Intravenous Administration of Contrast Agents for CT Studies

Intravenous access, for the injection of intravenous contrast, is vital in obtaining high quality contrast enhanced or angiographic studies. Proper technique is used to avoid the potentially serious complications of contrast media extravasation and/or air embolism. When the proper technique is used, contrast medium can safely be administered intravenously by power injector.

A short peripheral IV catheter in the antecubital or forearm area is the preferred route for contrast administration. The type of IV access required for CT studies is dependent upon the scan protocol; refer to the quick reference guide on page 6 to find the IV access required for each exam type.

IV contrast is typically administered via Power Injection. Power Injectors have embedded safety features which automatically reduce the contrast administration flow rate when they reach the 300 psi threshold. This flow rate adjustment can result in reduced image quality and ultimately lead to a non-diagnostic study. Prior to contrast administration, a saline bolus will be administered through the line that will be used to administer contrast. If the Technologist doesn't believe the line will withstand the administration of contrast at the required flow rate for the scan protocol, a new line will need to be placed prior to injection.

Each IV-line type is outlined in the below sections:

1) Peripheral IV

Doctors, Nurses and Radiology Technologists can insert peripheral IV catheters for the purpose of contrast administration, within parameters outlined in the *Peripheral Intravenous Device and Venipuncture policy*. A peripheral intravenous line (18 gauge) in the antecubital or forearm area is preferred when power injections are needed; the 20-gauge or larger catheter is preferable for flow rates of 3 mL/sec or higher.

Note: Central Venous Access Devices listed below may be accessed by a trained independent practitioner or RN within the parameters of the *Central Venous Access Devoce (CVAD) Care & Maintenance Policy.*

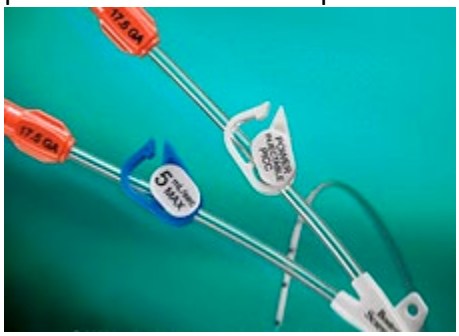
2) PICCs (peripherally inserted central catheters)

PICCs that are power injectable are clearly marked "power injectable" and have a maximum flow rate printed on the catheter lumen or hub itself. They should only be used according to manufacturer's guidelines in the presence of appropriately trained personnel. These lines include, but are not limited to the following:

- The PowerPICC line by BARD Access Systems. The Power PICC is a purple central venous catheter that has been approved by the FDA for power injection of contrast in adults and children. Refer to the marking on the hub of the catheter to determine the maximum rate of injection and to choose the correct lumen for power injection. Power PICCs of 4Fr single lumen, 5Fr single or double lumen and 6Fr single or double lumen can be power injected at 5 mL/sec and a maximum power injector pressure setting of 300 psi.

- Cook Spectrum PICC. The line with the red hub should be used for power injection. All catheter tube extensions are labeled with port name, gauge, and flush volume. A 4Fr single lumen can be injected at 4mls/see, a 5Fr single lumen at 7 mL/sec and a double lumen at 5 mL/sec at a Maximum Injector Pressure limit of 325 psi. Patients may come with this PICC line placed at an outside hospital.

- The Navilyst Power injectable PICC has the max ml/sec marked on the clamp on the lumen of the power injectable lumen. Depending on the lumen of the catheter the rate ranges from 3.5 mL/sec to 5 mL/sec at a Maximum Power Injector pressure of 300 psi. It has a clear extension tubing to visualize the blood return. Patients may come with this PICC line placed at an outside hospital.



- Morpheus Smart PICC by Angio-Dynamics has the max ml/sec marked on the clamp on the lumen of the power injectable lumen, which is usually 5 mL/sec. A patient may come with this PICC line placed at an outside hospital.

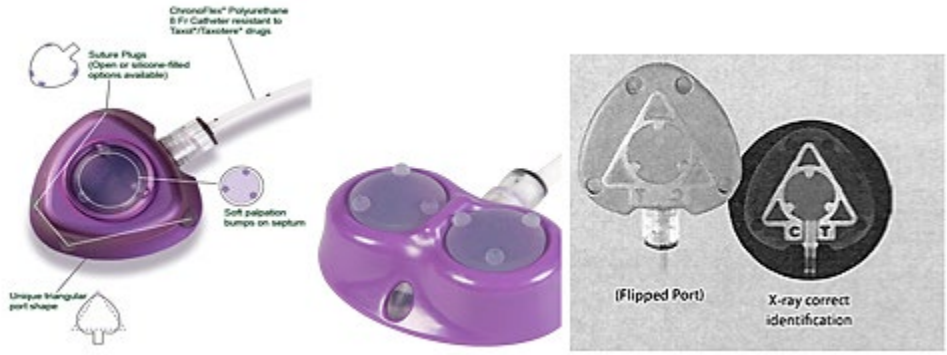
3) Implanted Ports

- The Smart Port by Angio-Dynamics is a subcutaneous indwelling central venous access port that is FDA-approved for power injection of contrast. It has distinctive scalloped edges that can be palpated or seen on a CXR or scout view. Note the “CT” is visible on x-ray image of the newer models of ports as an identifier that this port is power injectable. It is indicated for power injection of contrast media up to 5 mL/sec. and 300 psi pressure limit setting, when used with a Gripper Plus Huber needle.

- Smith Medical has power P.A.C. port that is power injectable up to 5 ml/sec. when used with a Gripper Plus power P.A.C. Huber needle. There are single-lumen and dual-lumen ports that are power injectable. Note that the word “CT” is visible on a x-ray image of the

newer models of ports as an identifier that this port is power injectable.

