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Case Report

Transarterial Embolisation for Intractable Haematuria: A Case Report and Review of Management Strategies

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ABSTRACT

Introduction: Refractory gross haematuria is a significant urological emergency, characterised by prolonged and life-threatening bleeding that does not respond to standard treatment. The main recognised aetiologies encompass malignant neoplasms of the bladder and haemorrhagic cystitis. When conservative treatments and intravesical medications fail, transarterial embolisation (TAE) is a dependable and effective technique for achieving haemostasis. This study aims to report cases of haematuria resulting from bladder pathology, the role of interventional radiology in embolisation, and technical considerations.

Case Presentation: We present two cases of refractory gross haematuria from the bladder managed with TAE. Case 1 involved a 65-year-old male with locally advanced, hypervascularised bladder squamous cell carcinoma (cT4aN3M1b). Case 2 involved a 69-year-old woman with haemorrhagic cystitis secondary to pelvic radiotherapy for stage IVb cervical carcinoma. Pre-embolisation angiography showed prominent blushing of feeder arteries arising from the superior vesical artery (SVA) bilaterally. Embolisation used gelfoam and PVA particles. The procedure reduces tumour blushing (Case 1) and hypervascularisation (Case 2), controlling haematuria.

Conclusion: TAE is a safe and effective treatment modality for managing persistent gross haematuria due to diverse bladder pathologies, including bladder malignancy and radiation cystitis. Bilateral vesical artery embolisation was performed in both cases to ensure a more sustained response and reduce the likelihood of recurrence.

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INTRODUCTION

Refractory gross haematuria signifies bleeding that is persistent, often life-threatening, and has failed to cease following initial, conventional management [1]. This condition presents a critical urological emergency requiring prompt assessment and intervention to prevent severe morbidity or mortality. Bladder malignant neoplasms, mainly urothelial cancer of the urinary bladder, radiation cystitis, cyclophosphamide-induced cystitis, severe infection, or locally advanced prostate cancer are major documented causes of severe, intractable bleeding [2,3].

The internal iliac artery provides the dominant arterial supply to the pelvic viscera, including the urinary bladder. The bladder receives its supply primarily through the superior vesical artery (SVA) and the inferior vesical artery (IVA), both of which arise from the anterior division of the internal iliac artery. The internal iliac artery has high variability in origin, length, and branching pattern. Detailed pre-procedural vascular mapping is crucial for safety and the successful vesical artery embolisation [4].

The management of haematuria arising from the bladder pathology can be challenging. Depending on aetiology, although commonly self-limited, conservative management and intravesical agents through cystoscopy are usually performed as the treatment of choice [5]. Transarterial embolisation (TAE) is indicated when conventional procedures, including bladder irrigation, clot removal, and intravesical agents, have failed. The procedure is widely considered a reliable, effective method for achieving haemostasis in haemorrhagic urological emergencies. TAE can also be used as an alternative to avoid aggressive surgery that may cause more harm than benefit [6].

The aim of this study is to present cases of haematuria arising from bladder pathology and the role of interventional radiology for embolisation and technical consideration.

CASE PRESENTATION

Case 1

A 65-year-old male patient diagnosed with bladder cancer cT4aN3M1b with proven squamous cell carcinoma, complaining of haematuria throughout the entire voiding process without associated pain for 6 months before admission. Initial imaging with multiphase abdominal CT scan shows a hypervascularised mass in the anterior part of bladder with associated dilatation and tortuosity of the vascular in the pelvic area (Fig.1). Due to persistent haematuria and unresolved anaemia even after several blood transfusions, the patient underwent TAE (Fig.2).

Case 2

A 69-year-old woman diagnosed with stage IVb cervical carcinoma with bone metastasis who completed a chemotherapy regimen and currently underwent radiotherapy. The patient had a history of urine retention, accompanied by haematuria after catheter insertion. An abdominal multiphase CT scan shows a hypervascular and thickened bladder wall (Fig.3). Embolisation performed in this patient from branches of the internal iliac artery arises from bilateral superior vesical arteries (Fig.4).

DISCUSSION

Vascularisation arises from the inferior vesical artery in the pelvis, which is a branch of the internal iliac artery, along with the middle rectal artery [7]. Pre-procedural imaging planning is a mandatory safety measure for TAE. Preprocedural pelvic CTA offers critical anatomical assessment and facilitates technical planning prior to the intervention [8].

