

Prostatic artery embolization (PAE) for prostatic origin bleeding in the context of prostate malignancy

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Abstract

Prostate artery embolization (PAE) has been shown to be beneficial in treating men with benign prostatic hypertrophy (BPH). Here we describe treating four patients with prostate cancer (two with organ-confined and two with metastatic prostate cancer) with prostatic bleeding with PAE. Patients had other causes of hematuria excluded and were followed up at 3, 12, and 18 months after PAE. All four cases were technically successful and all cases of hematuria had resolved by the three-month follow-up (100%). There was one case of recurrence at 13 months after PAE which was successfully treated. PAE is useful for controlling significant prostatic bleeding in patients with prostate cancer and improves quality of life. Patients may, however, need repeated treatments to control the bleeding.

Keywords

Embolization, interventional, modalities/techniques, procedures, prostate, structures

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Introduction

Prostate artery embolization (PAE) is rapidly becoming accepted as a robust alternative to treat benign prostatic hyperplasia (1). The evidence for employing PAE in other settings is less well established. Hematuria and prostate bleeding can be a debilitating condition. Hematuria of prostatic origin can occur in benign disease and malignant disease. Bleeding can impede patients' quality of life (QOL) necessitating catheterization and medical management, and it can be severe requiring blood transfusions and hospital admissions. The management options can be difficult to undertake. This is more pertinent if the patient also has cancer of the prostate as they may require other hospital treatments to control their cancer. These can include medical therapies, radiotherapy, and surgical options. Moreover, patients may present with late stage prostate cancer that has progressed despite androgen ablation therapy and radiation therapy or have co-morbidities precluding invasive surgical options. Furthermore, external radiation can result in progressive obliterative endarteritis culminating in cellular damage and further bleeding of prostatic origin.

Thus, PAE is an attractive technique in treating these patients.

Here we describe using PAE to control prostatic bleeding in patients with cancer.

Material and Methods

Four patients with diagnosed prostate cancer (two organ-confined and two metastatic prostate cancer) with cystoscopic evidence of prostatic bleeding were treated with PAE. All four patients were either receiving blood transfusions for hematuria or had received blood transfusions at their local hospital. Embolization occurred within one month of the commencement of bleeding in all cases. All patients were followed up for

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18 months. Follow-up was scheduled for 3, 12, and 18 months after the procedure. Patients were followed up with contrast-enhanced multiparametric prostate magnetic resonance imaging (MRI), IPSS, IIEF, and QOL questionnaires.

Patients had pre procedure planning computed tomography angiography (CTA) after administration of intravenous contrast (100 mL Niopam 370, Bracco UK Ltd., Wooburn, Bucks, UK) and sublingual glyceryl trinitrate (GTN; two metered doses of 0.4 mg; Ayrton Saunders Ltd., Runcorn, Cheshire, UK). A slice thickness of 0.625 mm was obtained with reconstructions in the transaxial plane of 1.25 mm and two coronal and sagittal planes of 3 mm. Immediately before the embolization procedure, prophylactic ciprofloxacin 500 mg (orally) and a voltarol Diclofenac suppository 100 mg were administered. After embolization, these medications were continued for seven days. The right common femoral artery was punctured under ultrasound guidance in all cases (4/4) adopting a Seldinger technique and a 5-Fr sheath was inserted (Cordis Corporation, Miami Lakes, FL, USA). A 4-Fr RIM catheter (Cordis Corporation, Miami Lakes, FL, USA) and hydrophilic guide wire (Terumo, Tokyo, Japan) were maneuvered to the left internal iliac artery. Digital subtraction angiography (left anterior oblique 35° and craniocaudal 10°) with 15 mL contrast at 8 mL/s was performed to identify the left prostatic artery. A 2.0 Progreat microcatheter (Terumo, Tokyo, Japan) or Persue microcatheter 2.0 (Merit Medical, Roissy en France, France) and 0.014 Fathom (Boston Scientific, Marlborough, MA, USA) were navigated into the left prostatic artery. A total of 100 µg of GTN intra-arterially was administered. Cone beam CT (CBCT) was then performed to confirm location and to exclude significant collateral supply. CBCT involves injection of 8 mL diluted (50:50) contrast at 0.5 mL/s with a delay of 6 s. Embospheres 300–500 µm (Merit Medical, Roissy en France, France) were injected until stasis in the vessel was achieved. The procedure was then repeated on the right side after cannulation of the right internal iliac with the RIM/SOS catheter. An image intensifier position of right anterior oblique 35° and craniocaudal 10° was used. After embolization, the right common femoral artery was closed with a Perclose Proglide suture (Abbott Vascular, Santa Clara, CA, USA).

