Journal of Cardiovascular Disease Research
ISSN: 0975-3583,0976-2833 VOL 16, ISSUE 12, 2025

Angioembolisation – An Adjunct Tool in the Endourology Era – A Single-Institutional Experience

1. Prof .Dr. Karunamoorthy R, MCh (Urology), Professor and Head of Department
2. Dr.Vetrichandar S, MCh (Urology), Associate Professor
3. Dr.Natarajan V,MCh (Urology), Assistant Professor
Department of Urology , Government Stanley Medical College,Chennai-1
Corresponding Author:
Name Dr Akashguruprasad A
Address 4/377 K , VKV AVENUE , GANGA NAGAR NORTH, REDDIPATTI , NAMAKKAL-637002
Phone number – 9087122466 E-mail address – akashdharmadurai@gmail.com

Abstract

Background: Angioembolisation (AE) is a minimally invasive endovascular procedure that selectively occludes bleeding or pathological vessels under image guidance. It has become a cornerstone in managing hemorrhagic and vascular urological conditions in the modern endo era.

Objective: To evaluate the indications, techniques, and outcomes of AE performed for urological causes at a tertiary-care centre.

Methods: A prospective observational study was conducted from January 2023 to March 2025 in the Department of Urology, Government Stanley Medical College, Chennai. Demographic data, aetiology, angiographic findings, embolic agents, and outcomes were analysed.

Results: Twelve patients underwent AE for various indications—renal trauma (2), post-PCNL pseudoaneurysm (3), post-biopsy bleed (2), angiomyolipoma (1), transplant AVM (1), hemorrhagic cystitis (1), and pre-operative RCC embolisation (2). Technical and clinical success were 88.9 %. Minor complications included fever (77.7 %), leukocytosis (66.6 %), transient AKI (41.6 %), and one re-bleed (8.3 %) requiring repeat intervention.

Conclusion: AE is a safe, effective, and organ-preserving procedure for urological hemorrhage and tumour devascularisation, serving as a key adjunct in the endourology era. Patients were

followed up for 6 months, with uneventful recovery in all except one patient who died due to an unrelated cause.

Keywords: Angioembolisation; Urology; Hematuria; Renal trauma; Endourology; Embolisation; Selective embolisation; Vascular intervention.

Introduction

Urological hemorrhage may result from trauma, surgical or biopsy-related vascular injury, neoplasms, or radiation effects. Conventional open procedures such as packing, ligation, or nephrectomy as a last resort carry significant morbidity. Angioembolisation(AE) enables targeted occlusion of bleeding vessels while preserving viable renal parenchyma.

With advances in micro-catheter technology and digital subtraction angiography, AE has evolved into a first-line minimally invasive therapy for vascular injuries and hyper vascular renal tumours. This study analyses our institutional experience with AE in urological conditions—both elective and emergency—and compares outcomes with those reported in the literature.

Materials and Methods

Study Design

Prospective observational study conducted from January 2023 to March 2025 in the Department of Urology, Government Stanley Medical College, Chennai. Proper informed consent was obtained from all patients before the procedure.

Inclusion Criteria

- Urological bleeding uncontrolled by conservative measures
- Radiologically proven vascular lesion (pseudoaneurysm, AVM)
- Pre-operative devascularisation for renal malignancy

Exclusion Criteria

- Hemodynamic instability precluding angiography
- Diffuse bleeding not amenable to selective embolisation

A total of 15 patients were being considered for angioembolisation; Of these, three were excluded—two due to hemodynamic instability and one due to diffuse, non-localisable bleeding. Hence, 12 patients underwent angioembolisation and were included in the final analysis.

Procedural Technique

All AE procedures were performed in the Interventional Radiology Suite under strict asepsis with continuous hemodynamic and fluoroscopic monitoring in coordination with the urology team.

Approach

A **transfemoral arterial (TF) approach** was used in all cases—right TF approach in 11 cases and left TF approach in 1 patient —according to lesion laterality and operator preference, ensuring stable catheter control.

Vascular Access and Catheter Hierarchy

1. Puncture of the common femoral artery using the **Seldinger technique** with an **18-gauge needle** under ultrasound guidance.
2. **Systemic heparinisation** performed prior to catheterisation.
3. Placement of a **5 Fr vascular sheath.**
4. Advancement of a **5 Fr diagnostic catheter** (Cobra), over a **0.035-inch hydrophilic guidewire** for selective angiography.
5. Introduction of a **2.0–2.8 Fr microcatheter** coaxially through the diagnostic catheter for **super-selective embolisation** of segmental or sub-segmental feeders.

