Homologous meniscus transplantation

Experimental and clinical results*

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Summary. The increase in severe ligament injuries of the knee has led to consideration of the need for meniscal transplantation in reconstructive operations for chronic rotational instability. Transplantation of the medial meniscus was carried out in two groups of 15 sheep. In one group lyophilised, γ-sterilised allogenic menisci were transplanted and these underwent a complete remodelling in 48 weeks. In the other group, deep frozen allogenic menisci were used and these remained fully functional without remodelling. We then carried out meniscal transplantation in 22 patients who were followed-up for a mean of 14 months. Arthroscopy was possible in two-thirds of the cases at an average of 8 months after operation. Both types of transplanted menisci, lyophilised and deep frozen, decreased in size, as small as a regenerated meniscus in some cases. In general the deep frozen menisci showed better results.

Introduction
Meniscectomy leads to degenerative changes in the knee joint, and this has been demonstrated in clinical, experimental and biomechanical investigations [1, 13, 20, 26, 29, 31]. The results of partial meniscectomy are better than total meniscectomy [28, 38, 40]. Arthroscopic partial meniscectomy is a further advance [5]. Suture of both fresh and old meniscal tears is frequently carried out [4, 9, 12, 18, 19, 23, 35, 38, 39]. The menisci are important in load transmission, and also have a significant dynamic function in the stabilisation of the joint; for example, the posterior part of the medial meniscus acts synergistically with the anterior cruciate ligament [3, 8, 11, 14, 28, 36].

Many attempts have been made to replace or reconstruct the meniscus, but only occasional clinical or experimental observations have been made [10, 17, 24, 34, 35]. The need for replacement arises when the anterior cruciate ligament substitute lacks the protection of the posterior part of the medial meniscus which has often been removed previously. If this is not present, the substituted ligament may well become loose.

Animal experiments
Material and methods
Thirty merino sheep, aged one year, were divided into two equal groups. Undamaged sheep menisci were prepared by
Fig. 1. Biomechanical investigation. Computer print-out of single values after transplantation of lyophilized menisci compared to normal values. (N normal meniscus, L lyophilised meniscus. Ordinate: force in Newtons, abscissa: time in weeks)

Fig. 2. Biomechanical investigation. Computer print-out of the single values after transplantation of deep frozen menisci compared to normal values. (N normal meniscus, T deep frozen transplant. Ordinate: force in Newtons, abscissa: time in weeks)