The management of haematuria associated with bladder cancer is determined upon the extent of tumour infiltration, stage, and overall presentation. Bladder cancer often causes recurrent refractory haematuria due to the mass's natural history. In advanced stages, surgery is not feasible, and the main purpose of treatment is palliative. The primary objective is to alleviate symptoms by stopping life-threatening haematuria. In haemorrhagic cystitis, an initial acute inflammatory response with tissue oedema is followed by neo-angiogenesis of thin, telangiectatic mucosal vessels, which tend to bleed and represent a potential source of severe blood loss [9,10].

In our patient, haematuria arises from bladder cancer known as biopsy-proven squamous cell carcinoma. The most common pathology finding in bladder cancer is urothelial carcinoma. The same cases with squamous cell carcinoma in the bladder due to metastatic processes present with haematuria as a symptom and also show improvement after treatment with bilateral embolisation [11]. Other studies also report TAE to treat causes of haematuria from other malignancies, such as leukaemia and rhabdomyosarcoma [12].

Radiation cystitis may manifest as either acute or chronic, characterised by diffuse inflammation resulting in haemorrhage from the bladder mucosa. A common cause of chronic haemorrhagic cystitis is radiation therapy for pelvic malignancies, with an incidence rate of approximately 3 to 15%. The most common inciting factors for haemorrhagic cystitis are chemotherapy and pelvic radiation therapy. While multiple chemotherapeutic agents can cause haemorrhagic cystitis, those most often implicated are the oxazaphosphorine alkylating agents ifosfamide and cyclophosphamide. Histologically, these molecular changes manifest as urothelial damage, including bladder mucosal oedema, ulceration, and haemorrhage [13]. Generally, cystoscopic fulguration of the bleeding points can effectively stop active bleeding; meanwhile, surgical treatments like urinary diversion or cystectomy are not common [14].

In general, TAE is indicated to occlude aneurysms, pseudoaneurysms, or any vascular malformation that may cause adverse health effects; treat acute or recurrent haemorrhages; or devascularize non-neoplastic or malignant tumours for palliation [15]. The current cases highlight the significance of transarterial embolisation of the superselective vesical artery in addressing refractory haematuria resulting from diverse aetiologies, including bladder cancer and radiation-induced hemorrhagic cystitis, without incurring ischaemic complications. Embolisation via femoral approaches was conducted under local anaesthesia for the bladder cancer patient and general anaesthesia for the radiation cystitis patient due to his unstable condition. Due to the small calibre

