

Vascular Imaging Protocols

Routine Neck Arch with Contrast

Last updated: 1/22/02

Coils: neck coil (position the patient as far into the coil as he/she will go so we can try to image the arch)

20cc Gadolinium contrast (*)

EKG Leads

Assess the patient's breath holding capability. If poor capability, give oxygen. If pt can't hold his/her breath call body radiologist.

Call body radiologist.

| Sequence | Plane | Comment | Film # |
|------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| DB Haste | Ax | Extend thru chest (phase encoding A-P) | 2 |
| Sat down | Ax | | 1 |
| 2D TOF | Ax | To cover carotid bifurcation. | 0 |
| 3D FLASH | Straight Sag | 1 measure. Use small FOV. 512 or 256 matrix. Try to minimize actual effective thickness (as small as 1mm) If attention to vertebral arteries use a coronal slab. | 0 |
| Timing Run | Ax | Thru mid neck – 1cc of contrast at 2cc/sec followed by 20 cc saline at 2cc/sec. | 0 |
| 3D FLASH | Sag | 2 measures (7 sec gap; 2 nd run may be done on inspiration) Inject 20cc of Gd at 2cc/sec followed by 20cc saline at 2cc/sec. Standard timing formula. | 0 |
| MIP | | Subtract if necessary. Do bilateral, as well as right and left sides separately. | 2 |
| VIBE | Ax | 1 measure (through chest) | 1 |

Assess coverage of the arch on the post-contrast 3D. If the origins of the great vessels are not adequately imaged, reposition the patient with the phased array coil over the chest and do a second injection.

NOTE: In case of suspected dissection, add axial T1 TSE.

(*) The use of gadolinium contrast material for these applications represents off-label usage in the U.S. Outside the U.S., please consult your country's regulations for local guidelines.

NOTE: These protocols apply to Siemens Symphony (with Quantum gradients) and Sonata systems. While they reflect the protocols used at NYU Medical Center, NYU is not responsible for their application elsewhere.

Subclavian Artery with Contrast

Last updated: 12/3/2002

Coils: phased array. Center the patient off-center to include side of interest as well as chest.

20cc Gadolinium contrast (*) or (if BILATERAL disease is suspected then may use DILUTE GAD 20 cc + saline 20 cc or inject the FOOT)

IV on contralateral side of pathology

Assess the patient's breath holding capability. If poor capability, give oxygen. If pt can't hold his/her breath call body radiologist.

Call body radiologist.

NOTE: IF SUSPECT THORACIC INLET OR OUTLET SYNDROME, BEGIN WITH ARMS UP

| Sequence | Plane | Comment | Film # |
|------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| DB Haste | Ax | Extend thru chest (phase encoding A-P) | 1 |
| Sat down | Ax | | 1 |
| 2D TOF | Ax | To cover carotid bifurcation. | 0 |
| 3D FLASH | Straight Sag | 1 measure. Use small FOV. 512 Try to minimize actual effective thickness (as small as 1mm) If attention to vertebral arteries use a coronal slab. | |
| Timing Run | Ax | Thru mid neck – 1cc of contrast at 2cc/sec followed by 20 cc saline at 2cc/sec. | |
| 3D FLASH | Sag | 2 measures (7 sec gap; 2 nd run may be done on inspiration) Inject 20cc of Gd at 2cc/sec followed by 20cc saline at 2cc/sec. Standard timing formula. | 2,0 |
| Subtract | | First 3D Flash post-pre | |

(*) The use of gadolinium contrast material for these applications represents off-label usage in the U.S. Outside the U.S., please consult your country's regulations for local guidelines.

NOTE: These protocols apply to Siemens Symphony (with Quantum gradients) and Sonata systems. While they reflect the protocols used at NYU Medical Center, NYU is not responsible for their application elsewhere.

Thoracic Aorta

Last updated: 5/9/2002

EKG leads. Right sided IV.

