CASE 1

PERITONEAL DIALYSIS (PD) CATHETER MANIPULATION

REASON FOR EXAM
Non Functioning PD Cath.

1.7 minutes of fluoror time was used.

ESTIMATED RADIATION DOSE
805.1 UGYM^2.

CONTRAST USED
Isovue-300, 20CC.

CONTRAST USED
Peritoneal dialysis catheter manipulation.

HISTORY
Poor functioning of peritoneal dialysis catheter.

TECHNIQUE
The catheter and surrounding skin were prepped and draped in a sterile manner. The procedure was performed using maximum sterile barrier technique including the use of the following: cap and mask, sterile gown and gloves, a large sterile sheet, hand hygiene, and 2% chlorhexidine for cutaneous antisepsis (or alternate site and Betadine were 70% alcohol). Contrast was injected through the peritoneal dialysis catheter and fluoroscopic images were obtained. A stiff shaft Glidewire was then advanced down the dialysis catheter multiple times in an attempt to change the position of the catheter. Final fluoroscopic image was obtained.

FINDINGS
Initial injection of the catheter demonstrates a partially loculated tube. Final images demonstrate the catheter is now coiled more superiorly with more free flow into the peritoneum.

IMPRESSION
Peritoneal dialysis catheter manipulation as above.
CASE 2

UPPER EXTREMITY ANGIOGRAM

REASON FOR EXAM
Left arm pain assoc with Fistula.
2.0 minutes of fluoro time was used.

ESTIMATED RADIATION DOSE
247.9 UGYM2.

CONTRAST USED
Isovue-300, 60CC.
Upper extremity fistulogram and arteriogram.

HISTORY
Numbness and pain in left hand exacerbated by dialysis through left upper arm dialysis fistula.

TECHNIQUE
Patient was given conscious sedation with Versed and fentanyl with constant monitoring by the physician and nursing staff. Total sedation time was 20 minutes.

The skin over the left upper arm fistula was prepped and draped in a sterile manner. 1% lidocaine was used for local anesthesia. The outflow cephalic vein was accessed with a 21-gauge needle and a guidewire was passed towards the anastomosis. The transition dilator was placed and used to perform fistulography. The transition dilator was then exchanged for a 5 French catheter which was placed into the brachial vein at the mid left upper arm. Images of the forearm and hand were obtained during injection of the brachial artery with and without compression of the outflow cephalic vein in the fistula. The Kumpe catheter was then advanced to the origin of the left subclavian and DSA images were obtained during injection of this vessel as well. Access was then removed and pressure help until hemostasis was achieved.

FINDINGS
The patient has a left upper arm brachiocephalic fistula. There is a mild relative stenosis in the mid upper arm of the cephalic vein which is not functionally significant. The anastomosis and remainder of the outflow from the left arm fistula are widely patent including the left upper cephalic vein, the left subclavian vein, the brachiocephalic vein on the left, and the superior vena cava.

Injection of the brachial artery above the fistula anastomosis demonstrates most injected contrast flows rapidly through the fistula although there is slow flow down to the brachial artery towards the forearm. Images of the forearm and hand demonstrate poor flow predominately down the ulnar artery towards the hand while the fistula is patent. With the fistula occluded manually, there is rapid flow down both the ulnar and radial arteries to the hand. There is an incomplete superficial palmar arch supplied primarily by the ulnar artery. The deep ulnar arch is more and is supplied by the radial artery. Near the wrist, there is a partially calcified bulbous extension from the radial artery at the site of a previous radiocephalic fistula. Images of the proximal left subclavian vein demonstrate no arterial stenosis.

IMPRESSION
Dialysis fistula steal syndrome is demonstrated by fistulography and arteriography. There is no underlying arterial stenosis which can be treated to improve steal syndrome. See above.

CASE 3

BILAT DIAGNOSTIC EXTERNAL CAROTID ANGIOGRAPHY WITH ADDITIONAL SELECTIVE IMAGRY AND EXTRACRANIAL EMBOLIZATION

Bilateral external carotid arteriograms, left facial and lingual arteriograms, angiogram through existing catheter, and embolization.

