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Assessment of antimicrobial shunt and external drain catheters

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Background

In an attempt to reduce the rate of shunt or external drain infection, various "antimicrobial" catheters have been developed. These have given encouraging results on preclinical testing, but the test methods are often poorly predictive of clinical performance. Requirements of clinically effective "antimicrobial" catheters need to be established, and test methods relevant to pathogenesis and infection risk developed in order to avoid waste of research time and investment, and particularly to avoid clinical disappointment. In addition, the principles of effective antimicrobial catheters need to be laid down.

Materials and Methods

Three different commercially available "antimicrobial" catheters were assessed using systems developed to determine their likely clinical performance. These assessed spectrum and duration of antimicrobial activity, bacterial adherence, and the tK100 (time taken to kill 100% of adhered bacteria) using chemiluminescence and differential membrane permeability fluorescence. Serial challenge under flow/perfusion was also carried out. Tests were carried out in the presence of a plasma protein conditioning film. In two cases where this was pertinent, mechanical properties were determined and confocal microscopy was done to determine distribution of the antimicrobials in the shunt material In the third case, the coating was located using pH 4 tetracycline fluorescence.

Results

The coated catheter was found to be coated on the outer surface only, and despite the use of huge antimicrobial concentrations it failed to prevent catheter colonisation. The remaining two, one admixed and one impregnated, both showed longlasting antimicrobial activity but only one was capable of achieving tK100. The admixed catheter showed adverse mechanical properties explained by the microscopy results.

Conclusion

Design of "antimicrobial" shunt or EVD catheters must take account of the pathogenesis of infection, and they must be subjected to preclinical testing that is highly predictable of clinical efficacy.