

## CASE SERIES

# Prostatic artery embolization for intractable hematuria in patients with unregulated coagulation parameters: Three case reports

Manuel Belmonte<sup>1</sup>, Abdulghani Khogeer<sup>2\*</sup>, Ghizlane Moussaoui<sup>3</sup>, Rafael Melo<sup>4</sup>, Louis-Martin Boucher<sup>4</sup>, Tatiana Villalpando-Cabrera<sup>4</sup>, Serge Carrier<sup>1</sup>, Mélanie Aubé-Peterkin<sup>1</sup>

<sup>1</sup> Department of Surgery, Division of Urology, McGill University Health Center, Montreal, Canada;

<sup>2</sup> Department of Surgery, Faculty of Medicine, Rabigh, King Abdulaziz University, Jeddah, Saudi Arabia;

<sup>3</sup> Department of Urological Sciences, University of British Columbia, Vancouver, Canada;

<sup>4</sup> Department of Radiology, McGill University, Montreal, Canada.

\* Co-First Author.

**Summary** *Introduction: Benign prostatic hyperplasia is a prevalent disease that could be responsible of severe intractable hematuria requiring invasive surgical management.*

*Case presentation: We report three high-risk cases presented with intractable hematuria of prostatic origin with high medical co-morbidities treated safely and effectively by prostatic artery embolization with favorable outcomes.*

*Conclusions: In non-surgical, anticoagulated patients, prostatic artery embolization represents a safe and effective intervention for the treatment of intractable hematuria related to benign prostatic hyperplasia.*

**KEY WORDS:** *Benign prostatic hyperplasia; Gross hematuria; Angioembolization; Coagulation disorders.*

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## INTRODUCTION

Benign prostatic hyperplasia (BPH) is a prevalent disease, affecting up to 50% of men over the age of 50, usually associated with lower urinary tract symptoms (LUTS) (1). Intractable hematuria represents a severe complication of BPH, which often requires invasive management (2). While transurethral resection of the prostate (TURP) remains the mainstay therapy for BPH, laser enucleation techniques represent the standard of care for the surgical treatment of larger prostates or in anticoagulated patients (3, 4). However, elderly or co-morbid patients may be at high medical risk for the prolonged anesthesia-time associated with laser TURP. In these cases, non-surgical treatment for BPH, such as prostatic artery embolization (PAE), may be considered. PAE consists of embolization of selected prostatic arteries to produce ischemic necrosis and shrinkage of the prostate gland (5, 6). Arterial embolization has previously been described for treatment of intractable hematuria due to prostate and bladder pathologies (7, 8). However, to the best of our knowledge, PAE for the treatment of intractable hematuria in co-morbid BPH patients with unregulated coagulation

parameters has yet to be described. This case series presents three patients of high medical risk with intractable hematuria of prostatic origin, where PAE was performed and resulted in the resolution of prostatic hemorrhage.

