



Efficacy and safety of uterine artery embolization via the distal radial approach for uterine fibroids or adenomyosis: a single-center retrospective cohort study

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Background: The standard approach for transarterial embolization of uterine fibroids or adenomas is via the femoral artery, but this approach limits the patient's quality of life and increases the risk of deep vein thrombosis in the lower extremities. We applied the distal radial approach technique for the treatment of uterine artery embolization, and aimed to explore the feasibility and safety of uterine artery chemoembolization through the distal radial approach.

Methods: We conducted a retrospective study at The First Hospital of Jilin University from January 1, 2021 to November 30, 2023. The main inclusion criteria were: (I) uterine fibroids and adenomyosis were confirmed by preoperative imaging examination; (II) able to accurately palpate the distal radial artery pulse, and the Allen test is negative. Exclusion criteria: patients with distal radial pulses that cannot be palpated, or who are palpable but have radial arteriotomy dialysis, have a tortuous angle on preoperative radial artery ultrasound, which is not conducive to guidewire catheter passage. The primary endpoint of this study was the success rate of distal radial artery puncture. The secondary endpoints included complications and the duration of the puncture.

Results: Sixteen patients were enrolled in this study, of which 8 (50%) had uterine fibroids, 5 (31.25%) had uterine adenomas, and 3 (18.75%) had both. The puncture success rate was 93.75% (15/16) and one patient who failed to puncture the distal radial artery was changed to the radial artery approach. The mean time of puncture was 21±8.54 minutes. There were no complications, including bleeding, hematoma, arterial dissection, pseudoaneurysm formation, or distal radial artery occlusion, observed.

Conclusions: Uterine artery embolization by the distal radial artery approach is safe and feasible, and should be widely promoted in uterine artery embolization.

Keywords: Uterine fibroids; adenomas; embolization; distal radial artery; puncture

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Introduction

Uterine fibroids are the most common reproductive system tumors found in women of childbearing age, and adenomyosis is a benign lesion caused by the invasion of the endometrium and interstitium into the myometrium, with both diseases being more common in women of childbearing age of 30–50 years old. Hence, there is a need to preserve the uterus. For young patients with uterine fibroids, the recurrence rate is higher two years after lesion removal, and the implementation of a secondary surgery has greater risks and damages. For patients who require treatment of symptoms, if the patient requires uterine preservation, has poor compliance with oral or injectable drugs, or is unwilling to undergo surgery due to various reasons, uterine artery embolization can be performed instead. Uterine artery embolization, first described in 1995, has emerged as a safe and effective uterus-sparing treatment of symptomatic fibroids (1–3). A classic approach is the transfemoral artery puncture. Due to the femoral artery being large, uterine artery embolization can be performed repeatedly, which is an ideal puncture approach for various endovascular treatments. However, patients are strictly bedridden and restricted from engaging in activities of daily living after surgery, which severely affects the quality of life and treatment compliance of patients. Furthermore, there are many complications that may arise, such as having high risk of developing deep vein thrombosis of the lower limbs, puncture point bleeding, and formation of pseudoaneurysm. With improved access techniques, the transradial approach

may be a better option (4,5). At present, there are no reports of uterine artery embolization in the distal radial artery approach, and we have more than 1300 successful experiences in the application of this technique in hepatic artery chemoembolization, and it is known that it is safe and effective through this pathway. However, due to the relatively slender blood vessels in women, it is necessary to further explore whether there will be vascular damage after the completion of surgery through this route. We hope that this study will improve the success rate of uterine artery embolization through the distal radial artery route and improve vascular injury. The distal radial approach (radial approach through the snuffbox area) is located in a triangular depression enclosed by the abductor pollicis longus tendon, extensor pollicis longus tendon, extensor pollicis brevis tendon, and radial stem protrusion. Prior to this study, we garnered experience in hepatic arterial chemoembolization through the distal radial approach of the upper extremity (6). In this study, we applied the distal radial approach technique for the treatment of uterine artery embolization, and aimed to explore the feasibility and safety of uterine artery chemoembolization through the distal radial approach. We present this article in accordance with the STROBE reporting checklist (available at <https://gs.amegroups.com/article/view/10.21037/gS-24-118/rc>)