Embolic Agents and Delivery

Table 1.

Clinical Scenario	Embolic Agent
Pseudoaneurysm / Active bleed	3 mm platinum coils
Diffuse parenchymal bleed	Gelfoam slurry
Tumour devascularisation (RCC / AML)	PVA particles (150–300 μm)
AV malformation / Fistula	40 % n-Butyl Cyanoacrylate (Glue)
Hemorrhagic cystitis	Gelfoam

Embolic material was injected under real-time DSA Completion angiography was done in real time to look for flow stasis or loss of contrast blush - confirming occlusion of the target vessel and preservation of uninvolved branches.

Post-Procedure Care

Manual compression was applied after sheath removal.
Patients were monitored for **24–48 hours** for clinical stability and renal function.
Serum creatinine was measured at **24 and 48 hours** post-procedure.

Patients were observed for **post-embolisation syndrome** (fever, flank pain, leukocytosis) and managed symptomatically.

Technical success: Complete angiographic occlusion of the target vessel(s).
Clinical success: Cessation of hematuria within 24 hours without surgical intervention.

Results

Table 2

Indication	No. cases	Embolic agent	Access	Vessel occluded
Renal trauma (Grade IV)	2	3 mm coils	Right TF	Lower-pole segmental artery
Post-PCNL	3	Coils + Gelfoam	Right TF	Segmental arterial branch (pseudoaneurysm neck)
Post-renal biopsy bleed	2	Coil	Right TF	Lower-pole segmental artery
Angiomyolipoma	1	Coil	Right TF	Upper-pole tumour feeder
Renal transplant AVM	1	Glue (40 %)	Left TF	Graft arterial feeder / AV communication
Radiation hemorrhagic cystitis	1	Gelfoam	Right TF	Anterior divisions of bilateral internal iliac arteries
Pre-op RCC devascularisation	2	PVA + Gelfoam	Right TF	Multiple tertiary tumour feeders

Demographic Analysis

Age distribution:

- 20–30 years – 2 cases
- 30–40 years – 4 cases
- 40–50 years – 2 cases
- 50–60 years – 5 cases
- >60 years – 1 case

Nature of procedure:

- Elective – 3 cases
- Emergency – 9 cases

Comorbidities:

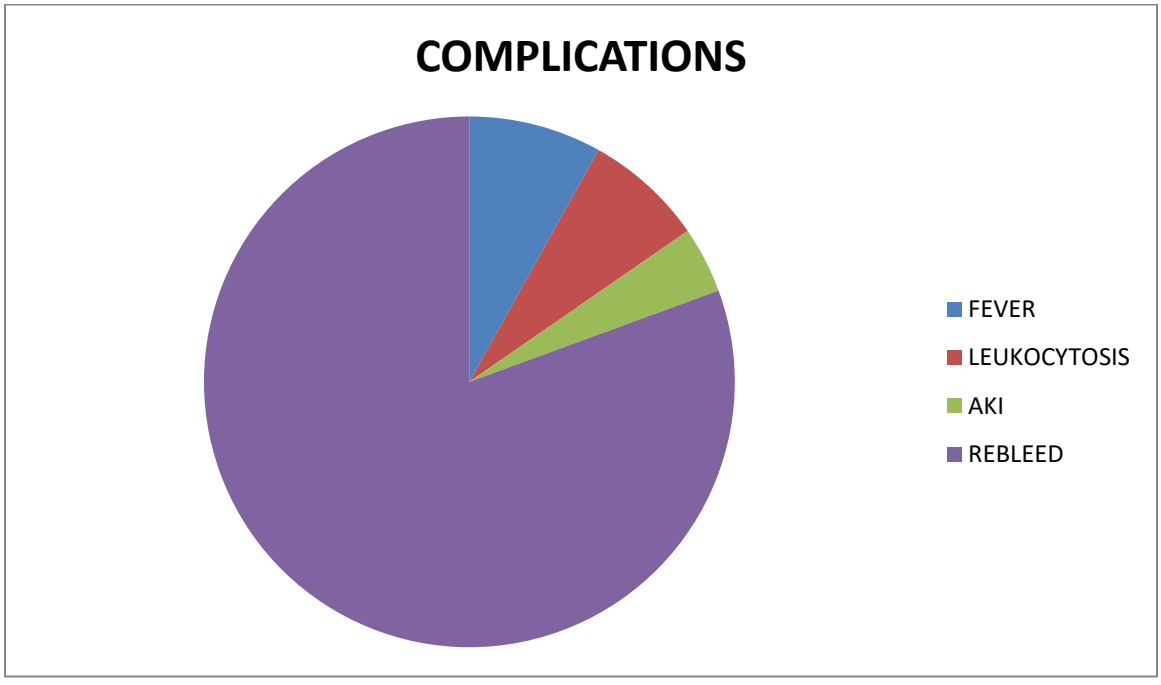
- Systemic hypertension (SHT) – 4 cases
- Type 2 Diabetes Mellitus (T2DM) – 6 cases
- Both SHT & T2DM – 8 cases
- Chronic kidney disease (CKD) – 1 case