The patient has squamous cell carcinoma and massive hemorrhage from the mouth and nose.

Consent was obtained from the patient’s wife.

Following sterile preparation and local anesthesia, ultrasound was utilized to obtain access to the right common femoral artery. The artery is patent and was accessed under direct visualization.

A 6-French sheath was then introduced. A vertebral catheter was then advanced through the sheath and selectively placed in the right external carotid artery. Right external carotid arteriogram was performed in PA and lateral projections. Since no definite abnormality is demonstrated, the catheter was returned to the thoracic aorta, and an attempt to obtain access to the left common carotid artery was unsuccessful. A Simmons 2 catheter was then introduced and reformed in the left subclavian artery. This was selectively placed into the common carotid and subsequently into the external carotid artery. Left external carotid arteriogram...
CASE 3 ... continued from page 2

was then performed. The findings were discussed with Dr. A. It was elected to proceed with embolization of the left lingual and facial arteries and consider embolization on the right lingual at a later time if bleeding does not cease.

Catheter was returned to the left external carotid, and a Renegade catheter was introduced into the lingual artery. This artery was then embolized with coils. This resulted in occlusion. An angiogram was then performed. An additional coil was placed which was felt to be in the facial artery. However, it may also be in the more proximal lingual artery. An angiogram through the existing catheter in the left common carotid, however demonstrated occlusion of both the facial and lingual arteries. Therefore, the catheter was removed, right femoral arteriogram was performed, and closure was achieved with an Angio-Seal closure device. The patient tolerated the procedure well. There was marked reduction in the rate of hemorrhage after the embolization.

FINDINGS

There is no definite extravasation from the right external carotid injection. The lingual branch is a large vessel which is unremarkable. There is no evidence of a pseudoaneurysm. Capillary blush in the posterior aspect of the tongue is normal. The internal maxillary and the middle meningeal arteries are unremarkable. The occipital artery is also normal. Ascending pharyngeal arteries are very small. No extravasation is demonstrated.

On the left, the facial artery is a small branch which arises proximal to the lingual artery. Spasm at the origin of this vessel. There is also spasm of a branch projected over the left side of the mandible. The lingual artery produces a dense blush in the posterior aspect of the tongue, but no definite neovascularity is demonstrated. There is also no evidence of extravasation. Selective injection into the superior thyroidal artery demonstrates no extravasation.

The final angiogram through the existing catheter demonstrates occlusion of the facial and lingual arteries. There are coils projected over the neck just below the angle of the mandible.

Right femoral arteriogram demonstrates no definite calcification in the artery where the puncture is located.

IMPRESSON

1. No definite extravasation.
2. Marked decrease in the rate of flow with embolic occlusion of the left lingual and facial arteries.

FLUOROSCOPY TIME

21.5 minutes.

CASE 4

EXTRACRANIAL EMBOLIZATION

STUDY

Arteriogram with embolization right lingual artery, right facial artery, and left facial artery.

HISTORY

Head and neck cancer with persistent bleeding.

TECHNIQUE

Fluoroscopy time 27. 2 minutes.

Right groin steriley prepped and draped. Lidocaine 1% used for local anesthesia. Potential access sites were examined using ultrasound and an acceptable patent vessel selected.

Micropuncture access of the right common femoral artery was performed using real-time ultrasound guidance. An ultrasound image demonstrating the vessel was obtained and stored.

Fluoroscopy used to monitor passage of a guidewire centrally, and a 6-French sheath placed. 5-French H1 catheter was used to select the right common carotid artery, and was subsequently advanced into the right external carotid artery. Contrast injection performed here with images recorded. Following that a 2.8 Cantata microcatheter was advanced through the H1, and used to select two branches of the lingual artery, followed by the facial artery. Embolization of each of these vessels was performed with coils. First branch of the lingual artery embolized using 2 mm diameter coils. The other branches embolized 3 mm diameter coils. Repeat contrast injection performed through the existing catheter after embolization to evaluate the results.

