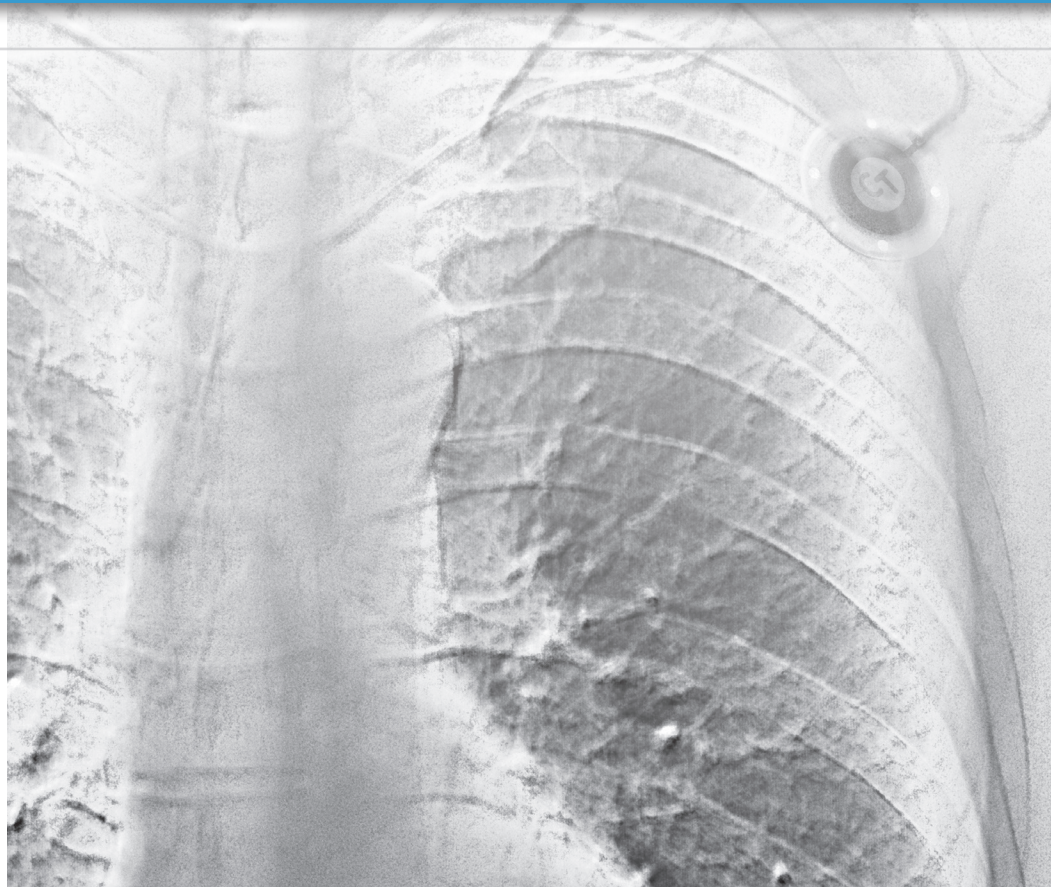


# Your clinical guide to implanted ports and non-coring needles

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## Implanted ports

An implanted port, often referred to as a totally implanted vascular access device (TIVAD), is a type of central venous access device (CVAD) that is inserted subcutaneously in the chest or arm. Implanted ports are increasingly becoming the CVAD of choice for patients who require long-term vesicant drugs, antimicrobials, blood products, parenteral nutrition, or who have persistent problems with their venous access (Hodson, 2019). Moss et al (2021) suggested that the implantable port is superior over peripherally inserted central catheters and tunneled central catheters (Hickman line) for treatment of solid tumors. The port body is usually manufactured in steel, titanium or polyurethane (or a combination of these). It contains a self-sealing silicone rubber septum that protects a reservoir located in the centre of the device (Figure 1). The housing (body) of the port is attached to a silicone or polysulfone catheter that is tunneled under the skin into the subcutaneous tissue via the internal jugular, axillary or subclavian vein and positioned in the lower third of the superior vena cava at, or near, the cavoatrial junction (Gorski et al, 2021). The septum faces the skin and is designed to withstand between 1000 and 2000 punctures, depending on the profile of the port (Hodson, 2019). This makes implanted ports suitable for long-term use.

