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Anterior Cruciate Ligament Hybrid Remnant Preservation Reconstruction Demonstrates Similar Outcomes as Traditional Reconstruction after 6 Months: A Randomized Control Trial

Joshua P. Castle
Henry Ford Health, jcastle1@hfhs.org

Eleftherios L. Halkias
Wayne State University, ehalkias@wayne.edu

Brittaney Pratt
Henry Ford Health, bprat1@hfhs.org

Ashley Frei
Wayne State University, afrei@wayne.edu

Matthew A. Gasparro
Henry Ford Health, mgaspar1@hfhs.org

Authors

Joshua P. Castle, Eleftherios L. Halkias, Brittaney Pratt, Ashley Frei, Matthew A. Gasparro, and Vasilios Moutzouros

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Background

The anterior cruciate ligament (ACL) is often debrided during reconstruction (ACLR) to improve visualization. However, remnant ACL tissue contains nerve fibers and including remnant tissue in ACLR could provide benefit. Therefore, a technique was developed that preserves the tibial remnant and incorporates it into ACLR: Hybrid Remnant Preservation Reconstruction (HRPR) ACLR. This study compares HRPR-ACLR to traditional reconstruction by comparing patient reported outcomes and complications.

Methods

Patients presenting to one surgeon's clinic with an ACL injury are screened. Exclusion criteria are patient age<14 years, multi-ligament injury, chronic tears, and revision ACLR. Patients are consented and randomized to HRPR or traditional ACLR. Demographics, patient-reported outcomes, range of motion (ROM) and complications were collected.

Results

Thirty-three patients were included, 20 HRPR and 13 controls. No demographic differences were noted. PROMIS-PF, PROMIS-PI, IKDC and PASS scores were equivalent. HRPR reported higher PROMIS-D scores at 6 months (41.90 ± 8.52 vs 34.92 ± 3.33, p=0.009). HRPR demonstrated significantly increased ROM in the affected (137.81 ± 9.69 vs. 127.33 ± 14.82, p=0.05) and unaffected (144.06 ± 9.26 vs 135.25 ± 7.34, p=0.01) legs after 3 months. No ROM difference existed after 6 months in the affected leg (139.0 ± 8.46 vs 131.0 ± 13.42, p=0.07) although a difference existed in the unaffected leg (142.32 ± 8.27 vs 135.62 ± 7.69, p=0.03). Two control group patients suffered complications compared to zero HRPR (p=0.07).

Conclusion

HRPR-ACLR demonstrates similar patient-reported outcomes and significantly increased range of motion without increased complications compared to traditional ACLR after 6 months.

Table 1. Clinical Characteristics of Study Population

Clinical Characteristics	HRPR (n=20)	Control (n=13)	P Value
Age, mean (SD)	21.1 (7.8)	18.2 (4.4)	0.19
Male, n (%)	8 (40.0%)	6 (46.2%)	0.73
BMI, mean (SD)	25.6 (7.0)	25.1 (5.36)	0.84
Race, n (%)			0.77
White	13 (65.0%)	6 (46.2%)	
African American	1 (5.0%)	2 (15.4%)	
Hispanic	1 (5.0%)	1 (7.7%)	
Asian	1 (5.0%)	1 (7.7%)	
Other	1 (5.0%)	0 (0.0%)	
Unknown	3 (23.1%)	3 (15.0%)	
Right Laterality n, (%)	9 (45.0%)	4 (30.8%)	0.41

* Indicates P value with significance (<0.05).

Table 2. Preoperative and Postoperative Patient-Reported Outcomes

	HRPR (n=20)	Control (n=13)	P Value
Preop VAS, mean (SD)	0.89 (1.54)	2.00 (2.70)	0.16
VAS 6 weeks, mean (SD)	0.89 (1.57)	0.68 (1.31)	0.72
VAS 3 months, mean (SD)	0.44 (0.89)	0.38 (0.87)	0.87
VAS 6 months, mean (SD)	0.00 (0.00)	0.00 (0.00)	N/A
Preop PASS, responses (% No)	16 (88.9%)	10 (90.9%)	0.86
PASS 6 weeks, responses (% No)	9 (47.4%)	2 (18.2%)	0.11
PASS 3 months, responses (% No)	8 (44.4%)	5 (38.5%)	0.74
PASS 6 months, responses (% No)	10 (50.0%)	5 (38.5%)	0.52
Preop PROMIS-PI, mean (SD)	60.05 (5.97)	60.18 (3.97)	0.95
PROMIS-PI 6 weeks, mean (SD)	55.65 (8.62)	56.30 (5.12)	0.83
PROMIS-PI 3 months, mean (SD)	49.22 (7.64)	50.85 (6.64)	0.54
PROMIS-PI 6 months, mean (SD)	46.90 (5.90)	46.62 (7.45)	0.90
Preop PROMIS-PF, mean (SD)	40.05 (6.62)	36.64 (7.58)	0.21
PROMIS-PF 6 weeks, mean (SD)	42.80 (7.37)	41.10 (3.81)	0.50
PROMIS-PF 3 months, mean (SD)	47.72 (4.78)	49.69 (7.65)	0.39
PROMIS-PF 6 months, mean (SD)	52.35 (5.97)	53.15 (8.49)	0.75
Preop PROMIS-D, mean (SD)	46.33 (8.12)	44.67 (9.72)	0.63
PROMIS-D 6 weeks, mean (SD)	40.53 (7.95)	43.30 (11.03)	0.44
PROMIS-D, 3 months, mean (SD)	40.83 (8.42)	36.46 (5.13)	0.11
PROMIS-D 6 months, mean (SD)	41.90 (8.52)	34.92 (3.33)	**0.009***
Preop IKDC, mean (SD)	44.41 (12.18)	37.17 (13.57)	0.17
IKDC 6 weeks, mean (SD)	44.73 (10.39)	48.99 (5.92)	0.23
IKDC 3 months, mean (SD)	63.60 (11.08)	65.35 (6.86)	0.62
IKDC 6 months, mean (SD)	77.01 (10.96)	78.69 (11.37)	0.68

