No Difference in ACL Reconstruction Revision Risk with Different Hamstring Autograft Configurations in Adolescent Patients

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Disclosures

- David Flanigan, MD is a consultant for and receives research support from Vericel, Zimmer, and Smith & Nephew; is a consultant for ConMed-MTF and DePuy Mitek; and receives research support from MTF, Histogenics, Aesculap, Cartiheal, Anika Therapeutics, and Moximed
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Background

- ACL injuries can lead to long-term complications in athletes[1,2] and adolescents[3]
- Hamstring grafts often used for anterior cruciate ligament reconstruction (ACLR) in skeletally immature patients
- Smaller autograft diameters (<8 mm) have been linked to higher revision risk[4]
- Optimal graft characteristics for ACLR not well established in clinical practice
- Evidence on configuration-specific impact on revision risk in adolescents is limited

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Purpose

- To evaluate whether hamstring autograft size (≥8.5 mm vs. <8.5 mm) and tendon configuration (quadrupled semitendinosus [4ST] vs. doubled semitendinosus and gracilis [4STG]) affect revision risk following ACLR in adolescent patients
- We hypothesized that larger grafts would correlate with lower revision risk, while 4ST and 4STG configurations would perform similarly

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Methods

- Retrospective review of 976 primary ACLR cases at OSU Wexner Medical Center (2013-2022)
- Final cohort: 470 adolescents (13-19 years) with hamstring autografts
- Collected graft size, tendon configuration (4ST vs. 4STG), and revision status data
  - Also recorded demographics and concurrent procedures
- Analysis performed: Chi-square tests, logistic regression, t-tests

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Table 1
Patient Factors and Revision Risk by Sex Across Graft Diameter Groups

		< 8.5 mm (n=226)	≥ 8.5 mm (n=244)	p-value
Average Age at Surgery (years) ± SD		17.2 ± 0.1	17.4 ± 0.1	0.117
Mean Body Mass Index (kg/m^2) ± SD		25.1 ± 0.4	25.0 ± 0.3	0.439
Average Time to Follow-Up (years) ± SD		1.7 ± 0.1	1.4 ± 0.1	0.013*
Revision Risk by Sex (%)[†]	Male	8.4%	11.8%	0.264
	Female	9.9%	7.5%	0.355

SD – standard deviation

* Statistically significant ($p < 0.05$)

[†] Fisher's exact test was used for the statistical analysis of revision risk by sex

Table 2
Patient Factors and Revision Risk by Sex Across Graft Configurations

		4ST (n=208)	4STG (n=238)	p-value
Average Age at Surgery (years) ± SD		17.2 ± 1.6	17.2 ± 1.6	0.444
Mean Body Mass Index (kg/m^2) ± SD		24.2 ± 4.7	25.9 ± 5.8	<0.001**
Average Time to Follow-Up (years) ± SD		1.4 ± 1.5	1.7 ± 1.9	0.019*
Revision Risk by Sex (%)†	Male	13.0%	9.5%	0.265
	Female	8.0%	10.6%	0.339

SD – standard deviation
* Statistically significant ($p < 0.05$)
** Statistically significant ($p < 0.001$)
† Fisher's exact test was used for the statistical analysis of revision risk by sex

