

Comparison between INSIDE-OUT vs ALL-INSIDE arthroscopic Bucket Handle meniscal repair (Systematic Review)

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Abstract

Background: Bucket handle tears are common among young people especially young athletes. There are many different arthroscopic techniques but most commonly used are inside-out and ALLinside. This study will compare between them.

Aim: This study aims to compare the clinical and radiological outcomes of ALL-INSIDE and INSIDE-OUT repair methods for bucket handle meniscal tears using magnetic resonance imaging (MRI). For anatomical evaluation, some studies relied on a second arthroscopic examination.

Material and Methods: Incorporating new research, this meta-analysis compares the Allinside and inside-out methods for repairing meniscal tears in bucket handles

Results: Using the following datasets to compare and contrast All-inside and inside-out methods for meniscal healing on bucket handles, including current research from 2010 onwards: EMBASE, Scopus, PubMed, and MEDLINE. As for medical publications: Sports medicine in the United States, THE KNEE, orthopaedic sports medicine journal, AJSM, and COCHRANE library. A total of 482 articles were identified in the database search: MEDLINE, PubMed, Scopus, EMBASE, and medical journals. After duplication and screening of the remaining 357 articles, 125 articles were screened, excluded article 104 and 21 articles met the eligibility criteria. After collecting the articles based on their reported outcomes, 21 remained for our systematic review.

Conclusion: The current study emphasizes the short-term and long-term consequences of comparing inside-out with all-inside meniscal healing. In the tiny subset of medium-sized vertical meniscal injuries, both inside-out and all-inside procedures performed today provide comparable failure rates, functional outcomes, and complication rates.

Keywords: Bucket handle meniscal repair; ALL-INSIDE INSIDE -OUT; TOTAL INSIDE

1. Introduction

An important clinical problem is the prevalence of bucket-handle meniscal tears, which disproportionately affect active, youthful patients.^{1,2}

Because the meniscus is essential for force transmission and joint stability, a partial meniscectomy for bucket handle meniscal tear (BHMT) may alleviate early symptoms but speed up arthritis in the afflicted compartment.

Research has demonstrated that elevated tibio-femoral contact pressures can occur from BHMT injuries that are left untreated. Hence, in order to improve the restoration of native tibiofemoral biomechanics, it is essential to preserve the BHMT fragment. After bucket BHMT repairs, some writers have noted positive outcomes following surgery. For BHMT repairs, both inside-out and all-in approaches have been detailed.³

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The inside-out approach was formerly thought to be the best for repairs, but it comes with a few drawbacks, such as the need for additional trained assistants to pass sutures, the need for safety incisions, and the possibility of neurovascular soft tissue complications. A considerable percentage of meniscus repairs are now performed using the all-insides procedure, which addresses some of these problems and is made possible by the enhanced layouts of more recent generation internal meniscus repair tools.⁴

The primary objective of this systematic review was to compare the success and failure rates of two surgical approaches for repairing bucket-handle meniscal rips: the inside-out approach and the all-in approach.

2. Patients and methods

Search Strategy

Incorporating articles published between 2010 and 2024 from the following databases, this systematic review aims to compare All-inside and inside-out approaches for bucket-handle meniscal repair. Scopus, EMBASE, MEDLINE, PubMed. Also, periodicals published in the medical field: Searches in the following databases were conducted: COCHRANE library, American Journal of Sports Medicine AJSM, Orthopedic Journal of Sports Medicine, and Bucket Handle Meniscal Tear, Repair, All-Inside, Inside-Out, and Total Inside.

Inclusion Criteria:

Studies on patients over 18 years, only English-language articles and studies were considered, featuring human subjects with bucket handle meniscal tears, bucket handle with anterior cruciate ligament (ACL) tear, studies for primary repair, and high-quality studies published after 2010.

Exclusion criteria:

Patients less than 18 years, publication language was not English; studies involving Bucket handle with multiligament injury and secondary repair or first-generation all-inside repair, Low quality studies not having sufficient data or incomplete follow-up duration.