Next, a Simmons-1 catheter was formed in the left subclavian artery. This was used to select the left common carotid artery, and the microcatheter was advanced through this and used to select...
the left external carotid artery, and contrast injection performed with images recorded. This microcatheter was subsequently advanced into the left facial artery. This vessel had previously been partially coil embolized, but did maintain patency. Embolization was carried to completion by addition of a 2 mm x 5 cm coil. Repeat contrast injection performed to evaluate the result.

Catheter was then pulled. Sheath exchanged for an Angio-Seal closure sheath. The Angio-Seal Evolution closure device was deployed, with no visible bleeding after holding gentle pressure.

FINDINGS

Series 3 demonstrates the lateral view of the right external carotid arteriogram. The first branch shown is the lingual artery, which also branches about 2 cm past its origin. The facial artery had a slightly high origin above this. Subsequent additional arteriography demonstrates selective catheterization of two of the lingual artery branches, as well as the facial artery. Embolization of each of these performed. Contrast injections performed following this demonstration occlusion of these vessels.

The lateral view of the left external carotid arteriogram is shown on series 13. Prior embolization coils in the left lingual and facial artery. However, the facial artery is partially recanalized. This was confirmed with injection shown on series 15. Embolization was carried to stasis with an additional coil. Repeat injection shown on series 16 through the existing catheter confirms occlusion.

IMPRESSION

Successful coil embolization of the right lingual and facial arteries, as well as the left facial artery. Note that the left lingual artery had already been embolized yesterday, and remains occluded.

CASE 5

SELECTIVE AND SUPERSELECTIVE UPPER EXTREMITY ANGIOGRAPHY

PROCEDURE

1. Aortic angiogram.
2. Right subclavian angiogram with abduction and neutral position.
3. Right axillary and brachial artery angiogram.
4. Right forearm angiogram.
5. Right hand angiogram without and with nitroglycerin.
6. Closure of arteriotomy site with Mynx closure device.

COMPARISON

None available.

INDICATIONS

Cold/pain hand.

MEDICATIONS

Fentanyl and Versed were administered by nursing staff. 5 mL of 2% Lidocaine was given for local anesthesia.

NURSING

Throughout the procedure, the patient’s vital signs and oxygen saturations were continuously monitored and remained stable.

COMPLICATIONS

No immediate complications.

CONSENT

Informed written consent was obtained.

PROCEDURE DESCRIPTION

The patient was placed on the angiographic table in supine position and prepped and draped in usual sterile fashion over right common femoral artery. Ultrasound demonstrated patent common femoral artery. 2% Lidocaine was injected to skin and subcutaneous tissues. Under ultrasound guidance, a Micropuncture needle was advanced into the right common femoral artery. Permanent image was stored for the record. An 018 was advanced through the needle and position confirmed with fluoroscopy. The Micropuncture needle removed and sheath advanced over the wire into the artery. The 018 wire was exchanged to Bentzon wire which was advanced into the abdominal aorta. The Micropuncture sheath was exchanged to 5-French sheath. A pigtail catheter was advanced over the Bentzon wire into the ascending aorta. Arch angiograms performed.

FINDINGS

There is normal origin of right brachiocephalic, left subclavian, and left common carotid artery. No evidence of any stenosis.
PROCEDURE

The procedure was performed with the patient’s right arm in abduction as well as in neutral position to evaluate for thoracic outlet syndrome. There was no stenosis of subclavian artery in both abduction and neutral position.

The pigtail catheter was exchanged to 5-French vertebral catheter. The catheter was advanced into the left subclavian artery distal to the vertebral artery origin. Angiogram of axillary and brachial artery performed.

No evidence of any stenosis in the axillary or brachial artery.

The catheter was then advanced into the mid to distal brachial artery. Angiograms of the forearm performed.

