Interventional Series: Embolotherapy

Series Courses

**VSIR21**

**Interventional Series: Embolotherapy**

**Series Courses**

<table>
<thead>
<tr>
<th>IR</th>
<th>VA</th>
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</thead>
</table>

AMA PRA Category 1 Credits ™: 3.25

ARRT Category A+ Credits: 3.75

Mon, Dec 1 8:30 AM - 12:00 PM Location: S406B

Participants

**Moderator**

Jafar Golzarian MD : Nothing to Disclose

**LEARNING OBJECTIVES**

1) Describe indications and technical aspects of embolization for symptomatic prostatic hypertrophy.
2) Explain the rationale and treatment of low flow malformations.
3) Describe the preparation of cyanoacrylates for embolization.
4) Describe two complications related to embolization.
5) List two important studies on embolotherapy.

**Sub-Events**

**VSIR21-01**

**Using Glue—How I Do It**

Yasuaki Arai (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Learn features of glue as embolic material, 2) Learn clinical situations that glue is preferable to be chosen, 3) Understand how to use glue, and 4) Be aware of pitfalls using glue in embolization.

**VSIR21-02**

**A Mixture of N-Butyl Cyanoacrylate, Lipiodol and Ethanol under Flow Control Using an Arteriovenous Malformation (AVM) Model, Is It Useful for Embolization**


**PURPOSE**

Recently, a mixture of n-butyl cyanoacrylate, Lipiodol and ethanol at ration of 1:1:3 (NLE 113) as new embolization material was introduced. The character of this embolization material is changed because n-butyl cyanoacrylate (NBCA) polymerization can be accelerated by addition of ethanol to NBCA and Lipiodol. Controllability of embolization for AVMs remains controversial. We evaluated usability of NLE in vitro model for AVMs.

**METHOD AND MATERIALS**

An original simulation circuit component including an artificial nidus was constructed to generate pulsatile flow (Figure 1). This system was filled with heparinized swine blood. NBCA and Lipiodol mixtures at ratios of 1:1, 1:3, 1:5 and 1:10, and NLE 113 with flow control or without flow control was injected to achieve complete embolization. Results of embolization were classified as complete filled, proximal embolization, pass through or sift to distal after balloon deflation, and each session was compared (Figure 2).

**RESULTS**

NLE 113 with flow control was complete filled in 6/6 cases (Figure 3). NBCA and Lipiodol mixture at ration of 1:1 with flow control was complete filled in 3/6 cases. NBCA and Lipiodol mixture at ration of 1:5 without flow control was complete filled in 3/6 cases. Other sessions did not achieve complete filled embolization.

**CONCLUSION**

Optimal embolization control of the AVM model was best using NLE 113 with flow control.

**CLINICAL RELEVANCE/APPLICATION**

In liquid embolic materials have difficult controllability, NLE 113 have excellent controllability under flow control. NLE 113 can be acceptable as embolic material for arteriovenous malformation.

**VSIR21-03**

**Embolization Treatment for Intractable Bladder Bleeding—Clinical Efficacy and Safety**

Maria Tsitskari MD (Presenter): Nothing to Disclose, Lazaros Reppas BS : Nothing to Disclose, Dimitrios Filipiadis MD, PhD : Nothing to Disclose, Kostantinos Palialexis : Nothing to Disclose, Chrisostomos Kostantos : Nothing to Disclose, Elias Brountzos MD : Nothing to Disclose

**PURPOSE**

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We evaluated the outcomes of embolization treatment for intractable bladder bleeding after failed conservative treatment.

**METHOD AND MATERIALS**

We retrospectively studied the records of 1 woman and 10 men with a mean age of 76 years referred between February 2008 and March 2014 for bladder embolization after failed conventional therapy. The underlying pathologies included bladder cancer in 9 patients, prostate cancer in 1 and metastatic osteosarcoma of the urinary bladder in 1 case. Embolization was feasible in 10 out of 11 patients. It consisted of superselective embolization of the superior or inferior vesical arteries with particles or glue in 10 patients, and selective proximal gelfoam sponge particle occlusion of the anterior division of the internal iliac artery in 1 patient. Clinical bleeding control and post-embolization angiography findings were used to assess outcomes.