### Benefits

Implanted ports offer a wide range of benefits (Table 1) that not only reduce risk factors, such as thrombosis and infection, but also help preserve vessel health (Hallam and Denton, 2020). The

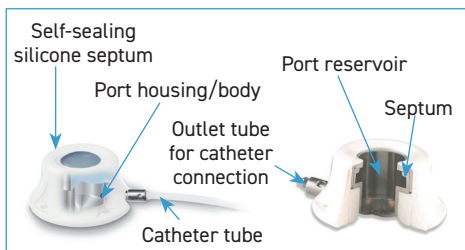


Figure 1. Components of an implanted port

popularity of implanted ports is largely due to the freedom they allow the individual to carry out their daily activities (York, 2019).

### Insertion

A pocket is created through the subcutaneous incision to house the implanted port. Once the port reservoir is connected to the catheter, the incision is usually sutured or glued closed.

Implanted ports are usually inserted in a theatre environment. However, with the increase in number of nurse-led vascular access services, nurses are inserting ports with the aid of ECG tip locations systems. During the majority of these insertions, ECG systems can be used to position the catheter when a confirmation trace is achieved, although chest ports will always need radiographic confirmation to rule out pneumothorax (Hodson, 2019).

As there is a risk of local (at the access site, tunnel or pocket) or systemic (bloodstream) infection, patients should be provided with information to allow them to monitor their port site for complications until healing occurs. Local infection should be suspected if there is erythema (redness), pain, erosion, exudate or malodour at the access site or around the pocket area (Blanco-Guzman, 2018).

### Table 1. Benefits of implanted ports

#### For patients

- Discreet and helps with body image (no tubes are visible when not accessed)
- Once the needle has been removed, safe to bathe or swim
- Minimal aftercare, as the port can be left for longer periods without being flushed\*
- Prevents the need for peripheral cannula insertion and blood sampling

#### For practitioners

- Easy to access for competent practitioners
- Reliable for blood sampling and administering infusions
- Prevents the need for potential difficult cannulations for administering IV therapy
- Fewer interruptions during IV therapy

\*Refer to manufacturer instructions for use and local guidance

## Non-coring needles

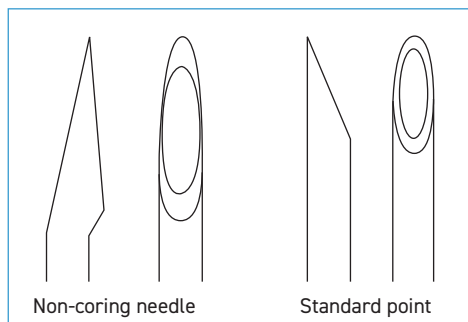
A non-coring needle is a specific type of needle designed to prevent 'coring' of the port septum during insertion. A standard hypodermic needle should never be used as there is a strong risk that a small piece of the septum will be broken off and accidentally injected into the patient.

Non-coring needles have an open tapered end, whereas standard hypodermic (coring) needles have an opening on the side (Figure 2). It is the 45° angle at the end of the non-coring needle that prevents it from 'coring out' plugs of silicone from the septum or tissue during insertion (York, 2019).

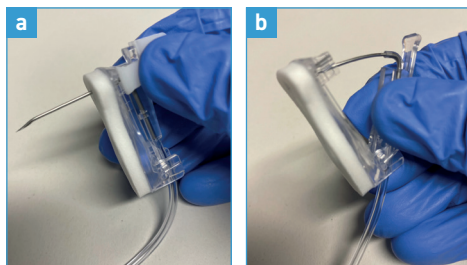
Non-coring needles should all be safety-engineered devices, which help prevent needlestick injury and exposure to blood-borne pathogens (Health and Safety Executive, 2013) (Figure 3).

