Return to Pivoting Sports after Cartilage Repair Surgery of the Knee: A Scoping Review

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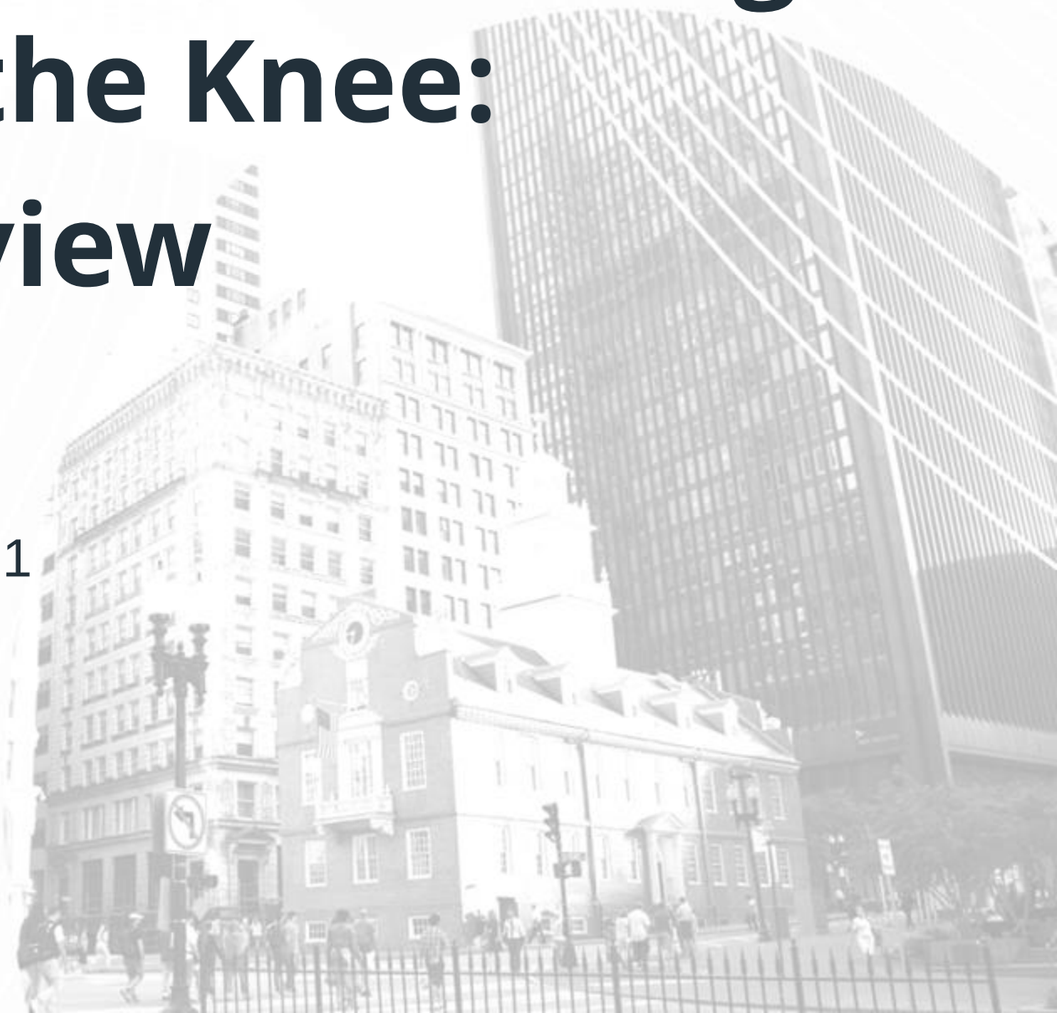

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Nothing to declare

Introduction

The prevalence of knee cartilage injuries among athletes is more than twice that of the general population.
Athletes may require surgical treatment to increase probability of returning to sports.

MF(microfracture), OAT(osteochondral autograft transplantation), OCA(osteochondral allograft transplantation), and ACI(autologous chondrocyte implantation) are the current main treatment options available.

For athletes, the RTS(return to sports) outcome after surgery is an important variable when selecting treatment.
However, this outcome is specific to individual athletes and focuses on their sport-specific goals.
The probability of RTS for an athlete competing in pivoting sports or running activities may be different.
RTS among all sports may not be an appropriate outcome variable to estimate an accurate outcome.

