

Title of Presentation:

Compression Failure Analysis of Porous PMMA

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Learning Objectives (After attending this session, the attendee should be able to):

- appreciate the structural strength retained by PMMA after induced porosity and the advantages that porous PMMA has when laden with chemotherapeutic agents.

ABSTRACT:

Antibiotic release from polymethyl-methacrylate (PMMA) is dependant on the surface area of exposed cement. In vitro and in vivo research have shown poor elution rates when antibiotic has been mixed with PMMA. Porous cement has been shown to increase antibiotic elution rates but the decrease in structural strength has not been quantified. We hypothesized that porous PMMA could maintain structural strength at porosities high enough to increase antibiotic delivery. Sucrose loaded PMMA cylinders were formed and tested to failure in compression. Compositions of 11.1%, 20.0%, 27.3% and 33.7% sucrose by mass were tested and failure load compared to non-porous PMMA. Stress-strain curves were generated and failure and minimum compressive strength (70 MPa) were defined per the ASTM F 451-99a (2007). Data analysis revealed a linear decrease in compression strength with the addition of sucrose to PMMA. However, sufficient structural strength was maintained when less than 20% sucrose by mass was used as filler. Our failure analysis supports the hypothesis that adequate compression strength can be maintained while significantly increasing the porosity of PMMA to levels shown to increase antibiotic elution rates.

