Workshop
Embolization IX: Prostate Embolization Case Show

Monday, March 2, 2015
1:00 PM – 2:30 PM
Room: 316

1:00 PM Abstract No. 3

Medium and long term outcome of prostatic arteries embolization, for patients with benign prostatic hyperplasia: results in 460 cases
Interventional Radiology, Saint Louis Hospital, Lisboa, Portugal

Purpose: To evaluate the medium and long term clinical outcome of prostatic arteries embolization (PAE) in 460 patients with benign prostatic hyperplasia (BPH).

Materials and Methods: PAE was performed in 460 patients with BPH and moderate to severe lower urinary tract symptoms (LUTS) refractory to medical therapy for at least 6 months between March 2009 and July 2013. PAE was performed with non-spherical polyvinyl alcohol (PVA) particles in 372 patients, 300- to 500-μm tris-acryl microspheres (Embosphere) in 40 patients, 300- to 500-μm spherical PVA particles (Bead Block) in 20 patients and 400-μm Polyzene-coated microspheres (Embozene) in 18 patients. PAE outcomes were evaluated based on International Prostate Symptom Score (IPSS), quality of life (Qol) and International Index Erectile Function (IIEF) questionnaires, prostate volume (PV), prostate specific antigen (PSA), and peak urinary flow rate (Qmax) changes from baseline. Clinical success was considered when there was reduction of the total IPSS score at least 25% and ≥ 15. Qol reduction of at least one point or ≤ 3 and no need of medical therapy or any other treatment.

Results: There were 8 (1.7%) technical failures and 29 patients were lost to follow up. All 423 controlled patients were followed up at 1, 3, and 6 months (short term) and every 6 months up to 3 years (mid term), 118 over 3 years (long term). From the last group, 27 patients have been followed over 4 years. A statistically significant improvement of all evaluated parameters was observed, over time. The cumulative rates were 81.3% at short term, 72.7% at medium term and 70.1% at long term. There were 2 major complications: a small bladder wall ischemia treated by surgery and a lasting pelvic pain for 3 months. Both patients remained without sequelae. There was not any case of sexual dysfunction.

Conclusion: PAE is a safe, well tolerated, and efficient outpatient procedure, for patients with BPH and moderate to severe LUTS, good mid-term and long term results and no sexual dysfunction.

Categorical Course
Research and New Horizons in Oncology

Monday, March 2, 2015
8:00 AM – 9:00 AM
Room: 402

8:00 AM Abstract No. 4

Selective hypoxia-activated intraarterial therapy in a rabbit liver tumor model
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Purpose: Tumor hypoxia has been shown to correlate with treatment failure and progression to a more aggressive cancer phenotype. Hypoxia resulting from embolization also contributes to chemoresistance after TACE. TH302, a nontoxic prodrug, has been shown to be selectively activated by hypoxia resulting in DNA damage and tumor cell death. The study aim was to evaluate the feasibility, safety and efficacy of hepatic hypoxia-activated intraarterial therapy (HAIAT) in a rabbit model.

Materials and Methods: 28 VX2 tumor-bearing rabbits were assigned to 4 intraarterial therapy (IAT) regimens: 1) saline (control group); 2) TH302; 3) doxorubicin-Lipiodol emulsion followed by embolization with 100-300μm beads (conventional, cTACE); or 4) a combination of TH302 and cTACE (TH302-cTACE). Blood work was performed pre-IAT and 24/48 hours, 7/14 days post-IAT. Antitumor efficacy was assessed quantitatively on CT (24h pre-, 7/14 days post-IAT). Pathologic tumor necrosis was quantified by slide-by-slide segmentation. Hypoxic fraction (HF) and compartment (HC) were determined by immunohistochemistry (IHC) and morphometrics of
Short- to mid-term safety and efficacy of prostatic artery embolization: a systematic review
A. Isaacson, Z. Cizman, C.T. Burke; Radiology, University of North Carolina, Chapel Hill, NC

**Purpose:** To summarize metrics of clinical success and rates of complication after prostatic artery embolization (PAE) for the treatment of benign prostatic hyperplasia (BPH) at 6 month and 12 month follow-up periods using all relevant published data.

