The Effect Retroverted Stems have on Hip Range-of-Motion to Impingement and Combined Anteversion

Thomas McCarthy BS MBA[1]; Matthew Thompson MS[1]; Jim Nevelos PhD[1], Seth A. Jerabek MD[2]

[1]Stryker, Mahwah, NJ; [2]Hospital for Special Surgery, New York, NY

INTRODUCTION

- Studies have shown that femoral stem torsion can vary from 19° retroversion to 33°anteversion (20/60 femurs having retroverted necks)[1]
- The purpose of this study was to show the effects that retroverted stems have on hip range-of-motion (ROM) to impingement and combined anteversion (CA).

METHODS

- A validated hip ROM 3D simulator was utilized.
- The user imported a CT (supine and standing pelvic tilt (PT) =0) and set the femoral flexion at 90° with 40° IR and pelvis with a 20° seated posterior PT.
- The following implant models were used: tapered wedge stem with 132° neck angle, and both 36mm and Dual-Mobility liners.
- The femoral stems were tested at retroverted values of -5°, -10°, -15°, and -20°.
- Combinations of cup inclination and version were found that brought on the onset of stem-to-liner impingement.
- ROM-to-impingement curves were generated and compared to the Lewinnek Safe Zone (LSZ) version range of 15°±10°, and Dorr combined anteversion acceptance range of 25 to 50.

RESULTS

- The ROM-to-impingement curves varied with different retroverted stem values.
- The -5° stem with 36mm liner produced a downward sloping curve (Left-to-Right) that crossed over the 40°/20° cup position.
- All combinations of cup inclination and version below this curve resulted in impingement. Other curves were above and parallel
- In general, for each 5° of stem retroversion, an extra 4.3° of cup version was required to avoid impingement.

