Prostatic Artery Embolization as a Treatment for Benign Prostatic Hyperplasia

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Benign prostatic hyperplasia (BPH) is a common problem affecting elderly males, causing symptoms of lower urinary tract obstruction. The medical and surgical treatment modalities have their complications and limitations. Recently, prostatic artery embolization (PAE) was proven to be a safe, effective treatment modality for BPH.

We report a case of a 55-year-old male with severe urinary obstructive symptoms and prostatic volume of 128 gm on magnetic resonance imaging. The patient underwent successful bilateral prostatic artery embolization without any short-term minor or major complications after ten months follow-up.

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Benign prostatic hyperplasia (BPH) is a common problem affecting males in their sixth and seventh decade. It is the main cause of obstructive lower urinary tract symptoms (LUTS) in aging males[1]. LUTS include hesitancy, frequency, urgency, sense of incomplete voiding and weak urinary stream. Moderate LUTS are managed medically with alpha blockers and 5–alpha reductase inhibitors. Those who are intolerant to or failed medical therapies are candidates for surgical management. Currently, transurethral resection of the prostate (TURB) is the gold standard for management of BPH[2]. However, TURB is not free of limitations and complications[3]. Recent studies have shown that prostatic artery embolization is an effective and safe alternative treatment for BPH[4-12].

To our knowledge, this is the first case of successful PAE to be reported from Bahrain.

The aim of this report is to present the effectiveness of prostatic artery embolization as a new treatment modality for benign prostate hyperplasia.

THE CASE

A fifty-five-year-old male with a history of type 2 diabetes mellitus presented with obstructive LUTS. The patient was refractory to medical treatment of alpha blockers and 5–alpha reductase inhibitors for six years. The patient was not a candidate for surgery due to large prostate size as seen on MRI.

Pelvis MRI, prostate specific antigen (PSA), urodynamic study, urinalysis and culture were performed along with International Prostate Symptom Score (IPSS) questionnaire, Quality of Life due to urinary symptoms questionnaire (QoL) for pre-procedural assessment and follow-up were performed. PSA was 2.3 ng/ml. The urodynamic study revealed normal bladder contractions without evidence of poor compliance, detrusor overactivity, high-pressure bladder or overactive bladder on filling and with additional maneuvers. Post-void residual volume was 300 ml, and peak flow rate (Qmax) was 16 mls. MRI showed enlarged prostate of 128 gm with significant invagination into urinary bladder base, see figure 1 (A and B). The patient was categorized as having severe symptoms based on his IPSS score of 25 points. He classified himself as 'unhappy' on QoL questionnaire.

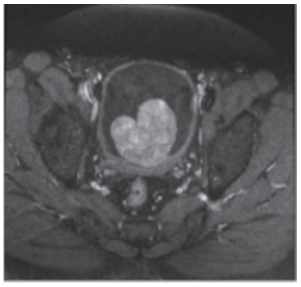

Figure 1 (A)

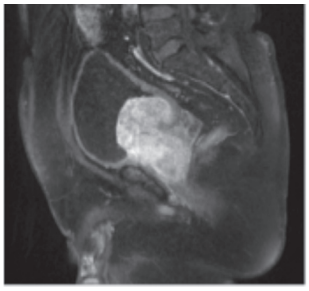

Figure 1 (B)

Figure 1 (A and B): Axial and Sagittal Planes of T1 Contrast Enhanced Fat Saturated Images of the Pelvis. Pre-Procedure MRI Showed Enlarged Prostate of 128 Gm with Significant Invagination into Urinary Bladder Base, Normal High Peripheral Zone Signal Intensity with No Focal Hypodensity, and Heterogeneous Signal Intensity of the Central Zone

The patient was given ciprofloxacin, 500 mg twice daily 2 days before the procedure and continued for seven days following PAE. In addition, Omeprazole 20 mg once daily and Naproxen 1,000 mg, twice daily were prescribed. Urinary 14 F Folly's catheter was inserted; the balloon was inflated with 6 ml saline and 4 ml contrast mixture on the table.

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The catheter was removed the next postoperative day, and the patient was able to void directly. PSA twenty-four hours after the procedure measured 23.5 ng/ml. He was discharged on the third day of admission.

PROCEDURE

Under local anesthesia, unilateral puncture approach through the right femoral artery was used. The left internal iliac artery and its anterior division were catheterized using 5-F RUC. Digital subtraction angiography (DSA) was obtained in 35° and 45° with 10° craniocaudal angulations in the right oblique. We used bolus injection of contrast using Medrad Mark 7 Arterion Injection System by Bayer to visualize the prostatic arteries, a maximum of 10ml.

