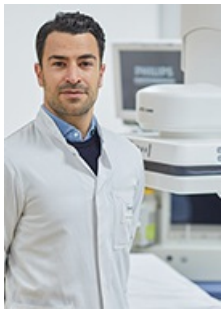
RSNA Press Release

Nonsurgical Procedure Provides Lasting Relief for Knee Pain

Released: June 16, 2026



Florian Nima Fleckenstein, M.D.

OAK BROOK, Ill. – Embolization of abnormal blood vessels using rapidly resorbable gelatin-based microspheres is safe and provides significant, lasting pain relief and functional improvement for patients with osteoarthritis-related knee pain, according to a new study published today in *Radiology*, a journal of the Radiological Society of North America (RSNA).

Osteoarthritis is the most common form of arthritis. It causes inflammation, stiffness, reduced mobility and sensory nerve pain. According to the World Health Organization, knee osteoarthritis affects over 365 million adults worldwide and is one of the leading contributors to disability.

“For many patients with knee osteoarthritis, there is a real treatment gap today,” said Florian Nima Fleckenstein, M.D., deputy head of Interventional Radiology Campus Mitte, Charité - Universitätsmedizin Berlin. “Conservative measures such as intra-articular injections no longer provide sufficient relief, but joint replacement is not an option for medical or personal reasons.”

Genicular artery embolization (GAE) is an emerging minimally invasive treatment that targets abnormal blood vessels using superselective embolization. In an osteoarthritic knee, these abnormal vessels build up around the joint and drive inflammation and pain. During GAE, an interventional radiologist guides a thin catheter directly to each affected vessel and injects tiny particles to block it, calming the inflammation and easing the pain without surgery.

For the study, researchers hypothesized that GAE using rapidly resorbable, gelatin-based microspheres could integrate the favorable characteristics of temporary embolic agents and permanent microspheres while eliminating their limitations. Rapidly resorbable, gelatin-based microspheres are size-calibrated, spherical particles designed to dissolve within hours.

“GAE is a whole new treatment regimen that targets abnormal hypervascularity around the joint and, in turn, modulates the pathological neurovascular environment,” Dr. Fleckenstein said. “By reducing both inflammation and pain, GAE with resorbable microspheres may be the first procedure that alters the course of the disease, slowing its progression."

The prospective single-center study included 114 women and 80 men with osteoarthritis-related knee pain who did not respond to at least three months of conservative treatment, including physiotherapy, anti-inflammatory drugs and intra-articular injections. The median age of the 194 participants was 69 years, and median body mass index was 28.4.

“We believe these results carry real weight because they come from real-world data,” Dr. Fleckenstein said. “With this broad, inclusive study design, our participants are exactly the patients that physicians encounter every day in their practices.”

Copyright ©2026 Radiological Society of North America (RSNA)

All participants underwent GAE with the resorbable microspheres between July and November 2024. Forty-five participants (23%) underwent two GAE procedures for bilateral knee osteoarthritis, with the second GAE conducted within four weeks of the first procedure.

In total, the patients underwent 239 GAE procedures using the resorbable microspheres. Embolization was performed under image (fluoroscopic) guidance. All procedures were technically successful with no moderate or severe adverse events and only mild, self-limited reactions in 6.7% of the study group.

Outcomes were analyzed at the participant level at baseline, six weeks, and three, six and 12 months following the procedure. The six-month assessment was performed in person by an orthopedic surgeon. Follow-up rates in the study were 94% of the patients at six weeks (183/194), 89% at three months (172/194), 89% at six months (171/194) and 79% at 12 months (154/194).

“In our cohort, we saw a significant drop in pain and a significant increase in function, including sports and recreation and daily activity,” Dr. Fleckenstein said. “Most importantly, their quality of life significantly increased.”

Median pain scores fell quickly and kept improving. On the Numeric Rating Scale (a 0-to-10 measure of pain intensity), scores dropped from 7 at baseline to 4 at six weeks and to 3 at the 6-, and 12-month follow-ups — a sustained reduction maintained throughout the year.

