

Cartilage Repair of the Tibiofemoral Joint with versus without Concomitant Osteotomy: A Systematic Review of Clinical Outcomes

Jaydeep Dhillon, BS
Matthew J. Kraeutler, MD
Sydney M. Fasulo, MD
John W. Belk, BA
Anthony J. Scillia, MD
Patrick C. McCulloch, MD



Introduction

- Various factors influence the cartilage regeneration potential that are specific to the knee joint, such as the isolated cartilage defect, meniscal status, ligamentous instability, and lower extremity malalignment
- Osteotomies can reduce contact pressure on the implanted graft, normalize mechanics, and significantly unload the affected compartment of the knee

Purpose

- To perform a systematic review to compare clinical outcomes of patients undergoing cartilage repair of the tibiofemoral joint with versus without concomitant osteotomy



Methods

- Systematic review conducted according to PRISMA guidelines
- Searched PubMed, Embase, Cochrane Library
- Search terms used were: *osteotomy AND knee AND (“autologous chondrocyte” OR “osteochondral autograft” OR “osteochondral allograft” OR microfracture)*
- Study inclusion criteria:
 - Clinical studies which directly compared outcomes between cartilage repair of the tibiofemoral joint alone versus cartilage repair of the tibiofemoral joint with concomitant osteotomy
- Study exclusion criteria:
 - Non-human or non-comparative studies
 - Evaluated cartilage repair/osteotomy of the patellofemoral joint

Methods

- Outcomes assessed included:
 - Patient-reported outcomes (PROs)
 - Knee Injury and Osteoarthritis Outcome Score (KOOS)
 - Visual Analog Scale (VAS) for pain
 - Satisfaction
 - Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)
 - Reoperation rate
 - Complication rate
 - Procedure payments

Results

- Five studies met inclusion criteria including a total of 2,267 patients
 - 1,747 patients underwent cartilage repair alone (Group A)
 - 520 patients underwent cartilage repair with concomitant osteotomy (Group B)

Study	LOE	n (A, B)	Patient Age (A, B), y	Follow-up, mo	BMI, kg/m ²	Male, %
Bode et al, 2013 ²	II	24, 19	38.3, 40.2	71.9	24.6	NR
Calcei et al, 2021 ³	III	954, 159	31.9, 31.9	39.2	NR	47.4
Faber et al, 2021 ⁴	III	538, 250	37.9, 41.4	36.0	NR	62.0
Ackermann et al, 2020 ¹	IV	127, 41	35.9, 36.0	NR	27.9	50.0
Minas et al, 2014 ⁵	IV	104, 51	NR	144.0	26.7	53.8
Total	-	1,747; 520	34.3, 37.7	44.6	27.0	53.2

Results

Study	Defect size (A, B), cm ²	Preop Alignment (A, B), deg	Lesion Location	Type of Osteotomy	Type of Cartilage Repair
Bode et al, 2013 ²	4.4, 4.9	2.3 (varus), 3.5 (varus)	MFC: 43	HTO: 19	ACI: 24
Calcei et al, 2021 ³	NR	NR	NR	NR	ACI: 469; OCA: 644
Faber et al, 2021 ⁴	3.9, 4.4	1.8 (varus), 5.7 (varus)	MFC: 788	HTO: 250	BMS: 71; OCA: 13; ACI: 226; D: 21; O: 82; M: 21
Ackermann et al, 2020 ¹	4.1, 4.9	NR	MFC: 168	HTO: 41	ACI: 60; OCA: 108
Minas et al, 2014 ⁵	NR	NR	NR	HTO: 48; DFO: 3	ACI: 104
Total	4.0, 4.5	1.8 (varus), 5.5 (varus)	MFC: 999	HTO: 358; DFO: 3	ACI: 883; OCA: 765; BMS: 71; D: 21; O: 82; M: 21

Results

- In one study⁴, patients in Group B had a significantly higher postoperative KOOS score (81.75 ± 14.22) compared to patients in Group A (74.40 ± 16.57) at final follow-up ($p=0.02$)
- The study found significantly lower pain levels among patients in Group B (2.02 ± 1.98) compared to Group A (3.20 ± 2.18) at final follow-up ($p=0.003$)
- The same study found a significantly higher satisfaction in Group B compared to Group A at final follow-up ($p=0.015$)

Results

- Three studies^{2,3,5} assessed reoperation rate at final follow-up
- All three studies found significant differences between groups, favoring Group B

Study	Group A	Group B	p-value
Calcei et al, 2021 ³	468/954 (49.1%)	31/159 (19.5%)	<0.05
Bode et al, 2013 ²	10/24 (41.7%)	2/19 (10.5%)	0.02
Minas et al, 2014 ⁵	35/104 (33.7%)	6/48 (12.5%)	0.01
Total	513/1,082 (47.4%)	39/226 (17.3%)	<0.0001

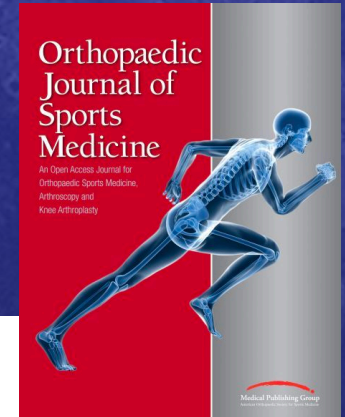
Discussion

- Based on the results of this study, we found a significantly lower reoperation rate for patients undergoing cartilage repair with concomitant osteotomy compared to cartilage repair alone
- In addition to lower reoperation rates, we also found superior PROs among patients undergoing cartilage repair with concomitant osteotomy in domains of both function and pain at short-term follow-up
- Furthermore, no significant differences were found between groups with regard to complication rate and procedure payments

Conclusions

- Patients undergoing cartilage repair of the tibiofemoral joint with concomitant osteotomy might be expected to experience greater improvement in clinical outcomes with a lower reoperation rate compared to cartilage repair alone
- Surgeons preparing for cartilage procedures of the knee joint should pay particular attention to preoperative malalignment of the lower extremity in order to optimize outcomes
- Further randomized controlled studies are needed before a definitive clinical decision can be made regarding performing an osteotomy with a cartilage procedure

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A Systematic Review of Clinical Outcomes

Jaydeep Dhillon,* BS, Matthew J. Kraeutler,^{†#} MD, Sydney M. Fasulo,[‡] MD, John W. Belk,[§] BA, Mary K. Mulcahey,^{||} MD, Anthony J. Scillia,^{‡¶} MD, and Patrick C. McCulloch,[†] MD

Investigation performed at Rocky Vista University College of Osteopathic Medicine, Parker, Colorado, USA



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