

The Effect of Additional Layer between Liner and PMMA on Reducing Cracks of Cement Mantle Hip Joints

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Abstract

Loosening of the acetabular liner component caused by the failure of the cement mantle is a complex phenomenon in a total hip arthroplasty. This failure is often associated with the occurrence of cracking in the cement mantle. Investigation of this cracking can be performed by fatigue test or simulation. Cracking can be caused by initial cracks (porosity), defects of cement mantle, or stress due to repeated loading. An initial crack may be caused by material defects. The stress depends on the load and on the strength of the material itself. To reduce crack failure, one can minimize the initial crack or optimize the thickness of the cement mantle and reduce stress that occurs in the cement mantle. This study offers a solution for reducing the intensity of stress on the cement mantle by providing an additional metal layer between the liner and the acetabular component cement mantle. The study is performed by simulating static contact using finite element analysis. Results show that the additional layer between the acetabular liner and the cement mantle can significantly reduce the stress on the contact surface of the cement mantle.

Keywords: layer, cement mantle, cracking, fatigue, hip joint

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