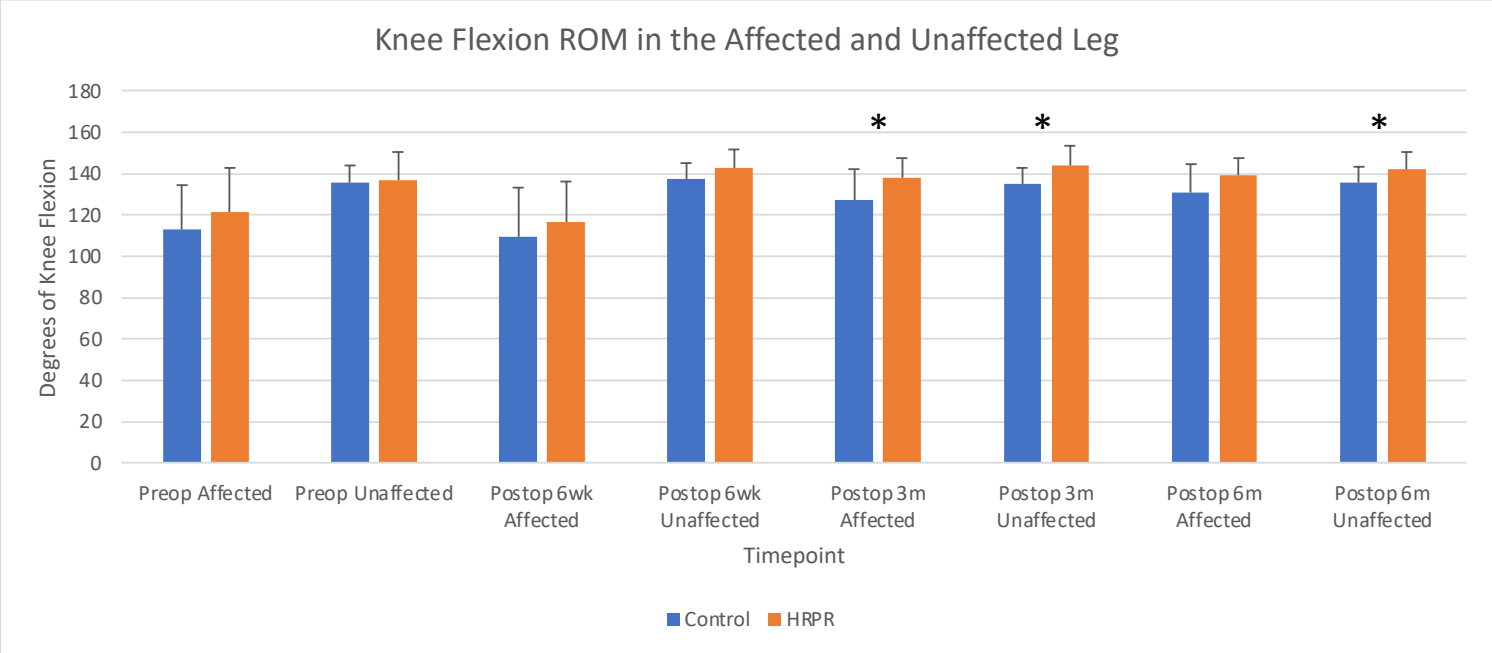
* Indicates P value with significance (<0.05). VAS=Visual Analog Scale, PASS= Patient Acceptable System State, PROMIS=Patient-Reported Outcome Measurement Information System, PI=Pain Interference, PF=Physical Function, D=Depression, IKDC=International Knee Documentation Committee Score

Table 3. Post-Operative Complications After 6 Months

	HRPR (n=20)	Control (n=13)	P Value
Arthrofibrosis, n (%)	0 (0.0%)	2 (15.4%)**	0.07
Complication Rate	0 (0.0%)	2 (15.4%)	0.07

* Indicates P value with significance (0.05). **One patient required re-scoping

Table 1. Knee Flexion as Measured by Degrees of Range of Motion



* Indicates P value with significance (<0.05)