



CLINICAL GUIDELINE

CT Examinations in Adults, Use of CVC and PICC for Injection of Contrast

A guideline is intended to assist healthcare professionals in the choice of disease-specific treatments.

Clinical judgement should be exercised on the applicability of any guideline, influenced by individual patient characteristics. Clinicians should be mindful of the potential for harmful polypharmacy and increased susceptibility to adverse drug reactions in patients with multiple morbidities or frailty.

If, after discussion with the patient or carer, there are good reasons for not following a guideline, it is good practice to record these and communicate them to others involved in the care of the patient.

Version Number:	3
Does this version include changes to clinical advice:	No
Date Approved:	7 th June 2023
Date of Next Review:	3 rd June 2025
Lead Author:	Ross MacDuff
Approval Group:	Diagnostics Clinical Governance Group

Important Note:

The Intranet version of this document is the only version that is maintained. Any printed copies should therefore be viewed as 'Uncontrolled' and as such, may not necessarily contain the latest updates and amendments.

Clinical Guideline

CT Examinations in Adults:

Use of Central Venous Catheters (CVC) and Peripherally Inserted Central Catheters (PICC) for Injection of Contrast

A guideline is intended to assist healthcare professionals in the choice of disease-specific treatments.

Clinical judgement should be exercised on the applicability of any guideline, influenced by individual patient characteristics. Clinicians should be mindful of the potential for harmful polypharmacy and increased susceptibility to adverse drug reactions in patients with multiple morbidities or frailty.

If, after discussion with the patient or carer, there are good reasons for not following a guideline, it is good practice to record these and communicate them to others involved in the care of the patient.

Version Number:	2
Does this version include changes to clinical advice:	N/A
Date Approved:	19/05/2021
Date of Next Review:	
Lead Author:	Dr Ross MacDuff / Dr Andrew Downie
Approval Group:	Diagnostics Clinical Governance Group

Important Note:

The Intranet version of this document is the only version that is maintained.

Any printed copies should therefore be viewed as 'Uncontrolled' and as such, may not necessarily contain the latest updates and amendments.

DR-GGC-GUID-015

CT Examinations in Adults:

Use of Central Venous Catheters (CVC) and Peripherally Inserted Central Catheters (PICC) for Injection of Contrast

Situation

On occasion there may be the need to consider injection of iodinated contrast via a central venous catheter (CVC) or peripherally inserted central catheter (PICC) for a CT examination in the adult population. Concerns have been raised about the safety of this practice.

This guideline is intended for use by:

- Radiographers and radiographic staff within the Diagnostics Directorate,
- ITU medical staff and Advanced Critical Care Practitioners

Background

The injection of contrast is a fundamental component of many CT examinations, often requiring large volumes at high flow rates. This is generally achieved via a peripheral venous catheter (PVC), however in some patients the only venous access is through a central venous catheter (CVC) or peripherally inserted central catheter (PICC).

Some catheters are designed for use with the high pressures generated by pump injectors, and are marked as such. For standard CVCs and PICCs, however, there are no published UK recommendations for their use for this indication. The Medicines and Healthcare Products Regulatory Agency (MHRA) issued a device alert suggesting injection at a maximum rate of 2ml/s and a pressure limit below the manufacturer's recommended maximum.

Assessment






The use of CVCs for pump injections has been variable across radiology departments within NHS/GGC. Anecdotally pump contrast injections via CVCs have been performed on a case by case basis with no locally reported significant complications. Complication rates within the published literature are also difficult to establish but one paper sites a crude event rate of 0.7%. This does however suggest that it may be that the potential risk from injection via a standard CVC is outweighed by the need to perform the study with contrast.

Recommendation

1. Firstly, determine if the available line is CT compatible. Refer to the poster displayed in control rooms, and available on Q-Pulse, **Guidance for Pressure Injection in CT**, DR-GGC-GUID-016 for help identifying if the line is compatible - Appendix 1.
2. If it is not, refer to the second poster, displayed in control rooms, and available on Q-Pulse, **Emergency Use of Standard CVCs with CT Power Injection**, DR-GGC-GUID-017. This flowchart allows you to make decisions on a case by case basis – Appendix 2, based on Plumb et al (2011).

References

1. Medicines and Healthcare products Regulatory Agency. Medical Device Alert MDA/204/010. Issued 25 Feb 2004
2. Plumb AAO, Murphy G. The use of central venous catheters for intravenous contrast injection for CT examinations. (2011) *The British Journal of Radiology*, 84, 197 – 203

