

Goel A, Jafroodifar A, Thibodeau R, Coelho M, Jawed M
Department of Radiology, SUNY Upstate Medical University, Syracuse NY

Introduction:

Geniculate artery embolization is a minimally invasive therapy during which a catheter is introduced, under local anesthesia with ultrasound guidance, into the common femoral or popliteal arteries and advanced distally into the genicular arteries of interest. Embolization is performed using a range of substrates from tris-acryl gelatin microspheres to polyvinyl alcohol (PVA) particles and/or coils. The technique has been utilized with good effect in the setting of recurrent hemarthroses after total knee arthroplasty (TKA). It has also shown promising results as a potential treatment for pain relief in mild to moderate knee osteoarthritis (OA).

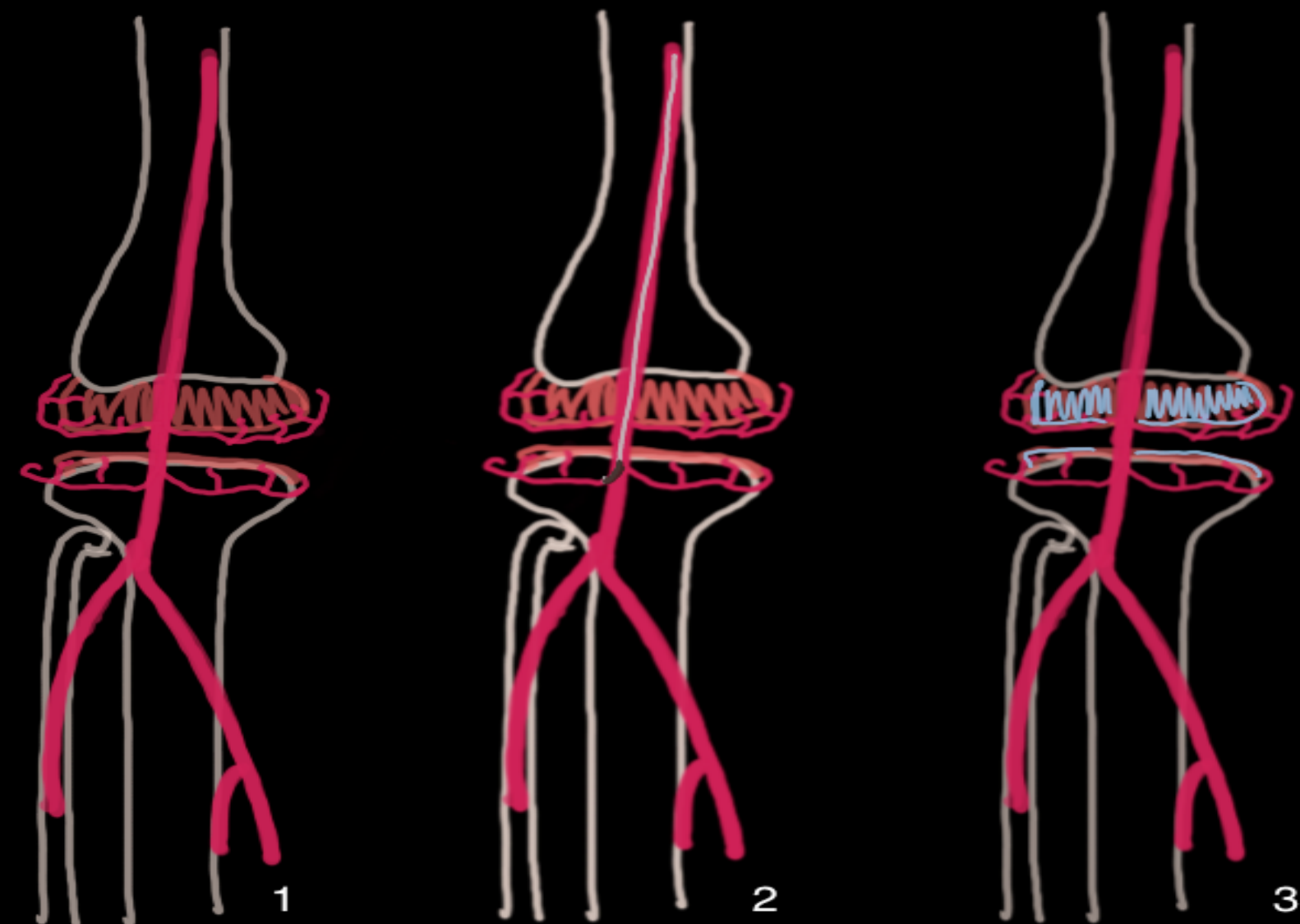
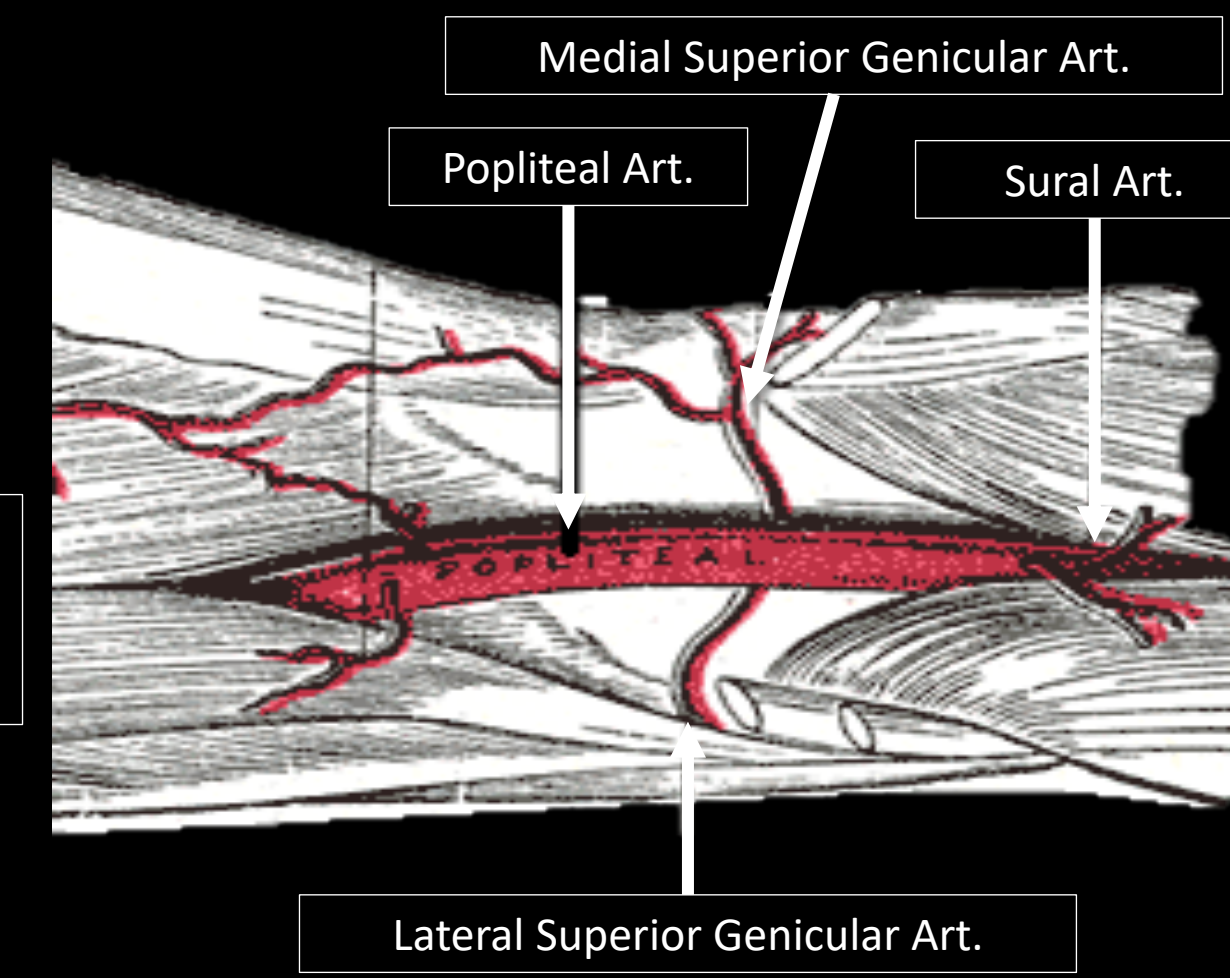
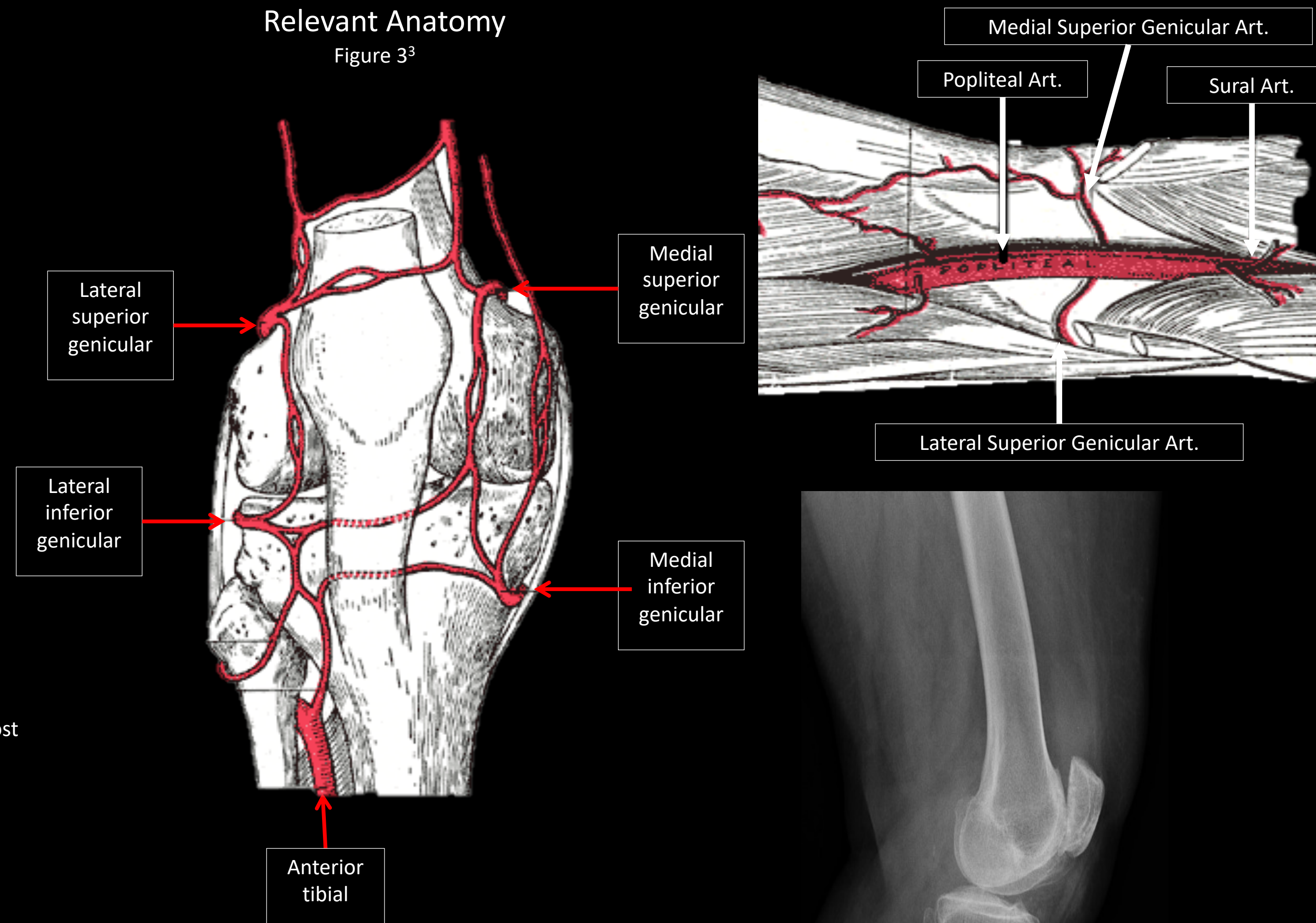


