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A Comparison of operative and non-operative management for partial tears of anterior cruciate ligament (ACL): A comprehensive systematic review

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Abstract
Background: Partial ACL tears are serious knee injuries, affecting 10% to 28% of all ACL injuries. These tears occur 70% of the time in pivot-intensive sports and are more common in younger individuals. Management of partial ACL injuries presents challenges, with conservative management and reconstructive surgery being two treatment strategies.
The aim: This study aims to determine the differences between operative and non-operative management for partial ACL tears.
Methods: By comparing itself to the standards set by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, this study was able to show that it met all of the requirements. So, the experts were able to make sure that the study was as up-to-date as it was possible to be. For this search approach, publications that came out between 2014 and 2024 were taken into account. Several different online reference sources, like Pubmed, SAGEPUB, and ScienceDirect, were used to do this. It was decided not to consider review pieces, works that had already been published, or works that were only half done.
Results: In the PubMed database, the results of our search brought up 7 articles, whereas the results of our search on SAGEPUB brought up 1980 articles, our search on ScienceDirect brought up 571 articles. In the end, we compiled a total of 3 papers, 1 of which came from PubMed, 1 of which came from SagePub, and 1 of which came from ScienceDirect. We included three research that met the criteria.
Conclusion: Accurate diagnosis and assessing the degree of damage are the only steps in treating partial ACL injuries. A complete ACL tear is a common complication in non-operative groups. A stiff knee can still occur even if patients get operative treatment. In our conclusion, there may be no difference between operative and non-operative management for partial ACL tears. Further research is required to determine the outcomes.

Keywords: Operative, non-operative, partial ACL tears

Introduction

The anterior cruciate ligament (ACL) is a major stabilizing structure of the knee against excessive anterior translation and internal rotation of the tibia. ACL tears are serious knee injuries, whether they are partial or full. Between 30 and 80 incidences per 100,000 persons annually were seen in the general population [1]. Although less prevalent than complete tears, partial ACL tears may represent 10% to 28% of all ACL injuries; nevertheless, the epidemiologic data pertaining to this entity are not as well-defined [2]. Occurring roughly 70% of the time as a consequence of a trauma sustained during a pivot-intensive sport like football, soccer, basketball, or alpine skiing, this injury is more common in younger people.[1] While no conclusive diagnosis can be made without the aid of diagnostic arthroscopy, a combination of clinical examination, including the Lachman test, Pivot Shift test, and imaging investigations, such as magnetic resonance imaging (MRI), offers a preliminary diagnosis [3].

The management of partial ACL injuries presented a challenge. Two opposing treatment strategies are available to the cruciate deficient individual: conservative management and reconstructive surgery [3, 4]. Over the years, many ACL reconstruction techniques have been described, including biological approaches, ACL augmentation, single-bundle repair, and ACL reconstruction. Though ACLR procedures have historically been the gold standard of care for complete ACL disruptions, there have been reports of potential side effects, including diminished proprioception, postoperative muscular weakness, inability to fully restore normal kinematics, donor site morbidity, and possibly premature osteoarthritis (OA) [4]. The purpose of this study is to compare the operative and non-operative management for partial ACL tears.

Methods

Protocol

By following the rules provided by Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, the author of this study made certain that it was up to par with the requirements. This is done to ensure that the conclusions drawn from the inquiry are accurate.

Criteria for Eligibility

For the purpose of this systematic review, we compare and contrast the differences between the operative and non-operative management for partial ACL tears. It is possible to accomplish this by researching or investigating the clinical outcomes based on knee functionality, stability, subjective evaluation, and complication rate. As the primary purpose of this piece of writing, demonstrating the relevance of the difficulties that have been identified will take place throughout its entirety.

For researchers to take part in the study, they needed to fulfill the following requirements: 1) The paper needs to be written in English, and it needs to determine the differences in clinical outcomes between the operative and non-operative management for partial ACL tears. For the

manuscript to be considered for publication, it needs to meet both of these requirements. 2) The studied papers include several that were published after 2014, but before the period that this systematic review deems to be relevant. Examples of studies that are not permitted include editorials, submissions that do not have a DOI, review articles that have already been published, and entries that are essentially identical to journal papers that have already been published.

