PHYSIOTHERAPY AFTER RECONSTRUCTION OF ANTERIOR CRUCIATE LIGAMENT

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ABSTRACT

The purpose of this study was to evaluate the existence of differences in the rehabilitation of patients after ACL reconstruction using bone-patellar tendon-bone graft and the four-strand semitendinosus and gracilis tendon grafts, through a literature revision. The researched databases were MEDLINE, EMBASE, LILACS, COCHRANE and PEDro. The inclusion criteria were published studies with methodology draw from randomized clinical trials with or without meta-analysis, individuals with ACL injury, associated or not to meniscal injury, submitted to ligamentoplasty using the bone-patellar tendon-bone graft and the four-strand semitendinosus and gracilis tendon grafts and physiotherapy; clinical trials comparing the differences in the rehabilitation of these patients, in Portuguese, English and Spanish, from 1990 to June, 2011. Five clinical trials were reviewed. No difference was observed between the techniques, however, with a recommendation for a less aggressive rehabilitation and greater attention to the strengthening of the hamstring when they are used as grafts.

Keywords: Anterior cruciate ligament. Arthroscopy. Treatment outcome. Rehabilitation. Physical therapy modalities.

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INTRODUCTION

The decision to reconstruct the anterior cruciate ligament (ACL) is based on factors such as: degree of instability, age of patient, knee solicitation level, presence of buckling, recurrent meniscal injuries and interest in returning to sport.[1,2] The goal of the surgery is to create a replica of the original ligament, yet a rehabilitation program is required to obtain the same functional capacities compared to the non-operated limb.

Many studies published in recent years describe the different grafting techniques and options for ACL reconstruction. The most commonly used grafts are: bone-tendon-bone with middle third of the patellar tendon (BTB) and four-strand semitendinous and gracilis tendon graft (FSSG).[3] For each type of graft there are advantages and disadvantages.

The BTB autograft presents high resistance, good fixation quality, easy material obtainment,[4] good healing potential, good long-term stability and better rate of return to sport, besides being a fast reconstruction and allowing more aggressive rehabilitation.[5] But there are complications, such as patellar fractures, patellar tendonitis, patellar tendon tear, sensitivity disorders, inability to kneel and pain in the anterior region of the knee.[4]

The use of the FSSG became frequent as a substitute for ACL as it avoids the removal of part of the extensor mechanism, thus reducing the chronic and acute complications of the patello-femoral joint.[6] However, weakness of the ischiotibial muscles can occur and the procedure is technically more complicated.[4] Combined with ligament reconstruction, knee rehabilitation is a point of crucial importance to achieve the desired results. The ideal rehabilitation program is based on biological and mechanical knowledge of the ligament.[7]

And for the knee to attain its near-normal function, the rehabilitation should have some objectives: reduce pain, control inflammation and healing, reestablish complete range of motion (ROM), prevent muscle hypotrophy, improve muscle strength, maintain proprioceptive function and facilitate the return to work and sports activities. To achieve all these postoperative goals there are several protocols.[2]

Based on the foregoing, the objective of this study was to identify and analyze the content of published scientific articles that verify evolution in the functional recovery of individuals submitted to ACL reconstruction using the BTB or FSSG graft, and that compare whether there is a difference in rehabilitation between the two techniques.

All the authors declare that there is no potential conflict of interest referring to this article.

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METHODS

This is a descriptive study with qualitative analysis carried out through a systematic review of randomized clinical trials, without meta-analysis, with degree of recommendation A and level of evidence 1A.

Strategies used in searching for and selecting the studies

Before locating the studies the participants defined the survey question: "Is there a difference in evolution in the rehabilitation of patients submitted to ACL ligamentoplasty with BTB and FSSG graft?"

To identify the studies the databases used were: MEDLINE, EMBASE, LILACS, COCHRANE and PEDro. The keywords, according to DeCS (Descritores em Ciências da Saúde, or Health Sciences Descriptors), used for the search were: anterior cruciate ligament, reconstruction, rehabilitation and physical therapy modalities.

Selection criteria

The study included: random clinical trials with or without meta-analysis; studies with volunteers submitted to ACL reconstruction surgery and to physiotherapy rehabilitation; surgical intervention by means of the reconstruction techniques with BTB or FSSG; clinical trials that compare the difference of evolution in rehabilitation; language: Portuguese, English and Spanish; and publication period: 1997 to June 2011. The following were excluded: non-random clinical trial, experiments with animals and revisions in literature.

The variables considered and investigated involving the evolution of rehabilitation were: pain, muscle strength, stability, ability to jump, return to activity, specific knee symptoms and rehabilitation time.

