Sport Sciences for Health (2021) 17:931–935
https://doi.org/10.1007/s11332-021-00754-7

ORIGINAL ARTICLE

Good functional outcomes in patient's age > 40 years after anterior cruciate ligament reconstruction with hamstring tendon graft: a retrospective study

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Received: 14 October 2020 / Accepted: 27 March 2021 / Published online: 4 May 2021

Abstract

Background Many surgeons are still hesitant to do arthroscopic anterior cruciate ligament reconstruction (ACL) in patients above 40 years old.

Purpose The effect of ACL reconstruction on functional outcomes in patients above 40 years of age.

Materials and methods Patients of age > 40 years who underwent ACL reconstruction were enrolled in the study. Functional outcomes (Lysholm, WOMAC score, and Tegner activity scale), pain (VAS score), and knee stability (KT-1000) were assessed at final follow-up and compared with pre-operative scores. All patients were followed up for a minimum of 2 years.

Results A total of 112 patients were included in the study. Eighty-eight were males and 24 were females. The mean age at the time of surgery was 44.8 ± 5.6 years (40–63 years). The mean Lysholm score was improved from 64.1 ± 11.7 to 87.2 ± 5.9 ($p = 0.0001$). Similarly, the WOMAC score was also improved from 8.8 ± 6.9 to 2.3 ± 1.9 ($p = 0.0001$). The mean side-to-side difference (KT-1000) also improved from 6.65 ± 2.25 mm to 2.32 ± 1.45 mm ($p = 0.0001$). More than 70% of the patients had excellent or good outcomes. Median pre-injury Tegner activity scale was 5 (3–8) and the median post-ACLR Tegner activity scale was 5 (3–7; $p = 1$).

Conclusion ACL reconstruction in patients > 40 years of age results in good functional outcomes and knee stability.

Keywords ACL · Older patients · Lysholm score · WOMAC score

Introduction

Anterior cruciate ligament (ACL) tear is a common injury among young athletes [1], however, in recent times, these injuries are commonly seen among middle-aged persons also as more and more people are getting motivated to participate in a physically active healthy lifestyle. Arthroscopic ACL reconstruction (ACLR) is the treatment of choice for these injuries in young active adults [2]. However, there is still a dilemma over the treatment of ACL injuries in middle-aged patients [3]. Previously set, an arbitrary upper age limit of 40 years is now challenged by many authors and they reported good functional outcomes after ACL reconstruction in above 40 years old of patients [4–9]. Despite satisfactory results of ACLR in middle-aged patients, many surgeons are still reluctant to perform ACL reconstruction in patients above 40 years of age especially in recreational sportspersons. Even the American Academy of Orthopaedic Surgeons (AAOS) guidelines recommend ACL reconstruction in 18–35 years young active athletes, there is no

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clear recommendation for patients above 40 years [10]. In Asia, where more than 2/3rd of the population is between 15 and 65 years, it is important to have clear guidelines about the management of ACL reconstruction in different age groups. The present study was aimed to analyze the outcomes of ACL reconstruction with hamstring tendon graft in patients > 40 years and give clarification regarding the management of ACL tear in middle-aged patients. It was hypothesized that functional outcomes and mechanical knee stability would be significantly improved after arthroscopic ACL reconstruction in these patients.

Materials and methods

This was a retrospective study. A total of 112 patients of age > 40 years who underwent ACL reconstruction were included in the study. ACL reconstruction was performed using semitendinosus-gracilis graft with preserved tibial insertion by transportal technique [11]. Graft fixation was done at the femoral end using endobutton and at the tibial end, free ends were suture back at the insertion. Partial meniscectomy was done for unstable meniscal tears. The Outerbridge classification was used to grade the chondral damage. Inclusion criteria were patients of either sex having clinically and radiologically diagnosed ACL tear and X-ray showing osteoarthritis ≤ grade 3 (Kellgren and Lawrence grade). Exclusion criteria were: (1) previously operated on the same knee, (2) multi-ligamentous injury, (3) inflammatory arthritis like rheumatoid arthritis, (4) patients who underwent alignment corrective procedure along with ACL reconstruction and (5) insufficient data.

