IN VITRO ANALYSIS OF ANTIFUNGAL IMPREGNATED POLYMETHYLMETHACRYLATE BONE CEMENT

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Introduction: Fungal infection of total joint arthroplasty is a rare but devastating complication. This study examines the change in mechanical properties of cement with the inclusion of variable concentrations of Amphotericin B antifungal and the elution rate from the polymerised cement.

Method: Amphotericin B powder was mixed in different concentrations with commercial tobramycin Simplex antibiotic cement. Compressive strength and modulus of standardised specimens was measured. The cumulative dose of amphotericin and tobramycin released into solution was measured using UV-V spectrometry.

Results: Incorporation of Amphotericin into the cement resulted in a statistically significant increase in compressive strength from 107MPa to 123MPa ($p<0.001$) with 200mg of antifungal per 40g cement powder. There was no statistically relevant change in modulus or strain to failure. At 72 hours no significant elution of antifungal (<1%) had occurred and the cumulative release of antibiotic had reached a maximum.

Conclusion: Contrary to expectations the mechanical properties of PMMA cement are improved by the addition of Amphericin B, however the elution of the antifungal is negligible. This is most likely due to the conjugated unsaturation found in the amphotericin B molecule which will readily react with methyl methacrylate during cement cure. This results in an increase in crosslink density in the bone cement, subsequently improving mechanical strength. The covalent bonds formed between the amphotericin B and the cement prevents it

from eluting. We suggest that the addition of Amphotericin B powder to PMMA cement is not a valid method for the treatment of deep fungal infections.