PROTOCOL FOR A SYSTEMATIC REVIEW OF PAEDIATRIC MENISCAL REPAIR

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ABSTRACT:

Background Meniscal tears in the paediatric population represent a significant challenge. Improved sensitivity of diagnostic imaging and increased intensity of organised sport among children is in part responsible for an increased incidence of injuries identified. While rare, these injuries have a significant impact on a patient's future and necessitate timely and meticulous repair.

Methods Adhering to PRISMA guidelines, MEDLINE, Embase and Cochrane databases will be interrogated from inception to November 2019. All primary clinical studies in which paediatric meniscal injuries are treated will be identified and included. Treatment techniques will be grouped according to surgical technique and a further analysis of any papers concomitantly repair anterior cruciate ligaments will also be analysed to identify any superiority. A qualitative synthesis will at first be attempted with further quantitative analysis should heterogeneity of studies allow it.

Discussion Paediatric meniscal injuries provide a dilemma for even the most experience surgeon, with no consensus on a preferred treatment option. Outcomes are often poor and can have long-term effects with early onset of osteoarthritis and limitation of future function. As such, this review will be pivotal in identifying the different treatment options being employed for meniscal repair in a paediatric population, if there is any superiority in a given treatment choice and moving towards identified a standard treatment protocol.

BACKGROUND:

The knee is a complex structure comprised of two joints, the tibiofemoral and patellofemoral joint. The former of these, the tibiofemoral joint, is involved in weightbearing.
This can be further subdivided into an inner (medial) and outer (lateral) compartment, each containing a hemispherical cartilaginous structure called a meniscus. (1)
The menisci act predominantly as shock absorbers during axial loading, however they also aid in stabilising the joint and increasing the conformity and contact surface between the proximal tibia and distal femoral articular surfaces.(2).
The menisci also have proprioceptive function, while providing nutrition to articular cartilage and joint lubrication(3,4).
Variations to meniscal structure, as in the case of meniscal tears, alters the normal biomechanics of the knee, increasing the likelihood of further injury.(5,6)
With loss of meniscal tissue, weightbearing effects are increased leading to earlier onset of osteoarthritis in comparison to an unaffected knee. (7,8)
With maturation and aging, loss of elasticity and alterations to the structural composition of menisci results an increased predisposition to injury.
As such, paediatric meniscal injury is rare, despite increased physical activity in the age group. Meniscal injuries within the paediatric and adolescent cohort accounts for only 0.15% of all knee injuries, however incidence is increasing annually.(9)

With a paucity of data regarding optimal treatment options for paediatric meniscal injuries, there is significant variability in the surgical technique utilised and post-operative management.(10)

The aim of the study is to review the current available techniques for repair of meniscal injuries in paediatric patients and ascertain the functional results, post-operative rehabilitation options and failure rates associated.

In addition, we hope to observe how outcomes for isolated meniscal repairs compare to those performed concurrently with anterior cruciate ligament (ACL) reconstruction given that both injuries can occur in conjunction.

METHODS/DESIGN:

The protocol has been prospectively registered on the PROSPERO database (CRD42020152627) (11) and will be reported in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analyses Protocols (PRISMA-P) statement (12).

SEARCH STRATEGY

We will search four major databases, MEDLINE, Embase, Google Scholar and Web of Science, the combination of which have been shown to provide the highest proportion of evidence on a given subject.(13)

Free-text terms will be combined with Boolean operators in parallel across the four databases (see Table 1).

After duplicate citations have been removed, titles and abstracts will be screened by two authors (AS and DM).

The remaining articles will be read in full in order to shortlist those eligible for inclusion. Further to this the reference list of any included studies will be screened to identify any possible relevant studies that may have been missed by the search strategy.

STUDY SELECTION

All primary clinical studies focussing on paediatric meniscal injuries undergoing repair will be eligible for inclusion.

English language papers and those with an available translation will be included and citations will be managed using Excel (Microsoft Corp, Redmond, Washington, USA) and Mendeley (Elsevier, Amsterdam, Netherlands).

PARTICIPANTS

Case reports, observational studies and randomised controlled trials in any clinical setting with patients aged up to and including 18 years old will be eligible for inclusion. Only conference abstracts will be excluded.

INTERVENTION

All methods of meniscal repair will be included for review. However, cases will be limited to primary procedures, with revision procedures being excluded.

Discoid meniscal repair, unless independent will also be excluded as the treatment is dissimilar to convention repair.

In addition, primary repairs with novel treatments and any repair in which complete or partial resection has occurred with also be excluded.

COMPARATOR

All clinical studies comparing meniscal repair strategies in isolation, or those comparing meniscal repair versus combined ACL and meniscal repair will be included for review.

Given our primary outcome is to identify if there is any benefit in a given meniscal repair strategies, or if concomitant ACL reconstruction is beneficial, we will only include studies in which these have been investigated in parallel and directly compared.

OUTCOME

Only completed, published studies that report any clinically relevant outcome will be included. Studies with any length of follow-up will be eligible for inclusion and those that are ongoing or unpublished will be excluded.

DATA EXTRACTION

Data collection will be undertaken as per the Cochrane Handbook of Systematic Reviews of Interventions (14).

All data will be extracted into a pre-designed electronic template in duplicate by two authors (DM and AS) with any disagreements being resolved by a third review team member (CG) as required.

Data items relating to the following will be extracted:

Patient demographics and study design

Pre-intervention diagnosis, mechanism of injury or condition

Meniscal repair technique, concomitant ACL reconstruction

Post-intervention outcomes, rehabilitations protocol and complications

If necessary, authors will be contacted to provide further clarity or missing information.

