

DOES PARTIAL MENISCECTOMY AFFECT ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION RESULTS?

A MENISCECTOMIA PARCIAL AFETA OS RESULTADOS DA RECONSTRUÇÃO DO LIGAMENTO CRUZADO ANTERIOR?

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ABSTRACT

Objective: To compare the application of partial meniscectomy concomitant with primary ACL reconstruction, using the graft from the patellar tendon with individuals who underwent only ACL reconstruction, in clinical functional criteria and degree of osteoarthritis (OA), after 10 years of the surgical process. **Methods:** This is a retrospective cross-sectional study with 37 patients who underwent ACL reconstruction with a graft from the patellar tendon, associated or not with partial meniscectomy, divided into 2 groups: with meniscal injury ($n = 22$) and without meniscal injury ($n = 15$). Anthropometric data and four outcome measures were used to analyze the results: SF-36 questionnaire, arc of motion assessment, Knee injury and Osteoarthritis Outcome Score (KOOS), and Ahlbäck Radiographic Classification. **Results:** No differences were found for health-related quality of life, arc of motion, functional condition and knee OA severity/grade in patients who underwent partial or no meniscectomy in conjunction with ACL reconstruction ($p > 0.05$). **Conclusion:** Participants who underwent partial meniscectomy in conjunction with primary ACL reconstruction with a graft from the patellar tendon, after 10 years of the surgical process, showed no significant differences in the clinical functional criteria and severity of knee OA, compared to individuals who underwent only ACL reconstruction. **Level of Evidence II, Prognostic study.**

Keywords: Anterior Cruciate Ligament. Knee. Meniscectomy. Osteoarthritis.

RESUMO

Objetivo: Comparar a realização da meniscectomia parcial concomitante à reconstrução do LCA (RLCA) primária, utilizando o enxerto do tendão patelar, com indivíduos que realizaram apenas a RLCA, em critérios clínico-funcionais e grau de osteoartrite (OA), após 10 anos do processo cirúrgico. **Métodos:** Trata-se de um estudo retrospectivo transversal, com 37 pacientes que realizaram a RLCA com enxerto do tendão patelar, associada ou não à meniscectomia parcial, divididos em dois grupos: com lesão meniscal ($n = 22$) e sem lesão meniscal ($n = 15$). **Dados antropométricos e quatro medidas de desfecho foram utilizados para análise dos resultados:** questionário SF-36, avaliação do arco de movimento, Knee Injury and Osteoarthritis Outcome Score (KOOS) e Classificação Radiográfica de Ahlbäck. **Resultados:** Não existem diferenças em termos de qualidade de vida relacionada à saúde, amplitude de movimento, condição funcional e severidade/grau de OA do joelho em pacientes que realizaram ou não meniscectomia parcial em conjunto com a RLCA ($p \geq 0.05$). **Conclusão:** Os participantes que realizaram meniscectomia parcial em conjunto com a RLCA primária com enxerto do tendão patelar, após 10 anos do processo cirúrgico, não demonstraram diferenças significativas nos critérios clínico-funcionais e gravidade da OA do joelho, comparados aos indivíduos que realizaram apenas a RLCA. **Nível de Evidência II, Estudos prognósticos.**

Descritores: Ligamento Cruzado Anterior. Joelho. Meniscectomia. Osteoartrite.

Citation: Borges JHS, Campos BSL, Andrade RAQ, Freitas A, Ribeiro MS, Lobo P Jr. Does partial meniscectomy affect the anterior cruciate ligament reconstruction results? *Acta Ortop Bras.* [online]. 2021;29(6):308-311. Available from URL: <http://www.scielo.br/aob>.

INTRODUCTION

Anterior cruciate ligament (ACL) rupture is the most common injury in the knee joint.¹ However, isolated damages to this structure are rare, with a high prevalence (40-70%) of involvement of the meniscus.² Many studies investigated the consequences of ACL reconstruction on knee joint function and structure,^{3,4} however, the

additional effect of partial meniscectomy on long-term postoperative outcomes remains controversial and little investigated. Osteoarthritis (OA) risk is believed to increase with ACL and meniscus injury compared to either of these isolated injuries.^{2,5} Although ACL reconstruction was widespread for many years as a preventive factor against the development of OA, recent studies found no

All authors declare no potential conflict of interest related to this article.

The study was conducted at Hospital Ortopédico e Medicina Especializada, Instituto de Pesquisa e Ensino.

