We investigated the effect of catheter-induced mechanical stimulation on venous endothelial cells and catheter sleeve formation and the efficacy of anti-thrombogenic technology for preventing catheter sleeve formation in vivo” Tanabe et al (2019).

Abstract:

BACKGROUND: Intravenous catheters are widely used but are often removed due to complications associated with catheter sleeve formation. A catheter sleeve can develop from a thrombus, and catheter-induced vascular endothelium damage may be a critical factor for thrombus formation. We investigated the effect of catheter-induced mechanical stimulation on venous endothelial cells and catheter sleeve formation and the efficacy of anti-thrombogenic technology for preventing catheter sleeve formation in vivo.

METHODS: We surgically implanted poly(2-methoxyethyl acrylate)-coated and uncoated catheters with and without a stylet into the right external jugular vein of a rabbit model for 14 days. Catheter sleeve formation and the ratio of residual venous endothelial cells were compared using histological examination and immunostaining with an anti-CD31 antibody, respectively.

RESULTS: Stiffening an uncoated catheter with a stylet induced catheter sleeve formation along more than two-thirds of the length of the catheter. The ratios of residual venous endothelial cells at the tip of uncoated catheters with and without a stylet were 3% and 36%,
respectively. While poly(2-methoxyethyl acrylate) coating also reduced the ratio of venous endothelial cells at the tip of the stiffened catheter (12%), it prevented external thrombus and catheter sleeve formation.

CONCLUSION: High levels of mechanical stimulation can affect catheter-related thrombosis and promote catheter sleeve formation, and anti-thrombogenic technology such as a poly(2-methoxyethyl acrylate) coating reduces thrombus formation and can prevent catheter sleeve formation on stiffened catheters. Further studies are required to determine the maximum degree of venous endothelial cell damage before catheter sleeve formation and to compare other anti-thrombogenic technologies with poly(2-methoxyethyl acrylate) for preventing catheter sleeve formation.

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