



Hamstring Regeneration After ACL Reconstruction

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Abstract

Anterior cruciate ligament injuries are a common sports injury in young population. ACL rupture or tear in younger ages are managed surgically by arthroscopic ACL reconstruction. Among The graft used for it are hamstring graft (semitendinosus and gracilis) are the commonest graft chosen.). The aim of this research study is to analyse the fate of hamstring tendons (both semitendinosus and gracilis) during the time course for determinants of regeneration.

Method: All patients underwent Arthroscopic ACL reconstruction were subjected to ultrasonography imaging and MRI imaging for all patients who have completed one-year postoperative period. Images were obtained at three levels and their dimensions were compared with normal side. Regrowth of the ST tendon was assessed via b-mode ultrasound at 12 months post reconstruction and MRI at 12 months

Results: Out of 13 patients analysed, 9 had regeneration of hamstring tendon as evaluated by MRI and 8 showed growth as assessed by ultrasound. The average size of neo tendon was 2.5 x 5 cm (ultrasound) and 6 x 4.2 (MRI) respectively

Conclusion: The study shows that there is definitive regeneration of hamstring graft after its procurement for ACL reconstruction. Hamstring grafting hence poses no serious damage to the functioning of the knee after its procurement for acl reconstruction

Keywords: Hamstring; Regeneration; Reconstruction

Introduction

Anterior cruciate ligament injuries are a common sports injury in young population. The incidence of ACL ruptures is estimated to range from 30 to 78 per 100,000 person-years [1]. ACL rupture or tear in younger ages are managed surgically by arthroscopic ACL reconstruction. Among the graft used for it are hamstring graft (semitendinosus and gracilis) which are the commonest graft chosen.

Most studies in literature are ambiguous regarding the fate of hamstrings based on function, regenerative potential, and cross-sectional area (CSA). The aim of this research study is analysis of

the fate of hamstring tendons (both semitendinosus and gracilis) during the time course for determinants of regeneration. Although the functional outcome and graft strength post ACL reconstruction has been studied but the fate of hamstring grafts after ACL is poorly studied, we aim to study the regeneration of hamstring graft after ACL reconstruction using ultrasound and MRI imaging modalities

Methods

All patients underwent Arthroscopic ACL reconstruction and were subjected to ultrasonography imaging and MRI imaging for all patients who have completed one- year postoperative period. Images were obtained at three levels and their dimensions are

compared with normal side. Regrowth of the ST tendon was assessed via b-mode ultrasound at 12 months post reconstruction and MRI at 12 months.

Inclusion criteria

- Patients who had sustained a unilateral ACL rupture and underwent arthroscopic ACL reconstruction
- No concomitant ligament tears
- Patients willing for participating in the study.

Exclusion criteria

- Multiligamentous injury
- Not willing for the study
- Obese patients

Statistical analysis

Prospective Observational Study. Prevalence and mean estimation with confidence interval. Prevalence will be compared using chi-square test and means will be compared using Mann Whitney U test. Sample size :15 (based on assumed prevalence) The following simple formula was used for calculating the sample $n = Z^2P(1-P)/d^2$ Where n is the sample size, Z is the statistic corresponding to level of confidence, P is

expected prevalence (that can be obtained from same studies or a pilot study conducted by the researchers), and d is precision.

Results

USG findings-1 / Non-1	Ultrasound -Neo tendon measurement (AP x TR)	MRI findings -1 / Non-1	MRI findings -Neo tendon measurement (AP x TR)	MRI findings - Distance between the joint line and the distal muscle end in case of Tendon Regeneration	MRI findings - Distance between the joint line and the distal muscle end in case of no Tendon Regeneration
0	0	0	0	0	11.2
1	2.5 x 5.3	1	6.6 x 4.6	7.5	0
0	0	0	0	0	17.4
1	2.5 x 2.1	1	1.6 x 2	7.6	0
1	2.3 x 5	1	6.1 x 7.6	15	0
0	0	0	0	0	15.6
1	1.5 x 1.5	1	2.8 x 4	1.8	
1	2.7 x 6.2	1	6.8 x 7.7	12.4	0
0	2.7 x 6.2	1	6.5 x 7	15.6	0
1	1.6 x 1.5	1	2.2 x 3.3	16	0
0	0	0	0	0	14.6
1	2.5 x 4.9	1	2.5 x 3.3	15	0
1	2.6 x 5.8	1	6.5 x 4.2	7.8	0