All patients underwent a similar rehabilitation protocol for a minimum of 6 months. From day 1, full-weight bearing walking with a brace, knee range of movement, and straight leg raise exercises were started. These exercises were continued for 6 weeks. After 6 weeks, gym cycling and half squats were started along with previous exercises and at 3 months, jogging and full squats were added. These exercises were continued for a minimum of 6 months.

Functional outcomes were assessed using the Lysholm score and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) [12] score both pre-operatively and postoperatively at the final follow-up. As Lysholm score includes factors like limp, pain, stairs climbing, instability, swelling, etc., it mainly assesses the daily functional movements. However, for the sportsperson, return to pre-injury activity level is also important, therefore, Tegner activity scale was also used at final follow-up and it was compared with the pre-injury status of the patients.

Knee laxity was measured using KT-1000 arthrometer pre-operatively and postoperatively at the final follow-up by the research fellow. The uninjured knee was tested first followed by the injured knee. At the time of testing, a bolster was kept under the thigh to keep the knee at 30 degrees of knee flexion. KT-1000 was recalibrated to zero every time before measuring the anterior translation of the tibia. The mean of three readings was taken to minimize the error. KT-1000 difference was calculated by subtracting anterior translation of tibia between affected and normal knee. The pain was scaled using VAS score pre-operatively and post-operatively at the final follow-up. All the patients were followed up for a minimum of 2 years.

In the present study, a comparison between matched young cohorts (< 40 years) was not done due to chances of selection bias on the basis of the Tegner activity scale, mean interval between injury and surgery, concomitant secondary pathology, and compliance to post-operative rehabilitation.

Statistics

Quantitative data were given as mean ± SD. Multiple t tests were applied to compare the quantitative data (Lysholm, WOMAC, Tegner activity scale, VAS score, and KT-1000). Shapiro–Wilk test was performed to check the normal distribution of data. Multiple t tests were performed for parametric values and Mann–Whitney test was used for non-parametric values. Categorical variables were reported as counts and percentages. All statistical analyses were performed at a significance level of $\alpha = 0.05$. The analysis was conducted using IBM SPSS STATISTICS (version 22.0).

Results

Eighty-eight were male and 24 were females. The mean age was 44.8 ± 5.6 years (40–63 years). The mean follow-up was 50.39 ± 32.36 months (24–112 months). In the present study, most of the patients enrolled were recreational sportspersons, only 3 patients were professional sportspersons. Details of patients involved in different sports are given in Table 1. In this study, 51% of the patients had grade 2 or more chondral damage and 58% of the patients had concomitant meniscal tear (Table 2). It was observed that functional outcomes after ACLR improved significantly. Lysholm score after ACLR improved from 64.14 ± 11.7 to 87.21 ± 5.91 ($p = 0.0001$). Similarly, WOMAC score also reduced significantly after ACL reconstruction (8.82 ± 6.9 to 2.31 ± 1.9; $p = 0.0001$). There was also significant relief in pre-operative pain (Table 3). The mean side-to-side difference was also reduced from 6.65 ± 2.25 mm to 2.32 ± 1.45 mm ($p \leq 0.000001$). More than 70% of the patients had excellent or good outcomes (Table 4). The median pre-injury Tegner activity scale was 5 (3–8) and the median post-ACLR Tegner activity scale was 5 (3–7; $p = 1$).