Results

The mean age of the patients was 69 years (age range = 64–76 years). All four cases had successful bilateral embolization. The immediate clinical success rate was also 4/4 at three months after PAE. However, there was one case of recurrence of hematuria at

13 months after embolization (25%) in a patient with local prostate cancer. This was reported to our department by the referring oncologist 13 months after PAE. This was re-embolized with success at 14 months after the initial embolization. The prostatic artery on the same side as the cancer had re-canalized to supply the tumor (Fig. 1). The remaining 3/4 (75%) patients did not have any reported return of hematuria at 18 months after embolization.

The prostate gland reduced in size during follow-up from a mean of 90 cc (range = 60–120 cc) to a mean of 60 cc (range = 48–90 cc) at three months after PAE to a mean of 55 cc at 12 and 18 months (range = 45–75 cc). The mean pre-procedure IPSS score improved from a mean score of 16 (range = 8–20) to a mean IPSS of 12 (range = 7–17) at three months and mean of 10 (range = 4–12) at 12 and 18 months. There was no change during follow-up in IIEF score. The QOL improved on the EQ-5D-5L (Visual Analogue Score/100) from a mean of 50 before PAE to a mean of 85 after PAE at 12 and 18 months. There were no PAE-related side effects.

Discussion

Prostate cancer is the most common cancer affecting men in the Western world. Prostate cancer can be found in approximately 6% of patients presenting with hematuria. Persistent hematuria despite conventional therapy can be very difficult to treat, especially in the context of locally advanced prostatic cancer. Often these patients are older, have radiation cystitis or bladder invasion, and have generalized comorbidities making them unsuitable for more invasive surgical options.

Initial treatment options might involve repeat hospitalization for bladder irrigation and multiple blood transfusions, which have significant risks and cost implications. Further management options include: external-beam radiotherapy used to decrease hematuria from prostate cancer, with a lasting effect of approximately two years after treatment; however, repeat hemorrhage can be a problem in the presence of radiation cystitis. Furthermore, refractory hematuria with radiation cystitis is often associated with generalized telangiectatic dilatation of mucosal vessels, which can make management even more complex. Tranexamic acid can also be used to treat hematuria secondary to BPH. However, patients with advanced prostate cancer that has progressed despite androgen therapy and/or radiation therapy are less likely to respond to these options in cases of recurrence of hematuria. For patients failing the first line of conservative management, transurethral resection of the prostate (TURP), focal cryoablative therapy, and high-intensity focused