Search Strategy

We used "operative"; "non-operative"; and "partial ACL tears" as keywords. The search for studies to be included in the systematic review was carried out from March, 17th 2024 using the PubMed, SAGEPUB, and ScienceDirect databases by inputting the words: ((("operability"[All Fields] OR "operable"[All Fields] OR "operate"[All Fields] OR "operated"[All Fields] OR "operates"[All Fields] OR "operating"[All Fields] OR "operation s"[All Fields] OR "operational"[All Fields] OR "operative"[All Fields] OR "operatively"[All Fields] OR "operatives"[All Fields] OR "operator"[All Fields] OR "operator s"[All Fields] OR "operators"[All Fields] OR "surgery"[MeSH Subheading] OR "surgery"[All Fields] OR "operations"[All Fields] OR "surgical procedures, operative"[MeSH Terms] OR ("surgical"[All Fields] AND "procedures"[All Fields] AND "operative"[All Fields]) OR "operative surgical procedures"[All Fields] OR "operation"[All Fields]) AND "non-operative"[All Fields] AND (("partial"[All Fields] OR "partials"[All Fields]) AND ("anterior cruciate ligament injuries"[MeSH Terms] OR ("anterior"[All Fields] AND "cruciate"[All Fields] AND "ligament"[All Fields] AND "injuries"[All Fields]) OR "anterior cruciate ligament injuries"[All Fields] OR ("acl"[All Fields] AND "tears"[All Fields]) OR "acl tears"[All Fields]))) AND ((y_10[Filter]) AND (english[Filter])) used in searching the literature.

Data retrieval

After reading the abstract and the title of each study, the writers examined to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilize as sources for their article and selected those studies. After looking at several different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in English and can't be seen anywhere else.

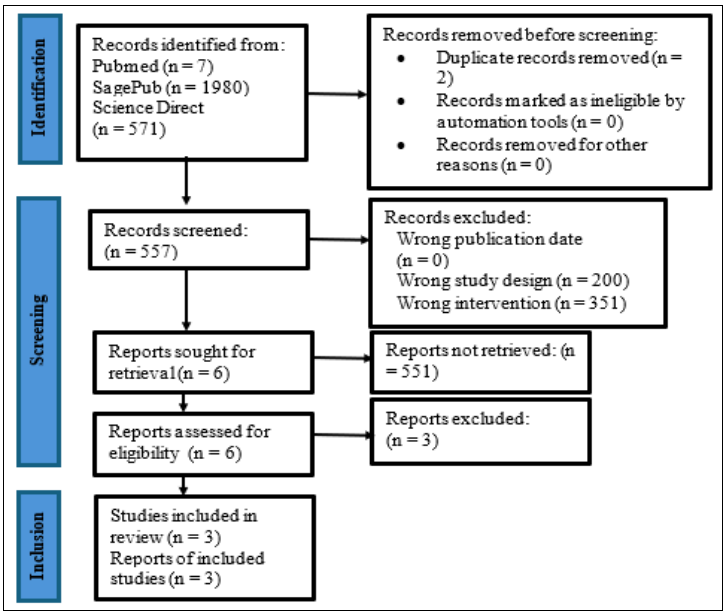

Fig 1: Prisma Flow Diagram

Only those papers that were able to satisfy all of the inclusion criteria were taken into consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration the conclusions of any study that does not satisfy our requirements. After this, the findings of the research will be analysed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for the purpose of this study: names, authors, publication dates, location, study activities, and parameters.

