Case Report

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Journal of Vascular and Endovascular Therapy
ISSN 2634-7156

2025
Vol.10 No.1:230

Feasibility of Transpedal Access for Transcatheter Embolization of the Genicular Artery: A Case Report

Shayan Nabavi Nouri*, Samuel Wietschner, Pankaj Khullar, Andrew Swift, Linda Koshy, Philip Green, Joseph Puma and Justin Ratcliffe

Department of Interventional Cardiology, Sorin Medical College, New York, United States

***Corresponding author:** Shayan Nabavi Nouri, Department of Interventional Cardiology, Sorin Medical College, New York, United States, Tel: (212)-738-0900; E-mail: snabavinouri@sorinmedicalny.com

Received date: September 28, 2023, Manuscript No. IPJVES-23-17962; **Editor assigned date:** October 02, 2023, PreQC No. IPJVES-23-17962 (PQ); **Reviewed date:** October 16, 2023, QC No. IPJVES-23-17962; **Revised date:** January 03, 2025, Manuscript No. IPJVES-23-17962 (R); **Published date:** January 10, 2025, DOI: 10.36648/2634-7156.10.1.230

Citation: Nouri SN, Wietschner S, Khullar P, Swift A, Koshy L, et al. (2025) Feasibility of Transpedal Access for Transcatheter Embolization of the Genicular Artery: A Case Report. J Vasc Endovasc Therapy Vol:10 No:1

Abstract

Osteoarthritis (OA) is a leading cause of functional impairment and debility in older adults and represents a significant detriment to patient quality-of-life. Inflammation, a key-driver in disease pathogenesis, destroys joint tissue and leads to the hallmark symptoms of pain and swelling. Cases of osteoarthritis refractory to conservative medical and physical therapy are typically referred for surgical replacement. Patients unable to undergo surgery may suffer unrelenting symptoms and physical dysfunction.

Genicular Artery Embolization (GAE) is a non-surgical, minimally-invasive transcatheter intervention for such patients. The procedure involves knee genicular artery angiography and selective branch cannulation for the purpose of vessel embolization. Embolization disrupts downstream blood flow to knee synovium, thereby limiting delivery of pain inducing proinflammatory factors. The procedure is typically performed through femoral artery puncture, and thus subject to all potential access related complications. Alternative access, instead using transradial or transpedal puncture, mitigates vascular access risks across the gamut of cardiovascular endovascular interventions. The feasibility and precedent for transpedal access in GAE has yet to be established. We present the case of a 86-year-old woman suffering from recalcitrant OA related right knee pain who underwent successful GAE using transpedal access.

Keywords: Osteoarthritis; Knee embolization; Therapeutic; Cardiovascular surgical procedures

Abbreviations: OA: Osteoarthritis; GAE: Genicular Artery Embolization; CFA: Common Femoral Artery; NSAID: Non-Steroidal Anti-Inflammatory Drugs

Introduction

Osteoarthritis (OA) is a degenerative joint disease affecting over 32.5 million U.S. adults and constitutes a leading cause of functional impairment and lower extremity disability in older adults [1]. Pro-inflammatory factors drive multifaceted joint tissue destruction in OA and generate the hallmark symptoms of pain and swelling [2]. The management of OA centers on pain relief, improvement in ambulation, and slowing of joint damage. Available therapies for OA include risk factor modification, pharmacologic, and physiotherapy, with surgical intervention reserved for refractory cases [3,4].

Genicular Artery Embolization (GAE) represents a novel, minimally-invasive, and non-surgical transcatheter treatment option for OA patients with recalcitrant symptoms who are not able or not willing to undergo surgical knee replacement. It has been shown to be a safe and effective procedure in improving patient knee OA symptoms [5]. The procedure involves catheterization and identification of the genicular arteries of the knee *via* arterial angiogram. The culprit branch artery, corresponding to the patient's site of pain, is selectively cannulated and embolized. Vessel closure interrupts blood supply to the subtended synovium and thereby diminishes the delivery of proinflammatory factors, mitigating inflammation and pain.

GAE has historically been performed *via* the femoral artery, an access site decreasingly used in other cardiovascular based catheterization procedures due to its higher risk for bleeding or related complications [6]. In the treatment of peripheral arterial disease, transpedal access has been increasingly used for performance of endovascular intervention. Transpedal access is safe, effective, and obviates femoral complications [7]. Additionally, transpedal access increases patient comfort and decreases recovery time [8]. The feasibility and precedent for transpedal access in performing GAE has yet to be established [9,10].