The prostatic vessels were selectively catheterized with a coaxial microcatheter using micro-wire. Another angiogram was performed to confirm the position of the catheter in the ostium of the prostatic artery followed by injection of 200µ of nitroglycerine. The microcatheter was then advanced distally into the prostatic artery before embolization, and an angiogram was obtained. After confirming the position of the catheter in the ostium of the prostatic artery, we placed the microcatheter distally in the artery and embolization was performed, see figures 2 and 3.

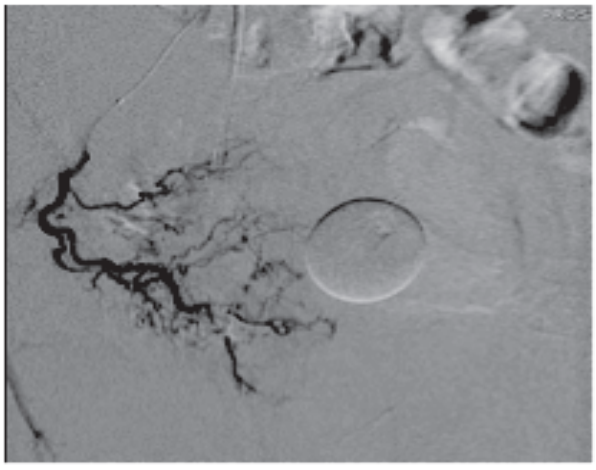

Figure 2: Selective Angiogram of Right Internal Iliac Artery Showing the Common Trunk of Superior Vesical and Prostatic Artery

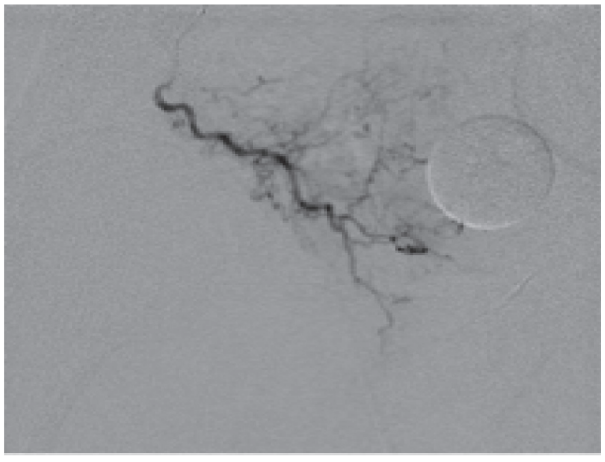

Figure 3: Super Selective Angiogram of Right Prostatic Artery

One ml of the embolizing material was injected followed by washing the catheter with one ml saline, then three ml saline. Embolization was performed using diluted tri-acryl gelatin microspheres 300-500 µm under fluoroscopy; it continued until complete stasis of flow at prostatic artery was achieved. The microcatheter was advanced as far as possible for distal embolization. After completion of the embolization of the left prostatic arteries, the microcatheter was removed, and the Waltman loop was formed on the RCU; the right prostatic arteries were cannulated and embolized in the same manner. Post-embolization pelvic angiogram was performed confirming proper embolization without acute complication; the sheath was removed and hemostasis was secured by manual compression.

One month postoperatively, the patient had marked symptomatic improvement indicated by the drop of IPSS score to 9 (moderate symptoms) and he chose the category of 'mixed satisfaction/ (unsatisfied/dissatisfaction)' on QoL questionnaire. In addition, elevated post-op PSA dropped to baseline.

Three months postoperatively, MRI revealed appreciable prostatic volume (PV) reduction to 76 gm which represents about 40%. Total PSA dropped to 0.34 g/ml which is significantly lower than baseline. Post-void residual volume on flowmetry test dropped to 110 ml, and Qmax increased to 19 mls. IPSS score remained 9 points. 'Mostly satisfied' was selected on QoL questionnaire.

Ten months postoperatively, prostatic volume decreased to 70 gm. Post-void residual volume showed marked improvement to almost normal level of 20 ml, while Qmax was unchanged. IPSS score and QoL category remained the same. PSA was also maintained low 0.42 ng/ml, see figure 4 (A and B).