Coils: phased array over chest.
20cc Gadolinium contrast (*)

Assess the patient's breath holding capability. If poor capability, give oxygen. If pt can't hold his/her breath call body radiologist.
Call body radiologist

| Sequence | Plane | Comment | Film # |
|------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| DB Haste | Ax | Gated. (phase encoding A-P) | 2 |
| DB Haste | Obl Sag | Gated. | 2 |
| TrueFisp | Ax | | 0 |
| 3D FLASH | Obl Sag | 1 measure. Use FOV 450-475. 512 or 256 matrix | 0 |
| Timing Run | Ax | Thru mid descending aorta – 1-2cc of the contrast mix at 2cc/sec followed by 20 cc saline at 2cc/sec. | 0 |
| 3D FLASH | Obl Sag | 2 measures (7 sec gap; 2 nd run may be done on inspiration) Inject 20cc of Gd at 2cc/sec followed by 20cc saline at 2cc/sec. Standard timing formula. | 0 |
| VIBE | Ax | 1 measure | 1 |
| MIP | | Subtract if necessary. | 2 |

(*) The use of gadolinium contrast material for these applications represents off-label usage in the U.S.
Outside the U.S., please consult your country's regulations for local guidelines.

NOTE: These protocols apply to Siemens Symphony (with Quantum gradients) and Sonata systems. While they reflect the protocols used at NYU Medical Center, NYU is not responsible for their application elsewhere.

Entire Aorta for Aneurysm

Last updated: 5/9/2002

EKG leads.

Right sided IV.

Coils: phased array over chest. Body coil for MRA.

30cc Gadolinium contrast (*)

Assess the patient's breath holding capability. If poor capability, give oxygen. If pt can't hold his/her breath call body radiologist.

Call body radiologist.

| Sequence | Plane | Comment | Film # |
|------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| DB Haste | Ax | Gated. | 2 |
| DB Haste | Obl Sag | Gated. | 2 |
| true FISP | Ax | | 1 |
| 3D FLASH | Obl Sag | 1 measure. Use FOV 450-475. 512 or 256 matrix. Body coil on #1/2, surface coils on #6. | 0 |
| Timing Run | Ax | Thru mid descending aorta – 1-2cc of the contrast mix at 2cc/sec followed by 20 cc saline at 2cc/sec. | 0 |
| 3D FLASH | Obl Sag | 2 measures (7 sec gap; 2 nd run may be done on inspiration) Inject 30cc of Gd at 2cc/sec followed by 20cc saline at 2cc/sec. Standard timing formula. | 0 |
| VIBE | Ax | In Chest and Abdomen 1 measure (Up to 5mm thickness), divide into 2 packages if necessary | 1 |
| MIP | | Subtract if necessary. | 2 |

(*) The use of gadolinium contrast material for these applications represents off-label usage in the U.S. Outside the U.S., please consult your country's regulations for local guidelines.

NOTE: These protocols apply to Siemens Symphony (with Quantum gradients) and Sonata systems. While they reflect the protocols used at NYU Medical Center, NYU is not responsible for their application elsewhere.

Abdominal Aorta MRA

Last updated: 12/2002

Phased array coil centered over abdomen

20 cc Gadolinium contrast (*)

Assess the patient's breath holding capability. If poor capability, give oxygen. If the patient can't hold his/her breath call body radiologist.

Run sequences in the order listed.

| Sequence | Plane | Comment | Film # |
|-----------------|-------|--------------------------------------------------------------------------------------------------------------------------|--------|
| optional STIR | Ax | do this if history of aortitis | 1 |
| HASTE | Cor | No fat sat. 5-6mm slices | 1 |
| VIBE | Ax | Thru Kidneys | 0 |
| 3D FLASH | COR | Use 512 matrix. Try to get effective thickness less than 1.5 mm. Want to include celiac and SMA and renal arteries | 0 |
| Timing Run | Ax | Thru kidneys – 1cc at 2cc/sec followed by 20 cc saline at 2cc/sec | 0 |
| 3D FLASH | COR | Two measures (with 7 sec between) Second measure may be done on inspiration. Standard timing run. | 0 |
| VIBE | Ax | History to prior | 1 |
| Do Subtractions | | 1-Arterial phase – pre-contrast 2 vibe post-pre | 0 |

NOTE: IF SUSPECT AORTITIS ADD AXIAL STIRS THROUGH AORTA

(*) The use of gadolinium contrast material for these applications represents off-label usage in the U.S. Outside the U.S., please consult your country's regulations for local guidelines.