**Materials and Methods:** PubMed was searched for publications that included PAE for the treatment of BPH as the subject matter through September 2014. Abstracts, review articles, commentaries and position statements were excluded. Articles that provided original data sets describing the safety and efficacy of PAE for the treatment of BPH written in the English language were included. Because of concern for data being reprinted in multiple papers, only the study with the largest sample size was included from author groups that had more than one study that met the inclusion criteria. Appropriateness for inclusion of each article was determined by two reviewers independently. Data from studies that were included were compiled and summarized using pooled weighted means. Major and minor complications were characterized using the SIR definitions.

**Results:** The search identified 141 articles of which 6 studies with a total of 467 patients were included. PAEs were performed bilaterally 85.7% (400/467) of the time and unilaterally 12.4% (58/467) of the time with nine patients unable to be embolized. The pooled weighted means of the clinical success metrics were as follows: the International Prostate Symptom Score went from 23.9 to 11.6 at 6 months and to 10.8 at 12 months. Quality of Life scoring went from 4.6 (mostly dissatisfied to unhappy) to 2.2 (mostly satisfied) at 6 months and to 2.0 (mostly satisfied) at 12 months. The total prostate volume decreased by 31.7% at 6 months and by 34.3% at 12 months. The peak urine flow velocity went from 8.36 ml/s to 15.73 ml/s at 6 months and to 16.87 ml/s at 12 months. There were a total of 22 minor complications and 1 major complication resulting in a pooled minor complication rate of 4.7% (22/467) and a pooled major complication rate of 0.2% (1/467).

**Conclusion:** PAE is effective in improving lower urinary tract symptoms caused by BPH with a low complication rate across a moderate sized pooled patient population in the short to mid-term.

**Purpose:** Surgical treatment of small or large-volume BPH is associated with high failure rates and complications such as bladder neck strictures and contractures. We present our experience of PAE in varying gland sizes.

**Materials and Methods:** Institutional Review Board approved retrospective study of 78 consecutive PAE patients from January 2011 to July 2014. Patients were evaluated at baseline, 1, 3, and 6 months (m) with American Urological Association (AUA-SI) symptom index including quality of life-related symptoms (QoL), International Index of Erectile Function (IIEF) and prostate imaging (MRI, US or CT at baseline). Analysis was performed for each stratified group (1: < 50cc; 2: 50-80cc; 3: ≥ 80 cc) individually from baseline to 1, 3, and 6m and between groups at each follow-up to assess for differences in outcome.

**Results:** Baseline volumes were: Group 1 (37.5 cc, 25.9-48, n=16), 2 (65.7 cc, 52-79.5, n=26), 3 (139 cc, 80-274, n=36). No significant differences in baseline age, AUA score, QoL or IIEF between groups (mean 65.2 yr, 26.4 AUA, 4.9 Qol, 14 IIEF, N=78). Technical success was achieved in 75/78 (96%), with 2 unilateral embolizations and 1 unsuccessful secondary to bilateral atherosclerotic occlusion. Statistically significant reduction in AUA was achieved in all groups from baseline to 1, 3 and 6m (n=77) (Group 1: Baseline 27.2 to 12.7, 12.0, 11.2 (p<0.006); Group 2: 25.6 to 16.4, 14.8, 14.0 (p<0.007); Group 3: 26.7 to 14.6, 14.1, 16.3 (p<0.001)), as well as statistically significant improvement in QoL. Comparative analysis demonstrated no statistically significant difference in outcomes between groups 1, 2 and 3 at all intervals. No change in IIEF for all groups was noted. Two minor (Society of Interventional Radiology Complications Classification System) complications occurred: groin hematoma and urinary tract infection.

**Conclusion:** PAE appears to offer similar positive clinical benefits to 6 months in patients with varying gland size. Future study aimed at comparing recurrence rates and procedural differences is warranted.

The preliminary outcome of prostatic arteries embolization with bead block for patients with benign prostatic hyperplasia

**Purpose:** To evaluate the preliminary clinical outcome of prostatic arteries embolization (PAE) with Bead Block in patients with benign prostatic hyperplasia (BPH).

