Comparative Clinical and Radiographic Outcomes of Particulated Juvenile Articular Cartilage Implantation in Shouldered and Unshouldered Patella Cartilage Lesions

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Disclosures

There is nothing to disclose that pertains to this particular study.

General Author Disclosures:

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Background

- Particulated juvenile articular cartilage (PJAC) has demonstrated promising early results in the treatment of symptomatic articular defects of the patella.
- However, uncertainty exists regarding the stability of this cell-based technique for lesions that are not well-contained or shouldered.

Purpose

- This study aims to compare clinical and radiological outcomes of PJAC in patients with **shouldered versus unshouldered full-thickness cartilage defects** of the patella.

Methods

- A retrospective review of the prospectively collected institutional knee registry was conducted on patients treated with PJAC for full-thickness symptomatic patellar cartilage lesions between March 2014 and August 2019.
- Cartilage defects were graded by the Outerbridge classification and characterized arthroscopically as shouldered or unshouldered.

Shouldered

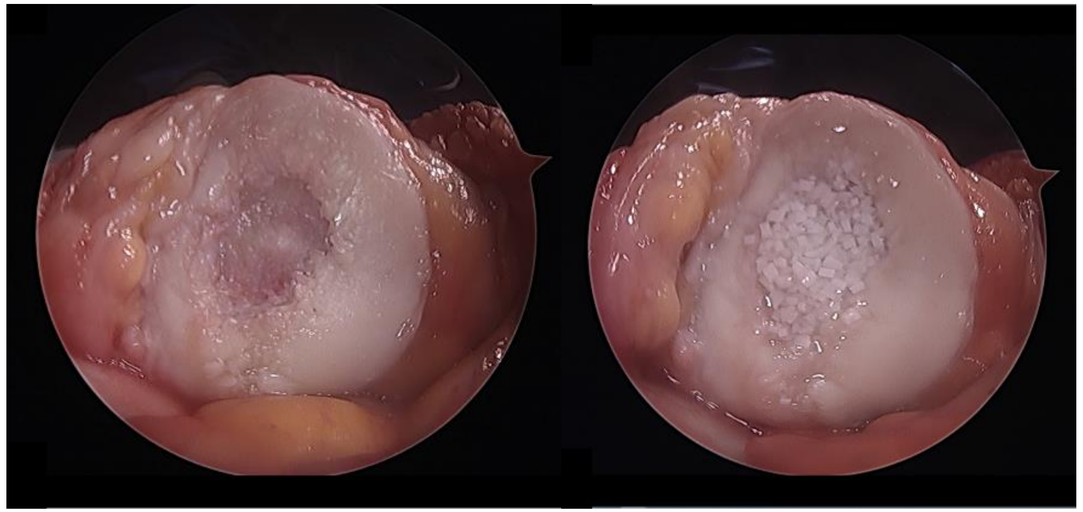


Figure 1a. Shouldered patellar cartilage defect Figure 1b. Shouldered patellar cartilage defect intra-operatively after treatment with PJAC

