CENTRAL VENOUS CATHETER-RELATED DEEP VEIN THROMBOSIS

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

BACKGROUND:
Central venous catheters are widely used for resuscitation, administration of chemotherapy, antibiotics and other medications, transfusion therapy, parenteral nutrition, blood sample acquisition, and supportive care, especially in patients with malignancy. Although the rate varies among studies, the incidence of symptomatic catheter-related DVT in patients with cancer is about 4% over the catheter’s lifespan. Risk factors for catheter-related DVT include: larger catheters, multiple lumens, catheter tip location not at the cavoatrial junction, the type and stage of cancer, and the use of chemotherapy. Peripherally inserted central catheters (PICCs) are associated with a higher risk of DVT than other central catheters. The role of heritable thrombophilias is unclear, and screening for them is not indicated.

DIAGNOSIS OF CATHETER-RELATED DVT:
Patients with central venous catheter-related DVT may develop 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 such as facial swelling and headache. Patients with central venous catheter-related DVT may also be asymptomatic. The best initial test for diagnosing DVT is Doppler ultrasonography (DUS). Isolated subclavian vein or more central venous thrombosis may not be well seen with DUS due to the clavicle and chest wall. In difficult cases, magnetic resonance imaging (MRI) or computed tomography (CT) may be required. Direct contrast venography is an invasive procedure and may be difficult to interpret.

TREATMENT OF CATHETER-RELATED DVT:
The goals of treatment for catheter-associated DVT are to improve acute symptoms, decrease long-term morbidity, prolong patency and survival of the catheter, and prevent recurrent DVT. Acute treatment recommendations are based primarily on trials in patients with lower extremity DVT. Removal of the affected catheter is not required if it is still needed, functioning properly and not associated with infection. Anticoagulation with low molecular weight heparin (LMWH) has been shown to be effective and safe in upper extremity DVT. Longer-term anticoagulation may involve continuation of LMWH alone, conversion to warfarin or use of one of the direct oral anticoagulants (DOACs), apixaban, dabigatran, edoxaban, or rivaroxaban; although the use of the latter class of anticoagulants in this setting has not been well studied. If LMWH is transitioned to warfarin, there should be an overlap for a minimum of 5 days and until the international normalized ratio (INR) is
therapeutic. The DOACs have very limited data in this setting, but they are known to be equivalent to standard therapy with warfarin for secondary prevention of lower extremity DVT and pulmonary embolism in non-cancer patients. In a recent study of rivaroxaban 15 mg orally twice daily for 21 days followed by 20 mg once daily in 70 cancer patients with central venous catheter-related upper extremity DVT, preservation of line function at 12 weeks was 100% and the risk of recurrent venous thromboembolism was 1.43% at 12 weeks. There was, however, one episode of fatal PE and the risk of clinically relevant bleeding was a higher than anticipated at 12.9%. These results suggest that further studies are required prior to recommending routine use of rivaroxaban in this setting.

Although duration of treatment for central venous catheter-related DVT is controversial, it is reasonable to treat patients with a DVT in the axillary or a more proximal upper extremity deep vein for a minimum of 3 months and as long as the catheter is in place (if longer). In those with a DVT involving only the brachial vein or thrombosis confined to the superficial veins, such as the cephalic or basilic vein, treatment with anticoagulation has not been studied. In this situation, anticoagulation with less than therapeutic doses of LMWH (e.g. approximately 50% of a treatment dose) to prevent progression of the thrombus while the catheter remains in place is reasonable.

**PREVENTION OF CATHETER-RELATED DVT:**

The most important aspects of prevention of catheter-related DVT are: use of central venous catheters only when necessary, insertion of the smallest catheters that satisfy their purpose and prompt removal when they are no longer needed. Usual thromboprophylaxis doses of LMWH have not been shown to be beneficial. If a patient has a past history of a catheter-associated DVT and now has a new indwelling catheter, it may be prudent to provide them with higher than usual doses of LMWH thromboprophylaxis, although this has not been studied and there may be an increase in bleeding with this approach. Low dose warfarin or fixed dose warfarin (1 mg daily) is not recommended. Warfarin targeted at INR 2.0 – 3.0 is effective but is associated with more bleeding.

**PEDIATRICS:**

Central venous catheters are a frequent 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%. Anticoagulant therapy for catheter-related DVT with LMWH or warfarin is recommended for at least as long as the catheter 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 pediatric patients with thromboembolism where possible. 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.

**OTHER RELEVANT THROMBOSIS CANADA CLINICAL GUIDES:**

- Cancer and Thrombosis
- Deep Vein Thrombosis: Treatment
- Pediatric Thrombosis
REFERENCES:


Date of version: 2017June13

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.