Methods

We did a retrospective study at The First Hospital of Jilin University from January 1, 2021, to November 30, 2023. Inclusion criteria: (I) uterine fibroids and adenomyosis were confirmed by preoperative imaging examination; (II) able to accurately palpate the pulse of the distal radial artery via the negative Allen test. Exclusion criteria: patients with distal radial pulses that cannot be palpated, or who are palpable but have radial arteriotomy dialysis, or those who have a tortuous angle on preoperative radial artery ultrasound, which is not conducive to guidewire catheter passage. The primary endpoint of this study was the success rate of distal radial artery puncture. The secondary endpoints included complications (bleeding or hematoma, arterial dissection, pseudoaneurysm formation, distal radial artery occlusion) and the duration of the puncture. Success of distal radial artery puncture was defined as puncture of the distal radial artery and embolization of the uterine artery by this pathway. During the whole process of this study, two professors from our department participated in quality control and supervision, and excluded the influence

Highlight box

Key findings

- Uterine artery embolization by the distal radial artery approach is safe and feasible.

What is known and what is new?

- The standard approach for transarterial embolization of uterine fibroids or adenomas is via the femoral artery because it can be manipulated repeatedly. But the femoral artery approach limits patient quality of life and increases the risk of deep vein thrombosis in the lower extremities.
- The distal radial artery puncture approach has a high puncture success rate and a favorable safety profile.

What is the implication, and what should change now?

- Clinicians may consider increasing the use of distal radial artery puncture for the treatment of uterine fibroids and uterine adenomas in their clinical practice.

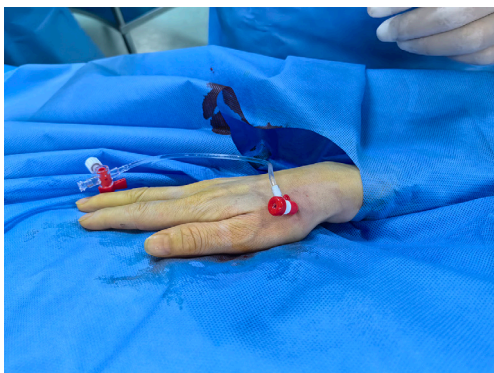


Figure 1 Distal radial artery puncture, indwelling catheter sheath. The patient lies supine with her hands resting on the abdomen, and the catheter sheath is indwelling after successful puncture of the distal radial artery.



Figure 2 Postoperative hemostasis. After the completion of the operation, an elastic bandage compressed the puncture point distally around the radial artery to stop the bleeding for 3 hours.

of operator experience and subjective factors. Follow-up for complications related to the puncture continued for three days after the operation. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by The First Hospital of Jilin University [Approval No: (2024) Provisional Examination No. (2024-060)] and informed consent was taken from all individual participants.

Procedure

The patient laid on her back on the Digital Subtraction Angiography (DSA) bed with her left/right palm flat on the middle and lower abdomen. After the local anesthesia

of 0.5–1 mL of 2% lidocaine was applied to the left/right distal radial artery access area, the distal radial artery was punctured with a 21-G needle. Upon seeing blood spurt out at the tail end, a short 0.018-inch guidewire was introduced and the puncture needle was withdrawn. A 4-F micropuncture sheath was introduced (*Figure 1*), and the dilator and short guidewire were withdrawn. The sheath was flushed and first rinsed slowly with 200 μ g (concentration 1% 2 mL) of nitroglycerin, then with lidocaine, and finally with 3,000 units of heparin sodium injection. After the distal radial artery approach was successfully established, a 125-cm ultimate 1 catheter and a 180-cm 0.035-inch guidewire were introduced into the left/right upper limb artery, through the brachial artery, axillary artery, and subclavian artery, and into the aorta. After the operation, the puncture sheath was pulled out, and the puncture site was bandaged to stop the bleeding (*Figure 2*). The compression time was 3 hours.

Statistical analysis

Categorical variables were statistically described using frequencies and proportions, and continuous variables were statistically described using mean [standard deviation (SD)]. 95% confidence interval (CI) of categorical variables was estimated using the Clopper-Pearson method. All statistical analyses were performed using SPSS Statistics software version 26 (IBM Corp., Armonk, NY, USA).

Results

Thirteen patients were excluded from this study (10 patients with a distal radial pulse that could not be palpated, 1 patient was palpable but had radial antrostomy dialysis, and 2 patients had a tortuous angle on preoperative radial artery ultrasound, which was not conducive to guidewire catheter passage).