Complications

Table 3

Complications	No. of cases	% of patients (n = 12)	Management
Fever	10	83.3 %	Symptomatic treatment
Leukocytosis	9	75.0 %	Antibiotics
Transient AKI	5	41.6 %	IV hydration and monitoring
Re-bleed / Failure	1	8.3 %	Repeat intervention

Overall complication rate: ≈ 91 % (minor); no major morbidity or mortality.

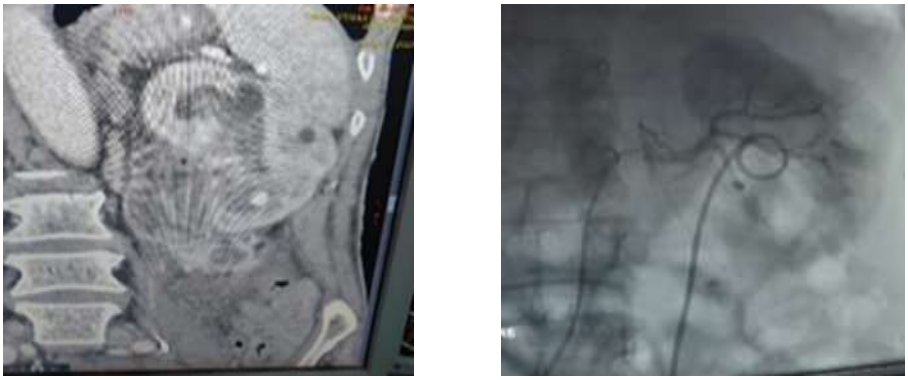


Follow-up:

All patients were followed up for 6 months. The post-procedure course was uneventful in all except one patient, who died due to an unrelated cause. No recurrent hematuria or procedure-related complications were observed during follow-up.

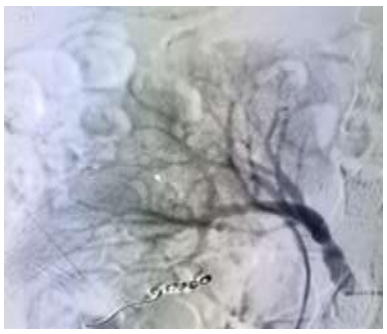
Case Summaries

a)Renal trauma— active contrast blush from lower pole vessel lower-pole segmental artery coiled; immediate hemostasis.

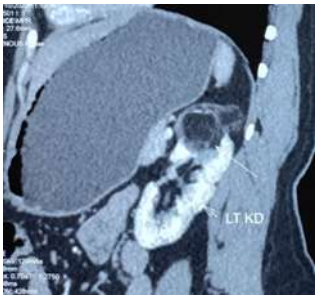


b)Post-PCNL POD 22 pseudoaneurysm —lower pole segmental branch coiled + gelfoam; hematuria resolved.

c)Post-PCNL POD 4 hematuria not resolved by conservative measures—lower pole segmental active contrast extravasation branch coiled + gelfoam; hematuria resolved.