Unshouldered

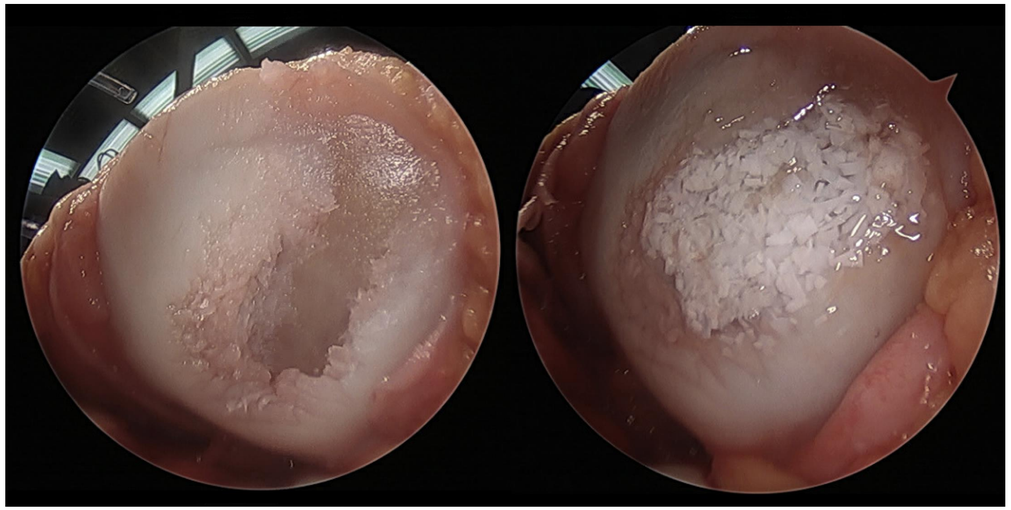
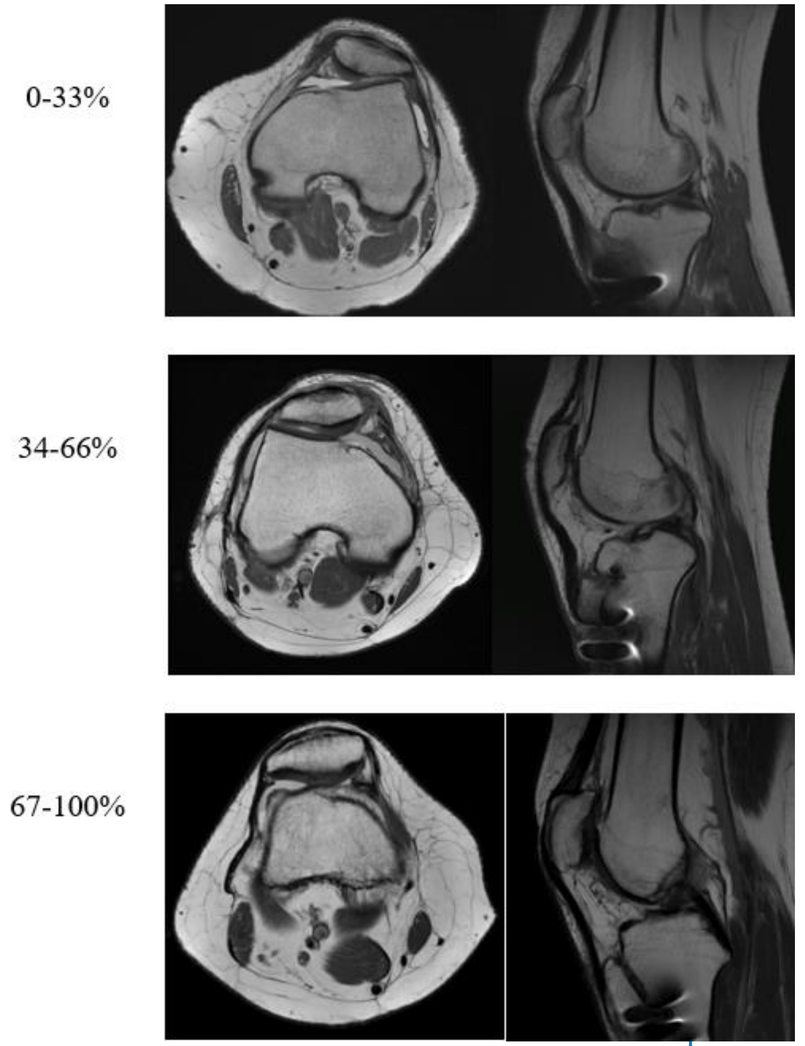


Figure 2a. Unshouldered patellar cartilage defect Figure 2b. Unshouldered patellar cartilage defect intra-operatively after treatment with PJAC

Methods

- Patient-reported outcome measures (PROMs) were obtained pre-operatively and at 1-year, 2-year, and final follow-up post-operatively.
- Post-operative MRI studies were read by a musculoskeletal fellowship-trained radiologist, characterizing the percentage of fill based on both coronal and sagittal images: 0%-33%, 34%-66%, or 67%-100%.



Post-op MRI grading, characterizing percentage of fill based on coronal and sagittal images

Results: Patient Characteristics

	Entire Cohort	Shouldered	Unshouldered	P
Variable	N = 64	N = 32	N = 32	
Laterality				.613
Left	27 (42.2%)	12 (37.5%)	15 (46.9%)	
Right	37 (57.8%)	20 (62.5%)	17 (53.1%)	
Sex				> .999
Female	47 (73.4%)	24 (75.0%)	23.00 (71.9%)	
Male	17 (26.6%)	8 (25.0%)	9.00 (29.1%)	
Age (years)	26.3 ± 7.6	26.1 ± 7.6	26.5 ± 7.9	.851
Height (in)	67.7 ± 4.0	67.8 ± 4.0	67.6 ± 4.2	.957
Weight (lbs)	158.3 ± 31.4	165.1 ± 31.5	151.8 ± 31.8	.239
BMI mg/kg^2	25.5 ± 4.9	25.7 ± 4.3	25.3 ± 5.5	.526
Symptom Duration (Years)	**7.6 ± 8.8**	**5.3 ± 7.1**	**10.1 ± 9.9**	**.023**
Injury Mechanism				> .999
Non-Contact	59 (92.2%)	28 (90.3%)	27 (93.1%)	
Contact	5 (7.8%)	3 (9.7%)	2 (6.9%)	
Tourniquet Time (minutes)	78.6 ± 19.4	78.0 ± 19.7	79.2 ± 19.8	.815
Prior Knee Surgery	**24 (37.5%)**	**7 (21.9%)**	**17 (53.1%)**	**.019**
Follow-up (years)	2.8 ± 1.7	3.0 ± 1.7	2.5 ± 1.5	0.2882

Values presented as mean ± standard deviation or n (%) unless otherwise indicated.