Quality Assessment and Data Synthesis

Each author did their own study on the research that was included in the publication's title and abstract before making a decision about which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll determine which articles to include in the review depending on the findings that we've uncovered. This criteria is utilised in the process of selecting papers for further assessment. in order to simplify the process as much as feasible when selecting papers to evaluate. Which earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

Result

In the PubMed database, the results of our search brought up 7 articles, whereas the results of our search on SAGEPUB brought up 1980 articles, our search on ScienceDirect brought up 571 articles. In the end, we compiled a total of 3 papers, 1 of which came from PubMed, 1 of which came from SagePub, and 1 of which came from ScienceDirect. We included three research that met the criteria.

Table 1: The literature included in this study

	Origin	Method	Sample Size	Result
Fayard, 2019[5]	France	Retrospective study	41 patients	The findings of this study suggested that thirty-nine percent of young active patients who had conservative treatment for a partial ACL injury went on to develop a complete ACL rupture, with half of the complete tears presenting with a concurrent meniscal lesion. The advancement to a full tear was found to be significantly influenced by age ≤20 years and participation in pivoting contact sports.
Yadav, 2019[6]	India	Retrospective study	20 patients	These results suggested more methodical and precise portal placement is required for ACL augmentation, with the intact ACL fibers being spared. The tibial tunnel entry site is located 1-2 cm medial to the tibial tuberosity in the AM bundle. In order to shield the AM bundle, the PL bundle is located roughly 3–4 cm medial to the tibial tuberosity. Long-term research involving more participants is necessary.
Zicaro, 2021[7]	Argentina	Prospective study	40 patients	The results of this study showed that at a mean follow-up of 25 months, 95.0% of patients had resumed their sports. Resuming athletics took an average of 4 months. Approximately 30.0% of these patients experienced a fresh episode of instability and needed surgery, with a median follow-up period of 5 months for group 1 and 8 months for group 2. PRP by itself was not enough to improve MRI images, clinical assessment, failure rate, or any of the other outcome measures that were examined.

Knee Functionality and Stability

The patients' mean age was 31.2 years. Sixty-two percent of the patients were in the physically active age group (less than 30 years). There were 87.5% males. Seventy-five percent of the patients reported pain, and seventy-seven percent reported instability. The mean time of presentation following the injury was 4.2 months. The most frequent cause of injury was sports-related activities (45%), followed by auto accidents (37.5%). Forty percent of the anterior drawer test results were positive, 35 percent of pivot shift results were positive, and 65 percent of Lachman test results were positive. 65% of patients had AM bundle tears and 35% had PL bundle tears during arthroscopy [6].

Subjective Evaluation

Fayard, *et al*. (2019) [5] reported the mean IKDC score was 96 (range, 84- 100) before the partial ACL injury and 82 (range, 69-98) at last follow-up [5]. While Zicaro, *et al*. (2021) [7] reported the IKDC score, median (IQR) was 77 (71-89) in the PRP group and PT 71 (70-79) in the physical therapy.

Complication Rate

Fayard, *et al*. (2019) [5] showed that nine patients (45%) had surgery as a result of nonoperative therapy failing. Six patients (75%) developed a full ACL rupture whereas eight (40%) were participating in pivoting contact sports. As confirmed by MRI and/or intraoperatively, sixteen (39%) of the patients developed a complete ACL tear at a mean of 20 months (range, 6-43 months). Thirteen patients had their ACLs rebuilt, and three more had surgery planned. Yadav, *et al*. (2019) [6] reported that 28% of the patients, a meniscal tear was associated. Zicaro, *et al*. (2021) [7] showed that after a single intraarticular PRP injection, no significant differences were seen between the individuals who received treatment and those who did not. In total, 32.0% of failures were noted at a mean follow-up of 25 months in both groups. In an average of four months, the remaining 67.0% of patients were able to RTS.