**RESULTS**

The technical success rate was 90% (10 of 11 cases). In the one patient embolization was not possible, due to severe tortuosity of the iliac arteries. Bleeding was controlled after the first procedure in 8 patients, and after a repeat procedure in 2. Non target embolization of the buttocks and the anterior abdominal wall was encountered in 1 patient. Late bleeding recurrence was reported in 2 of the 10 survivors. Mean post-embolization follow up was 30 months. During follow up 4 patients died, due to underlying conditions.

**CONCLUSION**

Selective vesical artery embolization is effective for the control of refractory, life threatening bladder bleeding.

**CLINICAL RELEVANCE/APPLICATION**

Selective angiographic embolization is safe and effective to control refractory, life threatening bladder bleeding. This procedure should be considered the treatment of choice since it usually obviates the need for emergency surgery in these severely ill patients.

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**Endovascular Treatment for Aldosterone Producing Adrenal Adenoma: A Long Term Follow-up Study**

**PURPOSE**

To investigate the efficacy of endovascular treatment for aldosterone producing adrenal adenoma (APAA) including the long term results.

**METHOD AND MATERIALS**

We retrospectively analyzed treatment results of 42 APAAs in 42 consecutive patients (12 male and 30 females; mean age, 47 years) that were treated by endovascular treatment (arterial or venous embolization) with absolute ethanol (AE) between August 1992 and June 2013. 25 adenomas were located in the right adrenal gland while 17 were in the left. The mean size of the adenomas was 14mm (range, 8-30 mm) in diameter. Before embolization, we mapped all feeding arteries of the adenoma. Then we determine the volume of AE to use for embolization by adrenal arteriograms or CT images. Prophylactic microcoil embolization of distal feeding arteries was performed in order to avoid unintentional AE injection. In venous embolization, a balloon catheter was used to avoid the reflux of AE. In order to prevent pain and vascular spasm during arterial embolization, we injected lidocaine into the feeding arteries. In addition, we used anti-alpha blocker and calcium blocker to prevent hypertension and hypercatecholaminemia. We evaluated the technical success rate which was defined as normal range of both serum aldosterone concentration and renin activity within 1 month after treatment and acute complications. Moreover, we evaluated rates of improvement in hypertension and normalization of serum aldosterone concentration and renin activity in the follow-up period. The mean follow-up period was 1309 days.

**RESULTS**

The number of treatment session was 56 and average dosage of AE was 1.8 mL. (range, 0.2-7 mL). Technical success rate was 88% (37/42) and five patients were subsequently treated by operation. Acute complication comprised of pain (64%), unstable blood pressure (23%) and pleural effusion (11%) without major complications. Rates of improvement in hypertension, normalization of serum aldosterone concentration and renin activity in the follow-up period were 72% (27/37), 97% (36/37), and 97% (36/37), respectively.

**CONCLUSION**

Endovascular treatment is less invasive and efficient therapeutic option for APAAs.

**CLINICAL RELEVANCE/APPLICATION**

Endovascular embolization of APAA is a promising treatment option.

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**Embolotherapy—My Best Tips and Tricks**

**LEARNING OBJECTIVES**

View learning objectives under main course title.
Embolization Disasters—The 5 Worst Cases I’ve Ever Seen
Michael David Darcy MD (Presenter): Advisory Board Member, AngioDynamics, Inc Speakers Bureau, W. L. Gore & Associates, Inc Speakers Bureau, Argon Medical Devices, Inc Consultant, Boston Scientific Corporation

LEARNING OBJECTIVES
1) Learn of some potential complications that can occur with interventional procedures. 2) Be aware of how to recognize these complications. 3) Understand strategies for managing complications.

ABSTRACT
5 major complications for various vascular and non-vascular cases will be presented to highlight the range of major disasters that an interventional radiologist might encounter. Discussion will cover potential causes, recognition, management of, and future prevention of similar complications.

Low Flow Malformations—How I Treat Them
William S. Rilling MD (Presenter): Research support, BTG International Ltd Research support, Sirtex Medical Ltd Research Support, B. Braun Melsungen AG Advisory Board, Angiodynamics, Inc Consultant, Cook Group Incorporated Consultant, B. Braun Melsungen AG Consultant, Guerbet SA Consultant, Vascular Solutions, Inc

LEARNING OBJECTIVES
View learning objectives under main course title.

Embolization of Intraosseous AVM
Wayne Francis Yakes MD (Presenter): Nothing to Disclose

PURPOSE
AVM of bone is a difficult management problem. Because standard embolic agents are rarely curative and only palliative, ethanol and ethanol with coils are evaluated to curatively treat bone AVMs as an alternative management strategy.