**Materials and Methods:** One hundred fifty patients, with BPH and moderate to severe lower urinary tract symptoms (LUTS) refractory to medical therapy for at least 6 months,
underwent PAE with spherical polyvinyl alcohol (PVA) particles - Bead Block 300µm - 500µm, between October 2012 and August 2014. The clinical success was evaluated by clinical improvement of International Prostate Symptoms Score (IPSS), Quality of Life (Qol) and International Index Erectile Function (IIEF) questionnaires and by changes from baseline of Prostate Volume (PV), Prostatic Specific Antigen (PSA), Peak Urinary Flow rate (Qmax) and post-void Residual Volume (PVR) at 1, 3 and every 6 months after PAE.

**Results:** There was not any technical failure. Three patients was lost to follow up, therefore 146 patients were controlled. Mean values: procedure time 80.3; fluoroscopy time 20.5; radiation 3842.1 Gy/cm; IPSS / QoL improvement of 10.4 ± 8.1 / 1.58 ± 1.01 points (32.5% / 20.7%). IIEF improvement 1.3 ± 3.0 (19.5%) points; PV reduction 26.2 ± 31.5 (28.1%); Qmax improvement 4.7 ± 5.4 mL/s (35%); PSA reduction 3.2 ± 4.2 ng/ml (29.1%). There were 14 initial clinical failures (6.5%). There were 22 patients who were followed over 1 year. In this group of patients there were 2 (9.1%) initial clinical failures, thus the short term clinical success was 90.9%. In the same group of 22 controlled patients over 1 year there was 1 clinical failure at 1 year. Therefore, there was a clinical success over 1 year in 19/22 patients (86.4%). Overall in this group of 150 patients as minor complications there were 2 cases of hematuria, 2 cases of hematospermia, 1 case of slight rectal bleeding and 1 case of urinary infection. All these adverse events were self controlled. There were no major complications, no sexual dysfunction.

**Conclusion:** PAE with Bead Block for patients with BPH is an efficient and safe procedure with very good preliminary outcome.

**4:15 PM Abstract No. 301**

Fibroid treatment options: a ten year analysis of utilization and referral patterns

E.J. Keller, H. Chrisman, R. Vogelzang; Northwestern University Feinberg School of Medicine, Chicago, IL

**Purpose:** To evaluate changing patterns of surgical and endovascular treatment of fibroids over a ten year period and to analyze whether values beyond patient care can drive medical decisions related to the use of Uterine Fibroid Embolization (UFE).

**Materials and Methods:** We collected and analyzed the medical records of all patients at our institution between January 2003 and December 2013 (n=7659) with a discharge diagnosis of uterine fibroids who were treated with either surgery (open/laparoscopic myomectomy, open/ laparoscopic hysterectomy) or embolotherapy. This cohort was further sorted by payer into Medicaid, Medicare, private insurance, or self-paid/ uninsured. We then reviewed literature on medical ethics and business ethics to offer an analysis of our results.

**Results:** The percentages of patients treated with UFE, myomectomy, or hysterectomy remained constant over 10 years and evenly divided between the 3 procedures with essentially no growth in UFE (27% in 2003 vs 30% in 2013). Laparoscopic procedural use however increased markedly over the same period (2.5% to 24.7%). The percent of hysterectomy and myomectomy patients on Medicaid remained relatively constant but significantly increased for UFE (0.03% % in 2003; 19% in 2013).

**Conclusion:** Since satisfaction rates for these procedures have been shown to be similar, one may expect uterine-preserving procedures such as laparoscopic myomectomy and UFE to experience similar growth. Despite UFE being a well-established alternative, gynecologists are consciously or unconsciously referring more patients with lower-paying insurance (Medicaid) to interventional radiology during the same time there was 400% growth in the number of laparoscopic myomectomy (1300% increase in overall laparoscopic procedures). Although incentives such as financial gains and self-referral are readily apparent they are rarely discussed in terms of specific examples and solutions. We believe a blend of business and clinical ethics may better encompass the values which motivate medical decisions and allow us to adjust medical education and systems to fit the values we hope to exemplify.
cases, surgery adjunctively to remove the AVM has not been required. Despite previous embolizations with coils, glue, and surgical ligations prior to being referred to our institution, endovascular and direct puncture approaches can successfully manage these lesions.