This review focused on RTS after focal chondral lesion surgery especially in pivoting sports where the prevalence of cartilage injuries is particularly high.

The purpose of this scoping review was to identify gaps in the current research and present available evidence for rates of RTS after cartilage procedures in pivoting sports athletes.

Methods

Scoping review

Stage 1. Identifying the research question

"What are the rates of RTS among pivoting sports athletes after cartilage procedures of the knee joint?"

Stage 2. Identifying relevant studies

PubMed(MEDLINE), CINAHL, and Cochrane Central Register of Controlled Trials

Search word: "(cartilage OR articular cartilage OR chondral OR chondrocyte OR articular OR osteoarticular OR osteochondral) AND (transplant OR transplantation OR allograft OR autograft OR autologous OR implantation OR implant OR mosaicplasty OR oat OR oats OR microfracture OR maci OR aci OR caci OR restore OR repair) AND (athlete OR athletic OR sport OR activity) AND (knee)."

Methods

Stage 3. Study selection

- Primary research studies, English, human subjects,
- MF, OAT, OCA, or ACI for full-thickness chondral and osteochondral defect or OCD,
- Pivoting sports,
- Minimum follow up of 12 months

Stage 4. Charting the data

- Number of athletes
- Mean defect size
- Mean age
- Location of the cartilage injuries
- Mean number of previous operations
- RTS, Return to preinjury level
- Time to RTS
- Level of sports

Results

16 studies were selected.

