CENTRAL VENOUS CATHETER-RELATED DEEP VEIN THROMBOSIS

TARGET AUDIENCE: All Canadian health care professionals.

OBJECTIVE:
To provide guidance on the diagnosis, treatment and prevention of central venous catheter-related deep vein thrombosis.

ABBREVIATIONS:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>CT</td>
<td>computed tomography</td>
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<td>DVT</td>
<td>deep vein thrombosis</td>
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<td>INR</td>
<td>international normalized ratio</td>
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<td>LMWH</td>
<td>low-molecular-weight heparin</td>
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<td>MRI</td>
<td>magnetic resonance imaging</td>
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<td>PE</td>
<td>pulmonary embolism</td>
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<td>TPN</td>
<td>total parenteral nutrition</td>
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BACKGROUND:
Central venous catheters are widely used for resuscitation, administration of medications, transfusion therapy, blood sample acquisition and supportive care, especially in patients with malignancy (see Cancer and Thrombosis guide). Although it varies among studies, the incidence of symptomatic catheter-related deep vein thrombosis (DVT) in those patients with cancer is about 4%. Risk factors include the type of catheter, the type and stage of cancer, the use of chemotherapy or radiation therapy, and, of course, recent trauma, surgery or immobility. The role of heritable thrombophilias is unclear, and screening for this is not indicated.

DIAGNOSIS:
The most common presentation is when a catheter is malfunctioning, such as a failure to obtain blood return or difficulty infusing through a lumen. Many patients are asymptomatic, but local symptoms include unilateral hand or arm swelling, pain or swelling in the neck or shoulder, visible collateral veins on the chest, or symptoms of superior vena cava obstruction. Pulmonary embolism (PE) can occur in about 16% of all patients with catheter-associated DVT. The best initial test for diagnosing thrombosis is duplex ultrasonography, noting that it is less reliable for upper extremity than for lower extremity DVT due to the position of the clavicle. However, the sensitivity and specificity of this test are shown to be above 94%. In difficult cases, magnetic resonance imaging (MRI) and computed tomography (CT) can also be used. Venography is the gold standard but it is
an invasive procedure and is often difficult to interpret. Lineograms, a radiographic study where contrast is injected into the catheter, are not recommended for excluding a diagnosis of catheter-related DVT. Post-thrombotic syndrome can occur in the upper extremity, and may manifest as chronic pain, swelling, edema, varicose veins and disability of the affected arm.

**TREATMENT:**

The goal of treatment for catheter-related DVT is to improve symptoms of the acute thrombosis, restore patency, reduce morbidity and mortality by reducing thromboembolism, and prevent recurrent thromboembolic events. Treatment recommendations follow those of lower extremity DVT (see DVT treatment guide), and initial treatment involves anticoagulation. Low-molecular-weight heparin (LMWH) has been shown to be effective and safe in upper extremity DVT, and is overlapped with warfarin for a minimum of 5 days and until the international normalized ratio (INR) is therapeutic. Oral vitamin K antagonists are recommended for the long-term treatment of upper extremity DVT. In patients with malignancy, however, consideration should be given to treating with LMWH alone (instead of LMWH followed by warfarin) as LMWH has shown to be more effective than warfarin in patients with cancer-associated lower extremity DVT and PE. The new oral anticoagulants have not been studied in this setting.

Duration of treatment is controversial (see Duration of Anticoagulation Therapy guide), but it is reasonable to treat for a minimum of 3 months, and to continue as long as the catheter is in place. In those with an upper extremity DVT with a catheter that has been removed, the duration of anticoagulation should not be shortened to less than 3 months. It has been shown to be safe to keep the catheter in during treatment of DVT, and it is not recommended to remove the catheter as long as it is needed and functioning properly.

**PREVENTION:**

Thromboprophylaxis using anticoagulation in patients with central venous catheters has been investigated in several studies, but at this time it has not been shown to be beneficial.

**PEDIATRICS:**

Central venous catheters are a necessity in children who require supportive care to manage their illness (e.g. antibiotics, transfusions). The incidence of thrombosis related to catheter use in children is estimated to be as high as 50%. Treatment (anticoagulation) of catheter-related DVT is recommended in the absence of contraindication using LMWH or warfarin for up to 3 months. Following therapy, long-term thromboprophylaxis may be indicated as long as the line remains in situ. Without a previous history of thrombosis, thromboprophylaxis is not recommended unless a child is on long-term total parenteral nutrition (TPN). Pediatricians with expertise in thromboembolism should manage, where possible, pediatric patients with thromboembolism.
When this is not possible, a combination of a neonatologist/pediatrician and an adult hematologist, supported by consultation with an experienced pediatric hematologist, is recommended.

REFERENCES:


Please note that the information contained herein is not to be interpreted as an alternative to medical advice from your doctor or other professional healthcare provider. If you have any specific questions about any medical matter, you should consult your doctor or other professional healthcare providers, and as such you should never delay seeking medical advice, disregard medical advice or discontinue medical treatment because of the information contained herein.