

CASE STUDY

Blood Clot Removed from Central Venous Catheter Lumen capped with a Neutral Displacement Connector



Conclusion

During all infusion therapy, in particular therapy which is intermittent, it is extremely important to follow INS standards and maintain positive pressure in the line in order to maintain patency and reduce the occurrence of occlusions. For lines that are intermittent and will not have fluid movement for a period of time, any negative reflux into the line at disconnection can potentially lead to a clot like the one discussed in this report.

Background

Intraluminal catheter occlusion is one of the most common complications associated with vascular access catheters. Although multiple factors predispose CVCs to occlusion, reflux of blood is frequently implicated. Historically, methods to prevent these occlusions have included turbulent flushing, coordinated flushing-clamping techniques, and manual positive pressure flush. These methods have been in use for many years to assist in the maintenance of catheter patency.

Maintaining catheter patency results in decreased use of thrombolytics, fewer treatment delays, reduction in diagnostic procedures, lower costs, and increased patient satisfaction. Procedures and methods to de-clot lines increase catheter manipulation, the risk of contamination, nursing time and overall costs. Replacement of clotted catheters is expensive and traumatic for the patient. Thrombotic occlusions may contribute to the development of CVAD-related infection because the blood clot serves as a rich culture medium for bacterial growth.

The type of needleless access device used can impact catheter occlusions rates.

A **negative displacement** needleless access port permits blood to backflow into the catheter when the male luer from the infusion device is removed from the access port. This retrograde blood flow into the catheter lumen may result in stasis of blood in the catheter and subsequent intraluminal thrombus formation.

A **positive displacement** needleless access port releases a small bolus of fluid from the device to clear and lock the catheter when the male luer from the infusion device is removed from the access port. A positive bolus at disconnect is critical as it clears the line and maintains patency even during intermittent therapy where re-access may not occur for hours.

So-called, **neutral displacement** devices claim there is no movement of fluid in the catheter upon connection or disconnection from the device. Review of the FDA 510K Website reveals that one of the manufacturers of a so called “neutral” displacement connector has not received FDA 510K clearance to market that particular device and another manufacturer’s 510K summary documents state their device actually exhibits negative displacement. Negative displacement, whether large or small, is a cause of concern. During intermittent therapy, fluid movement in the line can be stopped for hours at a time allowing a clot to form.

Clot Removed

A large teaching hospital in Northern California experienced first hand that neutral devices clot. Hospital A uses the MaxPlus® Connector on Central and PICC catheters and uses another so-called “neutral” connector on Peripheral IV catheters. Due to the hospital stocking two different devices to cap catheters a mistake was made and one of the lumens of a Central Venous catheter was capped with the so-called “neutral” connector. After several attempts to de-clot the line the catheter was removed from the patient and the clot was removed from the lumen. The lumen capped with the neutral connector contained a large clot. The educator at the hospital took this picture and crossed out the connector that should not be used to cap Central Venous Catheters and PICC’s. This picture is part of a presentation given during competency training at this hospital.

