

## Tibiofemoral Contact Mechanics Following Posterior Root of Medial Meniscus Tear, Repair, Meniscectomy and Allograft Transplantation

Jin Goo Kim, MD, PhD, KOREA  
Yong Seuk Lee, MD, PhD, KOREA  
Jeong Ku Ha, MD, KOREA  
Ho Jong Ra, MD, KOREA

Paik (Inje) and Gil (Gachon) Hospital  
Seoul and Incheon, KOREA

### Summary:

Both meniscal root repair and transplantation of meniscus improved contact mechanics, but it did not appear that repair of the meniscal root or transplantation of meniscus restores the biomechanical function back to normal level.

### Abstract:

#### Purpose:

The purposes of this study were to evaluate the effect on tibiofemoral contact mechanics of repair of the posterior root of the medial meniscus and the effect of meniscal allograft transplantation with medial collateral ligament release at different flexion angles.

#### Methods:

Ten fresh-frozen human cadaveric knees (five pairs) were used. A digital pressure sensor was inserted by capsulotomy and experiments were performed serially under the following six conditions, that is, with an intact medial meniscus (normal controls), with a root tear, after root repair, after total meniscectomy, after meniscal allograft transplantation, and after meniscal allograft transplantation plus medial collateral ligament release. During each experiment, knees were positioned at 0°, 30°, 60°, and 90° of flexion and peak pressure (kPa) and contact area (cm<sup>2</sup>) were measured.

#### Results:

At 0° of flexion, contact pressure did not differ among the six experimental settings. However, at 30° and 60° of flexion, contact pressure differed significantly between root tear and root repair specimens ( $p = 0.04$  and  $0.03$ , respectively) and between total meniscectomy and meniscal allograft transplantation specimens ( $p = 0.02$  and  $0.03$ , respectively). On the other hand, mean contact pressures were different between normal ( $476.7 \pm 473.1$  and  $573.3 \pm 479.1$  kPa) and root repair ( $575.7 \pm 357.8$  and  $598.6 \pm 415.8$ ) and between normal and meniscal allograft transplantation ( $635.7 \pm 437.4$  and  $674.3 \pm 533.2$ ). At 0°, 30°, 60°, and 90° of flexion, contact areas differed significantly between normal and total meniscectomy specimens ( $p = 0.02, 0.01, 0.02, \text{ and } 0.02$ , respectively) and between meniscal allograft transplantation and total meniscectomy specimens ( $p = 0.03, 0.02, 0.02, \text{ and } 0.03$ , respectively). Contact areas differed significantly between root tear and root repair specimens at 60° of flexion ( $p = 0.04$ ), and between normal control and root repair specimens at 60° and 90° of flexion ( $p = 0.03$  and  $0.04$ , respectively). The effects of meniscal allograft transplantation plus medial collateral ligament release on contact mechanics were not different from the effects of meniscal allograft transplantation alone (n.s.).

#### Conclusions:

Both meniscal root repair and transplantation of meniscus improved contact mechanics, but it did not appear that repair of the meniscal root or transplantation of meniscus restores the biomechanical function back to normal level. The meniscal allograft transplantation plus medial collateral ligament release were similar to those after meniscal allograft transplantation alone. Therefore, it is better to preserve meniscus and medial collateral ligament release could be done during the meniscal allograft transplantation.