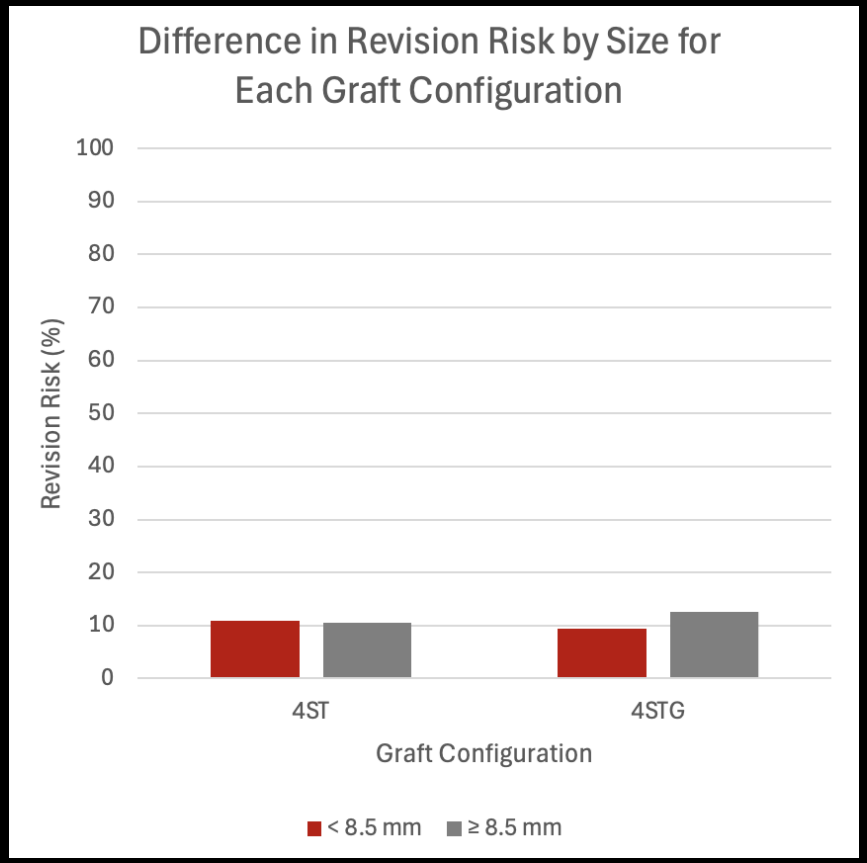

Figure 1. Revision risk comparison by graft size categories, determined for each graft configuration type.

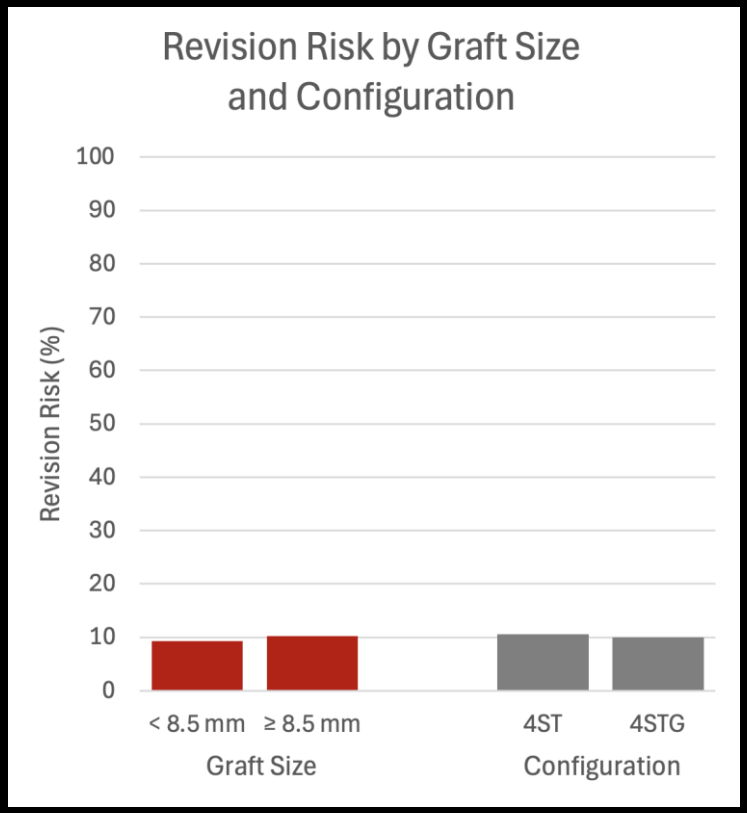

Figure 2. Revision risk compared between graft size categories and graft configuration types.

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Results

- Overall revision risk: 9.8% (46/470 patients)
- Mean follow-up: 1.5 years
- No significant difference in revision risk between <8.5mm and ≥8.5mm grafts (9.3% vs. 10.2%, p=0.76)
- No significant difference in revision risk between 4ST and 4STG configurations (10.6% vs. 10.0%, p=0.88)
- Average graft size was significantly larger for 4ST compared to 4STG configuration (9.0mm vs. 7.9mm, p<0.001), but revision risk analysis was not impacted

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Discussion and Key Findings

- No significant difference in ACLR revision risk based on hamstring graft size (≥8.5mm vs. <8.5mm) or configuration (4ST vs. 4STG)
- Although larger graft size (≥8.5mm) did not significantly reduce revision risk, this finding may not contradict prior evidence using lower thresholds (e.g., 8mm)[4]
- Revision risk did not differ significantly between male and female patients

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Limitations

- Retrospective design may introduce bias from non-standardized data
- Graft configuration distribution and significantly differences between average follow-up duration
- Higher proportion of larger grafts in this cohort may mask the influence of graft size on revision risk

Future Directions

- Increase sample size to control potential confounders and enhance statistical power
- Extend follow-up to assess long-term revision risk
- Collect patient-reported outcomes (KOOS, MARS) for functional insights
- Investigate impact of post-op activity levels on graft survival
- Analyze specific subgroups with open growth plates for optimized graft recommendations

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