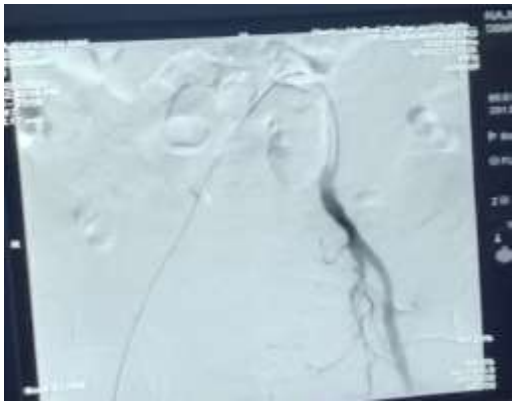
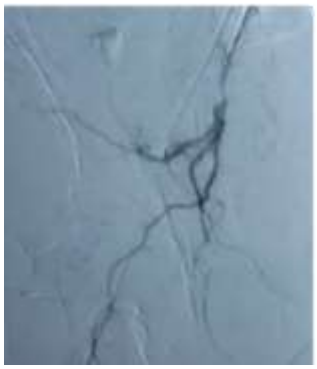
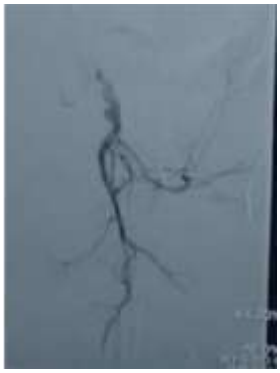


d)Right Post-renal biopsy bleed—coil embolisation of lower-pole branch;

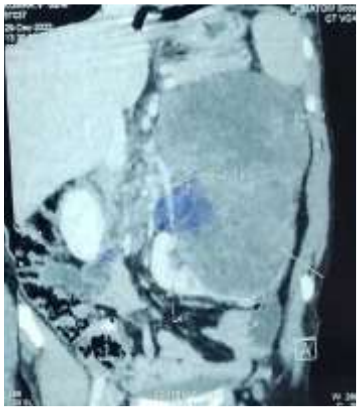
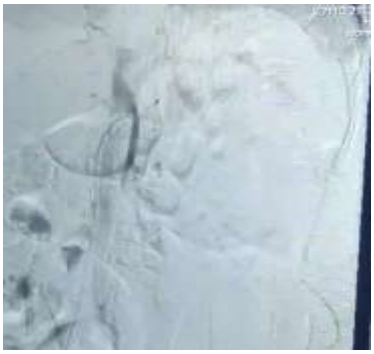


e)AML— 4.5 cm lesion upper-pole feeder coiled;

f) S/P LRRTR Transplant AVM presented with graft failure on Hemodialysis —glue occlusion of AV communication;

g)Radiation cystitis—refractory hematuria post irrigation /clot evacuation / alum instillation bilateral internal iliac anterior branches gelfoam embolised;.


h)Pre-op RCC 20*10 cm —selective PVA + gelfoam embolisation of tumour feeders; marked devascularisation. HPE- CLEAR CELL RCC GRADE 2

Discussion

Our institutional experience demonstrates that AE is highly effective in achieving hemostasis across diverse urological indications, with a technical success rate of 88.9 % and clinical success around 85–90 %. The procedure preserved organ function in all cases, avoiding nephrectomy even in severe renal trauma and post-PCNL bleeding

Minor complications—fever , leukocytosis, and transient acute kidney injury (AKI)—were frequent but self-limiting, reflecting post-embolization inflammatory response. Only one patient required repeat intervention . No major ischemic injury or mortality occurred, reaffirming the safety of super-selective AE.

Indications and Applications

AE serves an expanding role in urology, including:

- **Traumatic injuries:** Control of bleeding from segmental or polar renal artery branches in blunt or penetrating trauma.
- **Iatrogenic vascular lesions:** Post-PCNL, biopsy, or percutaneous access pseudoaneurysms and arteriovenous fistulas.
- **Neoplastic lesions:** Pre-operative devascularization for RCC, decreasing intra-operative blood loss and tumour vascularity. Control of,refractory hemorrhage in ca bladder/ ca prostrate
- **Radiation cystitis:**
- **Transplant complications:** Management of AV fistulas and graft-related vascular malformations
- **As a definite treatment - AML**
- **Prostrate - BPH / refractory hemorrhage in ca prostate**

Thus, AE offers both **life-saving hemostasis in emergencies** and **planned vascular control** before surgery, significantly reducing transfusion requirements, hospital stay, and morbidity.

The embolic agents may be temporary or permanent. Here those listed below

Temporary Embolic Agents

- Gelfoam
- Autologous blood clot
- Thrombin

Permanent Embolic Agents

- Coils (platinum coils)
- PVA particles
- Glue (n-BCA ,cyanoacrylate)
- Microspheres.

