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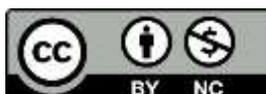
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Total Shoulder Replacements Wear Tested In A Unique Shoulder Simulator

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Background

Loosening and failure of shoulder implants *in vivo* has been attributed to the wear of polymeric components [1,2]. The Newcastle Shoulder Wear Simulator [3,4] is the first multi-station programmable simulator capable of reproducing activities of daily living allowing *in vitro* comparison of shoulder implants.

Methods

The Simulator [3,4] was used to test six JRI Total VAIOS shoulder prostheses, five in wear stations and one in a control station. A 2 million cycle wear test was performed in diluted bovine serum (protein content 26 g/L) using gravimetric measurements to determine polymeric wear. 'Mug to Mouth' was selected as an activity of daily living. Loads applied ranged from 180N to 250N at 1 Hz. Motion ranges were -16° to +12° flexion-extension, -18° to -5° abduction-adduction, and -42° to -17° internal-external rotation with 4 mm of sliding motion. Polymeric wear debris was analyzed using a Nanosight LM10-HS [3].

Results

The mean wear rate of the five articulating polymeric components was $21.3 \pm 4.5 \text{ mm}^3/10^6 \text{ cycles}$. Wear particles were sub-micron in size.

Conclusion

A previous wear test of JRI Reverse VAIOS Shoulders produced sub-micron particles at a wear rate of $14.2 \pm 2.1 \text{ mm}^3/10^6 \text{ cycles}$ [3]. The increase in wear can be attributed to the addition of sliding in the simulation. This is the first reported comparative wear test of Reverse and Total shoulder versions of the same design of implant.

Implications

Reverse shoulders may outperform Total shoulders clinically due to lower wear rates.

References

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[3] Smith *et al.* J. Biomechanics 2015; 48, 3072-3079. [3] Smith *et al* Proc. Inst. Mech. Eng. Part H 2016 – In press.