From baseline to the 12-month follow-up, Knee Injury and Osteoarthritis Outcome Score sub-scores improved across all domains: increased median daily activity scores increased from 53 to 71.5, sports and recreation increased from 15 to 36. Osteoarthritis-related symptoms improved from 51 to 68, pain scores improved from 44 to 65 (where 0 indicates extreme knee pain and 100 indicates no pain at all), and quality of life increased from 19 to 40.

Based on prior studies, a reduction in a Numeric Rating Scale pain score of ≥ 2.0 points and a change of ≥ 10 points in the Knee Injury and Osteoarthritis Outcome Score sub-scores are considered clinically meaningful and are defined as a minimum clinically important difference.

At the 12-month follow-up, 80% of study participants achieved improvements exceeding the minimum clinically important difference, based on the Numeric Rating Scale scores.

“Our study demonstrates that GAE using rapidly resorbable gelatin-based microspheres is a safe, minimally invasive therapy that provides meaningful pain relief and functional improvement in participants with osteoarthritis-related knee symptoms for at least 12 months,” Dr. Fleckenstein said. “By embolizing the pathological vessels, we're able to normalize the vessel structure — and, in turn, the neuronal structure of the knee.”

Dr. Fleckenstein noted that with almost 200 patients, this is the largest body of evidence yet for GAE using rapidly resorbable microspheres.

“This lets us speak about safety and efficacy with real confidence,” he said. “For the right patient, it can mean lasting relief from a single, minimally invasive procedure — a meaningful new option between injections and joint replacement.”

“Genicular Artery Embolization Using Rapidly Resorbable Gelatin-based Microspheres for Osteoarthritis-related Knee Pain.” Collaborating with Dr. Fleckenstein were Dina David, M.S., Paolo Garducci, M.D., Tazio Maleitzke, M.D., Stephan Oehme, M.D., Lynn Jeanette Savic, M.D., Timo Alexander Auer, M.D., Bernhard Gebauer, M.D., Tobias Winkler, M.D., Ph.D., and Federico Collettini, M.D.

Radiology is edited by Suhny Abbara, M.D., FACR, MSCCT, Mayo Clinic, Jacksonville, Florida, and owned and published by the Radiological Society of North America, Inc. (https://pubs.rsna.org/journal/radiology)

RSNA is an association of radiologists, radiation oncologists, medical physicists and related scientists promoting excellence in patient care and health care delivery through education, research and technologic innovation. The Society is based in Oak Brook, Illinois. (RSNA.org)

For patient-friendly information on interventional radiology, visit *RadiologyInfo.org*.

Images (JPG, TIF):

Copyright ©2026 Radiological Society of North America (RSNA)