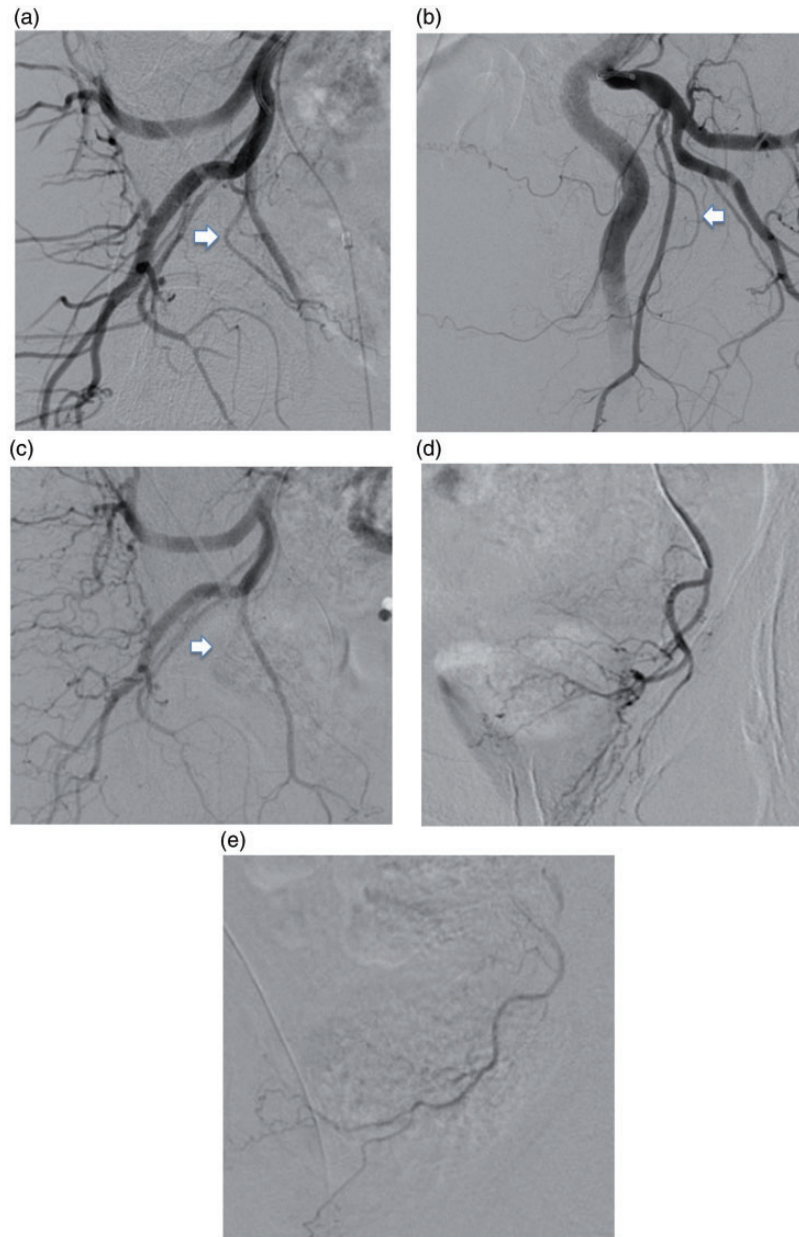


Fig. 1. (a) Initial pelvic catheter-based angiogram demonstrating the right prostate artery (arrowed); (b) initial pelvic catheter-based angiogram demonstrating the left prostate artery (arrowed); (c) 13 months after initial PAE following complaints of hematuria, the repeat catheter angiogram demonstrated an occluded right prostate artery (arrowed); (d) the first PAE demonstrating the left prostate artery before embolization; and (e) the recanalized left prostate artery after 13 months. The locally invasive tumor was a left-sided lesion (see Fig. 2).

ultrasound (HIFU) can treat locally advanced disease and alleviate obstructive symptoms if these are also a problem.

PAE has been shown to be successful in treating lower urinary symptoms and BPH (1), hematuria from BPH (2), acute urinary retention from BPH (3), and hematospermia (4). Here we have shown it can also be very helpful in treating prostatic origin bleeding in the context of prostatic cancer. Moreover, it can be

performed in advanced prostate cancer, in patients not suitable for radiotherapy or surgery, as a day case patient with minimal complications. The appearance of the cancer after PAE (Fig. 2) also appears changed and the potential for therapeutic advances in treating prostate cancer with embolotherapy are doubtlessly underway.