## Power-injectable needles

Ports that are suitable for power injection must only be accessed using power-injectable needles, which allow for safe intravenous (IV) administration of contrast medium by a power injector. Suitability for power injection must be verified via the port itself (CT initials, see on radiography) or reliable documentation (Box 1). These needles can withstand high pressure and thus ensure high flow rates (up to 5 ml/second), which provide enhanced angiographic studies (York, 2019). Non-power injectable needles can



**Figure 2.** Differences in the tips of non-coring and standard needles



**Figure 3.** A non-coring needle that is ready for insertion into a port (a) and following removal with the safety mechanism activated (b)

only be used in a power injectable port when standard infusions are given.

## Needle selection

When choosing a needle, it is necessary to consider both the depth of the port reservoir and the thickness of the tissue covering the port. Needle lengths range from 16 mm to 32 mm and are designed to penetrate through the septum and sit within the reservoir. If the needle is too short, it may not reach enough of the reservoir, putting the patient at risk of extravasation or infiltration; extravasation is the inadvertent administration of vesicant medication into the surrounding tissue, which can cause serious injury, (Barton et al, 2018). If the needle is too long, it could damage the integrity of the port septum, reducing its lifespan. In addition, excessive movement could cause the needle to bend or break. The needle length required may change if the patient loses or gains weight. In the event of weight loss, subcutaneous fat and skin will become thinner, so a shorter needle will be



### Box 1. Imaging

Port catheters are often made of polyurethane to make them safe to use for powerinjectable CT imaging and MRI. This is often marked on the port and can be seen on X-ray. Patients may also be given a card to keep in their wallet or purse, or a wrist band (usually purple) to wear, to indicate that this is the case (York, 2019)

needed to avoid port erosion. Conversely, if the patient gains weight, a longer non-coring needle might be required (York, 2019).

### Needle clearance

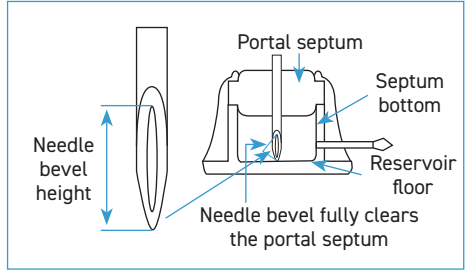
Selection of needle length must be based not only on the depth of the port and the type of therapy to be delivered, but also on the needle gauge. The distance between the bottom of the portal septum and the reservoir floor in relation to the height of the bevel on the non-coring needle is known as the portal needle clearance (*Figure 4*). This gap indicates the largest needle gauge that will fully clear the portal septum. Selecting the correct needle gauge will optimise the flow within the port. If a patient's therapy requires a large gauge needle, this will determine the size of the port that needs to be selected.

### Accessing an implanted port

Specialist training is required before accessing and de-accessing implanted ports (Gorski et al, 2021). Factors influencing successful implanted port access depend primarily on the patient's body type, the port location, subcutaneous depth and the angle of insertion (Barton, 2018). A step-by-step approach on how to access a port is described in *Figure 5* and *Table 2*. The process for de-accessing a port is illustrated in *Table 3*.