Ethical Considerations:

The study protocol was receiving ethical approval from the Research Ethics Committee, Faculty of Medicine, Al-Azhar University, Cairo.

Data Extraction:

When two writers disagreed after utilizing a data extraction form to separate pieces of information, they discussed it and eventually reached a consensus. Review Manager was populated by two authors who, where

appropriate, contacted trial authors to request further information or data.

Risk of Bias:

Each trial's authors were evaluated separately for their potential bias in the included trials. The following were evaluated using the 'Risk of bias' tool developed by The Cochrane Collaboration: sequence generation, allocation concealment, blinding of personnel and participants, incomplete outcome data, attrition bias, differences in rehabilitation, and performance bias related to the surgeon's experience, particularly with the devices, were all factors that could lead to disagreements that could not be resolved through discussion.

3. Results

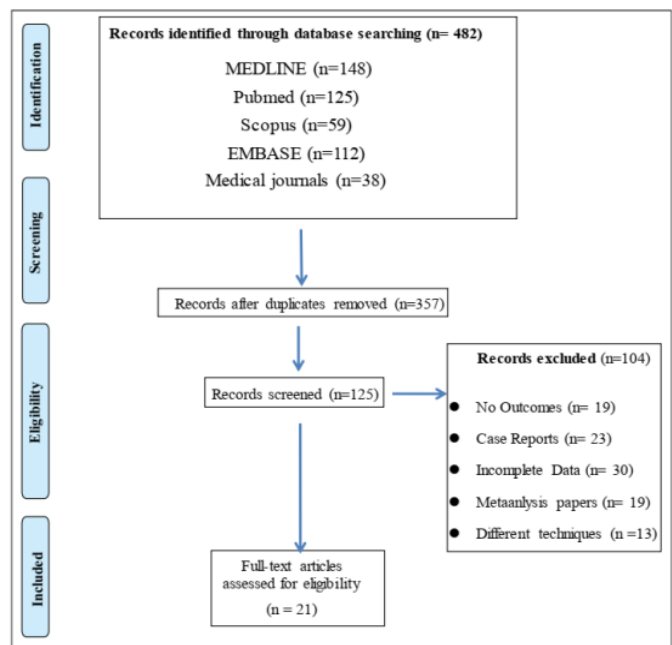


Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 flow diagram of the article selection process.

Systematic Review:

We discovered 482 items in the literature on our first attempt. We excluded 357 of them based on publication date and language requirements. The remaining 125 articles were reviewed for eligibility using the inclusion and exclusion criteria, whether in the form of titles, abstracts, or full texts. Eleven publications from the current literature search and ten from the prior systematic review make up the total of twenty-one studies. The 21 studies published between 2010 and 2023 included evidence from level 2, level 3, and level 4 investigations.

Results for many outcomes were documented in the trials, including: Research on Lyshlom score (studies), Tegner score (eight studies), IKDC score (four studies), and MCMS score (two studies) (Table 1)

Table 1. Outcomes Score of the included studies.

AUTHOR (YEAR)	TECHNIQUE	LYSHLOM SCORE (MEAN)	TEGNER SCORE (MEAN)	IKDC SCORE (MEAN)	MCMS SCORE (MEAN)
YIK ET AL., ⁵	All inside				
GOH ET AL., ⁶	All inside	88.5	6	78.9	
BORQUE ET AL., ⁷	All-Inside vs. Inside-Out				
ROSSO ET AL., ⁸	All-inside vs Inside-Out				
CUÉLLAR ET AL., ⁹	All-inside vs Inside-Out				
MARCHETTI ET AL., ¹⁰	All-inside vs Inside-out				
ROBERT ET AL., ¹¹	All-inside vs Inside-out				(All-inside)43.23 (Inside-out)42.45
MOATSHE ET AL., ¹²	Inside-out	84.5	5.5		52.5
KHETAN ET AL., ¹³	Inside-out	95.90	5.7	92.80	
SAMUELSEN ET AL., ¹⁴	All-inside vs Inside-out		All-inside (6.5) Inside-Out (6.6)	All-inside (94) Inside-Out (93.6)	
YUEN ET AL., ¹⁵	All inside				
ÇETINKAYA ET AL., ¹⁶	All-inside				
YOUN ET AL., ¹⁷	Inside-out				
KEYHANI ET AL., ¹⁸	All-inside vs Inside-out	All-inside (88) Inside-out (90)		All-inside (87) Inside-out (88)	
HALKER ET AL., ¹⁹	Inside-Out	91.5	6.7		
STEADMAN ET AL., ²⁰	Inside-Out	86	4		
FOK AND YAU, ²¹	All Inside				
ALVAREZ-DIAZ ET AL., ²²	All-inside		9		
BOGUNAVIC ET AL., ²³	All-inside				
YILMAZ ET AL., ²⁴	All-inside vs Inside-out	All-inside (93.90) Inside-Out (97.80)	All-inside (4.8) Inside-out (6.9)		
TENGROOTENHUYSEN ET AL., ²⁵	Inside-Out				

