ISAKOS

International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine

10th Biennial ISAKOS Congress • June 7-11, 2015 • Lyon, France

Paper #107

MRI Evaluation of Semitendinosus Grafts Maturation in Anatomical Double-Bundle Anterior Cruciate Ligament Reconstruction with Remnant Preservation

Takuya Naraoka, MD, JAPAN
Eiichi Tsuda, MD, JAPAN
Yuji Yamamoto, MD, JAPAN
Shugo Maeda, MD, JAPAN
Yuka Kimura, MD, JAPAN
Yasuyuki Ishibashi, MD, JAPAN

Department of Orthopaedic Surgery, Hirosaki University Graduate School of Medicine
Hirosaki, Aomori, JAPAN

Summary:
ACL reconstruction with remnant preservation did not accelerate the maturation of the ST grafts on MRI significantly, however, the effects of the remnant preservation were different depending on the period from injury to surgery.

Abstract:
PURPOSE
Graft maturation is one of the essential aspects within the multiple factors contributing to a return to sports after anterior cruciate ligament (ACL) reconstruction. Recently, remnant-preserved ACL reconstruction has been attempted to promote the ligamentization of the grafts. The purpose of this study was to evaluate the maturation of semitendinosus (ST) grafts with MRI in a group of patients who underwent anatomical double-bundle ACL reconstruction with remnant preservation. The hypothesis of our study was that remnant preservation enhances the ligamentization process.

METHODS
From April 2010 to January 2014, 194 consecutive anatomical double-bundle ACL reconstruction using ST grafts were performed. The inclusion criteria were primary ACL reconstruction and at least 6-month follow-up periods. The exclusion criteria were revision surgery, multiligament lesion, osteoarthritis and chondral lesions requiring treatment. A total of 146 knees were enrolled in this study: 72 knees had ACL reconstruction without preserved remnant (remnant < 25% of intra-articular portion of graft) (NP group), and 74 knees had ACL reconstruction with preserved remnant (remnant > 25%) (RP group). Furthermore, these were sub-grouped by the period from injury to surgery (Phase I was less than 3 weeks (n=22), phase II was 3 to 8 weeks (n=68), phase III was 8 to 20 weeks (n=31), and phase IV was more than 20 weeks (n=25)). At 3, 6 and 12 months after reconstruction, axial (for tibial tunnel integration) and sagittal (for graft maturation and femoral tunnel integration) 1.5-T MRI sections with proton density T2-weighted sequence were obtained. Regarding graft signal intensity, the predominant signal intensity (>50% of graft surface) was used to define graft status, and hyperintense, isointense, and hypointense were assigned to each: 1, 2 and 3 points, respectively. Regarding graft-tunnel interface, positive or negative for synovial fluid presence was assigned to each: 1 and 2. Each of 2 bundles was given a score (maximum 14). For categorical variables, we compared and verified the statistical significance through analysis of variance with $P<.05$.

RESULTS
The mean scores of each group were significantly improved with time postoperatively (NR-3,6,12M: RP-3,6,12M= 8.1,8.9,10.1: 8.5,8.8,10.0. $P<0.01$). In terms of each parameter, tibial graft-tunnel integration also significantly improved with time (NR-3,6,12M: RR-3,6,12M= 2.0,2.3,2.9: 2.1,2.3,2.6. $P<0.01$), but graft maturation scores were significantly decreased at 6 months, and significantly increased at 12 months (NR-3,6,12M: RP-3,6,12M= 3.7,3.4,3.9:

3.9,3.5,4.0. P<0.05). There were no differences between the two groups. Among sub-groups by the phases, the score of the RP-phase IV group was significantly higher than the NR-phase I group at 6 months, and RP-phase IV was higher than RP-phase III at 6 months only in the RP group (NR-3M(P1-2-3-4)/ 6M(P1-2-3-4)/ 12M(P1-2-3-4): RP-3M(P1-2-3-4)/ 6M(P1-2-3-4)/ 12M(P1-2-3-4)= 3.5-3.8-4.0-3.4/ 2.8-3.4-3.6-3.5/ 3.8-3.5-4.4-3.8: 4.0-3.8-4.0-4.5/ 3.6-3.5-3.0-4.5/ 4.0-4.1-3.6-4.2. P<0.05).

CONCLUSIONS

Graft maturation scores of both groups on MRI were decreased at 6 months and then increased at 12months. ACL reconstruction with remnant preservation did not accelerate the maturation of the ST grafts significantly. However, the effects of the remnant preservation were different depending on the phase, and it was possible that remnants in phase 4 enhanced ligamentization process of ST grafts.