A study of the chondroprotective effects of high molecular weight cross-linked hyaluronic acid in a rabbit knee osteoarthritis model

Objectives:

Recent reports show the efficacy of high-molecular-weight (MW) hyaluronic acid (HA) in treating osteoarthritis. However, its mechanism remains unclear. In this study, I examined the histopathological changes and friction coefficients in osteoarthritic knee joints after injecting high-MW cross-linked (CL) HA.

Design:

A bilateral anterior cruciate ligament transection model in Japanese white rabbits was used (n = 20). From week 5 after transection, low-MW HA (0.8 × 10^6 Da; HA80) or high-MW CL HA (6 × 10^6 Da; HA600) was injected weekly into the right knee for three weeks; normal saline (NS) was injected into the left knee (n = 10 in each group). A bilateral sham operation was undertaken to exclude spontaneous osteoarthritis (n = 3). Results were evaluated with macroscopy (India ink), histopathology (Kikuchi’s score), biomechanical testing, and rheological assessment of the joint fluid viscoelasticity. Statistical analysis was performed using one-way analysis of variance with a 95% confidence interval (P< 0.05).

Results:

The macroscopic findings showed severely damaged cartilage in 30% of the NS group and
20% of the HA80 and HA600 groups and intact cartilage in 100% of the sham group. The histological scores and friction coefficients of the HA600 group were significantly lower than those of the NS group (P= 0.007 and P= 0.002, respectively). Viscoelasticity measurements of the joint fluid showed no significant differences between the three groups.

**Conclusion:**

High-MW CL HA exerts potential chondroprotective effects and produces superior friction coefficients. Our results suggest that HA600 delays the progression of osteoarthritis effectively and improves joint lubrication significantly.