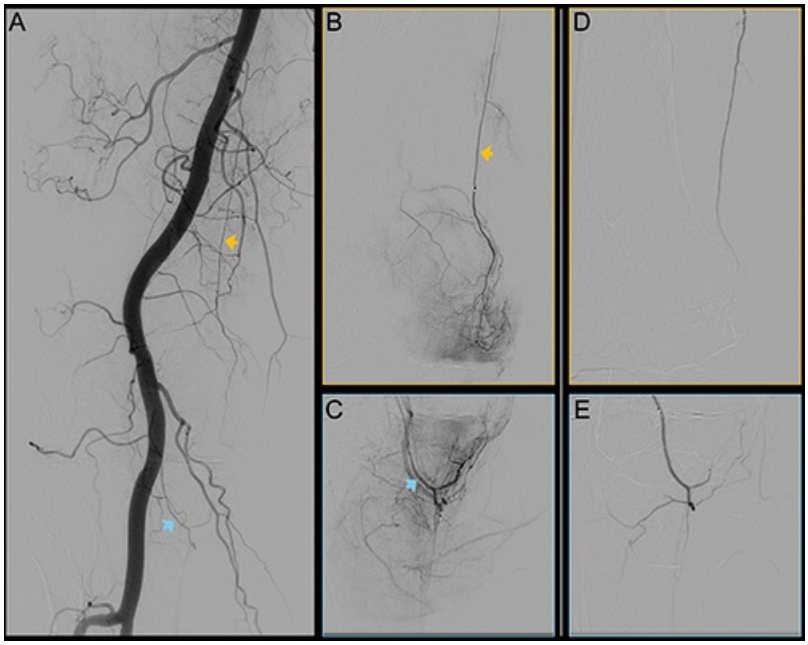


Figure 1. Digital subtraction angiography images of the right knee joint of a 62-year-old participant with predominantly medial knee osteoarthritis (OA). **(A)** Periinterventional image of the popliteal artery. Yellow arrow indicates the descending genicular artery, and blue arrow indicates the medial inferior genicular artery. **(B, C)** Selective preinterventional images show hypervascularity of two branches of the genicular artery: the **(B)** descending genicular artery (arrow) and the **(C)** medial inferior genicular artery (arrow). **(D, E)** Selective postinterventional images obtained after embolization with rapidly resorbable gelatin-based microspheres. Complete elimination of the blush is observed, with preserved perfusion of the proximal arterial segments.

Copyright ©2026 Radiological Society of North America (RSNA)