- The PowerPort by BARD is a subcutaneous indwelling central venous access port that is FDA-approved for power injection of contrast. It has a distinctive triangular shape that can be palpated (three palpable "bumps" arranged in a triangle) or seen on a CXR or scout view (either an opaque rounded triangle or a triangular outline with the letters "CT" under the triangle). It is indicated for power injection of contrast media up to 5 mL/sec and a 300 psi pressure limit setting, when used with a Gripper Plus Huber needle. There are also dual-lumen PowerPorts by BARD.



- The Seesite by Vygon is power injectable up to 5mL/sec and has a max PSI of 325. It has a radiopaque marker that would be demonstrated on chest x-ray as seen below.

4) Tunneled Central Catheters

- The ARROWgard Blue plus pressure injectable CVC is pressure injectable for CT scanning for up to 10 mL/sec. The center lumen is marked with the max ml/sec on the hub of the catheter. The words “No CT” are marked on the lumen that is not to be used for power injection.

- Power Hickman catheter by BARD is a tunneled central venous catheter that can be injected up to maximum flow rate of 5 mL/sec. and 300 psi pressure limits setting.

- Power Hohn by BARD comes in single, double, and triple lumen catheters. The specific lumen is marked if it is power injectable, up to a maximum of 5 mL/sec at a maximum of 300 psi.

5) Dialysis catheters

Dialysis catheters are NOT to be used for contrast administration.

Quick Reference Guide for IV access: Adult Patients

Radiology Technologists will use the guidelines below to determine appropriate IV access for each CT study. Staff are expected to follow manufacturers instruction for use for each IV line type.

For questions or concerns please reach out to Med Center CT at 984-974-8803 or Hillsborough CT at 984-215-2240. Please call CT to clarify pediatric IV line requirements.

***** 24g and 16g Insyte IV Catheters cannot be used for CT power injection per MIFU*****

Routine studies (excludes CT angiograms [CTA], cardiac, and perfusion scans):

· 20g or 22g Insyte or Diffusics catheter - placed in forearm/antecubital (preferred).

· Bard Power Ports and Power PICCs - Purple Power Ports must be accessed with a Bard Power Needle

· Angio-Dynamics - Xcela Power PICC line

· Power Glide Midlines

Non-Cardiac CT Angiogram (CTA) studies

· 20g Insyte or Diffusics catheter - placed in forearm/antecubital (preferred).

· Bard Power Ports and Bard Power PICCs. The line must be labeled at least 5mL/sec and must be accessed with a Bard Power Needle

· Power Glide Midlines

· Angio-Dynamics - Xcela Power PICC lines

· Arrowg+ard Blue Plus CVC Triple Lumen

- The Arrow single lumen, Arrowg+ard Blue Percutaneous Sheath Introducer is NOT power injectable and cannot be used. Triple lumen line can be placed in sheath introducer for CT Contrast administration.

· External jugular (EJ) lines cannot be used for CTA studies.

Cardiac Studies, TAVR, and CT Perfusion Studies

· 18g PIV (preferred but not required) or 20g Diffusics/Insyte catheter in the AC is required

- Preferable placement is in the right AC for cardiac studies
- PICC and Ports cannot be used for these studies.

Quick Reference Guide for IV access: Pediatric Patients

Radiology Technologists will use the guidelines below to determine appropriate IV access for each CT study. Staff are expected to follow manufacturers instruction for use for each IV line type. Refer to the tables below for power injection rates based on PIV gauge and always check max injection rate and PSI for the specific catheter.

Power injection is preferable; however, hand injection is acceptable if volume to be administered is under 30 mLs of contrast. Pediatric contrast administration volume is 2mL/kg.

Do not inject 1.9 fr PICC, UVC, non-central IJ, EJ and Dialysis catheters

For questions or concerns please reach out to Med Center CT at 984-974-8803 or Hillsborough CT at 984-215-2240. Please call CT to clarify pediatric IV line requirements.

Routine studies (excludes CT angiograms [CTA], cardiac, and perfusion scans):

- 20g or 22g Insyte, B. Braun or Diffusics catheter - placed in forearm/antecubital (preferred).
    - 24 gauge may be acceptable in neonates and patients less than 10 kg if no other access available ****24g Instye IV Catheter is not power injectable****
- Bard Power Ports and Power PICCs - Purple Power Ports must be accessed with a Bard Power Needle
- Angio-Dynamics - Xcela Power PICC line
- Power Glide Midlines

Pediatric Injection rates for routine studies:

18-22G	2mL/s
24G	1mL/s or less, or hand inject

Non-Cardiac CT Angiogram (CTA) studies

- 20g Insyte, B. Braun or Diffusics catheter - placed in forearm/antecubital (preferred).
- 22g Insyte, B. Braun or Diffusics catheter - placed in upper half of forearm or antecubital
    - 24 gauge may be acceptable in neonates and patients less than 10 kg if no other access available ****24g Instye IV Catheter is not power injectable****
- Bard Power Ports and Power PICCs. Purple Power Ports must be accessed with a Bard Power Needle
- Power Glide Midlines
- Angio-Dynamics - Xcela Power PICC lines
    - Arrowg+ard Blue Plus CVC Triple Lumen

- The Arrow single lumen, Arrowg+ard Blue Percutaneous Sheath Introducer is NOT power injectable and cannot be used. Triple lumen line can be placed in sheath introducer for CT Contrast administration.

· External jugular (EJ) lines cannot be used for CTA studies.

Pediatric Injection rates for CTA studies:

16-18G	4mL/s
20G	3mL/s
22G	2mL/s
24G	hand inject