Figure 1¹. 1) Osteoarthritic knee. 2) Selective microcatheter advanced into the medial genicular artery, ready for embolization. 3) Post embolization knee with decreased inflammation.



Procedure:

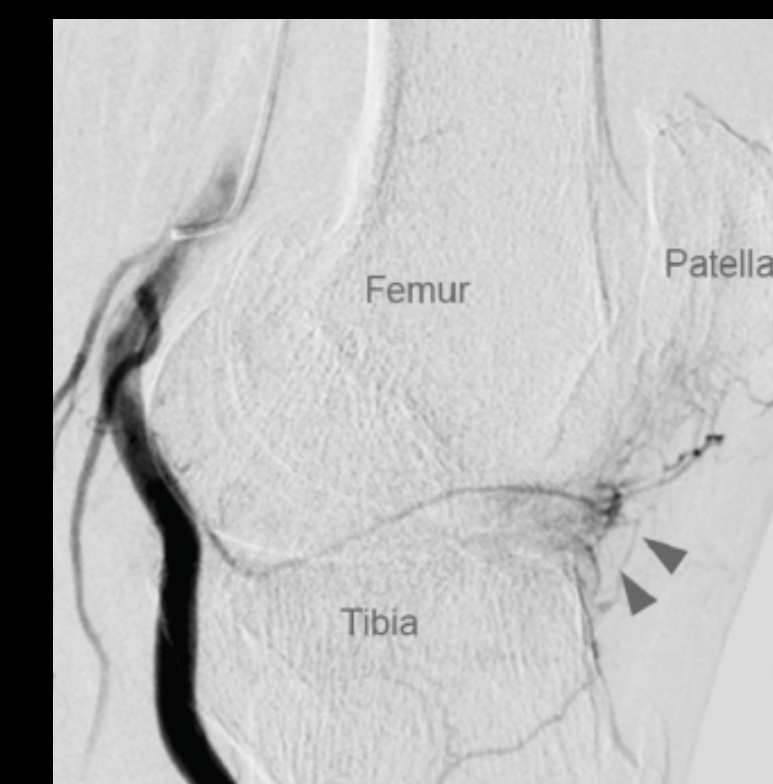
1. Ultrasound-guided access is gained via the ipsilateral common femoral artery in an antegrade fashion.
2. Introducer sheath inserted towards superficial femoral artery.
3. Angiographic catheter inserted towards the superficial femoral artery.
4. The popliteal artery is catheterized.
5. After injection of 3-5 mL of iodinated contrast, digital subtraction angiography (DSA) demonstrates the vasculature of the knee joint.
6. Area of interest, otherwise referred to as the neovessels, demonstrate "blush-type" enhancement on arterial phase imaging.
7. A microcatheter is inserted towards the neovessels (this may involve catheterization of any of the arteries labelled in Figure 3, in addition to the descending genicular, median genicular, and the anterior tibial recurrent arteries).
8. Embolization is performed with subsequent injection of contrast to check location of embolization material travel.
9. Procedure concludes when satisfactory elimination of neovessels is achieved.
10. Hemostasis at access site is achieved via manual compression.
11. Typically, patients are discharged same day if the treatment was successful without complications.

Figure 2². Total Knee Arthroplasty: Factors to Consider (adapted from Sundaram et al.) A cohort of studies were analyzed for different factors when considering patients and the procedural technique for geniculate artery embolization in the peri-operative period for TKA. Most of the embolization were performed via PVA. Many patients reported symptom improvement.

FACTORS TO CONSIDER	STUDY NUMBER							
	1	2	3	4	5	6	7	8
MEAN DEMOGRAPHIC AGE, YEARS.	76	73	N/A	64	69	72	57	66
MALE:FEMALE	2:3	4:5	3:2	4:4	3:1	1:4	N/A	6:8
EMBOLIC MATERIAL OF CHOICE	Polyvinyl Alcohol (PVA)	N/A	Embolitic Sphere	Embolitic Sphere	PVA	PVA	PVA	PVA
PARTICLE SIZE, MM. MIN-MAX	150-250	N/A	100-700	100-700	250-500	45-355	300-700	100-700
COIL EMBOLIZATION REQUIRED?	N	N/A	Y	N	Y	Y	N	N
% SYMPTOM IMPROVED	100	78	100	100	7	100	89	86
REQUIRE 2ND EMBO.	Y	N	N	N	Y	N	Y	Y
REQUIRE 3RD EMBO.	N	N	N	N	Y	N	N	Y
MEAN # OF EMBO.	1.4	1	1	1	1.5	1	1.4	1.6
MAJOR COMPLICATION (REQUIRES HOSPITALIZATION)	0	0	0	0	25	0	0	7
MINOR COMPLICATION (AS LISTED BELOW)	0	0	40	22	0	0	22	14
INGUINAL HEMATOMA	0	0	0	0	0	0	0	14
SKIN NECROSIS	0	0	40	25	0	0	11	0
INCISION BREAKDOWN	0	0	0	0	0	0	11	0



Figure 5⁵. Lateral radiograph of the knee demonstrating tricompartmental narrowing secondary to osteoarthritis. Angiogram demonstrates cluster of neovessels inferior to the patella.⁴



References

1. Image adapted from UNC School of Medicine Radiology webpage. Url: <https://www.med.unc.edu/radiology/geniculate-artery-embolization-gae/>
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3. Adapted from Anatomy of the Human Body by Henry Gray (1918)
4. Shibuya M, Okuno Y. Embolization for OA: Which Patients Are the Most Suitable Candidates? [published April 2018]. *Endovascular Today.* 2018;17:4.
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