The mechanical function of the meniscus, experiments on cadaveric pig knee-joints

THE MECHANICAL FUNCTION OF THE MENISCUS, EXPERIMENTS ON CADAVERIC PIG KNEE-JOINTS.

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Controversial opinions still exist about the mechanical function of the menisci in the statical and dynamical loading transfer in the knee joint. In order to be able to evaluate the influences of the different aspects of the menisci with respect to the force transfer in a consistent way, extensive mechanical experiments with a relatively large amount of cadaveric pigs knees were performed. Pigs knees were chosen because of the favorable availability and the expected pronounciated function of their menisci.

The experiments can be devided into 4 different types : measurement of the joint-space narrowing response resulting from different static and dynamic loading and unloading characteristics (different loads and strain rates ; also repeated dynamic loading) ; measurement of shock resorption (Impact loading response) ; measurement of the contact area in the knee under different (static) loading conditions ; and anatomical studies, using slices of epoxy imbedded knees.

All measurements (except the anatomical studies) were performed on knees with menisci and then again on the same knee after meniscectomy.

For all experiments a special set up was designed in order to be able to meet requirements of accuracy.

Joint space narrowing was measured with double extension gauges and special care was taken that kinematical behaviour of the knee was suppressed. The loading was applied in an Instron compression testing machine.

Impact loading response was measured with a fast load cell, the loads were applied by weights, falling from different heights.

Contact area were measured by X-ray methods, using bariumsulfate as radio-opaque fluid.

Preliminary results will be presented, giving a clear indication of the role of the plastic and visco-elastic behaviour, in axial as well as in circumferential direction, of the meniscus in the force transfer.

It will also be shown that a most accurate and refined experimenta set up is required in order to reach reproduceable results.