

Optimising the Tibial Keel Slot for the Oxford Unicompartmental Knee ReplacementLachlan Arthur¹, Xiaoyi Min¹, Shifan Jack Tu¹, Stefano Campi¹, Stephen Mellon¹, David Murray¹Presenting Author: Lachlan Arthur¹Nuffield Department of Orthopaedics, Rheumatology, and Musculoskeletal Sciences, University of Oxford**Abstract text** (max 300 words plus References and Acknowledgements)**Introduction:**

Tibial periprosthetic fracture is an important complication of the Oxford Unicompartmental Knee Replacement (OUKR). Primary fixation of cementless OUKR tibial components relies on the interference-fit of the 'keel' and a slot in the proximal tibia. Clinically used double blade keel saws (DKS) create slots with two grooves, generating stress concentrations where fractures may initiate. This study aimed to investigate slot factors that may influence incidence of tibial periprosthetic fractures.

Methods:

Slots were made in PCF20 polyurethane foam using the DKS plus/minus adjuvant rasping, single blade keel saw (SKS), and rasp-only. Round and square slots were machined with milling cutters. Compact tensile tests were conducted per ASTM E399 to determine tensile load to fracture (TLTF) and results were validated using bovine tibia. Cementless OUKR components were implanted into slots in custom polyurethane blocks and compressed to failure to determine anatomical load to fracture (ALTF). A custom MATLAB program calculated slot roundness from cross-sectional images.

Results:

Round slots (29.5N, SD=2.7) had higher TLTF than square (25.2N, SD=1.7, $p=0.03$) and DKS slots (23.3N, SD=2.7, $p<0.0001$). Fractures occurred at the round slot apices, square slot corners, and deepest DKS slot grooves. Rasping made DKS slots rounder, resulting in significantly higher TLTF. ALTF was not significantly different between square and round slots and adjuvant rasping of DKS slots did not significantly increase ALTF. SKS (850N, SD=133, $p<0.01$) and rasp-only (912N, SD=100, $p=0.0001$) slots had significantly higher ALTF than standard DKS slots (703N, SD=81).

Conclusions:

Round keel slots minimise stress concentrations and increase TLTF but does not increase ALTF. The SKS and rasp-only slots retain material at slot ends and have significantly higher ALTF. Future studies should assess saw blades that retain material and round slot ends to evaluate if their use may significantly reduce the incidence of tibial periprosthetic fracture.

Name and e-mail address of author for correspondence: Lachlan Arthur, lachlan.arthur@ndorms.ox.ac.uk**Abstract Category/Topic** (select from the table): Knee**Free keywords (up to 4):** Unicompartmental Knee Replacement, Fracture**Selected type of communication (Oral or Poster):** Oral