### Considerations

For experienced trained practitioners, accessing a port can be relatively straightforward when



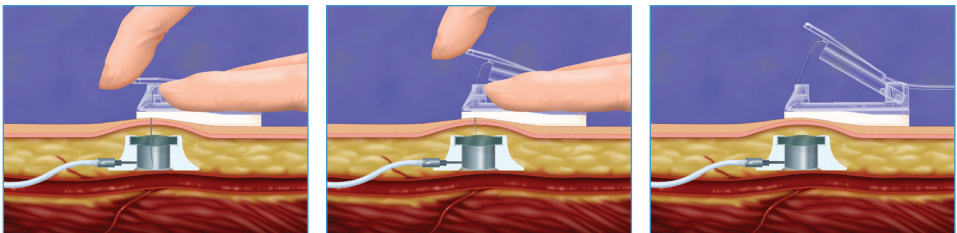
**Figure 4.** Portal needle clearance

it is visible and palpable. However, when access proves difficult it is vital the patient is positioned in a way that ensures the health professional can perform the procedure comfortably and safely. The patient should be asked to lie on a bed or a trolley that can be raised (so that the health professional does not have to stoop and bend over) and their head should be turned away from the direction of the port

To minimise the risk of healthcare-associated infections, vascular access devices (including add-ons) must be accessed and cared for using aseptic non-touch technique (ANTT) (Loveday et al, 2014)

### Avoiding pain

Accessing an implanted port can sometimes be painful for individuals. Application of a topical anaesthetic cream approximately one hour before needle insertion can help reduce this (Gwetu and Chhagan, 2015). However, over time the site usually becomes desensitised, so this is less likely to be required. ▶



**Figure 5.** Accessing and de-accessing the port

**Table 2. Stages for accessing a port (Wirral University Teaching Hospitals)**



- Explain and discuss the procedure with the patient, from whom consent is required
- Gather and collect the equipment, including the correct needle for the implanted port to be accessed
- Ensure the patient is in a comfortable position before inserting the needle (the patient can either be sitting up or lying down, depending on the position of the port)



- Apply appropriate personal protective equipment (PPE), in accordance with local policy, and decontaminate hands
- Locate the port and identify the septum
- Using Aseptic Non Touch Technique (ANTT), prepare equipment, including priming the non-coring needle with normal saline, before insertion
- Decontaminate hands
- Decontaminate the skin above and surrounding the port with a single-use applicator impregnated with chlorhexidine gluconate 2% and isopropyl alcohol 70% and allow to fully dry (Loveday et al, 2014)



- Insert the non-coring needle through the patient's skin at a 90° angle by placing your thumb and index finger on each side of the port and inserting the needle in the centre between the two digits; you will feel the needle hit the back plate once the needle is in place
- Check for flashback of blood in the chamber and aspirate 3–5 ml of blood to ensure correct placement (RCN, 2016)



- If unable to aspirate blood, flush the port with 2–3 ml sodium chloride and try again, observing for signs of pain, resistance and swelling at the site
- The needle should sit relatively flat to the skin
- If the port will not aspirate blood or flush through, consider repositioning the needle or try again
- Follow local guidance if port is not able to aspirated before proceeding (it may be necessary to use and thrombolytic drug such as urokinase – see section on restoring patency)
- Once blood aspirates easily, attach the needle-free device securely to prevent blood reflux into port catheter and reduce infection risk (York, 2019)
- If there is a contoured grip on the needle, remove it with a sliding motion



- Flush through the needle-free device with no less than 10 ml sodium chloride using a turbulent method and clamping with positive pressure
- If resistance, pain or swelling occurs, do not continue to flush
- If there is any concern that the needle is not sited correctly, remove and resite



- If the port is required for immediate use, cover the needle with a semipermeable transparent dressing (Box 2)
- Change transparent dressings every 7 days or more frequently if they become loose or are soiled (Blanco-Guzman, 2018)

**Table 3. De-accessing a port**



- If the needle is to be removed or exchanged, flush the port with no less than 10 ml of normal saline solution, using a turbulent method and clamping with positive pressure



- To de-access the port, place your thumb and index finger on the base to stabilise it



- With the other hand, place a finger on the tip of the safety arm. Lift the safety arm straight back. Check that the needle comes out perfectly straight
- Continue lifting until the needle clicks into the locked position. The safety needle is now ready for disposal into a sharps container
- Decontaminate hands

## Box 2. Semipermeable dressings

Many different types of semipermeable transparent dressings can be used on port needle sites. The dressing must be large enough to cover the entire needle and port site (a minimum of 4 cm surrounding the base) and the needle must be visible and secure

## Flushing an implanted port

Like any vascular device, implanted ports must be flushed to ensure that any blood and medicine are cleared from the device following the delivery of IV therapy.