METHOD AND MATERIALS
Twenty-nine patients (17 f, 12 m); age range 6 - 48 years, mean: 19 years) presented with bone AVMs involving the upper extremity, lower extremity, pelvis, spine, and head and neck areas. All patients underwent MR, arteriography, and endovascular repair of their bone AVMs. Ethanol alone, ethanol with coils, and coils were the sole embolic agents utilized.

RESULTS
Twenty-eight of twenty-nine patients are cured of their intraosseous AVM at follow-up (range 8 months - 168 months; mean: 54 months). One patient's therapy is on-going (mandible/maxilla/face AVM). Complications include one coil migration to the lung (retrieved without sequelae), three patients with skin injury in the lower extremity (healed uneventfully), and one patient with chronic weakness left quadriceps femoris muscle group, which was present prior to treatment and not improved with treatment of her pelvic/iliac wing AVM. One patient had a right maxilla infection/sinusitis treated by antibiotics.

CONCLUSION
Bone AVMs in the literature are rarely cured, save by amputation. Ethanol or ethanol with coils has proven to be consistent in ablating bone AVMs and are durable at long-term follow-up, in essence curing the AVM. When bone AVM is present in an extremity, multiple AVMs in that extremity can occur, an unexpected finding. Acceptable low complication rates are noted in this series.

CLINICAL RELEVANCE/APPLICATION
AVM of bone is a difficult management problem. Because standard embolic agents (glue, PVA, Onyx, Embospheres, etc.) are rarely curative and only palliative, ethanol and ethanol with coils are evaluated to curatively treat bone AVMs as an alternative management strategy.

Acquired Non–Traumatic Peripheral Arteriovenous Fistula
Wayne Francis Yakes MD (Presenter): Nothing to Disclose

PURPOSE
To determine the etiology of acquired non-traumatic arteriovenous vascular fistula (AVF), evaluate their venous physiology and determine management strategies. Non-traumatic acquired AVF of the peripheral vascular system and its management has not been described or published in the world’s literature.

METHOD AND MATERIALS
Ten patients (2 males, 8 female; age range 47 - 84 yrs; mean age: 66 years) presented with acquired peripheral arteriovenous fistulation of veins causing swelling and venous hypertensive changes in the lower extremities and left upper extremity. All presented with enlargement and swelling of their left lower extremity. Additionally, one patient had enlargement of her left buttock; one patient had bilateral lower extremity severe swelling with venous stasis changes in the legs, one patient had gross edema of the left upper extremity, two patients had non-healing venous stasis ulcers complicated with cellulitis; and one patient had a left femoral fracture that was surgically treated previously and due to a spine injury, was paraplegic. All patients had great difficulty with ambulating. No patient had a history of blunt or penetrating trauma. All patients underwent ultrasound, arteriography and lower extremity venography in their work-up.
RESULTS
All patients were discovered to have acquired (non-congenital) extensive AVF in the pelvic, groin, leg, thigh and left shoulder; four patients had major venous chronic occlusions. After treating their AVF endovascularly, all patients had resolution of their swelling despite the venous occlusions. The non-healing ulcers totally healed.

CLINICAL RELEVANCE/APPLICATION
Cure of these difficult lesions is possible with endovascular approaches utilizing coils and by eliminating the fistulas and the venous hypertension; stenting of the disease vein segments also proved successful in eliminating the numerous AVF in the vein wall.

VSIR21-10
Treatment of Peripheral Vascular Malformation (PVM): A New Concept of Low Pressure Sclerotherapy (LPS)
Khalil Riadh Hamza MD : Nothing to Disclose , Khawla Boughanmi (Presenter): Nothing to Disclose

PURPOSE
Intra lesion injection of sclerosant agent and peripheral compression of venous out flow are responsible for elevation of intra lesion's pressure of the sclerosis agent. We developed the concept of (LPS) by placing multiple needles in the (PVM).These needles work as multiple valves that allow the free circulation of the sclerosant agent and the outflow of the extra injected fluid. This technique is used for the treatment of low flow vascular malformations and peripheral AVM (nidus and venous side).

