young patients. It is most commonly a result of aberrant anatomy of the popliteal fossa. If undiagnosed, PAES can lead to acute ischemia and a threatened limb as a result of complete arterial occlusion or embolism. Ice hockey is a contact sport, and slashing on the covered legs is well described as a strategy and contact point. We present a unique case that highlights a blunt popliteal artery injury in a young player with an underlying type 2 PAES. We discuss the initial diagnosis and endovascular/vascular surgical treatment, followed by the delayed management of the popliteal artery injury. We also provide considerations for popliteal fossa blunt trauma and need for future protection of the popliteal fossa for athletes.

Key Words: popliteal artery entrapment syndrome, popliteal fossa trauma, ice hockey

(*Clin J Sport Med* 2022;32:e543–e545)

INTRODUCTION

Blunt trauma to the popliteal fossa is a possible complication of all contact sports. We describe the management and treatment of popliteal artery thrombosis after popliteal fossa trauma in the setting of PAES in a competitive ice hockey player.

Case Report

A 16-year-old young competitive ice hockey player reported no previous skating limitations. In early 2016, he suffered a very significant slash to the back of his right knee in the faceoff circle. He immediately felt the severe pain to his unprotected posterior knee fossa and was assisted to the bench area where his knee function and mobility was evaluated by the trainers. No pulse examination was documented. His activity was limited over the next few weeks with a cool foot. He did not return to hockey over the next month because he noticed a cool right foot and significant calf pain while skating. Owing to the persistent symptoms, he presented to vascular surgery after a duplex examination (Figure 1) revealed an occluded right popliteal artery. The patient underwent successful thrombolysis over 2 days with restoration of popliteal artery and tibial flow. He underwent a posterior exploration of the popliteal artery for presumed PAES. A fibrous band was discovered compressing the popliteal artery with associated small poststenotic dilation.

Submitted for publication January 25, 2021; accepted July 28, 2021.

From the *Men's National Team Operations, 10th Brendan Burke Intern, USA Hockey, Plymouth, Michigan; and †Vascular Surgery, Palo Alto Medical Foundation, Mountain View, California.

The authors report no conflicts of interest.

Corresponding Author: Tej Singh, MD, MBA, Department of Vascular Surgery, Palo Alto Medical Foundation, Mountain View, CA 94043 (pamfvascular@gmail.com).

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<http://dx.doi.org/10.1097/JSM.0000000000000970>

Magnetic resonance imaging had confirmed the lateral attachment of the medial head of the gastrocnemius muscle, but no further compression was observed. The patient resumed his competitive ice hockey schedule in 4 months. He returned 3 years later once again with calf claudication and an unprovoked thrombosed popliteal artery during his college hockey season. He once again had successful thrombolysis, and this time, posterior exploration of the popliteal artery revealed a larger thrombosed popliteal artery aneurysm with thrombus which was replaced with a small, focal, reversed left greater saphenous vein graft (Figure 2). No further muscle bands or compression of the popliteal artery was noticed, and the artery was freed fully. He is presently in surveillance with duplex ultrasound.

DISCUSSION

“Slashing,” or deliberate, forceful contact with the stick in ice hockey, is a common and rarely penalized behavior

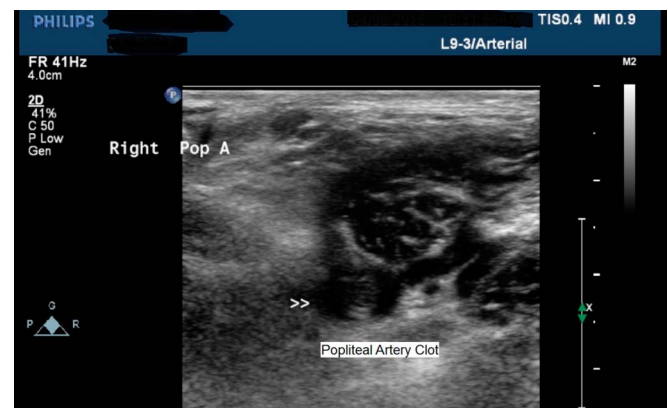


Figure 1. Duplex ultrasound showing the clot in the popliteal artery after the blunt injury to the fossa. Popliteal artery entrapment syndrome may have led to small aneurysm before trauma.