There is good flow to the interosseous artery. There was mildly delayed flow in the right radial artery. There was significant delay in the flow in the ulnar artery. More distally in the forearm, there was a small filling defect in the radial artery about 2 cm from proximal to the radiocarpal joints. The ulnar artery is near completely occluded about 2 cm proximal to ulnocarpal joint.

Selective angiogram of the hand was then performed. It demonstrated small filling defect in the radial artery at the level of scaphoid. There is patent deep palmar arch. The digital artery of the thumb is patent with flow up to the tip. The lateral branches of the right 2nd and 3rd fingers do not demonstrate any significant flow distal to the proximal interphalangeal joint. There is patency of both medial and lateral to the branches of 4th and 5th fingers. The lateral branch of the 5th finger demonstrates mildly delayed flow. The angiogram was repeated after administration of 200 mcg nitroglycerin. There was no significant change in the angiographic images compared to previous examination. Progreat wire with power catheter was then advanced through the 5-French catheter distal to this and selective angiogram of the ulnar artery was then performed with Progreat catheter. It appeared that the ulnar artery has two small branches at the distal forearm with the medical branch showing patency up to the distal ulna where its lateral branch having thrombus with no significant flow. The 014 wire was then advanced through the distal ulnar artery into the hand. Attempt was made to advance a 2 mm balloon into the distal ulnar artery. However, due to the long course of the wire and since the wire was getting coiled within the ascending aorta, the balloon could not be advanced into the distal forearm. The balloon and wire removed. Limited angiogram of the right common femoral artery performed. The arteriotomy site was above the common femoral bifurcation. The arteriotomy site was closed with Mynx closure device. No postprocedure hematoma. The patient tolerated the procedure well with no immediate complications.

IMPRESSION

1. Patent right innominate, subclavian, axillary, brachial arteries. No evidence of thoracic outlet syndrome obstructing the subclavian artery.
2. Small filling defects in the distal radial artery at distal forearm. The deep palmar arch is patent.
3. The ulnar artery is near completely occluded about 2 cm proximal to the ulnocarpal joint.
4. The 2nd and 3rd digits lateral digital arteries are near completely occluded to severely stenosed distal to the proximal interphalangeal joint. There is decreased blushing of the tip of 2nd and 3rd phalanx. The emboli are likely due to central etiology.
5. The findings were discussed with Dr. B immediately after the procedure. Dr. B came to Interventional Radiology to review the images.

PLAN

We will schedule a followup appointment with Dr. B next week. We will also consider repeat angiogram with access from the right brachial artery with possible angioplasty or thrombectomy of the ulnar as well as radial artery thrombus.
HOW DID YOU DO?

THE ABOVE CASES SHOULD BE CODED AS follows:

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*Describes placement of percutaneously placed vascular closure device. Verify specific Third-party payer rules before submitting.

### DIAGNOSIS CODE SUMMARY

**Case # 1**

**ICD-9-CM**

996.56  Mechanical complication due to peritoneal dialysis catheter

**ICD-10-CM**

T85.691A  Other mechanical complication of intraperitoneal dialysis catheter, initial encounter

**Case # 2**

**ICD-9-CM**

996.73  Other complications due to renal dialysis device, implant, and graft

**ICD-10-CM**

T85.89xA  Other specified complication of internal prosthetic devices, implants and grafts, not elsewhere classified, initial encounter

**Case # 3**

**ICD-9-CM**

459.0  Hemorrhage, unspecified

199.1  Other malignant neoplasm without specification of site

**ICD-10-CM**

R58  Hemorrhage, not elsewhere classified

C80.1  Malignant (primary) neoplasm, unspecified

**Case # 4**

**ICD-9-CM**

459.0  Hemorrhage, unspecified

195.0  Malignant neoplasm of head, face, and neck

**ICD-10-CM**

R58  Hemorrhage, not elsewhere classified

C76.0  Malignant neoplasm of head, face and neck

**Case # 5**

**ICD-9-CM**

444.21  Arterial embolism and thrombosis of upper extremity

**ICD-10-CM**

I74.2  Embolism and thrombosis of arteries of the upper extremities
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