Large Diameter Heads Can Be Anatomically Contoured for Soft-tissue Relief Without Affecting Their Contact Area

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INTRODUCTION

- Large diameter femoral heads provide improved range-of-motion and dislocation resistance
- Large-diameter femoral heads can lead to anterior hip pain by impinging on soft tissue, such as the iliopoulos tendon¹
- Anatomically Contoured femoral Heads (ACH) could solve the impingement problem

Hypothesis: Determine if an anatomically contoured femoral head can maintain the articular load-bearing contact area of a non-contoured femoral head

¹Browne et al. J Arthop 2011
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METHODS

• Performed finite element analysis of femoroacetabular load-bearing contact area with rigid shell and head, and elastoplastic liner
• Tested range of component placements
  • Femoral stem anteversion (0° – 10°)
  • Acetabular shell & liner abduction (20° – 60°) & anteversion (0° – 40°)
• Examined influence of component radial clearance
• Simulated maximum joint load from in vivo data\textsuperscript{2} of gait, chair sit and deep knee bend activities

\textsuperscript{2}Bergmann et al. J Biomech. 2001
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RESULTS

• **No difference** in contact area between contoured and non-contoured femoral heads
• Component placement affects load bearing contact area
• Load bearing contact area decreases with increasing head to acetabular liner radial clearance

![Average Contact Area (±Std. Dev.) for All Component Placements](image)
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CONCLUSION

- There was no difference in contact area between the anatomically contoured femoral head and the conventional femoral head.
- Contouring the femoral head could alleviate anterior hip pain due to soft-tissue impingement.
- Large diameter femoral heads provide additional range-of-motion and increased dislocation resistance.

Contact pressure of liner from gait cycle loading with cup at 40° abduction and 20° anteversion. Femoral stem was at 0° anteversion. Maximum contact pressure shown is 8 MPa.