4. Discussion

When it comes to orthopedic physicians' examinations, meniscal injuries rank high. Even though 61 meniscectomies are performed on 100,000 patients per year due to meniscal injuries, there are certain tear patterns that warrant meniscal repairs. The goal is to restore the meniscus's natural function and potentially delay the degeneration of the affected compartment.²⁶

It is possible to repair a meniscus using a number of different surgical procedures. Although inside-out and all-inside methods are more frequently utilized, outside-in repair is an alternative for meniscal injuries in the anterior and middle segments. The inside-out method has a long history of being the most effective method for meniscal healing. Accessing the posterior capsule is achieved by creating an incision either posteromedially or posterolaterally. The menisci are sutured in either a vertical or horizontal mattress arrangement using long needles under arthroscopic vision.²⁷

One unique issue with this method is that it requires an additional incision, which might lead to damage to the peroneal nerve or popliteal neurovascular bundle on one side and the saphenous vein on the other. There is a possibility that the operating time will be longer due to the technical demands of this approach and the greater need for support in the operating room. In posterior lateral tears, the all-inside method can save supplementary incisions but comes at a higher cost and puts the neurovascular bundle at Risk.²⁷

Previously, Grant et al. conducted a comprehensive analysis to contrast the inside-out and all-inside methods for fixing isolated

meniscal rips. Meniscal arrows, screws, or staples were the most common instruments utilized in the investigations cited by these writers. The review's findings are no longer helpful in deciding between all-inside and inside-out fixation, as these implants are no longer used in clinical practice. Also, there has been a roughly twofold increase in therapeutic research on meniscal repairs since their analysis was published; therefore, it is necessary to conduct a new systematic review on the subject.²⁸

Fillingham et al., using a systematic review, compared inside-out and modern all-inside repairs for comorbidities, functional outcomes, failure rates, and other outcomes. There was no difference between inside-out repair and current all-inside systems in terms of failure rates, either anatomic, using a second look by arthroscope and magnetic resonance imaging (MRI), or clinically, functional result scores, or complications.²⁹

Therefore, this study aimed to evaluate the inside-out technique and the all-inside strategy for fixing bucket handle meniscal rips, as well as their respective success and failure rates.

Moatshe et al.,¹² compared the results of bucket handle meniscal tear (BHMT) repairs to those of vertical meniscus tears repaired utilizing the inside-out meniscus methodology. Two years after the operation, they still hadn't seen any major changes in their knee functional ratings. Three patients required surgical lysis of adhesions, and three required revision anterior cruciate ligament (ACL) restoration, for a total of six patients who received bucket handle meniscal tear (BHMT) procedures. But none of them needed meniscal revision repairs. In this trial, we found comparable improvements in functional outcomes after 2 years and a comparable rate of re-

operation after 5 years of follow-up. Our all-inside meniscus repair method was the key differentiator.