Discussion

A study included demonstrated that age ≤20 years and participation in pivoting contact sports are significant predictive factors for failure of the nonoperative treatment of partial ACL tears. Nine patients ≤20 years of age (45%) developed a complete ACL tear and underwent surgery [5]. Patients' ages ranged from sixteen to forty-five years. 62.5% of the patients were under 30 years old. Due to anatomical, environmental, hormonal, and biomechanical reasons, female athletes are more likely to sustain an ACL injury. Five women and thirty-five men participated in our study. The fact that they participate in more outside and athletic activities in our scenario may be the reason for this male predominance. The two most frequent types of injuries were RTA (37.5%) and sports activity (45%). Football and cricket were the two most popular sports. Others were hurt when they fell off a height or slipped on the ground while going about their usual activities [6].

A partial ACL tear combines a positive Lachman's test with a firm endpoint. Three key features of partial ACL tears include a side-to-side difference in the KT-1000 criterion (<5 mm), an arthroscopic discovery of a partial tear, and a hyperintense signal within the ACL fibers on magnetic resonance imaging (MRI) [4]. Pain in knee joint was the most common (75%) presenting complaint. The second most common complaint was instability in knee joint (70%). Swelling in knee joint, locking sensation, stiffness of knee joint and limping were other presenting complaints. On clinical examination, Lachman test was positive in 32 patients (80%), anterior drawer test was found positive in 16 patients (40%) and pivot shift was positive in 26 patients (65%). In the study of Li *et al*., the main presenting symptom was knee instability followed by knee pain and swelling. Pivot shift test was positive in 15 cases (60%) and Lachman test and anterior drawer test was positive in all 25 cases (100%) [6, 8]. In a prospective study of 418 clinical cases, Panisset *et al*. found a significant degree of laxity between a population with complete ACL tears (98% of patients had a positive Lachman test and 80% had a positive pivot-shift test) and a group with partial tears (30%–64%) that had a negative pivot-shift test and a hard or delayed stop in the Lachman test [4].

Making an accurate diagnosis and assessing the degree of damage are the only steps in treating partial ACL injuries. A partial tear may not cause much morbidity in certain people, and their knee stability may be sufficient for everyday

activities and sports participation. In this case, supportive care is mostly advised, with a focus on allowing the patient to heal from the initial injury and gradually resume sports participation following rehabilitation. It is not always easy to determine which patients need more intensive care. Age, activity level, physical examination laxity, related injuries, and symptomatic instability are among the variables that are taken into account. It is frequently necessary to do surgery on patients who continue to exhibit instability after conservative therapy fails. Partial tears progressing to complete rupture are routinely treated with standard ACL reconstruction [2]. Numerous ACL reconstruction methods, such as single-bundle repair, ACL augmentation, ACL reconstruction, and biological treatments, have been documented over time. When treating partial rips of the ACL, single-bundle repair is rarely used since it has historically had subpar clinical results [9]. Recently, arthroscopic techniques have improved ACL repair, augmentation, and reconstruction outcomes [10].

ACL augmentation is preferable to ACL repair from the perspective of proprioception and joint stability due mechanoreceptor preservation in ACL remnants, according to Dachi *et al*., who underwent hamstring and allogenic fascia lata augmentation. Over the last ten years, research on the healing response has led to an increasing interest in biological treatments, [11], cell therapy, augmentation with growth factors, platelet-rich plasma, and scaffolds þ suture þ platelet-rich plasma [12]. Biological enhancement of the ACL has generated promising preclinical and short-term clinical outcomes, but further studies are necessary to define the role of these approaches in the treatment of partial ACL tears [12]. Preclinical and short-term clinical findings from biological improvement of the ACL have been encouraging, but further research is required to determine the effectiveness of these methods in treating partial ACL rips [4]. In 2013, Maestro *et al*. compared the stability following full single-bundle reconstruction in 36 cases to partial reconstruction in 39 cases (AM or PL bundle). A two-year follow-up was the bare minimum. Both translation and rotation results for partial reconstruction were determined to be satisfactory, however they did not show a statistically significant improvement over the control group. Suturing a partially torn ACL in conjunction with bone marrow stimulation obtained by femoral epiphysis drilling at the intercondylar notch produced satisfactory outcomes, according to one study [13]. Meniscus tears occur most frequently in patients with total ACL injuries (51.9–63%); the incidence of meniscus injuries in patients with partial ACL injuries is unknown [3]. Cyclops syndrome in combination with extension deficit and recurrent tears were reported in the postoperative period following a confirmed injury event. A 3% re-tear rate was reported in the largest study [13].