NOTE: These protocols apply to Siemens Symphony (with Quantum gradients) and Sonata systems. While they reflect the protocols used at NYU Medical Center, NYU is not responsible for their application elsewhere.

Abdominal Aorta Mesenteric Ischemia MRA

Last updated: 12/2002

Phased array coil centered over abdomen

20 cc Gadolinium contrast (*)

Assess the patient's breath holding capability. If poor capability, give oxygen. If the patient can't hold his/her breath, call body radiologist.

Run sequences in the order listed.

| Sequence | Plane | Comment | Film # |
|-----------------|---------------|--------------------------------------------------------------------------------------------------------------------------|--------|
| HASTE | Cor and Axial | No fat sat. 5-6mm slices | 1 |
| VIBE | Ax | Thru Kidneys | 0 |
| 3D FLASH | SAG | Use 512 matrix. Try to get effective thickness less than 1.5 mm. Want to include celiac and SMA and renal arteries | 0 |
| Timing Run | Ax | Thru kidneys – 1cc at 2cc/sec followed by 20 cc saline at 2cc/sec | 0 |
| 3D FLASH | SAG | Two measures (with 7 sec between) Second measure may be done on inspiration. Standard timing run. | 0 |
| VIBE | Ax | History to prior | 1 |
| Do Subtractions | | 1-Arterial phase – pre-contrast 2 vibe post-pre | 0 |

(*) The use of gadolinium contrast material for these applications represents off-label usage in the U.S. Outside the U.S., please consult your country's regulations for local guidelines.

NOTE: These protocols apply to Siemens Symphony (with Quantum gradients) and Sonata systems. While they reflect the protocols used at NYU Medical Center, NYU is not responsible for their application elsewhere.

Pulmonary Angiogram

Last updated: 6/29/01

EKG leads.

Right sided IV.

Coils: phased array over chest.

20cc Gadolinium contrast (*)

Assess the patient's breath holding capability. If poor capability, give oxygen. If pt can't hold his/her breath, call body radiologist.

Call body radiologist.

| Sequence | Plane | Comment | Film # |
|------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| DB Haste | Ax | Gated. | 2 |
| TrueFISP | Ax | | 0 |
| 3D FLASH | Cor | 1 measure. Use FOV 450-475. 256 matrix. | 0 |
| Timing Run | Ax | Thru main pulmonary artery. 1cc of the contrast mix at 2cc/sec followed by 20 cc saline at 2cc/sec. Time to pulmonary artery. | 0 |
| 3D FLASH | Cor | 2 measures (7 sec gap; 2 nd run may be done on inspiration) Inject 20cc of Gd at 2cc/sec followed by 20cc saline at 2cc/sec. Standard timing formula. | 0 |
| VIBE | Ax | 1 measure | 1 |
| MIP | | Subtract if necessary. | 2 |

Alternatively, for higher resolution, you can try a Sag 3D volume through each lung separately. Obviously, 2 injections will be needed unless only 1 lung is to be examined.

(*) The use of gadolinium contrast material for these applications represents off-label usage in the U.S. Outside the U.S., please consult your country's regulations for local guidelines.

NOTE: These protocols apply to Siemens Symphony (with Quantum gradients) and Sonata systems. While they reflect the protocols used at NYU Medical Center, NYU is not responsible for their application elsewhere.

Full Runoff

Last updated: 6/12/01

EKG leads. See coil selection below.

40cc Gadolinium contrast (*) + 20 cc saline. Fill saline side with 60cc.

Assess the patient's breath holding capability. If poor capability, give oxygen. If pt can't hold his/her breath, call body radiologist.