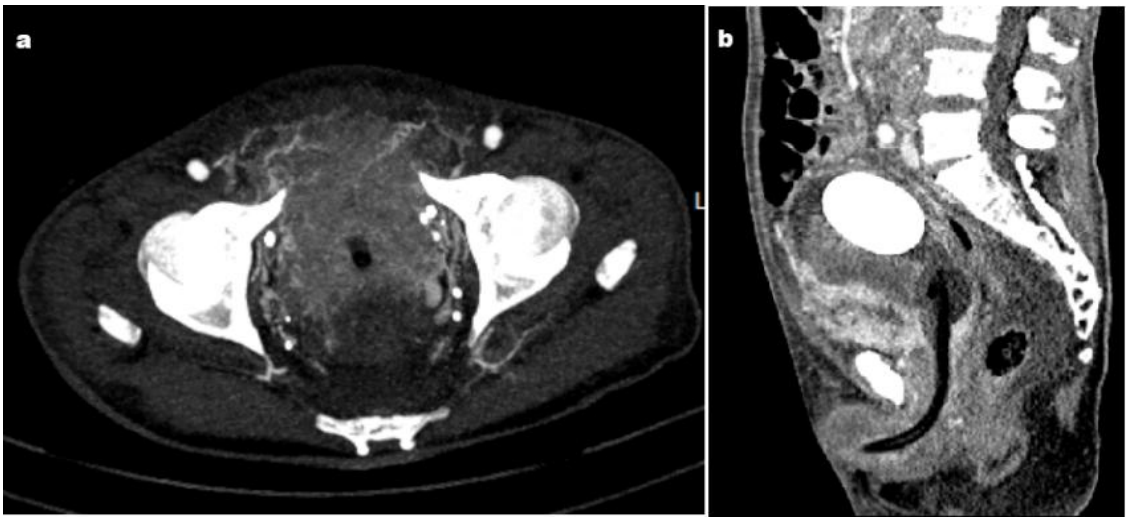


Fig. 1. The arterial (left) and venous (right) phases of the abdominal CT scan show a hypervascularized mass in the anterior part of the bladder with extensions to perivesical fat and the abdominal wall. There is also dilatation and tortuosity in the vasculature in the pelvis. A vesicolithiasis is also noted in the CT scan.

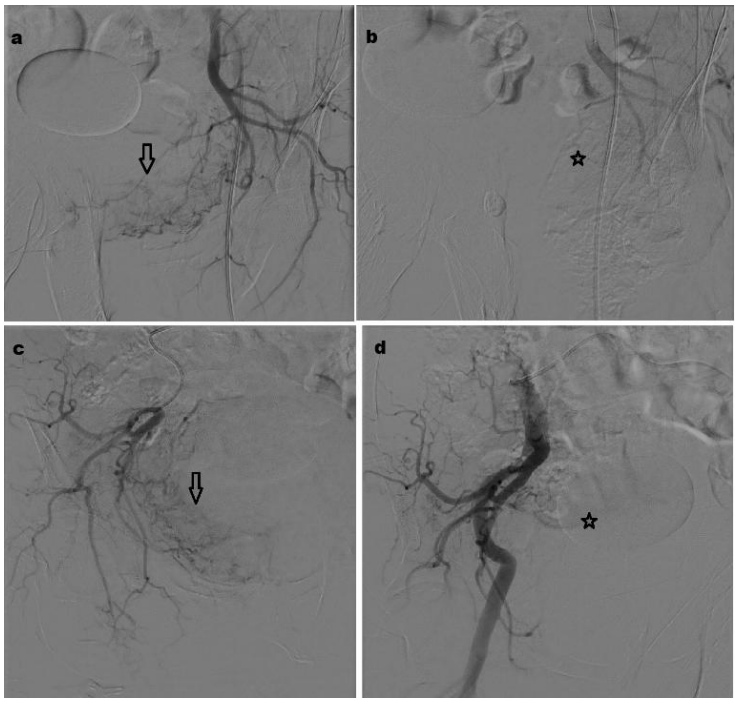


Fig. 2. Angiography and TAE were performed. Pre-embolisation angiography shows that the blushing of the feeder artery is visible from the branches of both the left **(a)** and right **(c)** superior vesical arteries (arrow). Superselective catheterisation with a 2.7 Fr microcatheter was performed to embolise with 355-500 micron PVA and gelfoam. Hypervascularisation is decreased (star) in the right **(b)** and left **(d)** superior vesical arteries.

and tortuosity of the vesical arteries, specialised microcatheters are necessary to achieve profound vessel engagement for flow-directed embolisation [3]. The preferred choice of polyvinyl alcohol (PVA) particles is 300-500 microns, as there is a lower risk of nontargeted embolisation and tissue devascularisation. When an active bleeding source or focal hypervascularity is identified, unilateral embolisation is usually sufficient, as in the above case; otherwise, a bilateral superselective approach is needed [14]. Superselective embolisation is a refinement that enabled the evolution toward superselective embolisation. This approach involves the direct cannulation and distal embolisation of the specific



Fig. 3. CT scan of patient with a history of cervical cancer who underwent radiation and chemotherapy. Arterial **(a)**, with MIP reconstruction **(b)** and venous phase **(c)** of abdominal CT scan shows diffuse hypervascular and thickened bladder wall supporting finding of radiation cystitis. The patient underwent a hysterectomy, and there was no sign of residual mass. There is also thickening of the rectum mucosa, supporting the finding of radiation-induced proctitis.

