Phlebitis: treatment, care and prevention

Peripheral venous cannulation is a common procedure used in hospital to deliver fluid and medicine.

Phlebitis (inflammation of the vein) can be caused by chemical, mechanical or infectious irritation.

Good practice with cannula insertion and infection control should help to prevent the condition.

5 key points

1. Peripheral venous cannulation is a common procedure.
2. Phlebitis – or inflammation of the vein – can be caused by mechanical, chemical or infectious irritation at the cannula site.
3. Careful placement and good hygiene can help to prevent phlebitis.
4. There are two assessment tools to identify early signs of the condition.
5. Vigilance can help to prevent rare but potentially severe complications such as sepsis.

In this article...

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Peripheral venous cannulation (PVC) is a common procedure carried out in hospital to allow rapid and accurate administration of medication (Endacott et al, 2009). However, the placement of an intravenous cannula can have undesirable effects, the most common of which is phlebitis.

Peripheral catheter-related phlebitis is caused by the inflammation of the tunica intima of a superficial vein. The inflammation is due to irritation of the tunica intima by mechanical, chemical or bacterial sources. If left untreated, it can lead to infection or thrombus formation (Royal College of Nursing, 2010).

It is estimated that in the UK 20-80% of patients with a PVC develop phlebitis (Pander et al, 2002). This broad range has also been reported in studies from other countries (Uslusoy and Mete, 2008) and suggests poor identification of phlebitis or poor reporting protocols.

It is essential for nurses to be able to identify patients who are at risk of developing phlebitis. In turn, early recognition will enable prompt intervention, minimising disruption to treatment.

Receiving intravenous therapy

Intravenous therapy is indicated for many reasons. A significant number of patients admitted into hospital receive some form of intravenous therapy via PVC.

These include intravenous antibiotic administration, intravenous fluids, intravenous pain relief and/or total parenteral nutrition (TPN).

Intravenous delivery devices include:

- Peripheral cannulas;
- Peripheral midline catheters;
- Peripherally inserted central catheters;
- Skin tunnelled cuffed central catheters (Hickman lines).

The type of intravenous delivery device used depends on the type of fluid administered and the length of time intravenous therapy will last. For example, peripheral venous cannulas are indicated for...
Infection control

Microorganisms gain access to new hosts via a variety of methods, with some microbes using more than one method of transmission. Microorganisms are not able to move freely between hosts by themselves – they require either direct physical contact with a new host, or they use another person, animal or inanimate object, to gain access.

Understanding these direct and indirect modes of transmission is essential for effective infection control (Box 1).

Clinical staff, especially those in close physical contact with patients, can act as a portal for disease-causing organisms, facilitating their spread between patients and the clinical environment. An unhygienic environment can harbour microorganisms and facilitate their contamination and spread (Randle et al, 2009).

Infection control measures are essential in the fight against disease-causing microbes, and in the delivery of a high-quality, effective healthcare service.

Good staff hygiene, hand hygiene and adherence to universal precautions (Box 2) are fundamental nursing skills that have consistently been shown to reduce cross-infection, improve hospital hygiene and help combat nosocomial infections (Burke, 2003).

In addition, aseptic technique can help prevent the transmission of microorganisms to wounds and other susceptible sites (such as intravenous cannula ports), and reduce the risk of cross-infection (Hart, 2007).

An aseptic technique is necessary when performing any clinically invasive procedure, especially if the patient has an infectious disease. It is, of course, indicated when delivering intravenous therapy, be it cannula insertion, intravenous drug or fluid administration (Randle et al, 2009).

Phlebitis has been linked with inappropriate catheter insertion sites and inappropriate catheter usage. In addition, a poor standard of infection control has a part to play and infection control and hygiene standards are essential in the treatment and prevention of the condition (Uslusoy and Mete, 2008).

Phlebitis

Mechanical phlebitis

Mechanical phlebitis occurs where the movement of a foreign object (cannula) within a vein causes friction and subsequent venous inflammation (Stokowski et al, 2009) (Fig 1).

It often occurs when the size of the cannula is too big for the selected vein (Martinho and Rodrigues, 2008). It has also been suggested that placement of a cannula near a joint or venous valve will increase the risk of mechanical phlebitis due to irritation of the vessel wall by the tip of the cannula (Macklin, 2003).