Station 1 = Abdomen / Pelvis

Station 3 = Legs

Station 2 = Pelvis / Thigh

Station 4 = Feet

NOTE: FOV for ALL stations should overlap so that there are no gaps.

| Sequence | Plane | Station | Comment | Film # |
|-------------------|-----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| | | 4 | PLACE FEET IN THE HEAD COIL. | |
| TOF | Obl Ax | 4 | 3mm sections with at least 0.5mm overlap. Plane is perpendicular sole of foot. | 0 |
| MIP | | 4 | MD to check MIP. Print only AP and Lateral for each foot. | 2 |
| | | 3 | PLACE LEGS ON THE SPINE COIL. | |
| TOF | Ax | 3 | 3mm sections with at least 0.5mm overlap. Plane is perpendicular sole of foot. | 0 |
| MIP | | 3 | MD to check MIP. Print only AP and Lateral for each leg. | 2 |
| | | 1 | REPOSITION FOR UPPER ABDOMEN / PELVIS Use body coil. Kidneys at the top of the field. | |
| TrueFISP | Ax | 1 | Used to plan the 3D slab | 0 |
| 3D FLASH | Cor | 1 | 1 measure. Use FOV 450-475. 512 or 256 matrix. | 0 |
| Timing Run | Ax | 1 | Thru femoral heads – 2cc of the contrast mix at 2cc/sec followed by 20 cc saline at 2cc/sec. Use timing formula. | 0 |
| 3D FLASH | Ax | 1 | 2 measures (7 sec gap; 2 nd run may be done on inspiration) Inject 20cc of mix at 2cc/sec followed by 20cc saline at 2cc/sec. | 0 |
| VIBE | Ax | 1 | 1 measure (Up to 5mm thickness) | 1 |
| MIP | | 1 | Subtract if necessary. | 2 |
| | | 2 | REPOSITION FOR PELVIS / THIGHS | |
| TrueFISP | Ax | 2 | Used to plan the 3D slab. | 2 |
| 3D Flash | Cor | 2 | 1 measure. Use FOV 450-475. 512 matrix. | 0 |
| 3D Flash | Cor | 2 | Add 10sec to the time to peak. 2 measures non-breath-hold. Inject 40cc of mix at 2cc/sec followed by 20cc saline at 2cc/sec. | 0 |
| Do Subtraction | | 2 | Arterial phase – pre-contrast | 0 |
| MIP | | 2 | Subtraction. | 2 |

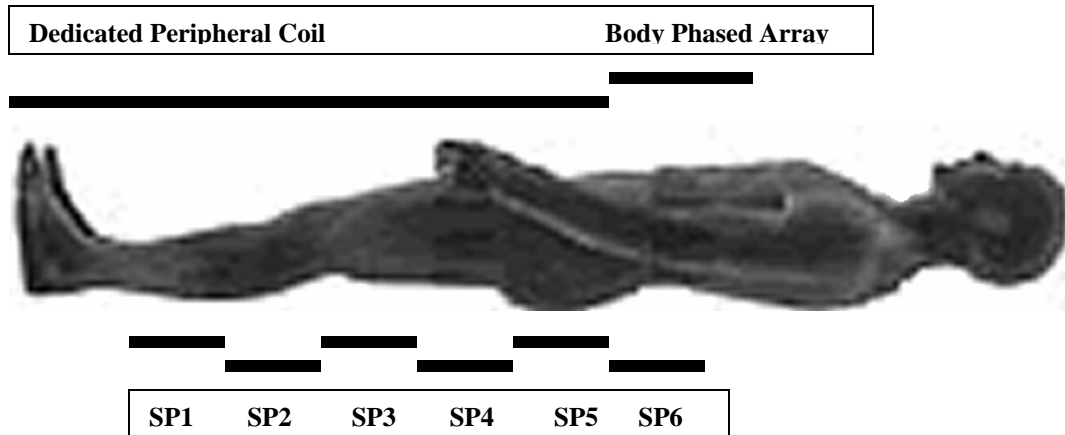
(*) The use of gadolinium contrast material for these applications represents off-label usage in the U.S.
Outside the U.S., please consult your country's regulations for local guidelines.

NOTE: These protocols apply to Siemens Symphony (with Quantum gradients) and Sonata systems. While they reflect the protocols used at NYU Medical Center, NYU is not responsible for their application elsewhere.

Symphony System Moving Table Runoff

Last updated: 6/30/01

The patient is positioned in the coils as shown below:



The peripheral coil and the spine elements (SP1-SP6) are fixed in position on the table. The phased array coil is positioned adjacent to the peripheral coil, over the abdomen.