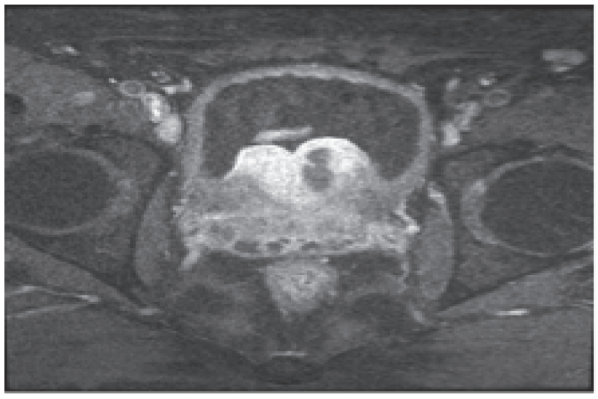

Figure 4 (A)

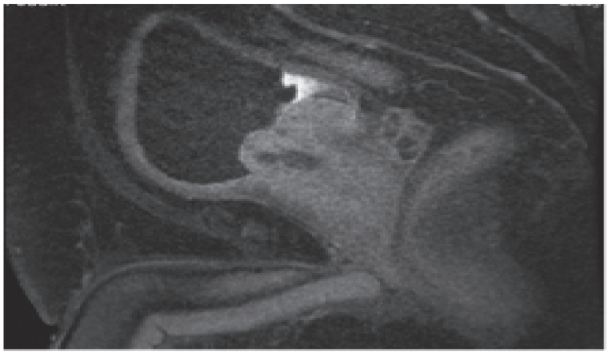

Figure 4 (B)

Figure 4 (A and B): Ten Months Postoperatively MRI, Axial and Sagittal Planes of T1 Contrast Enhanced Fat Saturated Images of the Pelvis Revealed Prostate Volume of 70 Gram

DISCUSSION

TURB is the standard surgical treatment. However, it is limited to treating prostate volumes less than 80 gm due to the high incidence of intra-operative and postoperative complications, which include bleeding, sexual dysfunction, incontinence and dilutional hyponatremia[3]. Open prostatectomy is used for prostate volumes more than 80 gm to 100 gm, but it is an invasive procedure associated with high morbidity rate, considerable blood loss and prolonged recovery time[13]. The role of minimally invasive treatment including interstitial laser ablation, transurethral microwave treatment and transurethral needle ablation is still controversial[2]. PAE is a technically demanding procedure which requires good anatomical knowledge of the male pelvis for identification of the prostatic artery (PA). The prostate has dual blood supply which could arise from one side or two sides and are usually asymmetrical[14]. The superior vesical artery was the origin of the prostate artery in our case. Other reported origins include internal pudendal artery, anterior gluteal-pudendal trunk, obturator artery and prostato-rectal trunk[4-6,14]. Non-targeted embolization (bladder, rectum and penis) is a source concern during performing PAE due to the anastomosis between the prostatic artery and the surrounding arteries. Therefore, precise identification of points of anastomosis is of paramount importance. We blocked a penile branch with a coil to avoid misdirected embolization.

A study compared the clinical results between unilateral and bilateral PAE showed 75% clinical improvement with the bilateral compared to 50% for the unilateral approach[6]. Bilateral prostatic arterial embolization was consistently associated with better clinical outcomes than the unilateral[5-7]. The anastomosis between the prostatic arteries from both pelvic sides may account for this finding. Theoretically, small sized embolizing material is more likely to penetrate tissues distally producing greater ischemic effect[8].

Bilhim et al compared the use of different polyvinyl alcohol (PVA) particle sizes. It was found that PSA level and PV showed greater reductions after PAE with 100µm PVA particles, but the clinical outcome was better with 200µm particles[9]. The appropriate size for each embolization material is yet to be determined.

DeMeritt et al observed improvement in BPH after prostate artery embolization performed to control hemorrhage in a complicated prostate biopsy case[10]. Carnevale et al in 2010 reported the first two cases treated by embolization[11].

Our patient had symptomatic improvement within one month, which is consistent with other studies[4-12]. Pisco et al found that IPSS decreased 10 points, prostate volume decreased 20% and IIEF score increased 0.5 points at one month postoperatively in a study of 89 patients[5]. Wang et al found that the pre-PAE IPSS score significantly decreased compared to post-PAE (26 to 9) and the PV decreased significantly (118 gm to 69 gm, the mean was 41.5%) after 24 months[6].