This type of phlebitis can be avoided by selecting the smallest possible device for the largest vessel (although some studies such as Uslusoy and Mete (2008) have suggested that catheter size is not a significant causative factor).

Consideration must also be given to the nature of the intended IV therapy and optimum cannula size for drug delivery. For example, a large-bore cannula would be appropriate for rapid fluid resuscitation while a cannula with a smaller bore would suffice for sliding scale insulin therapy.

Chemical phlebitis

Chemical phlebitis is caused by the drug or fluid being infused through the cannula. Factors such as pH and osmolality of the substances have a significant effect on the incidence of phlebitis (Kohno et al, 2009) (Figs 2 and 3).
Antibiotics are reported to increase the incidence of chemical phlebitis due to their low pH (Macklin, 2003). With a large proportion of hospitalised patients receiving IV antibiotics, nurses need to be vigilant when administering this therapy.

Isotonic fluids have been found to lower rates of phlebitis, while hypertonic fluids increase the incidence of phlebitis by initiating the inflammatory response (Uslusoy and Mete, 2008).

TPN is hypertonic but its osmolarity can be adjusted without affecting the pharmacodynamics of the solution, which, alongside the addition of drugs such as heparin, has been shown to increase the life of a fine bore midline cannula (Catton et al, 2006).

Infective phlebitis

Infective phlebitis is caused by the introduction of bacteria into the vein. It may start as an inflammatory response to cannula insertion, allowing bacteria to colonise the “inflammatory debris” (Malach et al, 2006).

Poor practices during drug administration and a higher frequency of drug administration have been found to increase the risk of infective phlebitis (Uslusoy and Mete, 2008).

Another risk factor is poor skin cleansing technique before cannula insertion. Malach et al (2006) found the bacterial growth on removed cannula tips were those commonly associated with normal skin flora.

Infective phlebitis can have significant ramifications for the patient due to the potential development of systemic sepsis.

Signs and symptoms

The commonest symptoms of any form of phlebitis are erythema and swelling along the venous track, leading to hardened, cord-like veins (Endacott et al, 2009). The area can feel warm and patients may experience pain or discomfort during drug administration (nurses should assess if this pain persists between administrations).

Difficulty in injecting or regular infusion pump occlusion would also indicate phlebitis. Any exudate oozing from the insertion site would also be suggestive of phlebitis, in particular infective phlebitis (Macklin, 2003). Pyrexia and haodynamic deterioration of an unknown origin should prompt investigation into cannula infection and potential systemic sepsis.

Assessment and classification

All patients with an intravenous access device should have the access site checked for determining when an intravenous catheter should be removed (Gallant and Schultz, 2006). A number of phlebitis scales and assessment tools have been developed to assist this, and the two most commonly used in the UK are the Phlebitis Scale and the Visual Infusion Phlebitis (VIP) scale.

The Phlebitis Scale was developed by the Infusion Nurses Society (2006). Using a grading scale from 0-4, it has proven to be a quick, easy and useful tool. It is shown in Box 3.

The tool recommended by the Royal College of Nursing is the Visual Infusion Phlebitis scale first developed by Jackson in 1998 (Box 4). The VIP scale has been shown to be a valid and reliable measure for informing clinical practice and decision making, indicating to clinicians the first stages of phlebitis and when intravenous cannulas should be replaced (Creed and Spears, 2010). They can help reduce the progression of phlebitis through early detection.

Phlebitis reduction measures

The incidence of phlebitis can be reduced by use of simple measures. Good practice during insertion will also extend the life of the cannula.

The clinician’s hands should be thoroughly washed, gloves worn and the patient’s skin adequately cleansed. Good clinical practice must be observed when administering intravenous drugs, starting at the point of reconstituting and drawing up the drug. This standard of practice must continue to the administration phase, with particular attention paid to cannula sites of patients on frequent intravenous therapy, as regular use of the cannula site increases the risk of bacterial phlebitis (Uslusoy and Mete, 2008).

The appropriate cannula should be selected for the vein. The site should also be carefully selected, to avoid any bony prominences, joints and venous valves that would cause the cannula to move within the vein lumen.

After insertion, the cannula should be dressed to minimise movement in the vein lumen, which could lead to mechanical phlebitis.

Evidence suggests that the addition of drugs such as heparin and hydrocortisone can reduce the incidence of phlebitis (Ikeda et al, 2004); patients on intravenous steroid therapy have a lower incidence of phlebitis (Kohn et al, 2009). However, this applies only to the administration of anti-neoplastic drugs and so is limited to patients receiving cancer chemotherapy.