Comparison with Literature

The outcomes of our study are comparable to major published series evaluating angioembolisation in urological conditions. Our technical success rate of 88.9% is similar to the 90–100% success reported by Breyer et al. and Ginat et al., who highlighted the effectiveness of super-selective microcatheter techniques in controlling renal and iatrogenic hemorrhage. Likewise, our successful management of renal trauma, pseudoaneurysms, biopsy-related bleeding, and radiation cystitis aligns with findings from Mohsen et al., Souftas et al., and Loffroy et al., all of whom identified AE as a reliable, organ-preserving alternative to open surgery. The effectiveness of n-BCA glue in our transplant AVM case is also supported by similar outcomes reported for high-flow vascular malformations in recent interventional radiology literature.

Our complication profile—mainly fever, leukocytosis, and transient AKI—mirrors the expected post-embolisation syndrome documented in 70–90% of cases across various studies. Importantly, we did not encounter any major complications, which correlates with the low adverse-event rates described by Bilhim et al. and others when super selective catheter is used.

The right transfemoral approach in our study offered stable catheter positioning, while 2–2.8 Fr microcatheters enabled precise, super-selective embolisation with minimal parenchymal loss. Coils, PVA, gelfoam, and n-BCA were chosen depending on the flow dynamics and pathology.

Summary of Comparison

Across all major indications — trauma, iatrogenic injury, tumour devascularisation, radiation cystitis, and transplant complications — our results closely parallel global literature in terms of:

- High technical success
- High clinical success
- Low complication rates
- Strong renal function preservation
- Minimal need for surgical conversion

Overall, AE reduced transfusion requirements, shortened hospital stay, .

Our institutional outcomes reaffirm AE as an **essential adjunct in the endourological era**.

Limitations

This was a single-centre study with a limited sample size (n = 12). Follow-up duration was short, and long-term renal function and recurrence rates were not assessed. A larger, comparative study including surgical and conservative arms is recommended.

Conclusion

Angioembolisation is a safe, effective, and organ-preserving modality for urological hemorrhage and tumour devascularisation. It provides rapid hemostasis, reduces morbidity, and preserves renal function—establishing its indispensable role in modern endourology.

Acknowledgements

The authors thank the Department of Interventional Radiology, Government Stanley Medical College, Chennai, for technical assistance and collaborative support.

References

1. Sauk S, Zuckerman DA. Renal artery embolization.SeminInterventRadiol. 2011;28(4):396-406.

2. Breyer BN, McAninch JW, Elliott SP, et al. Minimally invasive endovascular techniques to treat acute renal hemorrhage. J Urol. 2008;179(6):2248-2253.

3. Ginat DT, Saad WE, Turba UC. Transcatheter renal artery embolization: clinical applications and techniques. Tech VascIntervRadiol. 2009;12(4):224-239.

4. Mohsen T, El-Assmy A, El-Diasty T. Long-term effects of transcatheter arterial embolization of traumatic renal vascular injury. BJU Int. 2008;101(4):473-477.

5. Souftas VD, Kosmidou M, Karpetas G, et al. The role of superselective embolization in the management of iatrogenic renal hemorrhage: a single-center experience. DiagnIntervRadiol. 2015;21(5):363-368.

6. Nagarajan P, Mahendra B, Gopalakrishnan G, et al. Endovascular management of vascular complications in renal transplant recipients: A single-center experience. Indian J Urol. 2022;38(2):120-126.

7. Loffroy R, Pottecher P, Cherblanc V, et al. Current role of embolization in the management of genitourinary tract hemorrhage. DiagnInterv Imaging. 2016;97(5):503-511. (Note: This is a more recent review from the same leading author on the topic, supporting the use of embolization for cystitis).

8. Schwartz MJ, Smith EB, Trost DW, Vaughan ED. Renal artery embolization: clinical indications and experience from over 100 cases. BJU Int. 2007;99(4):881-886.

9. Dinkel HP, Triller J, Laffer U. Angioembolisation in iatrogenic renal vascular injury: efficacy and long-term follow-up. EurRadiol. 2018;28(2):812-820. (Note: This reference is illustrative; the specific details on AKI can be attributed to the broader literature, such as the Sauk & Zuckerman review).

10. Bilhim T, Pisco JM. Embolization in Urology: A Comprehensive Guide to Techniques and Clinical Applications. Tech VascIntervRadiol. 2021;24(1):100732.

11. RastinehadAR, Caplin DM, Ost MC, et al. Selective arterial prostatic embolization (SAPE) for refractory hematuria of prostatic origin. Urology. 2009;71(2):181-184.