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Article received on 10/13/2020, approved on 12/14/2020.



protective capacity.⁶ Likewise, meniscectomy has been considered one of the most important outcomes for knee OA development, being dependent on the amount of meniscus removed.^{7,8} However, previous studies show that joint ligament and meniscal injuries are not significant predictors of subjective (e.g., quality of life) and functional outcomes of patients,^{9,10} whereas others report worse functional capacity in individuals who underwent joint meniscal surgery with ACL reconstruction.¹¹

Such inconsistency in the information available and the importance of the subject raise the need for more studies on the topic. To the best of our knowledge, the investigation of functional clinical outcomes and long-term OA severity in this comparison scenario remains scarce.

This study aimed to compare functional clinical outcomes and the OA grade between individuals who underwent primary ACL reconstruction with graft from the patellar tendon accompanied by partial meniscectomy and individuals who underwent only ACL reconstruction 10 years after the surgical process. We believe that individuals who also underwent partial meniscectomy will present worse knee function, quality of life and more severe OA.

MATERIALS AND METHODS

Study design and participants

This is a retrospective cross-sectional study performed with 75 patients who underwent ACL reconstruction with a graft from the patellar tendon, associated or not with partial meniscectomy and operated by the same surgeon in 2009.

The exclusion criteria were patients who fractured the operated knee before or after the procedure, underwent a revision ACL surgery or of other associated ligament injuries, had previous arthrosis, under 18 years of age and older than 50 years, had asymmetric varus and valgus deformities, had rheumatologic diseases, underwent ACL reconstruction surgery in both knees, and who could not be contacted. In total, 37 patients participated; they were divided into two groups: patients with associated meniscal injury (MI) (n = 22) and without associated meniscal injury (WMI) (n = 15) (Figure 1).

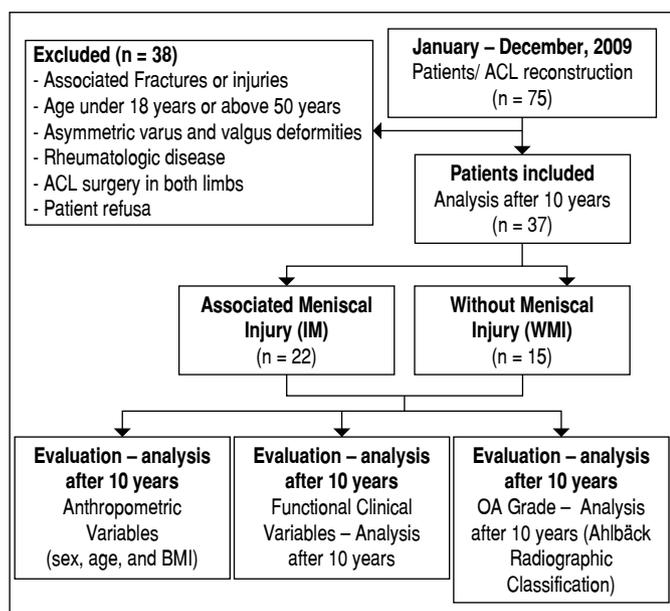


Figure 1. Flowchart of the patient selection process. ACL reconstruction: reconstruction of the anterior cruciate ligament; BMI: body mass index; SF-36: health status questionnaire; AoM: arc of motion; KOOS: Knee injury and Osteoarthritis Outcome Score.

Ethical Considerations

This study was submitted and approved by the Research Ethics Committee through Plataforma Brasil, under CAAE 18484919.3.0000.0023. All participants signed an Informed Consent Form before the study.

Surgical procedure and rehabilitation

All surgical procedures were performed by one of the authors of the present study. The technique was standardized for all patients. Intra-articular anatomical reconstruction with a single arthroscopic band with graft from the patellar tendon was used. All patients with meniscal injury underwent partial meniscectomy (no more than half of the meniscus was resected). Meniscal injuries were between 2.5 and 3.5 cm in length. The medial meniscus was involved in 15 cases and the lateral in 7.

For all patients, the same scientifically-proven and worldwide widespread rehabilitation protocol was applied.¹²

Analysis outcomes

The patients included in this study were evaluated after 10 years of the surgical procedure. The participants were invited by phone for a face-to-face evaluation at the *Hospital Ortopédico e Medicina Especializada* (HOME) – Brasília/DF.