Sixteen patients were enrolled in this study, of whom 8 (50%) had uterine fibroids, 5 (31.25%) had adenomyosis, and 3 (18.75%) had both. The clinical characteristics of patients are listed in *Table 1*. All patients were punctured with 21-G steel needles, and the sheath 4 F was used. Post-puncture complications in patients are listed in *Table 2*. The success rate of puncture was 93.8% (15/16, 95 CI: 69.8% to 99.8%), with one case of puncture failure changed to the radial artery approach, and the average puncture time (subject to the effective duration of anesthesia) was 21 ± 8.54 points. Using the ultimate 1 catheter for 4 F, the success

Table 1 Clinical characteristics of patients with uterine fibroids or adenomyosis (N=16)

Characteristic	Values
Age (years)	38.9±3.4
Diagnosis	
Uterine fibroids alone	8 (50.00)
Adenomyosis alone	5 (31.25)
Both	3 (18.75)
Number of uterine fibroids (n=11)	
1	1 (9.09)
2	5 (45.45)
3	4 (36.36)
4	1 (9.09)
Location of uterine fibroids (n=27)	
Submucosal	2 (7.40)
Intramural	16 (59.26)
Subserosal	9 (33.33)
Symptomatic	
Menorrhagia	11 (68.75)
Dysmenorrhea	9 (56.25)
Metrorrhagia	1 (6.25)
Urinary symptoms	4 (25.00)
Anemia and related	2 (12.50)

Data are presented as mean ± standard deviation or n (%).

rate of choosing a descending aorta was 100% (16/16). After 3 hours of compression post distal radial artery puncture, no bleeding or hematoma occurred, the distal and proximal radial artery pulses were good, and there were no arterial dissection, pseudoaneurysm formation, and distal radial artery occlusion observed.

Within the 3 days of follow-up post-embolization, the distal radial artery and radial artery pulsed well, and no delayed hematoma or hemorrhage occurred at the puncture site.

Discussion

Ravina *et al.* first reported uterine artery embolization in the treatment of symptomatic uterine fibroids in 1995 (7). This technique has the characteristics of uterine preservation, simple operation, quick postoperative recovery, and few

Table 2 Safety of patients

Post-operative condition	Values
Puncture success	15 (93.75)
Bleeding or hematoma	0
Arterial dissection	0
Pseudoaneurysm formation	0
Distal radial artery occlusion	0
Puncture time (points)	21±8.54
Delayed hematoma or hemorrhage	0

Data are presented as mean ± standard deviation or n (%).

postoperative complications, and has become one of the effective options to treat symptomatic uterine fibroids and adenomyosis. The American College of Obstetricians and Gynecologists (ACOG) has recommended uterine artery embolization as a safe and effective treatment option for patients with uterine fibroids who wish to preserve the uterus (Level A evidence) (8).

In 2011, Babunashvili *et al.* (9) reported for the first time a case of proximal radial artery occlusion with a retrograde opening of the distal radial approach through the snuff fossa, introducing the distal radial approach into the interventional field for the first time. In 2017, Kiemeneij (10) in the Netherlands reported on distal radial artery puncture, which is mainly used for interventional diagnosis and treatment of cardiac coronary arteries. The bony and obvious structure of this position makes it conducive for the positioning of the puncture point and compression hemostasis.

Why is uterine artery embolization carried out from the distal radial artery? When the femoral artery approach is used, patients need to be strictly bedridden and are restricted from engaging in activities of daily living, which severely affects the quality of life and treatment compliance of patients. The puncture point compression time is long, and there is a high risk of deep vein thrombosis of the lower limbs, puncture site bleeding, and pseudoaneurysm. Risks of complications of occlusion through the radial approach are high. Occlusion of conventional radial artery approaches has been reported in the literature to range from 0 to 33% (11). This may be due to inadequate heparinization (which is not needed during peripheral embolization compared to coronary intervention). In the previous study, we have reported hepatic arterial chemoembolization through the distal radial artery approach and achieved very

satisfactory clinical results (6).

In our center, the distal radial artery puncture approach was performed for uterine artery embolization, and there were no occlusion and hand complications. The most common cause of distal radial artery puncture failure is the slenderness of the blood vessels and spasm after puncture. There was no significant difference in the total time of interventional operation between the distal radial artery approach and the femoral artery approach.