7 studies reported on MF,

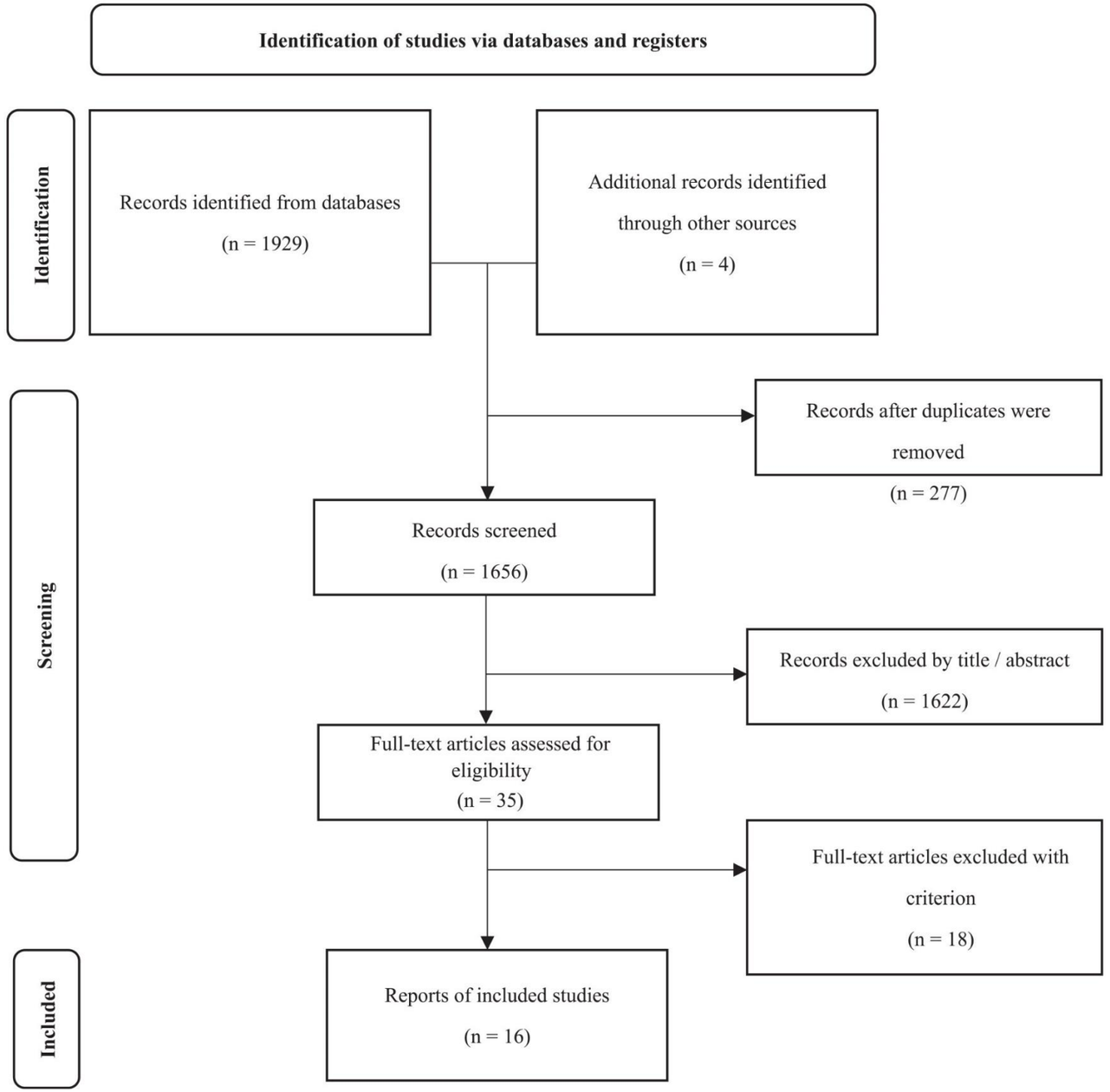
2 studies on OAT,

2 studies on OCA,

3 studies on ACI,

1 study on MF and OAT, and

1 study on MF and ACI.



MF(microfracture)

Study	No. of Athletes	Mean Defect Size, cm^2 (Range)	Mean Age, Years (Range)	Location	Mean No. of Previous Operations	RTS	Time to RTS	Level of Sport
Cerynik *et al*.1	24	NA	29	NA	NA	79%	By 30 weeks	Professional
Gudas *et al*.2	29	2.8	24.3	MFC: 89% LFC: 11%	NA	52% to preinjury level	At 6.5 months	Competitive (62%) Recreational (38%)
Harris *et al*.3	41	NA	27.7	NA	NA	83%	At 9.2 months	Professional
Kon *et al*.4	20	1.9	26.5 (18-35)	MFC: 65% LFC: 25% Trochlea: 15%	0.5	80%, 75% to preinjury level	At 6.5 months	Professional, Semiprofessional
Mithoefer *et al*.5	32	4.9 (0.2-20.0)	38.0 (16-54)	MFC: 53% LFC: 22% Trochlea: 25%	0.9	44%, 25% to preinjury level	NA	Professional (3%) Competitive (59%) Recreational (38%)
Namdari *et al*.6	24	NA	28.6 (21-40)	NA	NA	58%	By 6.3 months	Professional
Riyami *et al*.7	24	2.0(0.6-2.8)	NA	NA	NA	83.3%	By 6.2 months	Professional (63%) Semiprofessional (37%)
Schallmo *et al*.8	113	NA	NA	NA	NA	75%	NA	Professional
Steadman *et al*.9	25	NA	NA	NA	NA	76%	By 10 months	Professional

MFC = medial femoral condyle; LFC = lateral femoral condyle; RTS = return to sports.

RTS and return to preinjury level was reported in 44-83% and 25-75%, respectively.

The time to RTS varied between 6.2-10 months, and the mean defect size varied from 1.9-4.9 cm^2.

The most commonly location of surgery was at medial femoral condyle (MFC; 53-89%), and mean number of previous operations varied from 0.5-0.9 times.

OAT

Study	No. of Athletes	Mean Defect Size, cm^2 (Range)	Mean Age, Years (Range)	Location	Mean No. of Previous Operations	RTS	Time to RTS	Level of Sport
Werner *et al*.10	16	1.34 (0.15-2.8)	21.1	NA	NA	100%	At 11.8 weeks	NA
Gudas *et al*.2	28	2.9	24.6	MFC: 79% LFC: 21%	NA	93% to preinjury level	At 6.5 months	Competitive (57%) Recreational (43%)
Panics *et al*.11	61	2.4	25.3 (16-41)	MFC: 62% LFC: 25% Tibia: 5% Patella: 7% Trochlea: 2%	NA	87%, 67% to preinjury level	By 4.5 months	Professional

MFC = medial femoral condyle; LFC = lateral femoral condyle; RTS = return to sports.

