

Efficacy of three different valve systems of needlefree closed connectors in avoiding access of microorganisms to endovascular catheters after incorrect handling

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PURPOSE

Disinfectable needlefree closed connectors (DNCC) were designed to avoid needle-stick injuries and to be easily disinfected before handling. The purpose of this study was to analyze the extent to which incorrect handling affects the permeability of these devices to microorganisms and whether differences in DNCC design minimizes the negative effects of incorrect handling.

MATERIALS AND METHODS

Peripheral venous catheters were inserted in blood culture bottles under sterile conditions. Three different DNCCs with different valve designs (MicroClave[®], Bionector[®], and SmartSite[®] Plus) were used to close the catheters. The external surfaces of the connectors were contaminated with one of three different concentrations of a *Staphylococcus epidermidis* culture broth: A) 100 CFU/mL, B) 500 CFU/mL, and C) 1000 CFU/mL. Sixty units of each type of connector (total 180 connectors) were divided into three subgroups of 20 and contaminated with concentration A, B, or C of *S. epidermidis*. Ninety contaminated units were assigned to the Correct Handling Group, which was cleaned with 70% ethylic alcohol before handling. Ninety contaminated units were assigned to the Incorrect Handling Group, which was handled without disinfection.

RESULTS

% Sterility of Models After Contamination with <i>S. Epidermidis</i>			
	100 CFU/mL	500 CFU/mL	1000 CFU/mL
Correct Handling			
MicroClave	10/10 (100)	10/10 (100)	10/10 (100)
Bionector	10/10 (100)	10/10 (100)	8/10 (80)
SmartSite Plus	10/10 (100)	10/10 (100)	7/10 (70)
Incorrect Handling			
MicroClave	10/10 (100)	10/10 (100)	5/10 (50)
Bionector	10/10 (100)	8/10 (80)	2/10 (20)
SmartSite Plus	10/10 (100)	4/10 (40)	1/10 (10)

CONCLUSION

Increases in concentrations of external contamination and incorrect handling of the connectors resulted in increases in the connectors' permeability to the passage of microorganisms to the endoluminal way.

The connector with the best results was MicroClave. The valve design of a double access system includes a silicone valve that allows access to an endoluminal blunt cone that enters the male luer lumen. The protection of the blunt cone by the silicone valve allows total isolation of the endoluminal way even without disinfection following contamination with a broth culture of 500 CFU/mL. The absence of a second endoluminal protected access in the SmartSite Plus could explain its higher permeability. The results illustrate the importance of compliance with handling and disinfection protocols, as all of the connectors were adversely affected by incorrect handling and more aggressive microbial challenges.