Table a

Out of 13 patients analysed 9 had regeneration of hamstring tendon as evaluated by MRI and 8 showed growth as assessed by ultrasound. The average size of neo tendon was 2.5 x 5 cm (ultrasound) and 6 x 4.2 (MRI) respectively

Discussion

The anterior cruciate ligament injury is one of the most common knee injuries in sports. In India, football and Kabaddi are the sports that show the maximum incidence of this injury [2]. These may be contact or non-contact injuries. In the non-athletic population,

these are mostly non-contact injuries [3]. The changing pattern of surgical reconstruction leads to the 4 -strand semitendinosus and gracilis autograft to be the most commonly used. This is due to the ease of harvesting, no disruption of extensor mechanism as in BTB graft, and the significant potential of regeneration. The regeneration of the semitendinosus tendon after graft harvest for anterior cruciate ligament has been discussed in many studies. Methods evaluate the regeneration of the tendon have been variably described, ranging from MRI, to open surgical visualization of the regenerated tendon. The most widely used modality remains to be magnetic resonance imaging [4].

Recent interest has focused on ultrasound evaluation which, although is operator dependent, can be used as a cheap and easily available option for this purpose. Most of the studies have found that over a while the tendon will regenerate along its original course.

Other studies by Papandrea, *et al.* [5] showed a 100 % regeneration of ST tendon in 2yrs. Bedi, *et al.* [6]. study showed regeneration is seen in most patients but not structurally similar to native tendon whereas Stevanović, *et al.* [7] showed a 72 % regeneration of ST tendon.

Although most studies show a regrowth of the tendon, the functional status of the neo tendon needs assessment. Most of the available literature [8] shows a deficit of isometric flexion strength as compared to the non-operated knee. Choi, *et al.* [4] have shown that the strength deficit in patients with the regeneration of the tendons is less as compared to those who do not have regeneration.

Conclusion

Although our sample size is less, the study shows that there is definitive regeneration of hamstring graft after its procurement for ACL reconstruction. Hamstring grafting hence poses no serious damage to the functioning of the knee after its procurement for ACL reconstruction. Further research is needed to assess the strength of the regenerated neo tendon with larger sample size. We were able to demonstrate that ultrasound is a good modality for evaluating the semitendinosus tendon and can be used as a cheap tool for postoperative measurement of regeneration.

Bibliography

1. Bollen S. "Epidemiology of knee injuries: diagnosis and triage". *British Journal of Sports Medicine* 34.3 (2000): 227-228.
2. Gupta R., *et al.* "Acute Anterior Cruciate Ligament Injuries in Multisport Elite Players: Demography, Association, and Pattern in Different Sports". *Journal of Clinical Orthopaedics and Trauma* 7.3 (2016): 187-192.
3. Boden B., *et al.* "Noncontact anterior cruciate ligament injuries: mechanisms and risk factors". *American Academy of Orthopaedic Surgeon* 18.9 (2010): 20-527.
4. Choi J., *et al.* "Relationships among tendon regeneration on MRI, flexor strength, and functional performance after anterior cruciate ligament reconstruction with hamstring autograft". *The American Journal of Sports Medicine* 40.1 (2011): 152-162.
5. Papandrea P., *et al.* "Regeneration of the semitendinosus tendon harvested for anterior cruciate ligament reconstruction: evaluation using ultrasonography". *The American Journal of Sports Medicine* 28.4 (2000): 556-561.
6. Bedi A., *et al.* "Structural and functional analysis of the semitendinosus tendon after harvest for soft tissue reconstructive procedures: a dynamic ultrasonographic study". *Knee Surgery, Sports Traumatology, Arthroscopy* 21.3 (2012): 606-614.
7. Stevanović V., *et al.* "Semitendinosus tendon regeneration after anterior cruciate ligament reconstruction: can we use it twice?" *International Orthopaedics* 37.12 (2013): 2475-2481.
8. Nakamae A., *et al.* "Effects of knee immobilization on morphological changes in the semitendinosus muscle-tendon complex after hamstring harvesting for anterior cruciate ligament reconstruction: evaluation using three-dimensional computed tomography". *Journal of Orthopaedic Science* 17.1 (2012): 39-45.