RTS and return to preinjury level was reported in 87-100% and 67-93%, respectively.
The time to RTS varied between 11.8-6.5 months, and the mean defect size varied from 1.34-2.9 cm2.
The most commonly location of surgery was at medial femoral condyle (MFC; 62-79%).

OCA

Study	No. of Athletes	Mean Defect Size, cm^2 (Range)	Mean Age, Years (Range)	Location	Mean No. of Previous Operations	RTS	Time to RTS	Level of Sport
McCarthy *et al*.12	10	4.5	19.2	MFC: 50% LFC: 50%	1.7	77%	At 7.9 months	Competitive
Balazs *et al*.13	11	5.1	22.8 (19-29)	MFC: 7% LFC: 43% Trochlea: 36% Patella: 14%	1.0	80% 64% to preinjury level	At 20 months	Competitive (55%) Professional (45%)

MFC = medial femoral condyle; LFC = lateral femoral condyle; RTS = return to sports.

RTS and return to preinjury level was reported in 77-80% and 64%, respectively.

The time to RTS varied between 7.9-20 months, and the mean defect size varied from 4.5-5.1 cm2.

The most commonly location of surgery was at medial femoral condyle (MFC; 50%), and mean number of previous operations varied from 1.0-1.7 times.

ACI

Study	No. of Athletes	Mean Defect Size, cm^2 (Range)	Mean Age, Years (Range)	Location	Mean No. of Previous Operations	RTS	Time to RTS	Level of Sport
Kon *et al*.4	21	2.1	23.7 (16-37)	MFC: 67% LFC: 24% Trochlea: 19%	0.6	86% 67% to preinjury level	At 10.2 months	Competitive Professional
Mithöfer *et al*.14	45	5.7	26.0	MFC: 48% LFC: 23% Trochlea: 13% Patella: 11% Tibia: 5%	2.0	33% 26% to preinjury level	NA	Competitive (27%) Recreational (73%)
Mithöfer *et al*.15	18	6.4	15.9	NA	2.7	96% 61% to preinjury level	NA	Competitive (66%) Recreational (44%)
Niethammer *et al*.16	33	NA	NA	NA	NA	42%	NA	NA

MFC = medial femoral condyle; LFC = lateral femoral condyle; RTS = return to sports.

RTS and return to preinjury level was reported in 33-96% and 26-67%, respectively.

The time to RTS varied between 10.2 months, and the mean defect size varied from 2.1-6.4 cm2.

The most commonly location of surgery was at medial femoral condyle (MFC; 48-67%), and mean number of previous operations varied from 0.6-2.7 times.

Discussion

This scoping review provides an overview of reported rates of RTS for pivoting sports athletes after cartilage procedures. There was a high range in terms of rates of RTS and return to preinjury level for all procedures. Most studies reported high rates of RTS; however, return to preinjury level was lower. There was a high heterogeneity in regard to age, chondral lesion size, location of cartilage injury, number of previous surgeries, and level of sports, which may explain the variations in outcome.

RTS is a critical variable for patients who are involved in playing sports. For clinicians and athletes, these data are used as a basis for selecting treatment and making prospective predictions. However, simultaneously, RTS is a complex and ambiguous variable throughout the literature. It would be useful for both clinicians and athletes to have a report of RTS under a few defined conditions.

RTS with microfracture in pivoting sports was not higher. In contrast, our findings suggest that OAT is expected to have the highest RTS in pivoting sports. In addition, it has been reported that athletes RTS faster, especially, when the cartilage deficit is small. In pivoting sports with large cartilage defects, OCA and ACI are treatments to consider. In clinical practice, ACI may be chosen in many cases, because OCA has many limitations in its use. There are still not enough data on the size of the lesion to decide between ACI and OAT. Further investigation is needed in the future.

Conclusion

There was a high heterogeneity and range in rates of RTS in athletes participating in pivoting sports. Most studies reported high rates of RTS; however, return to preinjury level was lower. RTS with microfracture in pivoting sports was not higher compared with other techniques, and OAT is expected to have the highest RTS in pivoting sports. These data may be important to clinicians in shared decision making on the type of procedure to be performed and counseling pivoting sports athletes on prognosis and expected RTS rates.

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