A TECHNIQUE FOR MEASURING PATELLO-FEMORAL PRESSURES: A.B. Liggins, C.H. Rorabeck, R.B. Bourne, and J.B. Finlay, Orthopaedic Research Laboratory, University Hospital, P.O. Box 5339, London, Ontario, Canada, N6A 5A5.

PURPOSE: To develop an apparatus which would attach to a MTS universal testing machine, hold a cadaveric knee specimen in a range of flexion angles and allow loading of the quadriceps tendon up to physiological levels. The Fuji pressure-sensitive film method of interface pressure determination was to be developed to assess patello-femoral pressures in a new design of TKA with saddle shaped patella.

METHOD: The femur and tibia were cut 100 mm from the joint space and held in aluminum pots with bone cement. The femoral pot was attached via an adjustable clamping arrangement to a loadable secondary cross arm on the main MTS columns. The tibial pot was connected via a loading ball and socket joint to a sliding unit resting on the MTS table. The femur was held vertically, while raising or lowering the secondary cross head allowed variation of the flexion angle. Once in the desired position, the knee was loaded in place. The quadriceps tendon was sectioned in the sagittal plane, sutured around a loop of steel cable attached to the MTS actuator and frozen with liquid nitrogen prior to loading. Fuji film was cut such that it would conform to the saddle patella and was inserted prior to the application of 1 kN quadriceps load. An updated image processing system produced standardized false colour images, with colour key, of the resulting Fuji stains.

RESULTS: The apparatus has been shown to allow flexion angles between 0° and 90°, while the nitrogen freezing technique allows for the application of physiological loads. Preliminary results show a lack of congruence at the patello-femoral joint, with small areas of pressure beyond the 32 MPa calibrated range of the high grade Fuji film, surrounded by a thin region of high pressure gradient.

DISCUSSION: This technique provides a practical method of applying
patello-femoral loading and assessing the resulting interface pressures in vitro. The preliminary results indicate that a good degree of congruency is required to reduce high pressure magnitudes and gradients.

ACKNOWLEDGEMENTS: This work was supported by a grant from the Maurice E. Muller Foundation.