METHOD AND MATERIALS
In a period of 76 months (September 2006-december 2013), 170 patients were treated with this concept: 122 patients with venous malformations (VM), 26 patients with lymphatic malformation (LM) including 26 patients with macro cystic LM and two patients with micro cystic LM and 20 patients with superficial AVM. 3% tetradecyl sulphate foam, and since three years, lauromacrogol 400 have been used in all cases of VM(20-40ml) and in two case of micro cystic LM. Absolute ethanol (AE) was used in 88 patients: in 44 VM complementary to foam, in 24 LM and in 20 cases of peripheral AVM. Glue (isobuty1 2 cyanoacrylate) was used in 4 cases of AVM complementary to AE or before using AE. Up to 7 sessions were performed per patient.

RESULTS
Technical success was reached in all cases. Loss of volume at MRI ranged from 25% to 80% except for two patients who presented with large size VM. All patients were cosmetically improved and relieved of pain. Swelling of the lesion occurred in all treated cases and it was well tolerated and controlled with NSAIDs with resolution in few days (4-7 days). Significant complications occurred in 3 patients and consisted of phlyctena, fistula and necrosis. They were managed conservatively.

CONCLUSION
LPS concept using 3% STS foam, lauromacrogol and AE in our experience over more than six years has proven that it is the most effective with dramatic decreasing of complications. AE is used to treat macro cystic LM, superficial AVM and complementary to STS foam in some VM with extreme care concerning the volume injected.

CLINICAL RELEVANCE/APPLICATION
Placing multiple needles in peripheral Vascular malformation allow free circulation of the sclerosing agent these needles work as multiple valves that allow the exit of the sclerosing agent. The technique is effective with dramatic decreasing of complication. Actually we used this approach to treat VM, cystic LM and superficial AVM.

VSIR21-11
Predictive Quantification of Infarction Volume before Partial Splenic Embolization for Hypersplenism
Toshihiro Tanaka MD (Presenter): Nothing to Disclose , Tetsuya Masada : Nothing to Disclose , Hideyuki Nishiofuku : Nothing to Disclose , Takeshi Sato : Nothing to Disclose , Shinsaku Maeda : Nothing to Disclose , Kimihiko Kichikawa MD : Nothing to Disclose , Hiroshi Anai MD, PhD : Nothing to Disclose , Masayoshi Inoue MD : Nothing to Disclose

PURPOSE
To obtain the optimal splenic infarction volume is the key to achieve high efficacy and to reduce the risk of complications after partial splenic embolization (PSE). We have developed a new system to predict the infarction splenic volume before PSE using computed volumetric analysis software. The aim of this study is to evaluate the accuracy of this prediction system.

METHOD AND MATERIALS
The data, from 12 patients with hypersplenism who had received PSE, was retrospectively analyzed. 3-dimensional (3-D) arteriography image was reconstructed from the contrast enhanced CT obtained before PSE. Using a 3-D image analysis system (SYNAPSE VINCENT™), the volume of the area supplied from each splenic branch was calculated based on the Voronoi Diagram. The estimated infarction volume was defined by the total sum of the volume supplied from each embolized branch. The actual infarction volume was calculated on the contrast enhanced CT obtained 1 week after PSE. Pearson Correlation Coefficients was used to assess the correlation between the estimated infarction volume and the actual infarction volume.

RESULTS
The mean estimated and actual infarction volumes were 65.4±14.6% and 60.9±10.2%, respectively. The mean difference between them was 7.29±6.93%. The actual infarction volume was strongly correlated with the estimated infarction volume (p=0.791, P=0.002). There were no complications in any of the patients. The mean platelet count significantly increased from 7.96×10⁴/µL before PSE to 15.6×10⁴/µL two weeks after PSE (the increased ratio: 259±93.9%).
CONCLUSION

Our results demonstrated that infarction splenic volume can be precisely predicted before PSE using computed volumetric analysis software. This new system could be helpful for tailoring planning of PSE to achieve optimal splenic infarction volume in patients with hypersplenism.

CLINICAL RELEVANCE/APPLICATION

Predictive quantification of splenic infarction volume using the Voronoi Diagram method is accurate, which could be useful for planning before PSE.

VSIR21-12  Technical Aspects of Prostate Embolization—Why this is not UFE
Jafar Golzarian MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

VSIR21-13  5 Papers in 15 Minutes: Studies in Embolotherapy that Everyone Should Know
Sue Ellen Hanks MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Describe indications and technical aspects of embolization for symptomatic prostatic hypertrophy.
2) Explain the rationale and treatment of low flow malformations.
3) Describe the preparation of cyanoacrylates for embolization.
4) Describe two complications related to embolization.
5) List two important studies on embolotherapy.

VSIR21-14  Wrap Up and Discussion