Quality evaluation

Firstly the titles and abstracts of the clinical trials identified in the search were analyzed, and those that appeared to fulfill the inclusion criteria were distributed to two reviewers who evaluated them independently using two methods.

The first method used was the description of the allocation concealment process classifying the studies in four categories: 1) category A: means that the allocation concealment process was adequately reported; 2) category B: the allocation concealment process is not described, yet it is mentioned in the text, list or tables that the study is random; 3) category C: the allocation concealment process was inadequate; and 4) category D: the study is not random.

After being evaluated by the description of the allocation process, the clinical trials were evaluated by the second method using the quality scale of Jadad et al.[8], whose maximum score is five for the study to be considered excellent, and the score that characterizes the study as poor is two or less.

After the classification, the reviewers met to reach a consensus about whether to include or exclude the articles. If the reviewers disagreed, a third reviewer would have been asked to resolve the differences. However, this did not happen.

The articles identified as A or B, and with a score of 3 or above on the Jadad scale, were included. Those classified as C or D and/or with a score of two or below were excluded as they were not random clinical trials and presented doubtful or poor quality.

The classification of the articles was followed by the data collection. All the variables of the studies were observed and summarized. Characteristics of the methodology, of the participants and of the clinical outcome allowed or did not allow a comparison of the studies.

RESULTS

The initial search consisted of 237 studies; of these, 190 were excluded as they did not meet the established criteria. Therefore, 47 studies were analyzed by two reviewers. The references of these 47 articles were also reviewed to identify possible additional studies.

After the quality assessment and the consensus meeting, five clinical trials were found that met the inclusion criteria as they answered the survey question in full, i.e., compared the rehabilitation evolution difference between the groups. (Chart 1) The other 42 articles compared the surgical techniques with BTB and FSSG describing their advantages, disadvantages and complications.

DISCUSSION

Knee rehabilitation is a point of crucial importance to achieve desired good functional results. As variables of the evolution of this process we can consider: pain, joint stability, associated injuries, muscle strength, functional activities, specific knee symptoms, return to activity and rehabilitation time.

Pain is a common and significant symptom for many individuals after ligamentoplasty, and can interfere in the activities of daily living, including the postures of the lower limbs adopted on an everyday basis. In follow-up studies on patients submitted to ACL reconstruction using FSSG or BTB, no significant differences were observed as regards the reporting and intensity of pain in the knee region. This evaluation involved the use of a range of methods, from simple classification through a verbal report of the presence or absence of pain[9] and the use of the Visual Analog Scale (VAS),[10,11] to the use of a specific tool to assess knee pain: the Anterior Knee Pain Score (AKP), which considered pain at rest, while walking up or down stairs, seated with knee flexed for more than 30 minutes or squatting and kneeling.[12]

To evaluate knee joint stability and ligamentous laxity after surgery, it was observed that all the studies used the arthrometer as a tool, yet with different parameters: applying force of 134 N,[13] 89 N[9] and maximum manual force.[10-12] Some clinical tests were also used: the Lachman test[9,10] and pivot-shift test.[10,12] However, only the study by Heijine and Werner[12] demonstrated differences between the 2 groups, in which the BTB graft ensures a more stable joint for anterior translation and rotation movement of the tibia.

One of the complications arising from post-ligamentoplasty joint instability is osteoarthritis. Three studies considered this relation a postoperative variable.[12,13] [11-13] For this evaluation the participants used radiographs[11] and the Knee Injury Osteoarthritis Outcome Score (KOOS) questionnaire, which, besides pain, also evaluates function in daily living, function during recreational sports and quality of life.[12,13] There were no significant differences observed between the surgical techniques in any evaluation.

Chart 1. Studies analyzed.