If a full runoff to the toes is desired, TOF images through the feet can be performed in the dedicated peripheral coil. However, in most patients, the small vessels of the feet can be imaged with gadolinium and TOF imaging isn't necessary.

If TOF imaging is necessary center on the feet and run a single package of TOF sequence (128 slices 2-3mm with 30% overlap; gated, ideally). This typically takes about 10 minutes and will image into the ankle.

Subsequently, a single injection, 3-station table move acquisition is performed to image the arterial system from the renal arteries to the ankle/toes.

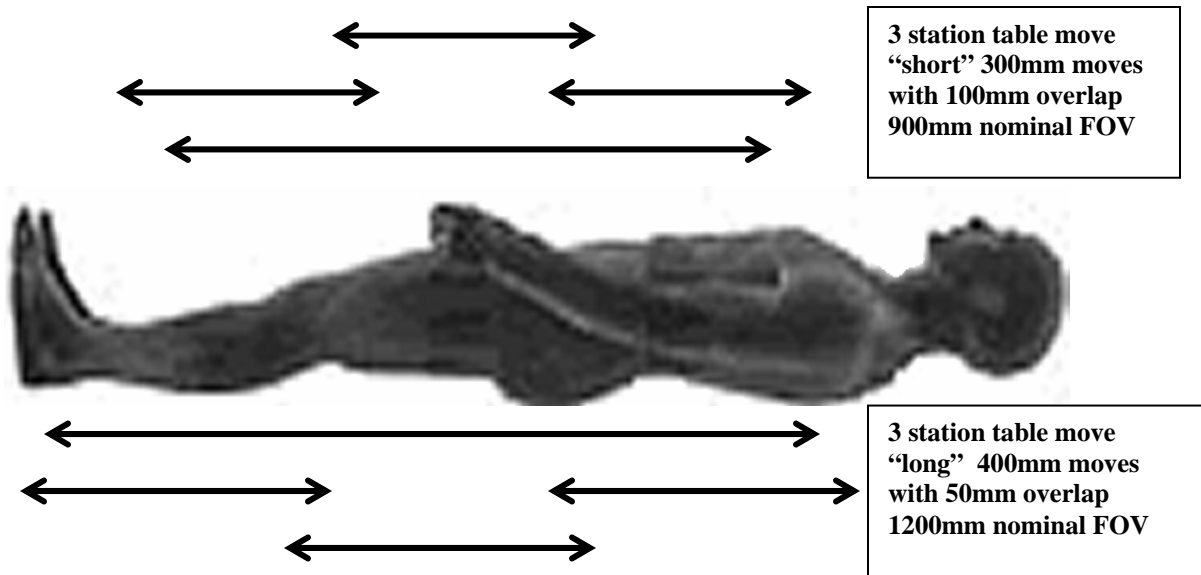
Depending on the patient's stature, the kidneys may or may not be covered by the spine element, SP6, posteriorly and the phased array coil anteriorly. If they are, these coils may be used during station 1 image acquisition. Otherwise, the body coil must be used for station 1.

Currently, 2 protocols are setup on the system for a single injection runoff:

