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Adhesion of Staphylococcus epidermidis and Staphylococcus aureus to Intravascular cannulae

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Abstract : The use of implantable foreign devices in medicine has recently increased dramatically. Intravascular cannulae and catheters are used to administer fluids, medications, parenteral nutrition, and blood products in order to monitor hemodynamic status and also to provide hemodialysis. The early and late failure of inserted or implanted devices is largely the result of bacterial infection and may lead to the disruption of integration between the device and the tissues which surround it. Staphylococcus aureus and Staphylococcus epidermidis are widely considered to be the most common organisms causing device-related infection. Our study showed that S. aureus and S. epidermidis adhered to intravascular cannulae made up of PTFE, SPTFE and vialon. Adhesion of S. epidermidis and S. aureus to intravascular cannulae varied significantly depending upon the type of material used and the presence of coating materials. Both bacteria adhered less to PTFE followed by Vialon and SPTFE and the adhesion capacity of S. aureus and S. epidermidis increased over time. Coating intravascular cannulae with human serum albumin inhibited the adhesion of S. aureus and S. epidermidis to these cannulae, and pretreatment of cannulae with fibronectin inhibited the adhesion of S. epidermidis but increased the adhesion of S. aureus to all types of cannulae. Pretreatment of cannulae surface with potassium chloride or calcium chloride increased the adhesion of S. aureus and S. epidermidis to cannulae, suggesting a role for electrostatic forces in the mechanism of such adhesion. This study will hopefully clarify the mechanism of adhesion and provide possible means of preventing such adhesion either by the use of better material coatings or by interfering with the process of adhesion by targeting bacterial structures responsible for it. Currently we recommend the use of PTFE cannulae as they exhibit a lower bacterial adhesion capacity compared to the other tested cannulae.

Keywords : Staphylococcus epidermidis, Staphylococcus aureus, adhesion, cannulae, PTFE, Vialon
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