Samuelsen et al.,¹⁴ found that the clinical success rates for all-inside and inside-only repairs of BHMTs were 80%. On average, they used 5.1 ± 1.3 suture devices for all-inside repairs in their analysis of 40 patients who were followed up for an average of 4.4 years. They also noted that there were two complications in the group that underwent inside-out BHMT repair: one wound dehiscence and one parameniscal cyst. In contrast, the group that underwent all-inside BHMT had no difficulties. Here we see the dangers of inside-out meniscus repairs once more.

The evaluations conducted by Nepple et al.,³¹ and Ayeni et al.,³² only included all-inside studies with the meniscal arrow. Grant et al.,²⁸ was the sole study of its kind to evaluate inside-out with all-inside meniscal repairs; nevertheless, the latter group included both the more conventional and more recent methods.

In addition, Borden et al.,³³ demonstrated biomechanically that the Fast-Fix device was superior to the meniscal arrow previously used. Results from the biomechanical analysis were in line with the randomized clinical trial's finding of lower clinical failure rates when comparing the Fast-Fix device to the meniscal arrow.

Findings from the present evaluation are consistent with those from Grant et al.,²⁸ In terms of clinical outcomes, both inside-out & all-inside meniscal repairs presented with comparable results. Our investigation revealed lower incidence of clinical failure when they compared to the previous assessment. Contrasted with earlier reports of 19% and 17%, respectively, the current rates of inside-out failure and all-inside failure were 10% and 11%, respectively.

It is uncertain if this indicates a genuine improvement in results over time, although it could be explained by advances in implant design and our collective learning curve. Alternatively, Lysholm scores are consistent throughout Grant et al.,²⁸ and the current review. Grant et al.,²⁸ their research revealed inside-out scores of 88.0 and all-inside scores of 90.4, which differ from the stated Lysholm scores of 87.8 and 90.2, respectively. And lastly, our review found that all-inside repair had higher Tegner scores. Grant et al.,²⁸ cited inside-out and all-inside procedures as having Tegner scores of 5.6 and 5.5, respectively; however, the current study found inside-out repairs to have a score of 5.3 and all-inside repairs to have a score of 6.3. We are unable to ascertain if these variations are genuine or associated with

variations in patient populations because this study is retrospective in nature, and we do not know the patients' baseline characteristics.

Jones et al. examined the effect of meniscal therapy on the narrowing of joint spaces in 262 patients, with a mean follow-up of 2.9 years following ACLR. Following meniscal repair, the joint space was less narrowed than following meniscectomy. Both studies^{9,20} agreed that meniscal repair seemed to be better than meniscectomy, although they warned that knees that get repairs don't fare as well as those with healthy menisci.³⁴

As reported by Vaquero and Forriol, Biological healing is the end aim of meniscal repair. Nonetheless, there is a lack of uniformity in the research regarding how to evaluate the efficacy of meniscal repair. It is possible that a "second-look" arthroscopic procedure is the most accurate way to evaluate meniscal healing. The cost, the hazards, and the lack of correlation between meniscus healing status as assessed arthroscopically and patient-reported results are the main reasons why second-look arthroscopic surgery is rarely documented in the current literature.³⁵

Tachibana et al. conducted arthroscopic second-look procedures on 46 patients at a follow-up appointment 14.3 months following anterior cruciate ligament repair (ACLR) and meniscal repair. They found that meniscal repairs were either not healed or incomplete in 39.5% of patients despite good clinical outcomes.^{36,37}

There are distinguishing features between meniscal rips sustained in anterior cruciate ligament (ACL) injuries and those sustained in isolation. Because anterior cruciate ligament repair (ACLR) creates a rich biological environment during reconstruction, many believe it has higher healing potential for meniscal repairs.³⁸

4. Conclusion

Overall, there is a lack of outcomes instruments and a lack of comprehensive evidence, however this systematic review focuses on the outcome failure rate (meniscal healing) evidence comparing inside-out versus all-inside bucket-handle meniscal repair.

Both techniques have similar outcomes considering meniscal healing, although the ALL-INSIDE technique is faster in procedure and less risky to the neurovascular bundle, so it can be used safely for the posterior horn.

Disclosure

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