<h1 style="margin: 0;">Guidance for Pressure Injection in CT</h1>	
<h2 style="margin: 0;">Peripheral Venous Catheters</h2>	 <ul style="list-style-type: none"> • Green: Typical flow rate 5ml/sec • Pink: Typical flow rate 4ml/sec • Blue: Typical flow rate 2ml/sec (Flow rate also depends on vein quality)
<h2 style="margin: 0;">PICC or Midline</h2>	<h2 style="margin: 0;">Arrow 4 lumen CVC</h2>
 <p>Standard PICC:</p> <ul style="list-style-type: none"> • No flow rate marked • Emergency use only (see below) <p>CT injectable PICC:</p> <ul style="list-style-type: none"> • Max flow rate & PSI on clamp • Max 6ml/s, 325 PSI for 5F 1-lumen, 6F 2-lumen <p>CT injectable Midline:</p> <ul style="list-style-type: none"> • Max flow rate & PSI on green label (see left) • Max 5ml/s, 300 PSI <ul style="list-style-type: none"> • Ensure clamp is open before injecting • After use, flush with 5ml Normal Saline 0.9%, using turbulent push/pause flush 	 <p>Standard CVC:</p> <ul style="list-style-type: none"> • No flow rate marked • Emergency use only (see below) • Use brown lumen <p>CT injectable CVC:</p> <ul style="list-style-type: none"> • Use lumen marked 10ml/sec or 5ml/sec • Do not use hubs marked "No CT" • Max 5ml/sec • Max 300 PSI
<h2 style="margin: 0;">Arrow catheter</h2>	<h2 style="margin: 0;">Arrow Sheath Introducer</h2>
 <p>8.5 vascular access Peripheral, subclavian, jugular or femoral catheter</p> <p>Conditions of use:</p> <ul style="list-style-type: none"> • Trauma team to connect pump • Do not remove connecting piece • Max 5ml/sec • Max 300 PSI • Flush with saline after use 	 <p>8.5F vascular access Subclavian, jugular, femoral sheath, with side arm</p> <p>Conditions of use:</p> <ul style="list-style-type: none"> • Trauma team to connect pump • Don't use if any catheter in sheath • Check clamp is open • Max 5ml/sec • Max 300 PSI • Flush with saline after use
<h2 style="margin: 0;">Emergency use, other devices & more Info</h2>	<p>For emergency use, or any other device, refer to the poster "Emergency Use of Standard Central Venous Catheters with CT" for advice.</p> <p>For more info search for "VAD Guideline" on Staffnet.</p>

Emergency use of standard central venous catheters with CT power injection

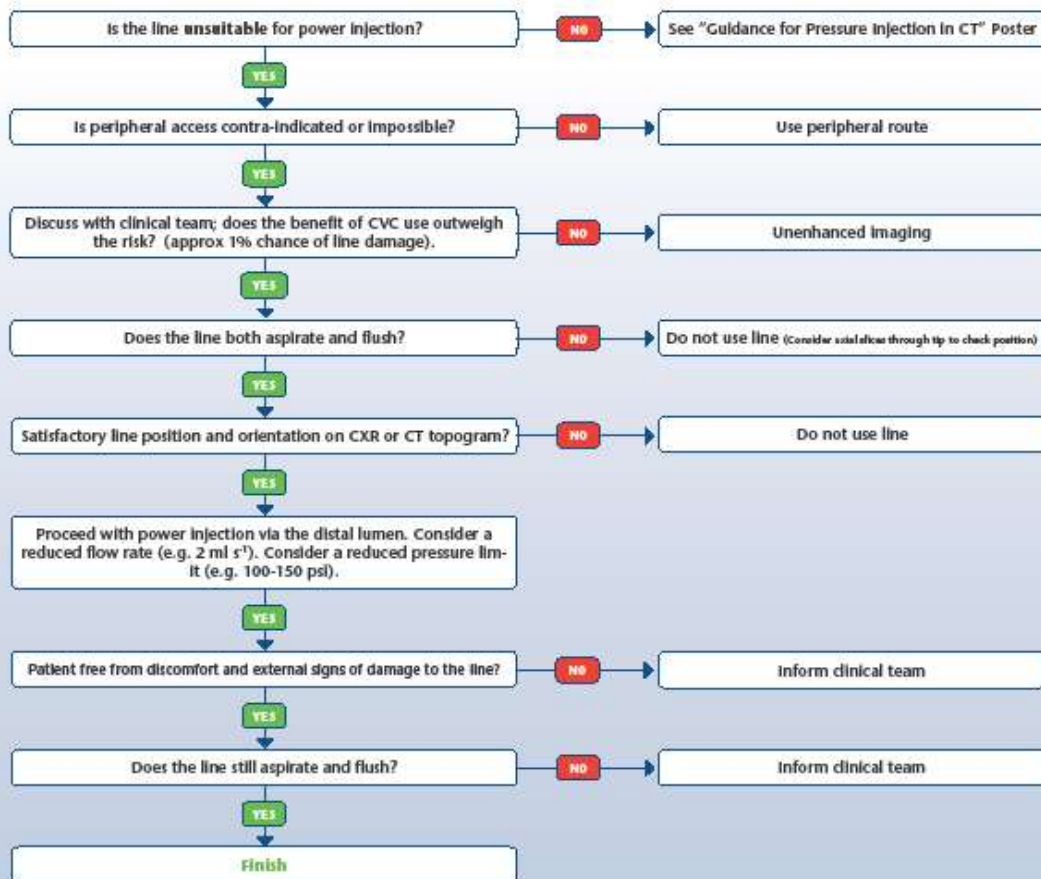


Preferred Access

Wherever possible, contrast for CT should be administered by a suitably sized peripheral i.v. cannula, or a central venous catheter (CVC) or peripherally inserted central catheter (PICC) designed to be CT compatible and withstand the pressures generated during injection. CT compatible lines are suitably labelled and can be identified using the "Guidance for Pressure Injection in CT" poster.

Non CT Compatible central venous access only

Occasionally the only available access will be a standard central venous catheter or PICC, not approved for CT injection. Use of such a catheter carries a small risk of rupture or fracture of the catheter, thought to be less than 1%. If contrast injection is essential in such circumstances, NHS GGC policy is that you may proceed, but only with the agreement of the clinical team caring for the patient, and using the flowchart below. If a multi-lumen CVC is in situ the distal lumen should be used unless it is so narrow that acceptable flow rates cannot be achieved.



Reference: Plumb AAO, Murphy G; The British Journal of Radiology, 84 (2011), 197 - 203