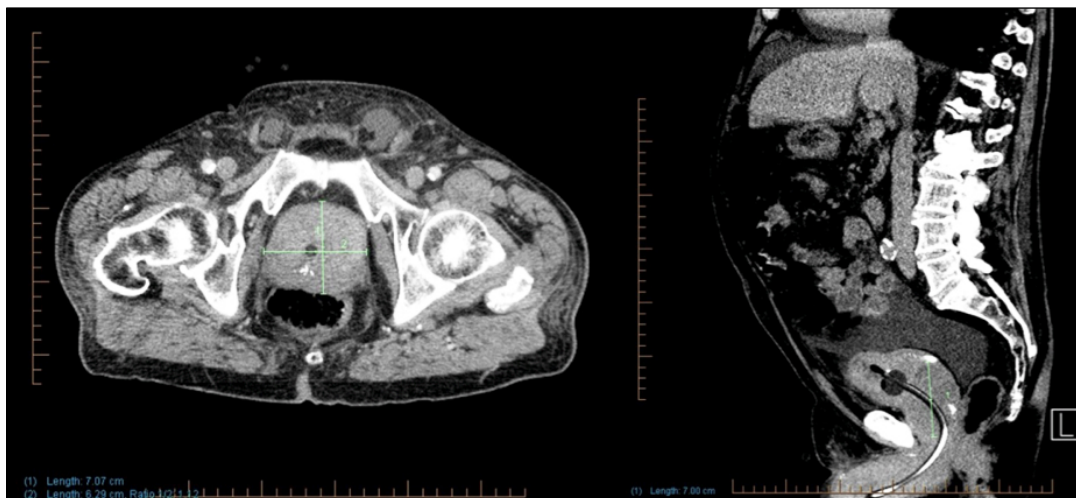
## CASE PRESENTATION

### Case 1

A 91-year-old man presented with a 48-hour history of painless gross hematuria. Previous medical history included BPH with voiding LUTS, atrial fibrillation on Edoxaban, left cortical stroke, dyslipidemia, hypertension and right-sided heart failure with ascites. Hemoglobin was 111 g/L at arrival, while pre-procedure hemoglobin was 89 g/L (baseline 120 g/L). Anticoagulation was held at arrival and daily subcutaneous thromboprophylaxis was prescribed. The prostate gland volume was 200cc on computed tomography (CT) (Figure 1). Cystoscopy confirmed the prostate gland was the origin of the hematuria. Continuous bladder irrigation (CBI) was performed for 10 days, with no resolution of symptoms. Given the multiple medical comorbidities, this patient was not a candidate for surgery and was offered PAE, which he accepted. The patient was on CBI for 5 days post-PAE before the resolution of the gross hematuria and passed the trial of void on day 6. Anticoagulation therapy was resumed on day 7 post-PAE. At 6-month follow-up, the patient was voiding well and had no recurrence of hematuria.

### Case 2

An 85-year-old man presented with recurrent gross hematuria for one month with clots, complicated by urinary retention and infection. Previous medical history included BPH, atrial flutter on Apixaban, sick sinus syndrome with pacemaker, coronary artery bypass surgery, type 2 diabetes mellitus and hypertension. At presentation, hemoglobin was 84 g/L (baseline 115 g/L) and required transfusion of 2 units of packed red blood cells (PRBC). The prostate gland volume was 120cc on CT



**Figure 1.** Prostate gland measurements pre-angioembolization for patient described in Case 1 (axial and sagittal views).

scan. Cystoscopy confirmed the prostate as the source of the bleeding. Symptoms did not resolve after 7 days of CBI. Given the multiple cardiac comorbidities and minimal LUTS prior to presentation, PAE was preferred by the patient. The anticoagulation was held 24 hours prior to the intervention. The patient had no recurrence of hematuria and passed trial of void at day 1 post PAE intervention; anticoagulation therapy was resumed then, and he was discharged from hospital on post-intervention day 2. At 1-month follow-up, he reported an improvement in LUTS and no recurrence of hematuria; he was subsequently lost to follow-up.