Study	Sample	Physiotherapeutic conduct	Results
Drogset et al.[10], 2010	BTB: 58 FSSG: 57	Started soon after surgery: knee mobilization, including total extension, weight bearing as soon as tolerated, closed kinetic chain exercises. Gentle running after 10-12 weeks. Return to sport after 6 months. Follow-up of 2 years.	Similar clinical and functional results, yet the rehabilitation protocol should be less aggressive in the FSSG group, as these present a tendency to lose strength in the ischiotibial muscles.
Ejerhed et al[9], 2003	BTB: 34 FSSG: 37	Started soon after surgery: weight bearing as soon as tolerated, immediate complete ROM, closed kinetic chain exercises. Complete extension associated with external rotation of the tibia allowed after 6 weeks. Running allowed after 3 months and contact sports after 6 months. Follow-up of 2 years.	Similar clinical and functional results, yet with fewer complaints of discomfort during walking in the FSSG group.
Heijine and Werner[12], 2010	BTB: 34 FSSG: 34	Weight bearing soon after surgery. Physiotherapy started 1 week after surgery, 2 to 3 times a week. Conduct: exercises for flexibility, thigh strengthening and proprioception. Follow-up of 3, 5, 7 and 9 months and of 1 and 2 years.	BTB grafts present less ligamentous laxity, and athletes manage to return at a higher level when compared with FSSG. The rehabilitation protocol of FSSG should be less aggressive and include more strengthening of the ischiotibial muscles.
Holm et al.[11], 2010	BTB: 28 FSSG: 29	1st week: cryotherapy, weight bearing. 2nd week: closed kinetic chain exercises and stationary bicycle. 6th week: gentle running. 10th week: agility exercises, increase in strengthening training, sports-oriented exercises. Follow-up of 10 years.	No clinical and functional difference between the groups.
Taylor et al.[13], 2009	BTB: 32 FSSG: 32	Started on the 1st day after surgery. Conduct: weight bearing according to tolerance, strengthening of quadriceps, guidance for maintenance of knee in hyperextension during rest, active and passive knee mobilization, closed kinetic chain exercises, functional exercises, stationary bicycle, running 3-4 months after surgery, exercises with emphasis on type of sport. Follow-up of 2, 3 and 4 years.	Similar clinical and functional results.

One of the functional performance appraisal methods is through an analysis of the strength of the thigh muscles. For this appraisal all the studies used the isokinetic dynamometer, measuring the concentric and eccentric torque of the quadriceps and ischiotibial muscles. Once again several parameters were used: angular velocities of 90°/s and 230°/s,[12] or of 60°/s and 240°/s[11] or only 60°/s.[9] There was also a description of the number of repetitions executed: 5 repetitions at an angular velocity of 60°/s, rest of 1 minute and 30 repetitions at 240°/s[10] and 10 repetitions at a velocity of 60°/s and 20 repetitions at 300°/s.[13] In this analysis it was demonstrated that two years after surgery the FSSG group did not recover the preoperative muscle torque, and reductions in the work of the posterior muscles of the thigh were observed between the 1st and 2nd year after surgery.[11,12] It was also demonstrated that the patients with FSSG presented less strength for knee flexion,[10] requiring a slower protocol concentrated on ischiotibial muscle strengthening exercises for this group.[12]

The only one of the functional tests applied in all the studies was the hopping exercise.[9-13] However, other tests were also applied, such as the walk test,[9] considering pain during and after the test; the kneeling walk test[9,10]; the step jump test[10,11]; and monopodal postural oscillation test, measured on a force platform.[12] Although no functional test demonstrated a difference between the groups, specifically with regard to the hopping test, it was observed in the studies by Heijine and Werner[12] and Holm et al.[11] that both techniques presented deficit in the operated limb when compared with the unoperated limb.

Questionnaires were applied to evaluate specific symptoms and the functional capacity of the knee: Cincinnati Knee Rating System (CKRS),[11] Lysholm questionnaire,[10-13] International Knee Documentation Committee (IKDC)[9,13] and Assessment Numeric Evaluation (SANE) Score.[13] The use of subjective evaluation of knee function, in which the patient gave a verbal account of their knee function, was also reported.[10] However, there were no significant differences observed between the use of BTB and FSSG in any study.

To evaluate the level of sport participation, all the studies[9-13] used the Tegner scale. Through this test, it was observed that one year after surgery the patients submitted to ligamentoplasty with BTB were able to return at a higher level besides having achieved this goal in less time than with FSSG, according to the conclusions of Heijine and Werner.[12]

Other physical evaluations were carried out: the range of motion (ROM) was measured, considering total ROM and loss of extension, using the goniometry[9,13]; knee and thigh perimetry, to evaluate muscle hypotrophy[13]; the presence of patellofemoral crepitus[10]; and change of sensitivity in the anterior region of the knee.[9]

In relation to the number of appointments for physiotherapy care, only one study[12] referenced this variable, which was similar between the groups. In the BTB group 50 (13-93) appointments were held, while in FSSG the total was 51 (18-109). For both cases, the appointments were held from two to three times a week.

As regards the protocols and physiotherapeutic conducts used, these have poor descriptions, without any mention of the time of use or of the application frequency of each technique. Also in relation to this analysis, uniformity was observed in the studies in some aspects, since they all[9-13] mention the use of early weight bearing, in the first postoperative week, while the majority used closed kinetic chain exercises.

CONCLUSION

After the ligamentoplasty, both with use of BTB graft and of FSSG, the clinical and functional results are similar, yet with recommendation for less aggressive rehabilitation, paying more attention to the strengthening of the ischiotibial muscles when FSSG is used.

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