

CASE REPORT

Selective Arterial Embolization for Palliative Treatment of Intractable Hematuria: Outcomes and Safety in 12 Patients

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Abstract: **Introduction:** Intractable hematuria due to advanced urological malignancies or radiation cystitis presents a major therapeutic challenge, especially in patients unfit for surgery. Selective arterial embolization (SAE) is a minimally invasive option for achieving hemostasis in such cases. **Methods:** We retrospectively reviewed 12 patients treated with SAE between 2021 and 2025 for persistent hematuria caused by bladder cancer (n=7), radiation cystitis (n=3), or prostate cancer (n=2). Embolization was performed using super selective catheterization and Embospheres (500–700 µm). Clinical success was defined as significant or complete resolution of hematuria without additional invasive treatment. **Results:** Clinical success was achieved in 9 (75%) patients and technical success in 10 (83%). Three patients required further interventions, including one cystectomy. No major complications were reported. Most (75%) patients tolerated the procedure well without recurrence.

Conclusion: SAE is a safe and effective palliative treatment for refractory hematuria, offering meaningful symptom relief and reducing the need for major surgery in high-risk patients.

Keywords: Hematuria, Embolization, Bladder Cancer, Radiation Cystitis, Prostate Cancer

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1. Introduction

Refractory hematuria is a serious and potentially life-threatening condition frequently encountered in advanced urological malignancies. It often presents in patients with bladder cancer who are either unsuitable for curative surgery due to poor general health, metastatic disease or who opt against radical procedures such as cystectomy. Similarly, radiation cystitis, a late complication of pelvic radiotherapy, can lead to persistent and severe bleeding that is difficult to control[1]. Initial management strategies for hematuria include conservative measures such as bladder irrigation with saline, alum, or formalin, bladder hydrodistension, and endoscopic fulguration. While these treatments may offer temporary relief, they are not universally effective, and surgical interventions in this patient population carry significant

morbidity and are often contraindicated[2]. Selective arterial embolization (SAE) has emerged as a minimally invasive and effective alternative for achieving hemostasis in patients with refractory hematuria. Advances in embolization techniques, including selective and super selective catheterization of the internal iliac and vesical arteries, have improved the safety and precision of this approach[3].

This retrospective case series, conducted between 2021 and 2025 at our institution, presents the experience of 12 patients suffering from intractable hematuria due to advanced bladder cancer, radiation cystitis, and prostate cancer. It offers new evidence supporting SAE as an effective palliative treatment option, particularly in patients who are not candidates for more invasive surgeries. The study evaluates the effectiveness, safety, and outcomes of SAE as a palliative intervention in this challenging patient population, adding valuable insights to the current medical literature.

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2. Methods and Study Design

This retrospective case series included 12 patients who presented with persistent hematuria secondary to bladder cancer, radiation cystitis, or prostate cancer and were treated with selective arterial embolization (SAE) between 2021 and 2025 at our tertiary care center. Medical records were reviewed to gather demographic data, clinical presentation, treatment details, and outcomes. Only patients who had a minimum follow-up duration of one-year post-procedure were included. All embolization procedures were performed in the interventional radiology unit by an experienced team using standard selective trans arterial embolization techniques.

We conducted CT angiography of the pelvic and bladder vasculatures during the arterial phase to accurately map pelvic arteries and identify any pathologies, including tumoral or mucosal blush and other potential issues. For angioembolization, under aseptic conditions, after local anesthesia, a 5 or 6 F Sheath was introduced to the common femoral artery, primarily the right side, and then, using a Cobra catheter, a pelvic angiogram was performed. Then, the vesical arteries of both sides are super selectively micro-catheterized using a microcatheter (Embocath) and microwire (Tenor). The embolization is performed by Embospher 500-700 microns. After the embolization, an angiogram is performed to confirm the complete exclusion of tumoral or mucosal blush. The femoral Sheath was removed using hand compression for 15 minutes to establish hemostasis. Data regarding the procedural technicalities were collected. Both clinical outcomes and imaging studies before and after embolization were reviewed retrospectively from hospital records and the institutional imaging archive. The primary outcome was defined as clinical success as complete resolution or significant reduction in hematuria without the need for further invasive interventions, such as repeat embolization, cystectomy or fulguration. Secondary outcomes included recurrence of hematuria, and procedure-related complications. Pre- and post-procedural imaging, including digital subtraction angiography (DSA), was reviewed from the institutional image archive to evaluate technical success and vascular anatomy. All patient data were anonymized, and confidentiality was maintained throughout the study. The study protocol was approved by the institutional ethics committee, and informed consent was obtained from all participants. All methods were conducted in accordance with relevant guidelines and ethical regulations.

3. Results

We included 12 patients with persistent hematuria. The median hemoglobin level prior to embolization was 7.4 g/dL. Most patients were male (n = 11), with one female patient.

The underlying etiologies of hematuria were bladder tumor (n = 7), radiation cystitis (n = 3), and advanced prostate cancer (n = 2). Prior to undergoing selective arterial embolization (SAE), 4 patients had received intravesical therapy, and 4 had undergone endoscopic fulguration. Blood transfusion was required in 7 patients before the embolization procedure (Table 1). Following embolization, clinical resolution or significant reduction of hematuria was achieved in 9 (75%) Patients. Technical success of embolization was confirmed in 10 (83%) of the patients. Three patients required additional interventions: one underwent repeat embolization, one underwent surgery, and one required endoscopic fulguration. Only one (8.3%) patient ultimately required cystectomy due to recurrent, refractory hematuria despite embolization and secondary procedures. No major procedure-related complications were reported (Table 2).