OUTCOME MEASURES

The primary outcome will be the number of meniscal repairs completely healed at 12 weeks, as assessed utilising functional outcome measures and scoring systems where applicable.

Secondary outcomes will include a comparison of concomitant ACL repair to ascertain if there is any benefit or superiority in combined repair.

SUBGROUP ANALYSES

Data will be further interrogated to ascertain if any particular rehabilitation protocol conveyed benefit, where listed. to ascertain if any particular meniscal repair technique is superior, we will present data according to intervention type.

RISK OF BIAS ASSESSMENT

Randomised controlled trials will be assessed using the Cochrane Collaboration Risk of Bias Assessment Tool (15).

However, it is likely that most included studies will be observational, and as such where appropriate the ROBINS-I tool will be utilised to assess risk of bias for each study (16).

Appraisal of the quality of evidence for each included study will be undertaken interpedently by two authors (DM and AS) utilising the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach (17). Any discrepancy will again be resolved by a third author (CG).

DATA ANALYSIS AND SYNTHESIS

All outcome measures will be evaluated initially using simple descriptive statistics.

Interventions will be pooled, with meniscal repair techniques being analysed according to intervention types.

A meta-analysis will only be performed if a sufficient number of studies (≥3) with consistent characteristics are included. In the instance that a meta-analysis is not possible, a qualitative synthesis will be performed.

PRISMA-P 2015 CHECKLIST

This checklist has been adapted for use with systematic review protocol submissions to BioMed Central journals from Table 3 in Moher D et al: Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. Systematic Reviews2015 4:1An Editorial from the Editors-in-Chief of Systematic Reviews details why this checklist was adapted - Moher D, Stewart L & Shekelle P: Implementing PRISMA-P: recommendations for prospective authors. Systematic Reviews 2016 5:15

Section/topic	#	Checklist item	Information reported		Information reported
			Yes	No	
ADMINISTRATIVE INFORMATION					
Title					
Identification	1a	Identify the report as a protocol of a systematic review	☒	☐	2
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	☐	☒	N / A
Registration	2	If registered, provide the name of the registry (e.g., PROSPERO) and registration number in the Abstract	☒	☐	51
Authors					
Contact	3a	Provide name, institutional affiliation, and e-mail address of all protocol authors; provide physical mailing address of corresponding author	☒	☐	4-25

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
Autores					
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the revie	☒	☐	205-208
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	☐	☒	N / A
Support					
Sources	5a	Provide name for the review funder and/or sponsor	☒	☐	203-204
Sponsor	5b	Proporcionar el nombre del financiador y/o patrocinador de la revisión	☐	☒	N / A

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
Support					
Role of sponsor/funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	☐	☒	N / A
INTRODUCCIÓN					
Rationale	6	Describe the rationale for the review in the context of what is already known	☐	☐	54-77
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	☐	☐	79-83
METHODS					
Eligibility criteria	8	Specify the study characteristics (e.g., PICO, study design, setting, time frame) and report characteristics (e.g., years considered, language, publication status)	☒	■	104-114

Section/topic	#	Checklist item	Information reported		Line number(s)
			Sí	No	
Information sources	9	Describe all intended information sources (e.g., electronic databases, contact with study authors, trial registers, or other grey literature sources) with planned dates of coverage	☒	☐	93-94
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	☒	☐	91-102
STUDY RECORDS					
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	☒	☐	135-149
Selection process	11b	State the process that will be used for selecting studies (e.g., two independent reviewers) through each phase of the review (i.e.,	☒	☐	135-149

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
Data collection process	11c	Describe planned method of extracting data from reports (e.g., piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	☒	☐	135-149

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
Data items	12	List and define all variables for which data will be sought (e.g., PICO items, funding sources), any pre-planned data assumptions and simplifications	☒	☐	144-147
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	☒	☐	151-162
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	☐	☐	164-174

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
DATA					
Synthesis	15a	Describe criteria under which study data will be quantitatively synthesized	☐	☐	176-182
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data, and methods of combining data from studies, including any planned exploration of consistency (e.g., I^2, Kendall's tau)	☐	☐	176-182
	15c	Describe any proposed additional analyses (e.g., sensitivity or subgroup analyses, meta-regression)	☐	☐	158-162, 176-182

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
DATA					
Synthesis	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	☐	☐	181-182
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (e.g., publication bias across studies, selective reporting within studies)	☐	☐	176-182
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (e.g., GRADE)	☐	☐	173-174

DISCUSSION:

Meniscal injuries are the most frequently encountered and treated injury of the knee joint and are particularly common in the paediatric population.

Adequate repair is of the utmost importance, with lifelong debilitating results as a consequence. Nonetheless, large variations in practice and no standardised protocol for treatment has made difficulty in assessing the best intervention.

This review hopes to highlight the different surgical techniques being employed for paediatric meniscal repairs and ascertain if any has superiority. In addition, we hope that studies identified will allow us to also answer if concomitant anterior cruciate repair is beneficial and if any particular rehabilitation protocol has benefit.

ABBREVIATIONS

ACL – anterior cruciate ligament

PRISMA - Preferred Reporting Items for Systematic Review and Meta-Analyses

ROBINS-I – Risk of bias in non-randomised studies – of interventions

Competing interests

The authors declare that they have no competing interests

Funding

There was no funding awarded to this study

Author's contributions

AS and CG devised the study idea.

DM revised the study protocol and inclusion criteria with AS and wrote the manuscript with input from AS.

The manuscript was subsequently reviewed by all authors (DM, AS and CG) prior to submission.

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