

# LUBRICATION EFFECT OF METAL-ON-METAL IN HIP JOINT REPLACEMENT

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## ABSTRAK

Penggunaan bahan *keras-keras* merupakan satu kaedah alternatif untuk menggantikan bahan *lembut-lembut* atau *lembut-keras* yang telah lama digunakan dalam penggantian sendi pinggul. Antara jenis bahan *keras-keras* yang biasa digunakan dalam penggantian sendi pinggul adalah logam-logam. Walaubagaimanapun, rangka pinggul yang menggunakan logam-logam boleh menghasilkan zarah penghakis yang kecil hasil daripada pergeseran permukaan sentuhan di antara kepala femoral dan acetabulum. Oleh sebab itu, prestasi pelincir di antara permukaan kepala femoral dan acetabulum adalah penting untuk mengurangkan zarah penghakis. Objektif kajian ini adalah untuk mengkaji kesan pelinciran terhadap penggantian sendi pinggul logam-logam. Dua jenis analisis sentuhan telah dijalankan, iaitu sentuhan tanpa pelinciran dan sentuhan dengan pelinciran. Dalam analisis sentuhan tanpa pelinciran, tekanan sentuhan yang maksima ialah 32.887 MPa sementara analisis bagi sentuhan dengan pelinciran, tekanan sentuhan yang adalah rendah. Hal ini berlaku kerana di antara kepala femoral dan acetabulum mempunyai satu lapisan pelinciran filem bendalir penuh. Hal ini menyebabkan penghakis yang dihasilkan melalui rangka pinggul logam-logam dapat dikurangkan kerana keberkesanan pelincir filem berupaya untuk mengurangkan penghakis dengan ketara. Di samping itu, kajian ini tertumpu kepada parameter rekabentuk iaitu kelegaian jejari dan saiz kepala femoral. Didapati bahawa tekanan sentuhan yang maksima adalah meningkat apabila kelegaian jejari meningkat dan tekanan sentuhan yang maksima adalah menurun apabila saiz kepala femoral meningkat.

## ABSTRACT

The use of *hard-on-hard* material is one of alternative methods to replace the *soft-on-soft* or *soft-on-hard* material which has long been used in hip joint replacement. The common type of *hard-on-hard* material used in hip joint replacement is metal-on-metal. However, the metal-on-metal hip implants produce the small wear particle as a result of attrition of the contact surface between femoral head and acetabulum cup. Therefore, the lubrication performance between the surface of the femoral head and acetabulum cup is essential to reduce wear particle. The objective of this study was to determine the effect of lubrication on metal-on-metal hip joint replacement. Two types of contact analysis were performed, without and with lubrication. In the contact analysis of without lubrication, the maximum contact pressure was 32.887 MPa while lubrication contact analysis, maximum contact pressure was lower. It was occurred because between the surface of femoral head and acetabulum cup has full fluid film lubrication. This causes the wear that produced by metal-on-metal hip joint implants can be reduced because an effective lubricant film is able to reduce wear significantly. In addition, this study focused on the design parameters, radial clearance and femoral head size. It was found that the maximum contact pressure increased when the radial clearance also increased and the maximum contact pressure decreased when the femoral head size increased.