To avoid chemical phlebitis, the possibility of bringing drug pH or osmolarity in line with physiological ranges should be explored (Kuwahara et al, 1999). For example, patients undergoing antibiotic or potassium therapy have a higher phlebitis risk due to the low pH of these solutions and neutralising such solutions may help prevent phlebitis (Kuwahara et al, 1999), although this is not usually done by nurses.

Similarly, TPN infusions have a high osmolarity, increasing the risk of chemical phlebitis (Kuwahara et al 1999). Adjusting the osmolarity of TPN solutions (if possible) can also help prevent phlebitis.

Complications

Early phlebitis at an intravenous site usually resolves after a cannula is removed or rested (Rickard et al, 2010). Complications are rare but can occur; these include infection, thrombosis, and recurrent superficial thrombophlebitis (Loewenstein, 2011).

One of the most serious complications — although fortunately rare — is septic thrombophlebitis, a condition characterised by venous thrombosis and inflammation in the presence of bacteraemia (Mermel et al, 2009).

**BOX 3. PHLEBITIS SCALE**

| Grade 0 | No symptoms |
| Grade 1 | Erythema at access site with or without pain |
| Grade 2 | Pain at access site with erythema and/or oedema |
| Grade 3 | Pain at access site with erythema and/or oedema, streak formation, palpable venous cord |
| Grade 4 | Pain at access site with erythema and/or oedema, streak formation, palpable venous cord greater than one inch in length and purulent drainage |

Source: Infusion Nurses Society (2006)
**BOX 4. VISUAL INFUSION PHLEBITIS SCALE**

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Score</th>
<th>Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV site appears healthy</td>
<td>0</td>
<td>No signs of phlebitis</td>
</tr>
<tr>
<td>Action: observe cannula</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One of the following is evident</td>
<td>1</td>
<td>Possibly first signs of phlebitis</td>
</tr>
<tr>
<td>● Slight pain near IV site or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Slight redness near IV site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action: observe cannula</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two of the following are evident</td>
<td>2</td>
<td>Early stage of phlebitis</td>
</tr>
<tr>
<td>● Pain at IV site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Redness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Swelling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action: resite cannula</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All of the following signs are evident</td>
<td>3</td>
<td>Medium stage of phlebitis</td>
</tr>
<tr>
<td>● Pain along path of cannula</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Redness around site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Swelling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action: resite cannula and consider treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All of the following signs are evident and extensive</td>
<td>4</td>
<td>Advanced stage of phlebitis or start of thrombophlebitis</td>
</tr>
<tr>
<td>● Pain along path of cannula</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Redness around site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Swelling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Palpable venous cord</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action: resite cannula and consider treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All of the following signs are evident and extensive</td>
<td>5</td>
<td>Advanced stage thrombophlebitis</td>
</tr>
<tr>
<td>● Pain along path of cannula</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Redness around site and swelling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Palpable venous cord</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Pyrexia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action: initiate treatment/resite cannula</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Jackson (1998)

**References**


**Treatment**

The treatment of phlebitis will depend to some extent on the severity of inflammation and presence of a thrombus. Moderate phlebitis will usually resolve itself. A patient with phlebitis with a VIP score of 2 or more will require their cannula to be removed or resited.

The initial treatment for any form of phlebitis is to stop the infusion and remove the PVC (Webster et al, 2010). This should be done with consideration for the patient's needs; if, for example, the patient is haemodynamically unstable, the PVC should only be removed once a new PVC has been sited.

An affected limb should be elevated to minimise inflammation and an anti-inflammatory cream or gel can be directly applied to the area (Reis et al, 2009).

Anti-inflammatory analgesics can be prescribed to treat both the inflammation and the pain associated with phlebitis.

**Conclusion**

Many patients in hospital require PVC as part of their medical management and care. A recognised associated risk factor is phlebitis.

Nurses are well placed to assess for the presence of phlebitis and act accordingly. By observing good practice both during and after peripheral catheter insertion, complication rates of phlebitis can be reduced and patient care improved. 


**Macklin D (2003) Phlebitis, a painful complication of peripheral IV catheterization that may be prevented. American Journal of Nursing; 103: 2, 55-60.**


**Royal College of Nursing (2010) Standards for Infusion Therapy. London: Royal College of Nursing.**