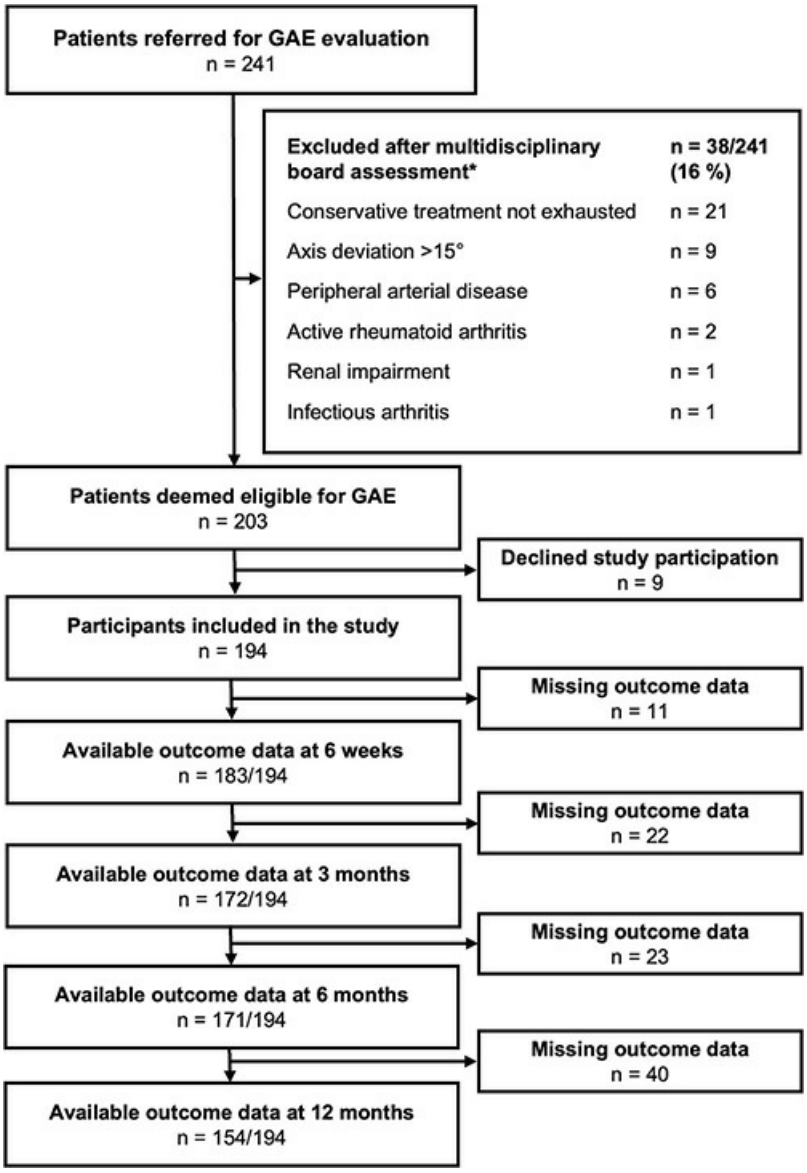


Figure 2. Study flowchart. Flow diagram illustrates participant inclusion and follow-up. A total of 241 patients were referred for treatment assessment, of whom 194 were finally enrolled into the study. Inclusion and exclusion decisions were made in a multidisciplinary board involving orthopedic surgery and interventional radiology. * = Multiple exclusion criteria may apply for one participant. GAE = genicular artery embolization.

Copyright ©2026 Radiological Society of North America (RSNA)

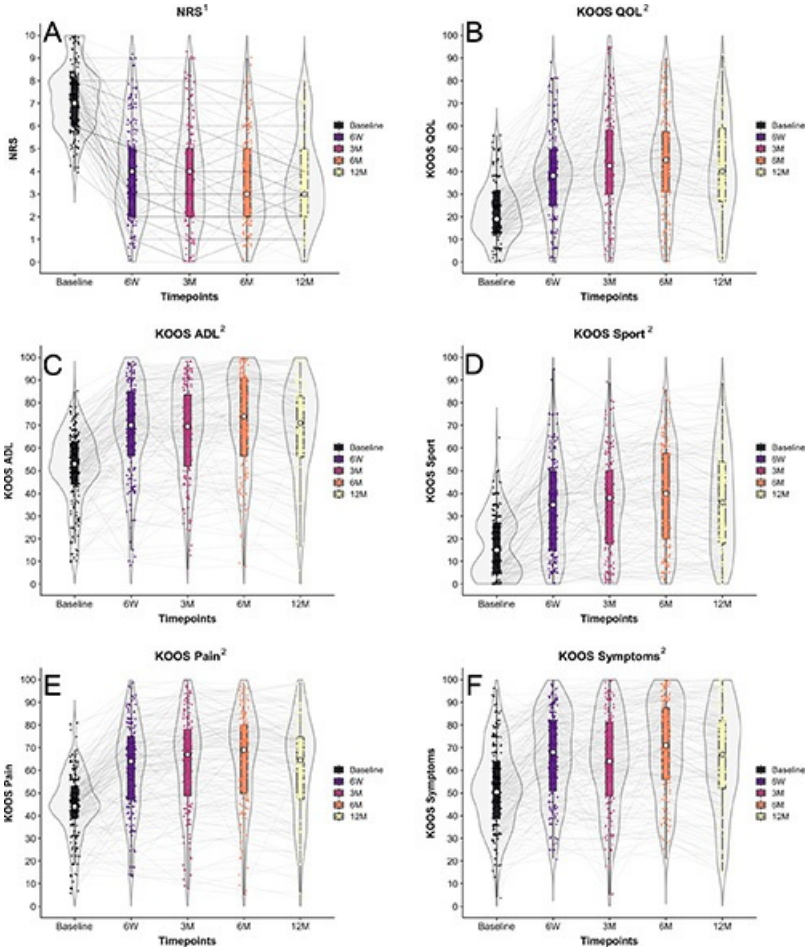


Figure 3. Violin boxplots with median values for numeric rating scale (NRS) pain score (range, 0–10) and Knee Injury and Osteoarthritis Outcome Score (KOOS) subscores (range, 0–100) over time. 1 = scores range from 0 to 10, with lower scores representing better outcome. 2 = Scores range from 0 to 100, with higher scores representing better outcome. ADL = activities of daily living, Sport = sports and recreation, QOL = quality of life.

Resources:

Abstract link

Copyright ©2026 Radiological Society of North America (RSNA)