Conclusion

Accurate diagnosis and assessing the degree of damage are the only steps in treating partial ACL injuries. A complete ACL tear is a common complication in non-operative groups. A stiff knee can still occur even if patients get operative treatment. In our conclusion, there may be no difference between operative and non-operative management for partial ACL tears. Further research is required to determine the outcomes.

References

1. Decary S, Fallaha M, Belzile S, Martel-Pelletier J, Pelletier JP, Feldman D, *et al*. Clinical diagnosis of partial or complete anterior cruciate ligament tears using patients' history elements and physical examination tests. PLoS One: 2018, 13(6).
2. Tjoumakaris FP, Donegan DJ, Sekiya JK. Partial Tears of the Anterior Cruciate Ligament: Diagnosis and Treatment. Am J Orthop: 2011.
3. Gupta R, Singhal A, Sharma AR, Shail S, Masih GD. Strong association of meniscus tears with complete Anterior Cruciate Ligament (ACL) injuries relative to partial ACL injuries. J Clin Orthop Trauma: 2021, 23.
4. Dallo I, Chahla J, Mitchell JJ, Pascual-Garrido C, Feagin JA, LaPrade RF. Biologic Approaches for the Treatment of Partial Tears of the Anterior Cruciate Ligament: A Current Concepts Review. Orthop J Sports Med: 2017, 5(1).
5. Fayard JM, Sonnery-Cottet B, Vrgoc G, O'Loughlin P, de Mont Marin GD, Freychet B, *et al*. Incidence and Risk Factors for a Partial Anterior Cruciate Ligament Tear Progressing to a Complete Tear After Nonoperative Treatment in Patients Younger Than 30 Years. Orthop J Sports Med, 2019, 7(7).
6. Yadav S, Singh S. Analysis of partial bundle anterior cruciate ligament tears- diagnosis and management with ACL augmentation. J Clin Orthop Trauma,2020:11:S337–41.
7. Zicaro JP, Garcia Mansilla I, Zuain A, Yacuzzi C, Costa Paz M. Has platelet-rich plasma any role in partial tears of the anterior cruciate ligament? Prospective comparative study. World J Orthop,2021:12(6):423–32.
8. Herrington L, Fowler E. A systematic literature review to investigate if we identify those patients who can cope with anterior cruciate ligament deficiency. Knee,2006:13(4):260–5.
9. Lee BI, Min KD, Choi HS, Kwon SW, Chun D Il, Yun ES, *et al*. Immunohistochemical study of mechanoreceptors in the tibial remnant of the ruptured anterior cruciate ligament in human knees. Knee Surgery, Sports Traumatology, Arthroscopy,2009:17(9):1095–101.
10. DiFelice GS, van der List JP. Clinical Outcomes of Arthroscopic Primary Repair of Proximal Anterior Cruciate Ligament Tears Are Maintained at Mid-term Follow-up. Arthroscopy - Journal of Arthroscopic and Related Surgery,2018:34(4):1085–93.
11. Richard Steadman J, Cameron-Donaldson ML, Briggs KK, William Rodkey MG, are B. A Minimally Invasive Technique ("Healing Response") to Treat Proximal ACL Injuries in Skeletally Immature Athletes [Internet] 2006, 19. Available from: www.ORTHOSuperSite.com
12. Adachi N, Ochi M, Uchio Y, Iwasa J, Ryoke K, Kuriwaka M. Mechanoreceptors in the anterior cruciate ligament contribute to the joint position sense. Acta Orthop Scand, 2002, 73.
13. Sonnery-Cottet B, Colombet P. Partial tears of the anterior cruciates ligament. Vol. 102, Orthopaedics and Traumatology: Surgery and Research. Elsevier Masson SAS, 2016, S59–67.