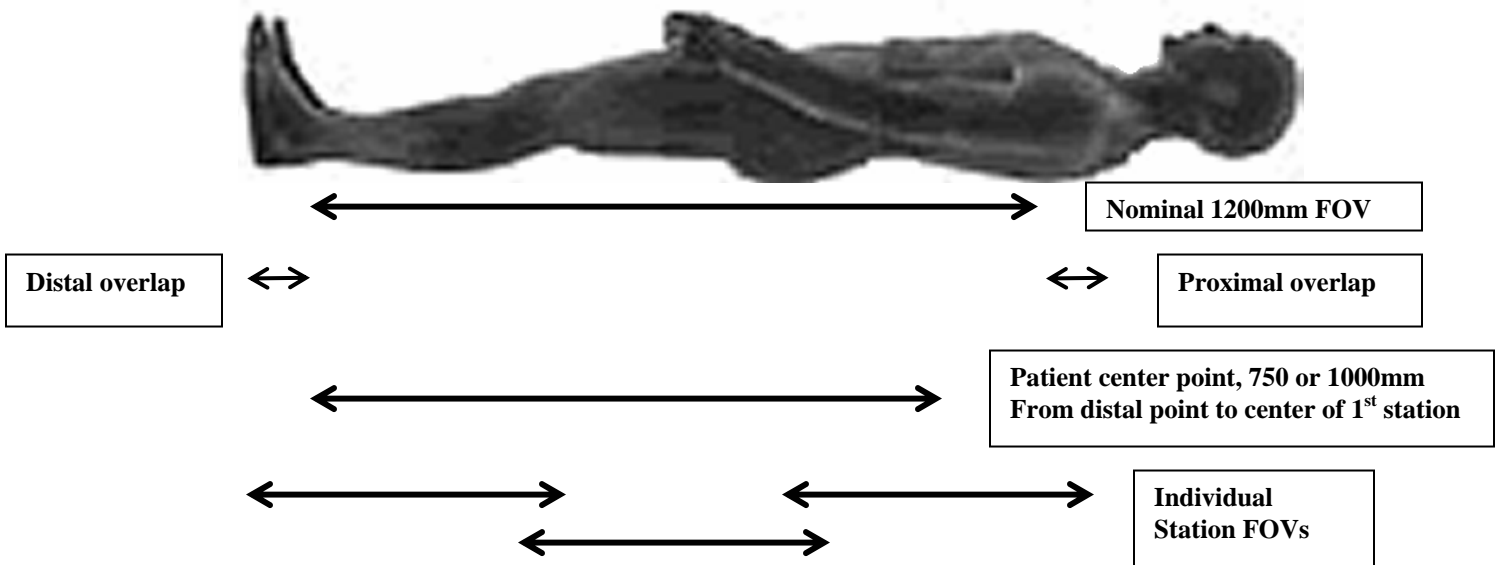
- Peripheral angio > Claudication > 3 station table move - Short
- Peripheral angio > Claudication > 3 station table move - Tall

NOTE: These protocols apply to Siemens Symphony (with Quantum gradients) and Sonata systems. While they reflect the protocols used at NYU Medical Center, NYU is not responsible for their application elsewhere.

These protocols cover approximately 900 and 1200mm respectively. The “short” protocol moves the table 300mm between each station and incorporates 100mm of overlap between stations. The “tall” protocol moves the table 400mm between each station and incorporates 50mm of overlap between stations. In general, even patients of average height are better imaged with the “tall” protocol. A small error margin is incorporated in the proximal overlap section at the top of the FOV.



However, by measuring up from the distal point of the FOV (typically midfoot – ankle which allows more distal coverage in the distal overlap section) a distance of 900 or 1200mm the coverage can be estimated. In order to center the patient, simply measure up 750mm from the distal point of the FOV for the “short” protocol or 1000mm from the distal point of the FOV for the “tall” protocol. This will ensure that the last station includes the feet (or whatever you choose to be the distal point).



NOTE: These protocols apply to Siemens Symphony (with Quantum gradients) and Sonata systems. While they reflect the protocols used at NYU Medical Center, NYU is not responsible for their application elsewhere.

When planning the 3D slab in each station, the minimum slab thickness should be used (angle the slab to help you). Ideally you want the acquisition time of the first station to be approximately 10 seconds and the acquisition time of the second station to be approximately 14 seconds. This should allow 1.5mm effective thickness. The short acquisition times allows you to chase the bolus down the legs with minimized venous contamination.

For the third station, again the slab should be minimized, but the desired effective thickness is about 1-1.2mm. In this station elliptical, centric k-space filling is used. This allows for a longer acquisition (needed for the higher resolution) without significant venous contamination in patients with relatively normal perfusion. Two acquisitions are performed in order to capture the arterial phase in patients with significantly delayed distal transit time.

As seen in the protocol below, after a general scout is performed, the timing run is performed at the level of the femoral heads (2cc of contrast are used). Then, a 3-plane scout is obtained at each of the 3 table positions/stations. At each of the 3 locations, in turn, a pre-contrast acquisition is planned (slab sized and positioned, coils selected, etc.) and run. Then, during contrast injection, the 3 pre-contrast scans are re-run sequentially. A 2-phase injection seems to work well; 25cc of the contrast mixture at 2cc/sec, followed by 35cc of the mixture at 1cc/sec then 20cc flush at 2cc/sec.