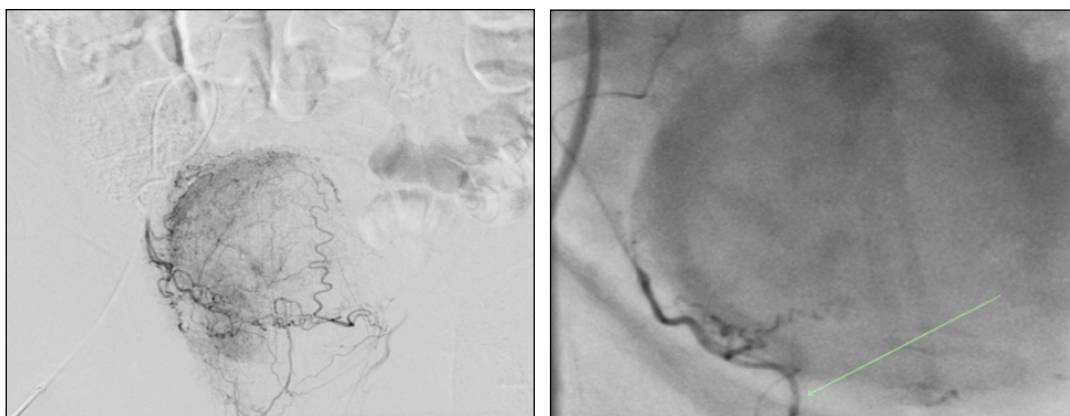
### Case 3

A 78-year-old man was transferred to our center in the context of an intractable prostatic hemorrhage non-resolving after 30 days of CBI. Patient was previously known for atrial fibrillation on Warfarin, hypertension, type 2 diabetes mellitus, morbid obesity, and chronic urinary retention secondary to BPH. The prostate volume was 150cc measured on CT. On arrival, hemoglobin level was 78 g/L (baseline 121 g/L) and raised to 96 g/L after receiving 2 units of PRBC transfusion. The cystoscopy confirmed the bleeding originated from the prostate. Surgery did not represent a safe treatment option for this patient given the significant medical comorbidities and associated anesthetic risk. As such, PAE was offered and

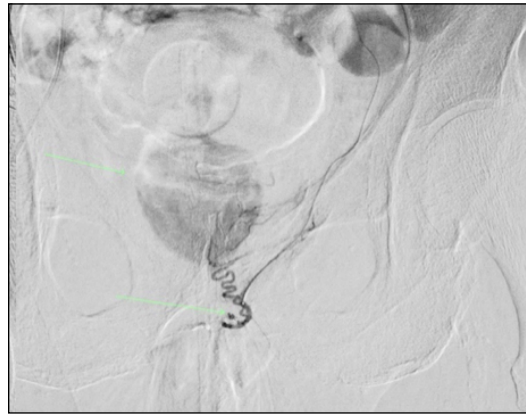
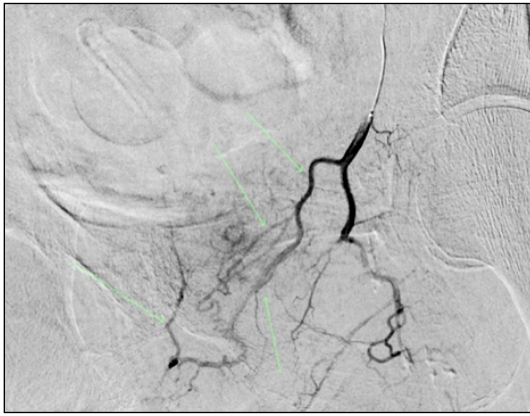
accepted by the patient. Anticoagulation therapy was held 24 hours prior to the intervention. The patient had resolution of gross hematuria on post-procedure day 1. He resumed anticoagulation therapy day 1 post-intervention. At 6-month follow-up, he had no recurrence of gross hematuria and LUTS had also improved.

### Prostatic artery embolization technique description

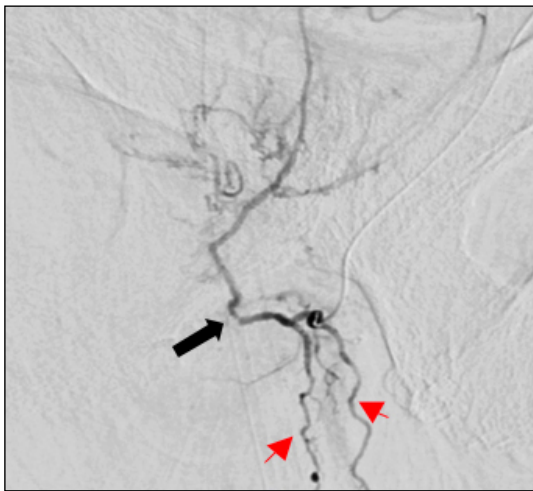
Technically, PAE was achieved under local anesthetic (Xylocaine) at the arterial femoral puncture site. Ultrasound was performed prior to the puncture to assess for the presence of femoral arterial pathology. Subsequently, the right common femoral artery was punctured, permitting the insertion of a 5-French regular vascular sheath. A 5-French Cobra (Cook, Bloomington, IN, USA) catheter was used for the internal iliac artery catheterizations and a 2-French ProGreat<sup>®</sup> microcatheter (Terumo, Somerset, NJ, USA) and Fathom<sup>™</sup> 0.016 inch wire (Boston Scientific, Marlborough, MA, USA) were used for the catheterization of the prostatic arteries. The microcatheter was advanced in the prostatic arteries beyond any significant side branches supplying the bladder, rectum or penis and its placement was confirmed using cone-beam CT. The PERfecTED technique (Proximal Embolization First, Then Embolize Distal) was performed. This technique, when possible, has been associated with greater degree of prostatic ischemia and infarc-



**Figure 2a.** Angiogram of prostatic arteries right lobe of the prostate pre and post angioembolization, respectively (patient in case 1). Note the absence of the prostatic parenchymal blush (arrow) post embolization.