Royal College of Nursing (RCN) guidance recommends flushing with 0.9% sodium chloride solution before, between and after use to ensure and maintain patency (RCN, 2016). No less than 10–20 ml of normal saline

solution should be used to clear the reservoir and catheter after use (RCN, 2016).

## Key considerations

When flushing an implanted port:

- Use the turbulent method, an essential rapid push/pause technique to inject the sodium chloride into the port
- Use positive pressure, by clamping the line before the last 1–1.5 ml of saline is flushed into the port using the turbulent method; once the clamp has been applied, pressure on the syringe is released
- Flush ports every 4 weeks following removal of the needle, following local guidelines or policy – note that a literature review by Blanco-Guzman (2018) found that intervals of up to 12 weeks are safe.

Heparin locks are still used in some clinical areas to promote longevity of the device and maintain patency. However, there is not enough evidence on the effectiveness of this method in preventing catheter occlusion (Loveday et al, 2014). Follow local guidelines or policy for use of heparin locks versus saline locks.

## Potential complications

If the port is not adequately flushed, two main complications can occur:

- Total occlusion of the device (*Table 4*)
- Withdrawal occlusion, where the device can be flushed easily, but blood cannot be aspirated from it.

## Risk factors associated with ports

### Infection

Risk factors for port-related infections include high frequency of device access, use of parenteral nutrition, haematological malignancy and neutropenia (Blanco-Guzman, 2018). A localised infection can become systemic, causing a catheter-related blood stream infection.

### Catheter-related venous thrombosis

This can occur at any time following port insertion. Symptoms include development of

**Table 4. Restoring patency after occlusion**

**Complete occlusion**

- Flush the port with sodium chloride (saline), using no less than a 10ml syringe; a quality flush using a turbulent method and positive pressure is effective against occlusion and persistent withdrawal occlusion
- Check for any kinks in the tubing of the needle, ensuring clamps are open
- Check the needle is in place correctly by observing for swelling or reports of pain around the port
- Consider using an antithrombotic agent such as urokinase, following local guidelines and policies for its use

**Persistent withdrawal occlusion**

- Try flushing the port with sodium chloride (saline) using no less than a 10ml syringe
- Move the patient so they are either lying flat or sitting upright
- Encourage the patient to take deep breaths, as this will move the port away from the vessel wall
- Consider use of an antithrombotic agent using a pushlock technique
- Consider a lineogram to ascertain presence of fibrin sheath
- Follow local guidelines and policies for use

Source: Gorski et al, 2021

collateral vessels, warmth, erythema or pain around the area of the clot. Thromboses can be diagnosed with an ultrasound (Doppler) or CT scan. Anticoagulation may be required, especially in arm ports.

If it is well positioned, non-infected and surveillance demonstrates good resolution of symptoms, the central venous catheter will not need to be removed should it still be required and is functioning well (Wall et al, 2016).

If symptoms do not resolve, however, the only option may be to remove the catheter. Always refer to local guidelines when determining a course of action.

**Needle malposition**

If a needle is not inserted correctly, its bevel will not reach enough of the reservoir and lead to a risk of infiltration or extravasation.

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**MA Healthcare**

Produced by MA Healthcare on behalf of ICU Medical

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Designer: **Veesun Ho**  
Editor: **Benjamin Wakefield**  
Head of projects: **Chris Beck**  
Associate publisher: **Tracy Cowan**  
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Managing Director: **Anthony Kerr**

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**Cover image:** Alfred Pasiেকa via Science Photo Library  
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