The timing run is typically performed at the level of the femoral heads in order to assess the proximal transit time. Since this value represents the time to the distal point of the first station, you can use the time to peak as the scan delay, even with a short first station acquisition time.

(*) The use of gadolinium contrast material for these applications represents off-label usage in the U.S. Outside the U.S., please consult your country's regulations for local guidelines.

NOTE: These protocols apply to Siemens Symphony (with Quantum gradients) and Sonata systems. While they reflect the protocols used at NYU Medical Center, NYU is not responsible for their application elsewhere.

Claudication Protocol

Last updated: 12/3/02

Position the patient feet first on the table.

Coils: Dedicated peripheral coil over the legs and phased array over the abdomen.

30cc Gadolinium contrast (*) + 20 cc saline.

Assess the patient's breath holding capability. If poor capability, give oxygen. If pt can't hold his/her breath call body radiologist.

| Sequence | Plane | Comment | Film # |
|-----------------------------------------|---------|-------------------------------------------------------------------------------------------------------------------|--------|
| TrueFISP upper leg | 3-plane | Through expected | 0 |
| TrueFISP pelvis | 3-plane | Breath hold. | 0 |
| Timing Run | Ax | Thru femoral heads: 1 cc of the contrast at 2cc/sec followed by 20 cc saline at 2cc/sec. Try to check both sides. | 0 |
| 3D FLASH pelvis | Cor | Minimize slab and acq time (goal <15 sec). 512 matrix. 1 measure. Non-breath-hold. | 0 |
| 3D FLASH upper leg | Cor | | 0 |
| Re-run prior 2 sequences post-contrast. | | Inject 20 cc at 2cc/sec followed by 10 cc at 1cc/sec. Use timing formula. | 0 |
| VIBE | Ax | Large slab through the abdomen. 5mm effective thickness. | 0 |
| VIBE | Ax | Through the knees if popliteal aneurysm is suspected. These sequences may also help for venogram analysis. | 0 |

(*) The use of gadolinium contrast material for these applications represents off-label usage in the U.S. Outside the U.S., please consult your country's regulations for local guidelines.

NOTE: These protocols apply to Siemens Symphony (with Quantum gradients) and Sonata systems. While they reflect the protocols used at NYU Medical Center, NYU is not responsible for their application elsewhere.

Indirect Gadolinium-Venography

Last updated: 7/3/01

Uses the same principles regardless of the location of interest. Namely it is a recirculation technique in which contrast is injected in a peripheral vein and is subsequently imaged in both arterial and venous/equilibrium phases. This allows for subtraction of the arterial phase from the late phase, resulting in a venous phase image.

Coil placement depends on the region of interest. (UE/mediastinum, LE/pelvis, portal vein/SMV etc). Position the phased array coil and/or additional coils as needed.

The IV should be placed opposite to the side of interest if arm/chest imaging is to be performed. This is to avoid artifacts in the arteries adjacent to incoming full-strength contrast during the injection.

40cc Gadolinium contrast (*) is used because we want to image into the venous phase (a complete circulation is required) and dilution occurs.

In addition to the contrast technique, time-of-flight imaging may be performed to supplement the data. A traveling saturation band is placed "down stream" to the vein (at the opposite side used as for arterial the studies).

| Sequence | Plane | Comment | Film # |
|------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| DB Haste | Ax ± Cor | optional | 2 |
| TrueFISP | Ax | Phased Array or Body coil by 10s | 0 |
| TOF | Ax | optional, MIP –print 2 copies | 1 |
| 3D FLASH | Cor | Adjust plane as needed. 1 measure. If on 6 do all 3 stations unless otherwise specified | 0 |
| Timing Run | Ax | Thru area of interest – 1-2cc of the contrast mix at 2cc/sec followed by 20 cc saline at 2cc/sec. Time to the artery. | 0 |
| 3D FLASH | Cor | 2-3 measures (typically 30-40 sec gaps) Inject 40cc of Gd at 2cc/sec followed by 20cc saline at 2cc/sec. First measure, use Standard timing formula. | 2 (delayed) |
| VIBE | Ax | 1 measure through all 3 stations (2mm resolution) | 0 |
| MPR | | best venous phase -unsubtracted | 2 |

(*) The use of gadolinium contrast material for these applications represents off-label usage in the U.S. Outside the U.S., please consult your country's regulations for local guidelines.