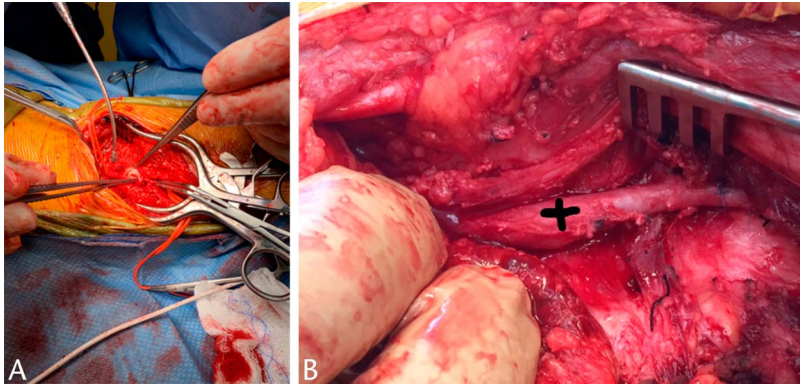


Figure 2. A, B, Popliteal artery injury and surgical repair with a prone approach. Marking highlights the reversed saphenous vein graft in proper position.

throughout all levels of ice hockey. Slashing weak or unprotected areas, such as the back of the knee, above the wrists, or the lower back, is tolerated behavior in the sport, although can cause serious injury under certain conditions. These areas are targeted for players to cause injuries, weaken opponents, and influence play due to the pain inflicted and areas unprotected fully.

Popliteal artery entrapment syndrome was first described in 1879 by Stuart¹ as he encountered the anatomical variation while doing a dissection. The reported incidence ranges from 0.2% up to 3.5% in postmortem autopsies of the general population and can account for up to 60% of cases involving young adults with claudication symptoms.^{2,3} Most cases are

male (80%) and younger than 30 years.⁴ Popliteal artery entrapment syndrome has 5 anatomic variants^{5,6} plus a functional syndrome of vessel compression due to calf muscle hypertrophy.⁷ They are described as follows (Figure 3):

1. type I: popliteal artery has an aberrant medial course around the medial head of gastrocnemius,
2. type II: artery is not displaced, but the medial head of gastrocnemius inserts more lateral than usual; the artery passes medial and beneath the muscle,
3. type III: an accessory slip of medial head of gastrocnemius slings around the artery,
4. type IV: artery lies deep in popliteal fossa entrapped by popliteus or fibrous band, and