Anthropometric data were initially collected using a questionnaire. Four outcome measures were used for analysis and divided into functional clinical outcomes (a) and OA grade (b): A1) physical and general health through the Short Form-36 – Health State Questionnaire (SF-36); only the two most relevant subdomains were selected for objectivity purposes: SF-36: Physical functioning (PF SF-36) and SF-36: General Health (GH SF-36). SF-36 is considered an effective measure for assessing health-related quality of life;¹³ A2) functional evaluation of the arc of motion (AoM) of both knees, verified by goniometry; A3) patient's opinion about their knee, associated problems, and functional limitations through the Knee injury and Osteoarthritis Outcome Score (KOOS). The KOOS questionnaire demonstrated a high correlation with structural knee changes associated with OA in previous studies;¹⁴ B1) grade of knee OA involvement, verified by bilateral radiography with load in anteroposterior and profile incidences, evaluated by the Ahlbäck Radiographic Classification. To determine the score of each patient, radiography images were evaluated independently by two experienced evaluators. In cases of divergence, a third more experienced evaluator determined the definitive classification.

Statistical analysis

Univariate descriptive analysis was used to analyze the individual behavior of each variable: absolute and relative frequencies, quartiles, mean, median, and standard deviation. The Wilcoxon-Mann-Whitney nonparametric test was applied to compare means between the two independent groups (with and without meniscal injury). The statistical software R version 3.6.1 was used for data analysis and the significance level adopted was 5%.

RESULTS

Comparison of functional demographic and clinical variables between groups after 10 years

ACL reconstruction was performed in 75 patients, associated or not with meniscal injury. Of these, 49.3% (37/75) participated in the study and completed the 10-year follow-up, being 20 men and 2 women in the MI group and 15 men in the WMI group (Figure 1). Demographic and functional clinical variables

were similar between the MI versus WMI groups ($p \geq 0.05$) groups (Table 1). No significant differences were found for age (42.41 ± 8.29 vs 46.07 ± 9.73), BMI (27.07 ± 3.92 vs 26.76 ± 2.46), SF-36 scores for physical functioning (94.09 ± 06.66 vs 90.33 ± 11.09) and general health (85.91 ± 12.87 vs 85.67 ± 8.20), contralateral knee flexion AoM (127.10 ± 11.06 vs 127.50 ± 11.04), AoM of the operated knee (123.80 ± 13 vs 125.60 ± 11.95) and the KOOS score (93.10 ± 5.34 vs 92.61 ± 5.21).

Table 1. Characterization of the sample. Demographic and clinical functional variables of the Meniscal Injury (MI) and Without Meniscal Injury (WMI) groups. Age, BMI, SF-36 scores, contralateral and operated knee flexion ROM and the score obtained in the Knee injury and Osteoarthritis Outcome Score (KOOS) were expressed as mean, standard deviation (SD), minimum and maximum. Data referring to gender by frequency (n).

Variable: mean SD (minimum - maximum)	Meniscal Injury (MI) group	Without Meniscal Injury (WMI) group
Female (n)	2	0
Male (n)	20	15
Age (years)	42.41 8.29 (29 – 50)	46.07 9.73 (31 – 50)
BMI (kg/cm)	27.07 3.92 (21 – 39.3)	26.76 2.46 (22.8 – 31.4)
SF-36: Functional capacity (score)	94.09 6.66 (80 – 100)	90.33 11.09 (55 – 100)
SF-36: General Health (score)	85.9 12.87 (50 – 100)	85.67 8.20 (70 – 100)
Knee flexion ROM (degrees)	127.10 11.06 (110 – 157)	127.50 11.04 (108 – 145)
Operated knee flexion ROM (degrees)	123.80 13 (110 – 150)	125.60 11.95 (104 – 145)
KOOS: mean SD (minimum – maximum)	93.10 5.34 (81.50 – 100)	92.61 5.21 (82.10 – 98.20)

Comparison of osteoarthritis severity between the groups after 10 years

Based on Ahlbäck's Radiographic Classification, no significant difference was found for the OA degree between groups (MI group: 64% of the sample obtained a score equal to 2, 27% equal to 3 and only 9% equal to 4; WMI group: 20% of the sample obtained a score equal to 1, 47% equal to 2, 20% equal to 3, and only 13% equal to 4) (Table 2).

Table 2. Comparative analysis of the results of the Ahlbäck radiographic classification between the Meniscal Injury (MI) and No Meniscal Injury (WMI) groups.