Prior to undergoing SAE, 4 patients had received intravesical therapy, 4 had undergone endoscopic fulguration, and 7 patients required blood transfusion due to severe hematuria. Despite these interventions, the hematuria persisted, necessitating the use of SAE for further management.

Follow-up imaging, including digital subtraction angiography (DSA) and CT angiography, confirmed the technical success of SAE in most cases. Hematuria resolution or significant reduction was observed in the majority of patients, with recurrence of symptoms in three patients, all of whom received further interventions

3.1. Complications and Additional Interventions

Of the 12 patients who underwent selective arterial embolization, 9 (75%) experienced no post-procedural complications. Hematuria recurred in 3 (25%) patients: one case was successfully managed with endoscopic fulguration, while the other required a repeat angioembolization. One patient developed a massive gross hematuria and ultimately required cystectomy due to failure of conservative management. No other complications were observed in the cohort (Table 3).

4. Discussion

Arterial embolization (AE) is a minimally invasive endovascular technique performed by interventional radiologists, involving the targeted occlusion of vascular supply to specific tissues under image guidance. Since its introduction in the 1970s, AE has gained significant traction in urologic practice, particularly in the management of acute hemorrhagic conditions. More recently, its application has expanded to include benign prostatic hyperplasia (BPH) and prostate malignancies. Given the evolving scope of AE, it is essential for urologists to possess a thorough understanding of its indications,

technical considerations, therapeutic potential, And associated risks.[4]

Saadi et al. described a case of a 50-year-old man with metastatic muscle-invasive bladder cancer and severe hematuria unresponsive to chemotherapy, endoscopic resection, and radiotherapy. After the patient declined cystectomy, bilateral super selective embolization of the superior vesical arteries was performed using Embospheres, resulting in immediate resolution of hematuria without complications. This case highlights the potential of selective arterial embolization as a safe and effective palliative option in patients with advanced, inoperable bladder cancer.[5]

Ocampo et al. reported on 21 patients treated with selective arterial embolization (SAE) for refractory hematuria between 2013 and 2021. The majority were elderly males, with advanced prostate cancer being the most common underlying condition. Despite SAE being performed within an average of 24 days post-admission and demonstrating a low complication rate (4.7%), hematuria persisted in 61.9% of the patients, and more than half (52.3%) required additional interventions. Notably, 27.2% ultimately underwent cystectomy, with a mean interval of 29.6 days following embolization. These findings underscore the safety of SAE as a minimally invasive option, but also highlight its limited efficacy in certain cases, reinforcing the need for careful patient selection and close post-procedural monitoring.[1]

From our experience, selective arterial embolization demonstrates a favorable safety profile and offers a meaningful clinical benefit in patients with persistent hematuria from various urologic etiologies. The 75% clinical success rate and low incidence of major complications in our cohort align with previously reported data, supporting SAE as a viable minimally invasive option. However, the need for additional interventions in a subset of patients and the occurrence of recurrent hematuria highlight that SAE may not be definitive for all cases, especially those with complex or aggressive underlying pathology. Careful patient selection, tailored procedural planning, and vigilant post-procedural monitoring remain essential to optimize outcomes. Our findings also underscore the importance of a multidisciplinary approach involving urologists and interventional radiologists to manage challenging hematuria cases effectively.

5. Conclusion

Selective arterial embolization (SAE) is a safe and effective palliative treatment for persistent hematuria refractory to conventional therapies. It offers significant symptom relief with a low complication rate and can reduce the need for more invasive surgical procedures, such as cystectomy. While additional interventions may be necessary in some

cases, SAE represents a valuable option for managing intractable hematuria in patients with advanced urological malignancies and radiation cystitis, especially those not suitable for major surgery. This study emphasizes the importance of careful patient selection, individualized treatment planning, and ongoing monitoring to optimize patient outcomes. SAE provides meaningful clinical benefits and should be considered a viable alternative in managing refractory hematuria in high-risk populations.

6. Appendix

6.1. Acknowledgment

Written informed consent was obtained from the patients for the publication of this case report.

6.2. Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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6.4. Authors' Contributions

All authors were involved in the conception, drafting, and revision of the manuscript. All authors read and approved the final version of the manuscript.

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Table 1: Demographic characteristics

| Characteristic | Value |
|--|-------|
| Male | 11 |
| Female | 1 |
| Advanced Prostate Cancer | 2 |
| Radiation Cystitis | 3 |
| Bladder Tumor | 7 |
| Median Hemoglobin Before Embolization | 7.4 |
| Intravesical Therapy | |
| Yes | 4 |
| No | 8 |
| Endoscopic Fulguration | |
| Yes | 4 |
| No | 8 |
| Blood Transfusion Before Embolization | |
| Yes | 7 |
| No | 5 |

Table 2: Outcomes after angioembolization

| Outcome | Value |
|---|-------|
| Post-Embolization Hematuria Resolution | |
| Yes | 9 |
| No | 3 |
| Embolization Success | |
| Yes | 10 |
| No | 2 |
| Need for Additional Procedures | |
| None | 9 |
| Endoscopic Fulguration | 1 |
| Surgery | 1 |
| New Embolization | 1 |
| Need for Cystectomy | |
| No | 11 |
| Yes | 1 |

Table 3: Complications after angioembolization

| Patient Group | Number of Patients (n=12) | Percentage (%) |
|-------------------------|---------------------------|----------------|
| No Complications | 9 | 75% |
| Hematuria | 3 | 25% |