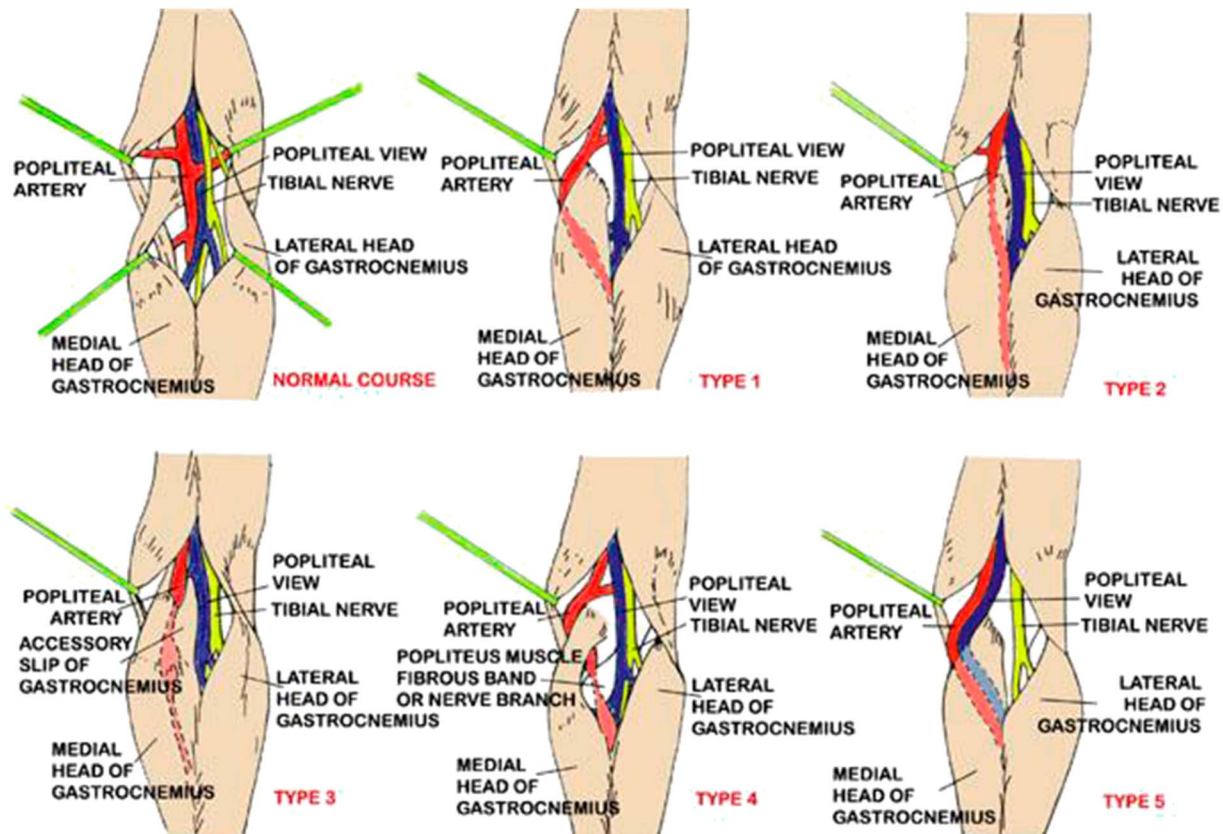


Figure 3. Diagrams highlighting the 5 anatomic variations of popliteal entrapment syndrome as described and clinically followed.⁶

5. type V: both popliteal artery and vein are entrapped.

Most patients present with intermittent calf claudication that is relieved completely by rest, some present with chronic limb ischemia and occasionally acute pain after thrombus formation in an aneurysm.⁸ Popliteal artery entrapment syndrome must be suspected in all young patients with calf claudication, and appropriate diagnostic imaging must be undertaken after a full history and physical is completed.⁹

In this case, we describe the first case of popliteal fossa blunt trauma resulting in leg ischemia and the eventual discovery of PAES in an ice hockey player. Blunt trauma and PAES has been described in a field hockey player previously.¹⁰ The standard treatment plan was offered at the first presentation with his young age and developing hockey career. His second presentation resulted in vein interposition grafting due to an enlarging aneurysm and eventual cessation of his hockey career.

The patient's symptoms only developed after the initial slash to the unprotected popliteal fossa. Before the contact, he had never experienced any symptoms related to his PAES. It is unclear whether the popliteal fossa trauma injured the popliteal artery or facilitated further effects of the developing PAES. Most likely the patient suffered popliteal artery blunt trauma to an already small developing popliteal aneurysm from PAES which continued to expand after initial emergent treatment. The combination of trauma and underlying PAES aneurysm formation may have led to the "perfect storm." Thrombus formation in the small aneurysm was followed by complete occlusion, embolization, and distal arterial occlusion at the time of the second treatment. This case is the first reported ice hockey popliteal artery injury with PAES as an underlying factor. Popliteal artery and vein injury should be suspected in all ice hockey players who suffer posterior fossa slashes and should be appropriately addressed by the trainers and medical personnel with a high clinical suspicion for arterial injury.

It is important to have PAES in the differential diagnosis when evaluating young patients with disabling claudication. Although the exact pathophysiology of the syndrome is not completely understood, it is believed that the anomaly occurs

at the embryologic level of development depending on the timing of migration of the popliteal artery and the medial head of the gastrocnemius muscle.⁸

CONCLUSIONS

We present the first reported case of blunt popliteal fossa from an ice hockey slash causing popliteal artery occlusion with underlying PAES. Successful thrombolysis followed eventually by resection of the damaged artery and interposition vein grafting resulted in an excellent functional outcome in a young ice hockey player. Ice hockey medical teams must suspect blunt popliteal artery injury and/or PAES in all skaters reporting calf pain with or without trauma. Ongoing concerns about popliteal fossa trauma in contact sports such as ice hockey may lead to improvements in popliteal fossa coverage.

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