

Oral presentation

An *in vitro* investigation of the antimicrobial activity of silver-processed catheters for external ventricular drainage

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Background

Ventriculitis is a serious complication of external ventricular drainage (EVD). Silver-processed catheters (S-PC) are available that are intended to reduce the risk of infection. Clinical results of use of S-PC in other settings have been mixed, with benefit limited to only short-term use [1,2]. Little clinical experience of S-PC for EVD use [3], and no in-depth laboratory studies have been reported. We therefore examined the catheters to determine their antimicrobial activity in clinically relevant tests.

Materials and methods

Test bacteria were *Staphylococcus epidermidis*, *Staphylococcus aureus* (MRSA) and *Escherichia coli*. Catheters (Silverline®) were purchased from Forth Medical Ltd, UK. For comparison, an in-house processed catheter [4] was tested. Both contain nanoparticulate silver. Two tests were conducted, and scanning electron microscopy (SEM) was also carried out. tK100: This measures the time taken to kill 100% of bacteria when attached to the catheter material [5]. *In vitro* challenge5 determines the ability of the S-PC to resist colonisation in flow conditions when repeatedly challenged with bacteria (as in EVD). In addition, focused ion beam SEM (FIBSEM) investigated the distribution of silver in the catheter materials.

Results

At high bacterial inoculum (107 cfu/mL) both S-PCs failed to show any antimicrobial activity and they were

also not able to resist colonisation. At low inoculum (104 cfu/mL) initial reduction in viability in the tK100 test was followed by resurgence after 2 days to control levels. Again, the S-PC became colonised. FIBSEM showed more silver nanoparticles in the in-house catheter material but it still did not show superior activity.

Conclusion

S-PC exhibit antimicrobial activity for a few days, after which they are ineffective in killing attached bacteria. This may be sufficient to reduce infection rates in very short-term EVD.

References

1. Saint S, Elmore JG, Sullivan SD, Emerson SS, Thomas D, Koepsell TD: **The efficacy of silver alloy-coated urinary catheters in preventing urinary tract infection: a meta-analysis.** *Amer J Med* 1998, **105**:236-241.
2. Niël-Weise BS, Arend SM, Broek PJ van den: **Is there evidence for recommending silver-coated urinary catheters in guidelines?** *J Hosp Infect* 2002, **52**:81-87.
3. Beer R, Lackner P, Pfausler B, Schmutzhard E: **Nosocomial ventriculitis and meningitis in neurocritical care patients.** *Neurocrit Care* 2009, **10**:363-367.
4. Furno F, Kelly S, Morley S, Wong B, Sharp BL, Arnold PL, Howdle SM, Bayston R, Brown PD, Winship PD, Reid HJ: **Silver nanoparticles and polymeric medical devices: a new approach to prevention of infection?** *J Antimicrob Chemother* 2004, **54**:1019-1024.
5. Bayston R, Ashraf W, Bhundia C: **Mode of action of an antimicrobial biomaterial for use in hydrocephalus shunts.** *J Antimicrob Chemother* 2004, **53**:778-782.