**Figure 2b.** Angiogram of the left lobe of the prostate pre and post angioembolization, respectively (patient in case 1).



**Figure 3.** Visualization of the penile arteries (arrows) prior to angioembolization of the left prostatic artery (block arrow).

tion, thus leading to better clinical outcomes (13). Embolization was performed using Embospheres® 300-500 um (Merit Medical, South Jordan, UT, USA) diluted in 20 mL 1:1 ratio of contrast to saline injected in 1 ml aliquots followed by 3 ml normal saline flush between aliquots until complete stasis was obtained (Figure 2a). A similar technique was performed on both sides, always making sure to avoid non-targeted embolization via collaterals to other critical arterial structures such as the penile arteries (Figures 2b, 3).

## DISCUSSION

Prostate hemorrhage represents a severe complication of BPH, and rapid control of the bleeding is necessary to avoid morbidity associated with intractable gross hematuria. Medical therapies, such as 5-alpha reductase inhibitors, have previously been proposed as treatment avenues in BPH-related gross hematuria (9). However, time to response, particularly in patients with larger prostates, has been reported to be on average 10 days or longer (9). When conservative management fails, surgical procedures such as TURP or Holmium laser enucleation of the prostate often represent the best treatment option for patients. While regional anesthesia is preferred for these interventions, it may be contraindicated due to patients' anticoagulation status. Consequently, prolonged general anesthesia is used, which increases the risk for

perioperative complications in anticoagulated patients with cardiac or metabolic comorbidities (10). PAE represents a minimally invasive procedure performed under local anesthesia. Embolization of the prostatic arteries was previously shown to improve LUTS and preserve sexual function scores in patients with BPH (11). A previous study, where patients with unregulated coagulation parameters were excluded, has reported on the use of PAE for the treatment of BPH related gross hematuria and found the intervention to be safe for non-surgical candidates (7). In this case series, we presented three non-surgical candidates on anticoagulation therapy who successfully underwent PAE. In all 3 cases, no immediate complications occurred. None of the patients developed infection, and groin pain was not a complaint our participants reported.

Complete resolution of the intractable hematuria was seen in all cases, with no recurrence at a minimum of 6-months' follow-up. While PAE represents a non-inferior or alternative to TURP, it is not void of limitations (12). The access to this procedure in the community is limited and anatomical variants or severe atherosclerotic disease render the procedure difficult and sometimes impossible. The follow-up times for the patients in our series is short, limiting the assessment of the durability of the hemostatic effect of PAE.

## CONCLUSIONS

PAE represents a safe and effective intervention for the treatment of BPH-related intractable hematuria in non-surgical and anticoagulated patients. Our experience with PAE in high-risk patients has been favourable and warrants further investigation with a larger cohort and longer follow-up.

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### Correspondence

Manuel Belmonte, MD  
manuel.belmontecg@gmail.com

Mélanie Aubé-Peterkin, MD, FRCSC (Corresponding Author)  
melanie.aube-peterkin@muhc.mcgill.ca

Carrier Serge, MD  
serge.carrier@mcgill.ca

McGill University Health Centre  
1001 Décarie Blvd, Montreal, Quebec H4A 3J1, Canada

Abdulghani Khogeer, MD  
dr-abdulghani@hotmail.com

Department of Surgery, Faculty of Medicine, Rabigh, King Abdulaziz University, Jeddah, Saudi Arabia

Ghizlane Moussaoui, MD  
ghizlane.moussaoui@mail.mcgill.ca

Department of Urological Sciences, University of British Columbia, Vancouver, Canada

Rafael Melo, MD  
rcardosodemelo@gmail.com

Louis-Martin Boucher, MD  
lmboucher@yahoo.com

Tatiana Villalpando-Cabrera, MD  
tacaal@hotmail.com

Department of Radiology, McGill University, Montreal, Canada

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**Conflict of interest:** The authors declare no potential conflict of interest.