FIGURE 1

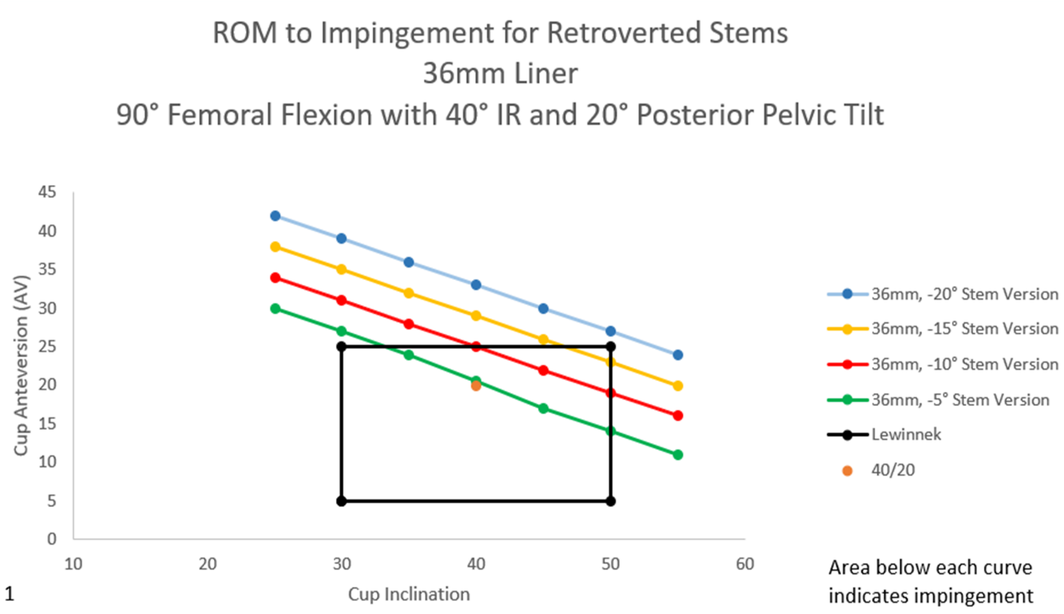

Fig. 1

FIGURE 2

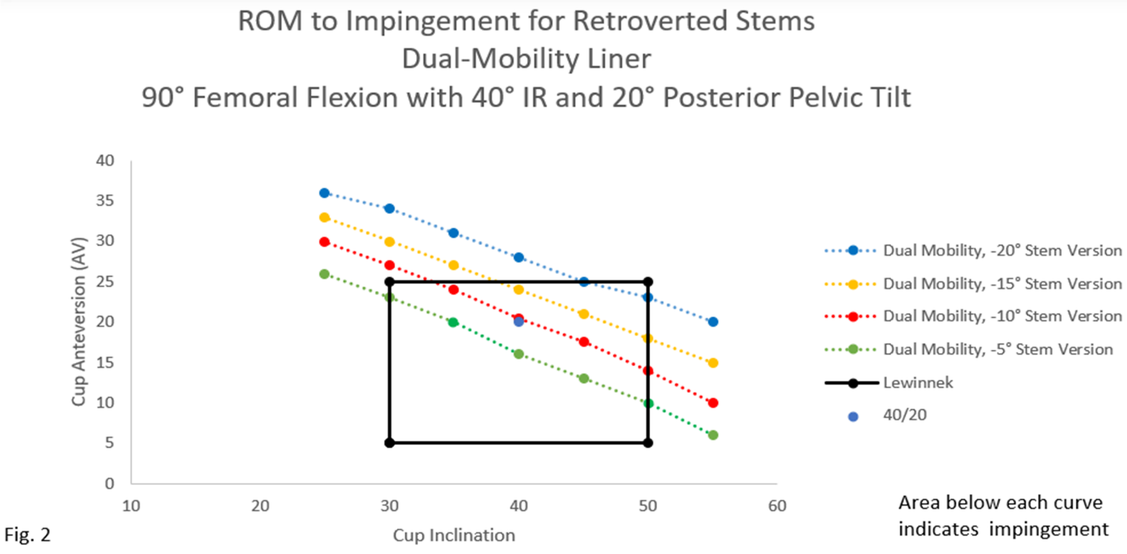

Fig. 2

Using a Dual-Mobility liner gained back 4°- 5° of version.

FIGURE 3

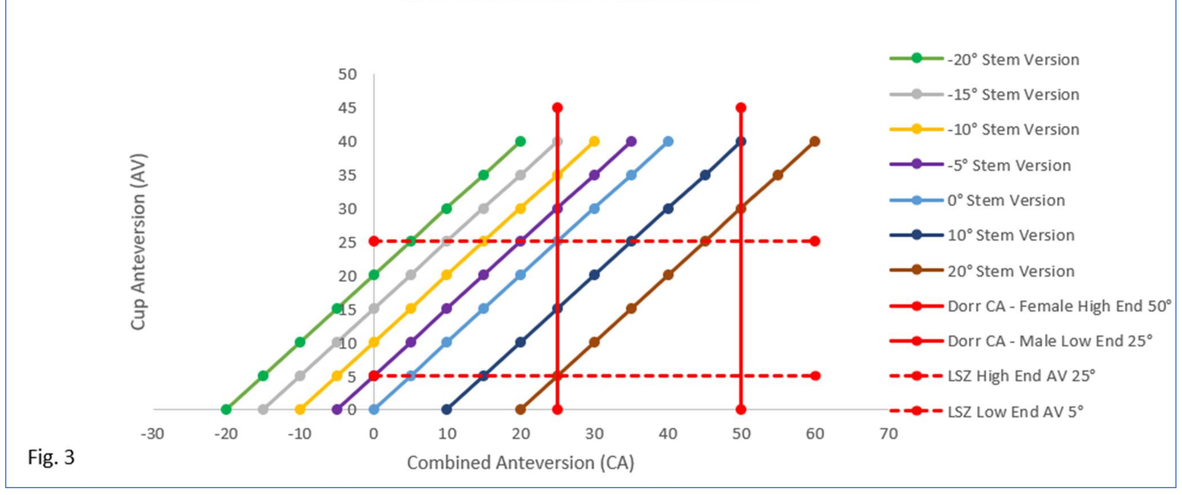

Fig. 3

No retroverted stem satisfied both the LSZ and Dorr criteria at the same time.

CONCLUSIONS

- Retroverted stems require high cup version angles to avoid impingement.
- Retroverted stems will not satisfy both the LSZ and Dorr criteria at the same time.
- Based on our results, using dual-Mobility cups may help to avoid impingement.

REFERENCES

1. Ernst Sendtner, Schuster Tibor, Roman Winkler, Michael Wörner, Joachim Grifka & Tobias Renkawitz (2010) Stem torsion in total hip replacement, Acta Orthopaedica, 81:5, 579-582, DOI: 10.3109/17453674.2010.524596

DISCLOSURES

- TM, MT, JM are employees of Stryker.
- SAJ: IP Royalties and Consultant for Stryker

MKOTHI-AJA-2_25164