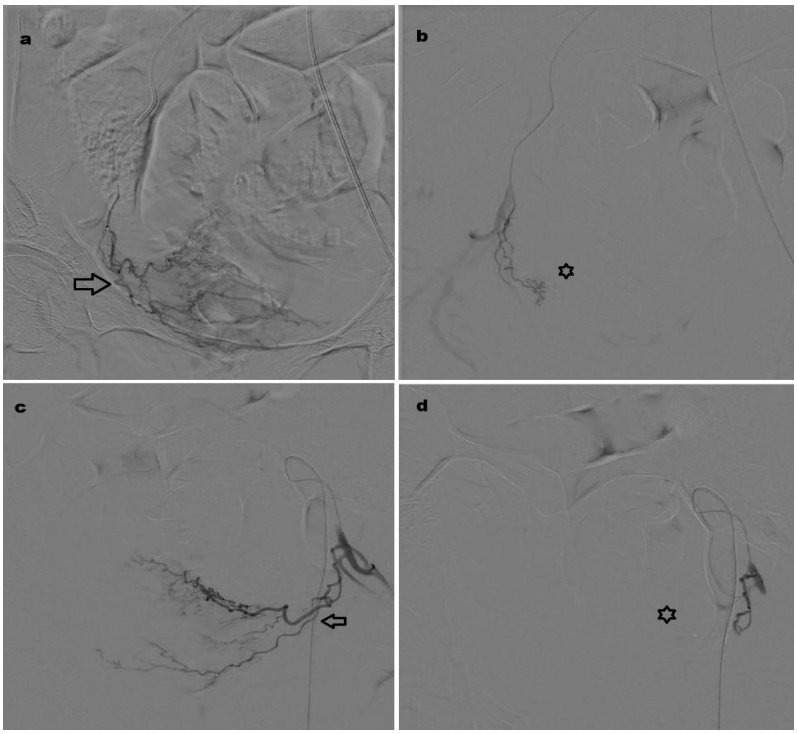


Fig. 4. Angiography and TAE were performed. Pre-embolisation angiography shows a blushing feeder artery, which is visible from the branches of the right **(a)** and left **(c)** superior vesical arteries (arrow). Superselective catheterisation with a 2.4 Fr microcatheter was performed to embolise with 355-500 micron PVA and gelfoam. Hypervascularisation is decreased (star) in the right **(b)** and left **(d)** superior vesical arteries.

target vessel, such as the superior or inferior vesical artery, supplying the bleeding area [16].

Other than PVA, embolic agents such as coils also can be used to treat haematuria [9]. The best embolic agent and optimal embolisation technique remain controversial. In most previous reports, patient numbers were small. Bilateral embolisation was performed in both cases. The decision to perform unilateral or bilateral TAE of the internal iliac artery branches for haematuria depends on angiographic findings, the size of the vascular pathology, and the goal of preventing re-bleeding. Bilateral embolisation is recommended when

the mass is large, and several studies also recommend preventing collateral recurrence, which commonly arises from inferior mesenteric, external iliac, and femoral arteries due to rich collateral from the internal iliac artery [10,17]. Bilateral embolisation also provides a more durable response and reduces the rate of early rebleeding. Unilateral embolisation is most commonly performed for localised bleeding or focal pathologies [10].

The definition of success differed between studies. Some studies defined success as control and no recurrence of haematuria, while others used the need for blood transfusion as an indicator of success [3]. There is no complication found in both patients after the procedure. Common complications following TAE include gluteal claudication, Brown-Sequard syndrome, bladder necrosis, skin necrosis, and gluteal paresis [18, 19]. A previous study shows that embolisation of the anterior division of the internal iliac artery is associated with a higher incidence of complications and rebleeding [20]. Coagulopathy, sepsis, and renal insufficiency are relative contraindications to percutaneous transcatheter embolisation. Clinical improvement efforts should be made to correct or improve these conditions prior to the procedure [6].

The complications of embolisation rates are dependent on operator experience, the type of lesion, vascular territory, and patient clinical condition. Patients with unstable haemodynamics, multiorgan failure, malignancies, coagulopathy, renal failure, and infection will have higher complication rates [15].

CONCLUSION

Selective angiographic embolisation is a safe and effective method of controlling refractory, life-threatening bladder bleeding. This procedure should be considered the preferred treatment because the primary goal is to relieve symptoms by stopping haematuria in broad bladder pathology, such as nonneoplastic causes or unresectable malignancy.

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CONFLICT OF INTEREST

There is no conflict of interest in this research.

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