Table 1 Details of patients involved in various activity before the injury

Type of sports	Number of patients
Kabaddi	14
Volleyball	14
Badminton	16
Cricket	11
Hockey	8
Swimming	6
Basketball	5
Others athletic activity	38

Table 2 Demographic details of the patients

Mean age	44.8 ± 5.6 years
Male: female	88:24
Mean delay in surgery (months)	26.16 ± 40.4 (0.1–168)
Concomitant meniscus tear	
Medial meniscus	31 (28%)
Lateral meniscus	16 (14%)
Both meniscus	18 (16%)
Normal menisci	47 (42%)
Chondral damage	
Grade 4	15 (13%)
Grade 3	20 (18%)
Grade 2	28 (25%)
Normal or grade 1	49 (44%)

Table 3 Comparison of pre-operative and post-operative functional scores

	Pre-operative	Post-operative at final follow-up	*p* value
Lysholm score	64.14 ± 11.7	87.21 ± 5.91	0.0001
WOMAC score	8.82 ± 6.9	2.31 ± 1.9	0.0001
VAS Score	3.11 ± 1.58	1.48 ± 0.61	0.0001
KT-1000 difference	6.65 ± 2.25 mm	2.32 ± 1.45 mm	0.0001

Table 4 Number of patients having different levels of outcomes measured using Lysholm Score

	(*n* = 112)
Excellent (> 90)	35
Good (84–90)	46
Fair (65–83)	31
Poor (< 63)	0

Discussion

The major finding of the present study was that there was a significant improvement in the functional outcomes and mechanical knee stability after ACLR in patients age > 40 years. Management of ACL tear conservatively in above 40 years of age is outdated now, with most of the studies in the literature are in favor of surgical management [7, 9, 13–18]. Previously, theoretical points, such as pre-existing chondral damage, arthrofibrosis, and poor wound healing, that were considered against the surgical management in elderly patients do not hold true, as instability episodes lead to further chondral and meniscal damage which ultimately leads to more severe osteoarthritis. Even the presence of grade ≥ 3 chondral damage at the time of ACLR is not a contraindication, as good results were observed in patients even with full-thickness chondral damage [19–21].

Many previous studies reported satisfactory results after ACL reconstruction even in patients > 50 years [22–28]. Raju et al. reported good functional outcomes after ACL reconstruction in 75-year-old patients [29]. Toanen et al. reported excellent results of ACL reconstruction even in patients above 60 years of age [30]. This suggests that physiological age and activity levels are more paramount than chronological age.

Ciccotti et al. reported that non-operative treatment of ACL tear led to satisfactory outcomes in more than 80% of patients aged > 40 years with an ACL tear [31]. However, other than this study, no other study reported good functional outcomes with conservative treatment. Further, conservative treatment is associated with lifestyle modifications. In today's world, where non-communicable disease constitutes 70% of deaths, people are opting for a more active and healthy lifestyle, therefore, lifestyle modifications are not advisable.

In the present study, the mean Lysholm score was 87.21 at the final follow-up. A recent meta-analysis study reported Lysholm score improved to 90.5 at the final follow-up in patients above 40 years [32]. Guido et al. reported a mean Lysholm score of nearly 88 at the end of 1 year and 90 at the end of a 2-year follow-up [33]. In the present study, not only the functional outcome improved but also the pain and mechanical knee stability improved significantly. Improvement in pain could be because of arthroscopic lavage and partial meniscectomy [34].

Conservative treatment for an ACL tear in patients > 40 years of age has been associated with residual knee laxity [35] which causes increase chances of meniscal and chondral damage, which ultimately leads to osteoarthritis (OA) knee [36]. However, the role of ACL reconstruction in the prevention of knee OA is controversial but

it improves the knee kinematically to prevent secondary injuries to the knee [37, 38].

The results of the present study further emphasize the importance of ACL reconstruction in active middle-age patients. Management of ACL tear is important in middle-age patients also, and the results of present study suggested that ACLR not only improved knee stability but it also helps in returning to pre-injury activity and alleviating pain.

This study has some limitations— there is a discrepancy in male-to-female ratio, as majority of the patients were males; second, this was not a comparative study, matched cohorts were not available for comparison; third, it was a retrospective study; hence, there are chances of recall bias.

Conclusion

ACL reconstruction in patients above 40 years of age results in good functional outcomes and increased knee stability.

Funding No funding was received for the present study.

Declarations

Conflict of interest Authors have no conflict of interest.

Ethical approval This was a retrospective study, therefore, ethical approval was not taken for this study.

Consent for participation Consent was received from all the patients.

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