

# Genicular Artery Embolization as a Treatment Option for Refractory Knee Pain Post Total Knee Arthroplasty

Nishanth Konduru<sup>1</sup>, Samuel Joshua<sup>1</sup>, Anton Hnatov<sup>1</sup>, Hardayal Singh<sup>2</sup>, Siddhartha Rao<sup>1</sup>  
<sup>1</sup>Rao Clinic, Cary, NC, <sup>2</sup>Carolina Regional Orthopaedics, Rocky Mount, NC  
 nkonduru04@gmail.com

**Disclosures:** N. Konduru: None. S. Joshua: None. A. Hnatov: None. H. Singh: None. S. Rao: None.

**INTRODUCTION:** Total Knee Arthroplasty is a surgical intervention performed for advanced cases of knee osteoarthritis (OA), offering long-term pain relief and improvement in quality of life. Despite its general effectiveness, an estimated 20-25% of patients report insignificant pain relief even one year following TKA, highlighting the need for adjunctive treatment options. Recent literature suggests that knee pain due to OA may be influenced by synovitis caused by angiogenesis. As such, Genicular artery embolization (GAE) has emerged as a form of pain management. This study examines the viability of GAE as a treatment for reducing chronic pain in patients who have previously undergone total knee arthroplasty (TKA).

**METHODS:** 37 consecutive patients (13 males and 24 females) with a history of persistent pain for at least one year following TKA underwent GAE at a single center. Patients had not undergone GAE before their TKA procedure and had exhausted other treatment options for pain, such as medications, steroid injections, and physical therapy. All patients referred to us by their orthopedic specialists were ruled out for implant dysfunction. Patients with significant peripheral arterial disease and joint malalignment or infection were also excluded based on examination, x-rays, and arterial duplex ultrasound when clinically indicated. After enrollment, baseline WOMAC and VAS scores were obtained from each participant to assess the severity of pain and functional status. WOMAC and VAS scores were measured on a 0-100% scale and 1-10 scale, respectively. Peri-procedure, embolic agents were delivered through a microcatheter to the targeted arteries by a board-certified endovascular specialist. Branches of genicular arteries that fed regions of the synovium where patients felt the most pain and revealed significant blush were specifically targeted. Patients were discharged within 30-90 minutes post-procedure, and prescribed Celebrex 200 mg as needed for 7 days and tapered Medrol Dosepak 4 mg for 6 days to assist with any post-procedural soreness. Clinical success was determined by successful embolization of targeted arteries and improvement in patient response to pain questionnaires. Patient response was measured at one-month and three-month intervals following embolization. Clinical significance of improvement in patient outcomes was assessed using a paired t-test.

**RESULTS SECTION:** The sample size consisted of 13 male patients and 24 female patients who presented with chronic knee pain lasting from 1 year to 20 years following TKA. Patients were of an average age of  $72.8 \pm 9.7$  years, with a BMI of  $29.3 \pm 6.1$ . Among 37 patients, WOMAC scores at preliminary, one-month, and three-month follow-up appointments were  $64\% \pm 6\%$ ,  $39\% \pm 8\%$ , and  $36\% \pm 8\%$  (95% CI). VAS scores at preliminary, one-month, and three-month follow-up appointments were  $8.1 \pm 0.6$ ,  $3.2 \pm 1.1$ , and  $3.1 \pm 1.0$  (95% CI). A paired t-test showed a statistically significant improvement in both the one-month and three-month post-procedure evaluations ( $p < 0.05$ ). Overall, 64.9% of patients experienced at least a 50% improvement in pain scores by the end of the study term, and 94.5% of patients reported no longer requiring analgesics to manage pain. In this study cohort, five patients reported stiffness in the knee, and one patient reported feeling tenderness around the knee within the first month following embolization. No other post-procedural complications were noted.

**DISCUSSION:** Genicular artery embolization provided substantial pain and functional relief for patients with refractory knee pain post-TKA. The procedure was technically successful in every case and was associated only with minor, transient adverse events. WOMAC scores decreased by 29% and VAS scores decreased by 5.0 by the end of the study term. These findings position GAE as an effective pain relief adjunct in post-TKA patients who are not suitable for revision surgery and have long-standing joint pain (>1 year). Although this study serves to establish GAE as a method of improving patient quality of life, it does not have a scope large enough to determine lifelong viability or generalizability across a larger population. Larger, multicenter trials are needed to confirm long-term efficacy and establish GAE's role within the post-TKA pain management pathway.

**SIGNIFICANCE/CLINICAL RELEVANCE:** (1-2 sentences): An estimated 20-25% of patients who undergo TKA report insignificant pain relief for multiple years following TKA. This study aims to find a viable treatment method for patients who are not suitable for TKA revision surgery and have not found relief with conservative treatment such as steroid injections and physical therapy. This study aims to provide treatment insights into OA, as it is one of the most prevalent diseases in the United States. The conclusions found within this study support that GAE can be used as a treatment adjunct for OA. As such, we believe that patients suffering from OA-related knee pain can benefit significantly due to the implementation of GAE in their treatment pathways.

## IMAGES AND TABLES:

Patient Demographics			
	Male	Female	Total
Count	13	24	37
BMI (kg/m <sup>2</sup> )	$29.4 \pm 4.3$	$29.2 \pm 6.9$	$29.3 \pm 6.1$
Age (years)	$68.9 \pm 10.1$	$74.9 \pm 8.9$	$72.8 \pm 9.7$