No complications were encountered in our case. Acute urinary retention is an important complication due to the edema of the periurethral prostatic tissue after embolization. Our protocol is to keep the catheter for 24 hours postoperatively to allow the inflammatory swelling to subside. Urinary retention requires prolonged catheterization and hospital stay. Wang et al, Pisco et al and Bagla et al reported retention rates of 28.4%, 2% and 0% respectively[5-7]. Other minor reported complications include pain, transient hematuria, transient hypospermia, urinary tract infections and rectal bleeding[5,6,10]. Reported major complications include bladder wall ischemia and inferior vesical artery dissection[10].

CONCLUSION

PAE is a promising treatment for patients who are not candidates for surgical treatment, with high prostate volume and those refusing surgery. Careful embolization of bilateral prostatic arteries is associated with good clinical outcomes. PAE would soon prove effective primary alternative to the available surgical treatment.

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REFERENCES

1. Emberton M, Andriole GL, de la Rosette J, et al. Benign Prostatic Hyperplasia: A Progressive Disease of Aging Men. Urology 2003; 61(2):267-73.
2. Oelke M, Bachmann A, Descazeaud A, et al. EAU Guidelines on the Treatment and Follow-Up of Non-Neurogenic Male Lower Urinary Tract Symptoms Including Benign Prostatic Obstruction. Eur Urol 2013; 64(1):118-40.
3. Rassweiler J, Teber D, Kuntz R, et al. Complications of Transurethral Resection of the Prostate (TURP)Incidence, Management, and Prevention. Eur Urol 2006; 50(5):969-79.
4. Bilhim T, Pisco J, Tinto HR, et al. Unilateral Versus Bilateral Prostatic Arterial Embolization for Lower Urinary Tract Symptoms in Patients with Prostate Enlargement. Cardiovasc Intervent Radiol 2013; 36(2):403-11.
5. Pisco J, Campos Pinheiro L, Bilhim T, et al. Prostatic Arterial Embolization for Benign Prostatic Hyperplasia: Short-and Intermediate-Term Results. Radiology 2013; 266(2):668-77.
6. Wang MQ, Guo LP, Zhang GD, et al. Prostatic Arterial Embolization for the Treatment of Lower Urinary Tract Symptoms Due to Large (> 80 Ml) Benign Prostatic

Hyperplasia: Results of Midterm Follow-Up from Chinese Population. BMC Urol 2015; 15:33.
7. Bagla S, Martin CP, van Breda A, et al. Early Results from a United States Trial of Prostatic Artery Embolization in the Treatment of Benign Prostatic Hyperplasia. J Vasc Interv Radiol 2014; 25(1):47-52.
8. Jeon GS, Won JH, Lee BM, et al. The Effect of Transarterial Prostate Embolization in Hormone-Induced Benign Prostatic Hyperplasia in Dogs: A Pilot Study. J Vasc Interv Radiol 2009; 20(3):384-90.
9. Bilhim T, Pisco J, Pinheiro LC, et al. Does Polyvinyl Alcohol Particle Size Change the Outcome of Prostatic Arterial Embolization for Benign Prostatic Hyperplasia? Results from a Single-Center Randomized Prospective Study. J Vasc Interv Radiol 2013; 24(11):1595-602.e1.
10. DeMeritt JS, Elmasri FF, Esposito MP, et al. Relief of Benign Prostatic Hyperplasia-Related Bladder Outlet Obstruction after Transarterial Polyvinyl Alcohol Prostate Embolization. J Vasc Interv Radiol 2000; 11(6):767-70.
11. Carnevale FC, Antunes AA, da Motta Leal Filho JM, et al. Prostatic Artery Embolization as A Primary Treatment for Benign Prostatic Hyperplasia: Preliminary Results in Two Patients. Cardiovasc Intervent Radiol 2010; 33(2):355-61.
12. Carnevale FC, da Motta-Leal-Filho JM, Antunes AA, et al. Quality of Life and Clinical Symptom Improvement Support Prostatic Artery Embolization for Patients with Acute Urinary Retention Caused by Benign Prostatic Hyperplasia. J Vasc Interv Radiol 2013; 24(4):535-42.
13. Gratzke C, Schlenker B, Seitz M, et al. Complications and Early Postoperative Outcome After Open Prostatectomy in Patients with Benign Prostatic Enlargement: Results of a Prospective Multicenter Study. J Urol 2007; 177(4):1419-22.
14. Bilhim T, Tinto HR, Fernandes L, et al. Radiological Anatomy of Prostatic Arteries. Tech Vasc Interv Radiol 2012; 15(4):276-85.