Raio-X Ahlback (n - %)	Meniscal Injury (MI) group	Without Meniscal Injury (WMI) group
Grade – 1	0 – 0%	3 – 20%
Grade – 2	14 – 64%	7 – 47%
Grade – 3	6 – 27%	3 – 20%
Grade – 4	2 – 9%	2 – 13%

DISCUSSION

The main objective of this investigation was to compare individuals who underwent a partial meniscectomy together with ACL reconstruction with the graft from the patellar tendon and patients who underwent only ACL reconstruction after 10 years of the surgical process. Our data suggest long-term similarity of the functional

and severity clinical results of knee OA in patients who underwent or not meniscectomy in conjunction with primary ACL reconstruction in a cross-sectional retrospective investigation. This study is not the first to compare different outcomes among patients who underwent partial meniscectomy after primary ACL reconstruction; however, to the best of our knowledge, it is the first in which no differences between the groups were found regarding functional clinical criteria and OA grade after a long period (10 years after the surgical process).

The ACL is considered as the main stabilizer of the knee, restricting rotational and translational movements between the tibia and femur.¹⁵ Its rupture increases joint instability, which may lead to functioning changes in most patients.¹⁶ Likewise, anatomical and biomechanical studies show that menisci are vital structures for maintaining joint health.¹⁷ The removal of a part of the meniscus may decrease the energy attenuation capacity from joint movement, promote constant pain and slow down the capacity to produce quadriceps strength, an important active stabilizer of the femorotibial joint.¹⁸ Meniscectomy, performed separately, has already been shown to increase the risk knee OA development and decrease the functional capacity of patients.^{7,19}

From these assumptions, greater impairment of functioning and higher OA grades would be expected when meniscectomy was performed in conjunction with ACL reconstruction. However, our results are not consistent with this hypothesis. The type of surgical treatment used is an important point to be considered. The highest OA rates are found in open total meniscectomy and the lowest in patients who underwent arthroscopic partial meniscectomy.⁷ Moreover, previous studies have shown that lateral meniscectomy leads to a faster progression of OA compared to medial meniscectomy.^{7,19} These findings may help to understand the results found in this study. Meniscal surgical procedures were partial meniscectomy and the highest prevalence of injuries was on the medial meniscus. Classic references such as Daniel et al.²⁰ show an increase in the incidence of knee OA after ACL reconstruction regardless of meniscectomy, evaluated by imaging tests. The authors explain that joint injuries from the surgical procedure, abnormal joint mechanics and inflammatory response after ACL reconstruction surgery seem to be the main factors linked to increased joint degeneration and not meniscal removal.²⁰ In a 5-year prospective analysis, Paradowski et al.⁹ demonstrated that isolated ACL reconstruction showed no superiority in terms of lower limb function as evaluated by the KOOS questionnaire when compared to combined partial meniscectomy. Likewise, meniscal repair or partial meniscectomy did not affect the functional recovery of quadriceps muscle function and strength in the return to sport after ACL reconstruction.¹⁰

The fact that all surgical procedures were conducted by the same surgeon is an important aspect that should be highlighted in this study. Our research limitations should serve as guidance when designing future studies. The sample size is small, so our results should be interpreted with caution. Most of the analysis outcomes were not collected before the surgical procedure, making it impossible to conduct a prospective follow-up study.

CONCLUSION

Participants who underwent partial meniscectomy in conjunction with primary ACL reconstruction with graft from the patellar tendon 10 years after the surgical process did not demonstrate significant differences in the functional clinical criteria and severity of knee OA in comparison to individuals who underwent only ACL reconstruction.

AUTHORS' CONTRIBUTION: Each author contributed individually and significantly to the development of this article. JHSB: preparation of the entire research project, intellectual conception of the article, data/statistical analysis, writing and review of the article; BSLC: preparation of the entire research project, intellectual conception of the article, data/statistical analysis, writing and review of the article; RAQA: preparation of the entire research project, intellectual conception of the article, data/statistical analysis, writing and review of the article; PA: preparation of the entire research project, intellectual conception of the article, data/statistical analysis, writing and review of the article; MSR: preparation of the entire research project, intellectual conception of the article, data/statistical analysis, writing and review of the article; PLJ: preparation of the entire research project, intellectual conception of the article, data/statistical analysis, writing and review of the article.

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