Case Presentation

An 86 years old woman was seen in the clinic for ongoing management of severe OA of her right knee. She had been treated for several years with Non-Steroidal Anti-Inflammatory Drugs (NSAIDs), physical therapy, and had even undergone intra-articular corticosteroid injections with minimal relief or improvement in ambulation. She was a poor candidate for

surgical knee replacement given her age and multiple comorbidities including: Obesity, hypertension, hyperlipidemia, coronary artery disease, and pulmonary embolism. Given her ongoing symptoms and debility despite years of conservative therapy and her high surgical risk, she was referred for consideration of GAE. After discussion of the risks and benefits of the procedure, the patient and physician elected to proceed.

The right anterior tibial artery was accessed under ultrasound and fluoroscopic guidance using the Seldinger technique, and a 5F/10 cm hydrophilic introducer sheath was inserted. A diagnostic peripheral angiogram of the right lower extremity was performed to exclude obstructive peripheral arterial disease; three vessel runoff was confirmed. Using a 4F/125 cm CORDIS™ vertebral catheter, a dedicated genicular artery angiogram was performed with identification of all downstream branches. The superior lateral genicular artery was wired and cannulated using a 0.014" TERUMO™ Runthrough guidewire and TERUMO™ PROGREAT angled microcatheter. Selective angiogram was performed to select the distal genicular artery supplying the knee joint. TERUMO™ 200 micron hydropearl microspheres were prepared and 2.5 mL were injected into the genicular artery. Completion angiogram demonstrated successful embolization and no downstream tibial vessel compromise (**Figure 1**).

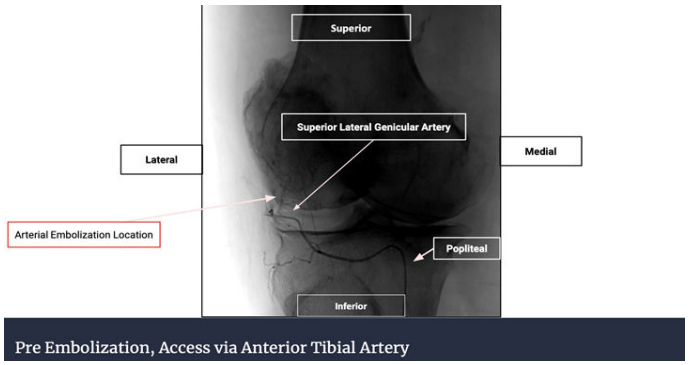

Figure 1: Pre embolization; genicular arteries visible.

The patient was discharged after a one-hour recovery from conscious sedation and removal of hemostatic compression band. In clinical follow up, the patient endorsed improvement in her knee pain with increased functional capacity and decreased reliance on oral pain medicine. She experienced no untoward symptoms related to transpedal vascular access (Figure 2).

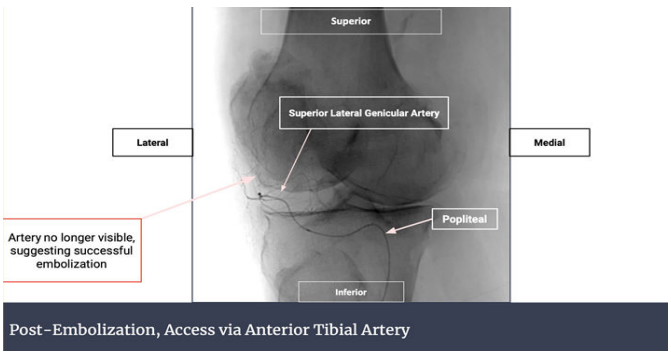

Figure 2: Post embolization of genicular arteries.

Results and Discussion

Osteoarthritis is a degenerative joint disease that affects 32.5 million adults in the United States, and is a leading cause of functional impairment and disability of the lower extremities. Genicular artery embolization has emerged as a safe alternative to surgical knee replacement. GAE involves the identification of the genicular artery and embolization of the culprit branches corresponding to the patient's site of pain. The reduction in blood flow thereby reduces inflammation and pain associated with OA. Historically, GAE has been performed *via* the femoral artery and thus subject to femoral access site complications. Transpedal access has emerged as a safe and effective alternate access site.

In this case, the genicular artery was successfully identified and cannulated; TERUMO™ 200 micron Hydropearl microspheres were injected resulting in successful embolization of the genicular arteries. The patient, in clinical follow up, endorsed the successful embolization with a reduction in knee pain, and experienced no complications related to transpedal access. This case represents the successful utilization of transpedal access in the embolization of the genicular arteries in the treatment of OA.

Conclusion

We demonstrated the safe and successful utilization of transpedal access for geniculate artery embolization in the treatment of medically refractory osteoarthritis. The use of tibial artery access in GAE can mitigate the risk of potentially serious access site related complications from femoral artery puncture. In addition, it eliminates potential equipment length limitations associated with radial artery access use. Transpedal GAE may represent a feasible and viable alternative to a traditionally femoral procedure, with potential improvement in procedure safety related to access site use.

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