9:12 AM  Abstract No. 107
Management of chest and shoulder arteriovenous malformations
W.F. Yakes; Vascular Malformation Center, Englewood, CO

Purpose: To determine the efficacy of Endovascular Repair of Shoulder arteriovenous malformations (AVMs).
Materials and Methods: Fifteen patients (10 females, 5 males) presented for repair of shoulder AVMs. Three patients had extension of AVM to the supraclavicular and axillary areas. Two patients had multiple AVMs. Eight patients had previous failed therapies (embo: PVA/coils/gelfoam; surgeries: excisions/bypass). All patients underwent ethanol endovascular AVM repair; seven patients had additional coil embolizations (110 treatments). Patient age range 18-76 years; mean age 47.
Results: Thirteen patients are cured at long-term follow-up (37 months mean follow-up). One patient with bilateral shoulder AVM and multiple other AVMs therapy is on-going. Another patient’s treatment is on-going. Complications include two patients with minor superficial blisters, one patient with transient radial nerve injury with complete recovery and one patient with clot embolus to hand, treated with urokinase w/distal 3rd phalanx removed.
Conclusion: A recent report of shoulder AVM repair in JVIR documented failure of nBCA approach. These authors stated that shoulder AVMs were not possible to treat. This report documents cure of these difficult lesions is possible with ethanol endovascular and direct puncture approaches. Long-term cures are documented in this patient series despite previous publications stating treatments of these lesions are not possible. One patient with a massive left shoulder AVM demonstrates persistent cure at 16 year follow-up.

Scientific Session 12
Arterial Embolization

Monday, March 24, 2014
1:30 PM – 3:00 PM
Room: 16A

1:30 PM  Abstract No. 108
Prostatic arterial embolization, as an alternative to surgery, for patients with benign prostatic hyperplasia refractory to medical therapy: results in 500 cases


Purpose: To evaluate the safety and efficacy of prostatic artery embolization (PAE) in 500 patients with benign prostatic hyperplasia (BPH) and indication to surgery.
Materials and Methods: Five hundred consecutive patients with BPH and moderate to severe lower urinary tract symptoms (LUTS) after failure of medical therapy for at least 6 months and indication to surgery who underwent PAE. The age ranged between 45 and 89 years (mean 69.5 ± 8.3 years) and the prostate volume between 35 to 269cc (mean 92cc ± 56.3cc). Patients were evaluated before and at 1, 3, 6 and every 6 months after the procedure. Nonspherical polyvinyl alcohol (PVA) particles were used. The follow up control ranged from 3 to 52 months (mean 20.1 months). All patients were controlled at short-term at least at 3 months, 319 patients over 1.5 years (mid term) and 48 patients over 3 years (long term). From the last group 12 patients have been followed over 4.5 years.
Results: There were 9 technical failures and 22 patients were lost to follow up. From the 469 controlled patients there were 107 (22.8%) clinical failures, 60 (12.8%) at short term, 34 (7.3%) at mid-term and 13 (27.1%) at long term. Cumulative rates of clinical success at short term were at 3 months 87.2%, at medium term at 18 months 80.2%, and at long term at 36 months 72.3%. As major complication there was a bladder wall ischemia treated by simple surgery and an uncomfortable perineal pain lasting for 3 months. Both patients remained without sequela. There was not any case of sexual dysfunction or urinary incontinence.
Conclusion: PAE is a safe, well tolerated, and efficient outpatient procedure, an alternative to surgery, for patients with BPH refractory to medical therapy, with good short, mid-term and long term results, without sexual dysfunction or urinary incontinence.

1:38 PM  Abstract No. 109
FEATURED ABSTRACT
Feasibility and effects of transcatheter arterial embolization for frozen shoulder refractory to non-surgical management
Y. Okuno; Radiology, Orthopedicsurgery, Edogawa Hospital, Tokyo, Japan

Purpose: Frozen shoulder is a condition of uncertain etiology that is characterized by painful restriction of shoulder motion. Despite the large number of patients affected by this condition, the source of pain in frozen shoulder has not been definitively determined. Neovessels and accompanying nerves are possible sources of pain. Previous work demonstrated that transcatheter arterial embolization for patients with painful tendinopathy resulted in excellent pain relief (1). We hypothesized that abnormal neovessels play an important role in frozen shoulder and that transcatheter arterial embolization can relieve the pain associated with this condition.
Materials and Methods: Transcatheter arterial embolization using imipenem/cilastatin sodium as an embolic agent proceeded in eight patients (male, n = 2; mean age 50.3 y)