Results: Cartilage Fill

	Shouldered	Unshouldered	P
Variable	N = 32	N = 32	
Percent Fill			.604
0 - 33%	6 (18.8%)	8 (25.0%)	
34 - 66%	4 (12.5%)	5 (15.6%)	
67 - 100%	22 (68.8%)	19 (59.4%)	
Latest post-Operative MRI Time Point (months)	14.8 ± 8.0	12.4 ±7.1	.240

- Radiographically, shouldered and unshouldered defects demonstrated similar rates of cartilage fill on postoperative MRIs (p =.604)

Results: Patient Reported Outcomes

Patient-Reported Outcome Measurements from Baseline to 2-year follow-up

	Baseline (N = 64)	2-year follow-up (N = 64)	P Baseline to 2-year follow-up
KOOS QOL	**23.1 ± 19.5**	**65.3 ± 20.3**	**< .001**
KOOS-PS	9.1 ± 10.0	10.3 ± 7.3	.384
HSS Pedi-FABS	**41.2 ± 16.4**	**76.0 ± 14.1**	**< .001**
IKDC	**34.8 ± 15.1**	**13.9 ± 10.2**	**< .001**
Kujala	**52.0 ± 19.2**	**87.5 ± 10.0**	**< .001**
SF-12 Mental Health	**48.9 ± 12.2**	**53.4 ± 7.7**	**.015**
SF-12 Physical Health	**39.5 ± 9.9**	**51.5 ± 7.7**	**< .001**
VR-12 Mental Health	**49.4 ± 11.4**	**54.0 ± 7.3**	**.019**
VR-12 Physical Health	**40.7 ± 10.2**	**52.8 ± 7.1**	**< .001**
VR6D	**0.66 ± 0.14**	**0.79 ± 0.10**	**< .001**

Values presented as mean ± standard deviation

The entire cohort showed a statistically significant improvement from baseline to 2 years in KOOS QOL, HSS Pedi Fabs, IKDC, Kujala, SF-12 Physical health, VR-12 Physical health, and VR6D (all P < .001) with the exception of KOOS-PS, which showed no significant difference (P=0.34)

Results: Patient Reported Outcomes

Change in Patient-Reported Outcome Measures from Baseline to 2-years

	Shouldered (N = 32)	Unshouldered (N = 32)	P
KOOS QOL	41.1 ± 21.9	37.0 ± 24.1	.651
KOOS-PS	**-27.2 ± 14.8**	**-10.7 ± 17.6**	**.015**
HSS Pedi-FABS	-2.8 ± 9.5	-2.54 ± 10.4	.923
IKDC	35.0 ± 24.5	29.0 ± 13.2	.410
Kujala	**44.3 ± 26.3**	**26.9 ± 17.8**	**.039**
SF-12 Mental Health	6.3 ± 12.2	3.1 ± 8.8	.519
SF-12 Physical Health	14.2 ± 11.6	7.5 ± 7.6	.151
VR-12 Mental Health	5.3 ± 11.0	3.5 ± 7.7	.689
VR-12 Physical Health	14.9 ± 11.6	6.6 ± 8.8	.098
VR6D	0.16 ± 0.17	0.07 ± 0.09	.196

Values presented as mean ± standard deviation

- Overall, there were no significant differences between shouldered and unshouldered lesions in baseline and 2-year PROMS. However, the shouldered group had a higher improvement from baseline to 2 years in KOOS-PS and Kujala scores

Conclusion

- PJAC implantation led to significantly improved PROMs for both shouldered and unshouldered patellar cartilage lesions over time.
- Radiographically, shouldered and unshouldered defects demonstrated similar rates of cartilage fill on postoperative MRIs.
- Most PROMs were equivalent between shouldered and unshouldered patellar cartilage defects, suggesting similar efficacy of PJAC for these defects.
- Thus, unshouldered lesions can be addressed in a similar fashion to shouldered lesions when implementing PJAC.

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