NOTE: These protocols apply to Siemens Symphony (with Quantum gradients) and Sonata systems. While they reflect the protocols used at NYU Medical Center, NYU is not responsible for their application elsewhere.

Direct Gadolinium-Venography

Last updated: 7/3/01

This technique is rarely done today, but is most often used for subclavian vein studies.

Very dilute contrast is used (1cc Gadolinium contrast (*) in 50cc saline); this is to be injected in the side of interest.

Try to put the IV as distal as possible in the extremity of interest. If the deep venous system of the extremity is of interest, a distal tourniquet may be helpful (applied just before contrast administration).

Phased-array coil placed over area of interest. If the study is for the subclavian vein, make sure the coil covers some of neck base to check for jugular vein involvement.

| Sequence | Plane | Comment | Film # |
|------------------|--------------|-------------------------------------------------------------------------------------------------------|--------|
| DB Haste | Ax ± Cor | | 2 |
| TrueFISP | Ax ± Cor | | 0 |
| TOF | Ax | Optional. As indicated. | 1 |
| Sat up / down | Ax | Optional. As indicated. (E.g. through the neck in subclavian cases.) | 1 |
| 3D FLASH | Cor | Adjust plane as needed. 1 measure. | 0 |
| | | NO TIMING RUN | 0 |
| 3D FLASH | Cor | 3 measures (typically 25 sec gaps) Inject 4 0cc of mix at 0.5cc/sec. NO FLUSH. | 0 |
| 3D FLASH | Cor | Repeat 3D with 1 measure Inject the remaining 10cc of mix at 0.5cc/sec. NO FLUSH. | 0 |
| VIBE | Ax or Sag | 1 measure through veins of interest. This can save the case if the venogram doesn't come out well. | 0 |
| MIP | | Subtract if needed. Use the phase with the best venous opacification. | 2 |

(*) The use of gadolinium contrast material for these applications represents off-label usage in the U.S. Outside the U.S., please consult your country's regulations for local guidelines.

NOTE: These protocols apply to Siemens Symphony (with Quantum gradients) and Sonata systems. While they reflect the protocols used at NYU Medical Center, NYU is not responsible for their application elsewhere.

Vascular Malformation MRA

Last updated: 7/3/01

This technique is done to evaluate vascular lesions such as AVMs

40 cc Gadolinium contrast (*) undiluted

If there is an upper extremity lesion, make sure IV is in opposite arm
Use head or extremity coil if possible

Call Body radiologist.

| Sequence | Plane | Comment | Film # |
|-----------|-------|--------------------------------------------------------------------------------------------------------------------|--------|
| true fisp | Ax | | 0 |
| DB HASTE | Ax | May want to use coronal plane | 2 |
| T1 | Ax | | |
| T2 TSE | Ax | Fat sat is optional. | |
| VIBE | | | |
| 3D FLASH | Cor | With fat sat. (on 1 or 2, use 3D FLASH found in carotid protocol, change parameters to achieve 6-9 sec. scan time) | 0 |
| | | NO TIMING RUN | 0 |
| 3D FLASH | Cor | 15-25 measures no gap Inject gad at 2 cc sec, followed by 20 cc saline at 2cc/sec | 0 |
| VIBE | Ax | 1 measure through veins of interest. This can save the case if the venogram doesn't come out well. | 2 |
| SUBS | | Subtract first few arterial-pre and last 2-3 postcontrast measures-pre. | 0 |

(*) The use of gadolinium contrast material for these applications represents off-label usage in the U.S.
Outside the U.S., please consult your country's regulations for local guidelines.

NOTE: These protocols apply to Siemens Symphony (with Quantum gradients) and Sonata systems. While they reflect the protocols used at NYU Medical Center, NYU is not responsible for their application elsewhere.