Uterine artery cannulation time differences: the distal radial artery (“upper approach”) cannulation procedure was easier and shorter than the femoral artery (“inferior approach”), although it should be noted that no statistical difference was observed.

Compared with the conventional radial artery approach, the incidence of occlusion of the distal radial artery in our center was 0%, the incidence of wrist hematoma was 0%, and radial artery dissection and aneurysm did not occur. However, we need to continue observational follow-up to provide a more accurate summary of long-term distal radial artery complications, as literature (12-14) has reported that the incidence of distal radial artery occlusion is 0.0–5.2%, hematoma is 0.8%, radial artery dissection is 0.3%, arteriovenous fistula is 0.2%, and pseudoaneurysm is 0.2%.

This study has two limitations. Firstly, the sample size was small and secondly, it was a single-center study, which may affect the validity of results.

Conclusions

Uterine artery embolization by the distal radial artery approach is safe and feasible and, if there is no contraindication, it can replace access through the femoral artery, with greater safety and lower risk. In the future, it is expected that various embolization treatments will be carried out in outpatient clinics or day wards, which can greatly reduce the admission pressure of hospitals, reduce the financial burden of patients, and reduce the pressure of medical insurance.

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Footnote

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by The First Hospital of Jilin University [Approval No: (2024) Provisional Examination No. (2024-060)] and informed consent was taken from all individual participants.

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References

1. Gao H, Li T, Fu D, et al. Uterine artery embolization, surgery and high intensity focused ultrasound in the

- treatment of uterine fibroids: a network meta-analysis. *Quant Imaging Med Surg* 2021;11:4125-36.
2. Han L, Shi G, Ruan J. Uterine necrosis following uterine artery embolization: case report and literature review. *Gynecol Pelvic Med* 2022;5:27.
 3. Tazhibayev D. Results after Endovascular Uterine Artery Embolization in the Treatment of Symptomatic Leiomyoma. *The Arab Journal of Interventional Radiology* 2023;7:S1-S41.
 4. Mikheeva Y, Kurtasov D, Kisliy ND, et al. Distal Radial Access for Endovascular Interventions. *Clinical Medicine (Russian Journal)* 2023:111-5. doi: 10.30629/0023-2149-2023-101-2-3-111-115.
 5. Casinader S, Easey K, Mikhail P, et al. "Distal Radial First": Primary Access for Coronary Angiography and Interventions. *Heart Lung Circ* 2023;32:e10-e11.
 6. Li J, Xian L, Wang X, et al. Hepatic artery chemoembolization with distal transradial access for primary hepatocellular carcinoma: a novel interventional therapy for peripheral tumors. *Am J Transl Res* 2023;15:5791-6.
 7. Ravina JH, Herbreteau D, Ciraru-Vigneron N, et al. Arterial embolisation to treat uterine myomata. *Lancet* 1995;346:671-2.
 8. ACOG practice bulletin. Alternatives to hysterectomy in the management of leiomyomas. *Obstet Gynecol* 2008;112:387-400.
 9. Babunashvili A, Dundua D. Recanalization and reuse of early occluded radial artery within 6 days after previous transradial diagnostic procedure. *Catheter Cardiovasc Interv* 2011;77:530-6.
 10. Kiemeneij F. Left distal transradial access in the anatomical snuffbox for coronary angiography (ldTRA) and interventions (ldTRI). *EuroIntervention* 2017;13:851-7.
 11. Fayed H, Elshemy A. Radial Artery Occlusion Following Cardiac Catheterization by Conventional Radial Approach versus Distal Radial Approach: Incidence and Predictors. *European Journal of Health Sciences* 2023:1-10. doi: 10.47672/ejhs.1370.
 12. Flores EA. Making the right move: use of the distal radial artery access in the hand for coronary angiography and percutaneous coronary interventions. *Cath Lab Digest* 2018;26:16-25.
 13. Roghani-Dehkordi F, Hashemifard O, Sadeghi M, et al. Distal accesses in the hand (two novel techniques) for percutaneous coronary angiography and intervention. *ARYA Atheroscler* 2018;14:95-100.
 14. Sgueglia GA, Di Giorgio A, Gasparidone A, et al. Anatomic Basis and Physiological Rationale of Distal Radial Artery Access for Percutaneous Coronary and Endovascular Procedures. *JACC Cardiovasc Interv* 2018;11:2113-9.

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