11. Management of central venous access complications

Guideline 11.1. Catheter dysfunction should be corrected by local fibrinolysis designed to restore flow patency. Repetitive catheter dysfunction requires local fibrinolysis with additional catheter imaging, microbiological assessment and systemic coagulation evaluation (Evidence level III).

Rationale

Catheter dysfunction is a relatively common event for haemodialysis patients. It reduces the effective blood flow rate and reduces dialysis dose. Catheter dysfunction may be minimized by using the appropriate material, a perfect insertion technique [1] and strict protocols for catheter care [2]. Catheter design and material are essential for achieving high blood flow and adequate performance [3,4]. Tunnelled catheters provide usually higher flows (up to 400 ml/min) at low resistance and reduced recirculation compared with non-tunnelled catheters. Dual catheters with independent lines and side holes at the tip provide higher flows than dual-lumen catheters [5,6]. Catheters inserted in the right internal jugular vein offer the best flow compared with other central venous sites [7]. Catheter dysfunction must be detected and corrected early in order to restore blood flow and dialysis dose. Catheter dysfunction may occur in different ways:

(i) Complete obstruction, making dialysis impossible.
(ii) Incomplete obstruction (endoluminal fibrin deposits restricting catheter lumen or obstructing catheter side holes at the tip, external fibrin sleeves surrounding catheters) resulting in inadequate flow and/or excessive extracorporeal blood pressure alarms during the dialysis session. Depending on the location of the fibrin clot (arterial and/or venous line), there may be high negative arterial pressure (obstruction at the arterial catheter line) or high positive venous pressure (obstruction at the venous catheter line).

Catheter care and handling are very important to prevent catheter dysfunction. Prevention of catheter clot formation in the catheter tip during the interdialytic period is crucial. This may be achieved by installing an antithrombotic lock solution (standard heparin, low molecular weight heparin, sodium citrate) [8,9]. A certain amount of the antithrombotic lock solution may leak into the circulation via side- and central catheter holes. Loss of antithrombotic locking solution facilitates catheter clot formation while it increases the haemorrhagic risk. Regular use of low dose of antithrombotic drugs such as coumarin derivatives or antiplatelet agents in dialysis patients have failed to improve catheter outcomes [10–12].

Catheter performance monitoring is required to detect catheter dysfunction. Such monitoring is an integral part of the quality assurance process to ensure dialysis efficacy and to reduce catheter-related morbidity [13]. It relies on markers evaluating catheter flow performances such as estimations of effective blood flow rate, venous and arterial pressure values at constant flow, recirculation and dialysis dose delivery as measured by Kt/V [14].

Catheter maintenance is important to achieve the prescribed blood flow during dialysis sessions. To prevent and/or to correct catheter dysfunction it is recommended to clean the catheter lumen periodically by applying fibrinolytic agents (urokinase, tPA) either as lock solution or continuous infusion on both arterial and venous lines [15]. Occluded catheters are reopened either by means of a mechanical method (brush) or pharmacological method (urokinase, tPA) [16–18]. Removal of the fibrin sleeve may be achieved either by lasso wire stripping or by infusing a fibrinolytic solution (urokinase, tPA), during 3–6 h [19]. Alternatively, the catheter may be exchanged over a guidewire [20].

Recommendations for further research

Investigation into better thrombolytic agents and mechanical tools to declot thrombosed catheters are of importance.

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