The only case of recurrence in this small series was in a patient with locally invasive prostate cancer in which

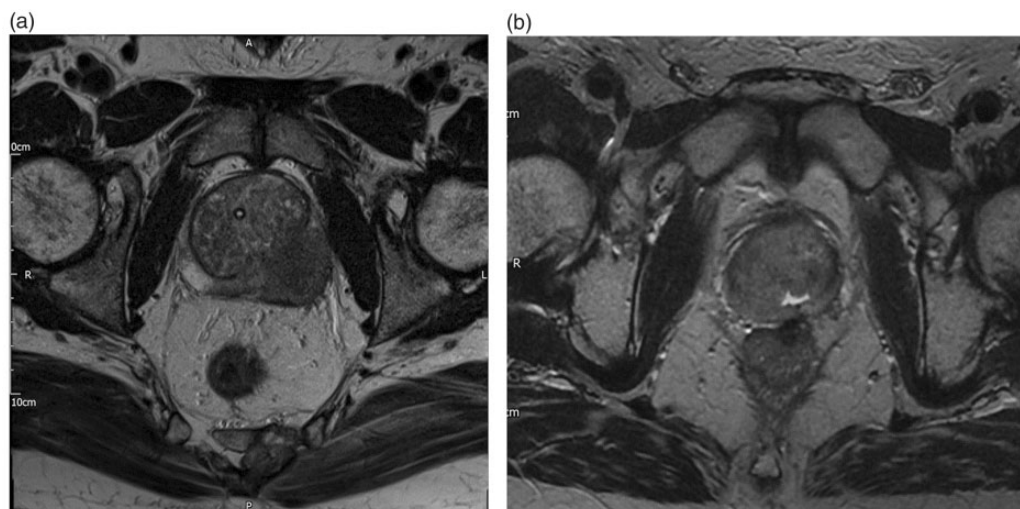


Fig. 2. T2-weighted MRI sequences demonstrating (a) the tumor on the left side posteriorly within the gland and (b) the appearance 12 months after PAE.

there was recanalization of the left prostatic artery 13 months after PAE (Fig. 1). This was successfully embolized with good clinical success. Angiogenic factors released by the cancer likely led to the recanalization of the ipsilateral prostate artery. Prostatic embolization in the context of malignant prostate disease may therefore require repeat procedures to fully control bleeding. Indeed, others have recently reported a 67% success rate in controlling bleeding in the context of prostate cancer with a 2/9 (22%) rate of recurrence at three months, which was similar to our finding of a 1/4 (25%) recurrence rate (5). In this series, however, four patients died during follow-up (4/9, 44%) and all prostatic angiograms demonstrated neovascularity.

In the context of prostatic bleeding from BPH, the success of embolization has been shown to be higher than in patients with prostatic cancer (100% vs. 75%, respectively) (2). This is perhaps not surprising; it is also not surprising that in cases of cancer there may need to be additional episodes of embolization over time to control the bleeding. Despite this, the quite debilitating condition of prostatic origin bleeding in BPH and prostate cancer has been relatively poorly researched and there remain few successful treatment modalities. The maintenance of sexual function and lack of incontinence is especially important for some men. There are also improvements in QOL and sexual function by discontinuing the medication currently used to control prostatic symptoms. Current alternatives to medical therapies involved surgery and general

anesthetic which all come with complications and specific side effects. Here all cases were performed as inpatients as the patients were either transferred for the procedure from surrounding hospitals or were inpatients receiving blood transfusions. However, PAE is usually performed as a day-case procedure with a 4-h stay and regular nurse led monitoring after the case which has financial implications for an ever-stretched NHS.

This series has its limitations. It is a very small series; therefore, statistical analysis has not been attempted and no comparison to other treatments has been made directly.

In conclusion, PAE has shown promise in controlling hematuria, which is a notoriously difficult condition for urologists to treat. Controlling hematuria in patients with inoperable cancer allows an improved QOL but likely requires repeat procedures. Further studies on PAE and prostatic cancer are warranted.

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