

Strength and Functional Outcomes Following Achilles Tendon Reconstruction Using Hamstring Tendon Autograft

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Introduction/Purpose: Use of hamstring tendon (gracilis and/or semitendinosus) autografts with limited morbidity and positive outcomes has been well reported in knee ligament reconstructions as well as in foot and ankle applications including chronic Achilles rupture or Achilles tendinosis augmentations. Advantages of hamstring autograft reconstruction when compared to alternative procedures such as local tendon transfers, synthetic grafts, or allografts are better healing and reduced morbidity within the foot and ankle. In this study, we examined the effect of Achilles tendon reconstruction using hamstring autografts on strength and functional outcomes. We hypothesized patients would experience positive outcomes following repair evidenced by significant outcome score improvements and limited ankle plantarflexor and knee flexor strength deficits when compared to patients' contralateral side and dorsiflexion and extension strength respectively.

Methods: Patients who underwent Achilles repair with a hamstring autograft by a fellowship-trained sports medicine and foot and ankle surgeon since 2011 were evaluated for inclusion. Patients younger than 18 or with history of contralateral lower extremity pathology were excluded. Thirty-one potential participants were identified. Patients, average age 38 ± 10.9 , had strength testing at an average of 19 months post-operatively (range 15-28 months). Isokinetic testing was completed with a Biodex dynamometer under supervision of a physical therapist blinded to surgical side. Peak plantarflexion and dorsiflexion torque and torque at 30 degrees of plantarflexion were measured at speeds of 60 and 120 degrees/sec. Peak flexion and extension torque and torque at 30, 70, and 90 degrees of flexion were measured at speeds of 180 and 300 degrees/sec. Pre- and post-operative FAOS scores were reviewed retrospectively. Comparisons were completed using Student's T-tests.

Results: All patients except one have reported being very satisfied or satisfied with their surgery. The remaining patient reported being neither satisfied nor dissatisfied. One case reported pain at the harvest site. No additional surgeries were required and all patients would recommend their surgery to someone else. The only significant difference ($p < 0.05$) in relative plantarflexion and dorsiflexion strength within the ankle occurred at 30 degrees of plantarflexion when testing at the higher speed. Flexion strength was significantly lower ($p < 0.05$) than extension strength at 90 degrees of flexion for both tested speeds and in peak torque at the higher speed (Table). Every FAOS subscale except Symptoms was significantly greater post-operatively than pre-operatively ($p < 0.05$). Post-operative Symptoms scores were still greater by an average of 16.15 points with $p = 0.06$.

Conclusion: Achilles reconstruction using hamstring tendon autografts appears to produce good outcomes with minimal functional deficits. Functional outcome scores increase, patient satisfaction is relatively high, and there are limited negative symptoms at the harvest site. A greater than 10-point average difference between pre- and post-operative FAOS scores in each subscale reflects a clinically significant difference. Current data shows there is limited difference in loss of plantarflexion strength when compared to dorsiflexion. Similar to previous findings, hamstring strength is reduced at higher degrees of flexion and higher speeds. Overall, relative torque results reflect limited ankle or knee strength deficits.

Relative Torque, % of non- operated leg	60 degrees/second			120 degrees/second		
	Plantarflexion	Dorsiflexion	P-value	Plantarflexion	Dorsiflexion	P-value
Peak (% , ± SD)	80.82 ± 21.83	89.45 ± 17.53	0.43	75.75 ± 19.83	95.20 ± 25.09	0.13
30 degrees (% , ± SD)	52.14 ± 22.16	81.89 ± 29.48	0.07	46.49 ± 26.11	89.52 ± 34.73	0.02*
	180 degrees/second			300 degrees/second		
	Flexion	Extension	P-value	Flexion	Extension	P-value
Peak (% , ± SD)	82.15 ± 11.09	87.26 ± 14.08	0.15	77.66 ± 10.66	91.16 ± 19.04	0.05*
30 degrees (% , ± SD)	89.22 ± 18.72	77.53 ± 26.63	0.31	79.85 ± 33.93	84.57 ± 38.15	0.46
70 degrees (% , ± SD)	77.19 ± 10.37	89.27 ± 12.84	0.12	77.52 ± 7.53	92.85 ± 18.12	0.11
90 degrees (% , ± SD)	58.54 ± 24.60	89.32 ± 23.71	0.01*	53.90 ± 27.86	79.17 ± 21.75	0.01*

Table. Strength results from isokinetic testing of the ankle and hamstring are shown. Torque values are reported as a percentage of the torque value for the contralateral, non-operated leg. Peak torque values are the peak torque from each testing cycle. P-values compare relative plantarflexion and dorsiflexion strength and flexion and extension strength respectively. *Indicates a significant difference between relative plantarflexion and dorsiflexion or relative flexion and extension ($p \leq 0.05$).