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Original Article

Evaluation of Knee Arthroscopy with Concomitant Reconstruction of Anterior and Posterior Cruciate Ligament

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Abstract

Objective: **The Aim of the study is to evaluate the outcome of knee arthroscopy with concomitant reconstruction of anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL).**

Materials and Methodology: **From November 2013 to December 2016, the Institute of Trauma and Orthopedics, Viet Duc University Hospital has conducted a study in 33 patients who had a knee injury.**

Results: **Ages ranged from 20 to 45 (mean 34.9). There was no difference between injuries of the left knee and right knee. Chief complaints included swelling, pain and limited movement. The sensitivity of MRI in diagnosis was 100%, 91.9%, and 78% for the ACL, PCL, and meniscus, respectively. Nineteen of 33 patients had other types of injury. Two materials preferred in surgery were autologous graft (Hamstrings) (72.2%) and homologous graft, postsurgical mean Lyscholm score: 88.1 ± 10.1, 12.5% of patients has g18 of 32 patients returned for follow-up on time and had very good outcome without any complications such as loose knee, joint stiffness, significant pain or atrophy of the quadriceps femoris muscle, good outcome, 6.2% of patients has bad outcome and required reoperation.**

Conclusions and Recommendations: **Concomitant injury of ACL and PCL is a serious injury and significantly affects patients' quality of life. Successful surgery can markedly improve patients' function and quality of life, and enable them to resume daily activities.**

Keywords: **Concomitant injury of ACL and PCL, knee trauma arthroscopy for knee**

Introduction

Knee injuries are common in daily activities but do not usually receive attention from patients because of the mild symptoms. Concomitant injury of the anterior cruciate ligament and (ACL) the posterior cruciate ligament (PCL) is rare but its complication is severe if not promptly diagnosed and treated[1,2].

The injury mechanisms include direct and indirect trauma, but mostly are due to an indirect twisting force causing the concomitant injury to both ligaments[2]. Ligament injuries are often transient and missed, however, if patients do not pay attention and it causes the instability of the knee joint if not treated[3].

Following many patients up who have been operated in Viet Duc University Hospital (VDUH), we have noticed many patients with severe sequelae, which seriously impacted the quality of life. Therefore, we conducted a study to research this problem.

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Materials and Method

It is a combination of retrospective and prospective observational study of 33 patients diagnosed with knee injuries.

Retrospective study

Patients diagnosed with close knee trauma with ACL and PCL were treated in the Institue of Traumatology and Orthopedies (ITO) by reconstruction arthroscopy from November 2013 to November 2014.

Prospective study

Patients were operated on in ITO from December 2014 to December 2016.

Inclusion criteria

Patients admitted to the Institute of Trauma and Orthopedics (ITO), VDUH for treatment of rupture of both ACL and PCL caused by trauma, both female and male included, and aged between 16 and 60 years old.

Exclusion criteria

Patients with other concomitant injuries such as head trauma, chest trauma, abdominal trauma or the medical record is not completed.

Lysholm Knee Scoring Scale is used to evaluate outcomes of knee ligament surgery in patients. First version of this was published in 1982. The present scale includes 8 items: Limp, support, locking, instability, pain, swelling, stair climbing, squating. Maximum score is the sum of each response to the 8 items, of a possible score of 100. Computer scoring is not necessary[4].

RESULTS

Outcome

- **Demographic of patients**

Mean age 34.9. Max 57, min 20. Male 57.6%, female 42.4%, no statistical difference.

Among 33 patients, 15 (45.5%) had injury in the left kneeand 18 (54.5%) had injury in the right knee. No statistical difference.

Table 1 Age distribution (n=33)

Gender \ Age	20-45	>46	Total	%
Male	16	3	19	57.6
Female	10	4	14	42.4
Total	26	7	33	
%	78.8	21.2	100	

Table 2 Site of lesions (n=33)

Site of injury	Number	%
Left knee	15	45.5
Right knee	18	54.5

Table 3 Construction material (n=33)

	Material	Number	%
Autologous	Lateral fibularis longusand hamstring	16	48.5
	Hamstring	4	12.1
	Hamstring (bilateral)	2	6.1
Homologous	Achilles	7	21.2
	Lateral fibularis longus	1	3.0
	Achillesand patella	1	3.0
Autologous hamstring and homologous lateral fibularis longus		2	6.1
	Total	**33**	**100**

Table 4 Associated injuries (n=33)

Injury	Number	%
Lateral meniscus	5	15.2
Medial meniscus	8	24.2
Lateral ligament	2	6.1
Both menisci	5	15.2
Lateral ligament + meniscus	1	3.0

Among 33 patients, 19 (57.5%) had associated injuries, including 5 (15.2%) with injury of both menisci, 2 (6.1%) patients with lateral ligament injury, and 1 patient with lateral ligament and meniscus.

After surgery, no patients had infection of the knee or site of material harvesting. Two out of 33 patients had knee effusion. To treat this, knee aspiration and buccellation were done.

Table 5 Complication (n=32)

Complications		Yes	No
Infection	Knee	0	32
	Site of material harvesting	0	32
Knee effusion		2	30
Numbness at site of material harvesting		0	32

The minimal postsurgical follow-up duration was 3 months, the longest duration was 28 months.

Among 33 patients, 32 patients were followed up and examined after surgery, these patients were assessed by the 1993 IKDC Subjective Knee Evaluation Form and Lyscholm Knee Score.

- **Patients returning for follow-up**

32/33 patients were followed up after surgery, there were:

- 20 patients returned on time for follow-up.
- 12 patients returned late for follow-up (37.5%).

- **Postsurgical Lyscholm knee score**

Postsurgical mean Lyscholm score: 88.1 ± 10.1; min 31 (1 patient); max: 95 (4 patients). Lyscholm score improved significantly after surgery compared to before surgery.

- **Knee function evaluation by Lyscholm score**

- 4 (12.5%) patients had very good outcome.
- 2 (6.2%) patients had bad outcome and required reoperation.

Table 6 Lyscholm knee score (n=32)

	Mean ± SD	Min-Max
After surgery	88.1 ± 10.1	31-95
Before surgery	32.6 ± 17.34	18-78

$p < 0.001$

Table 7 Knee function evaluation (n=32)

Lyscholm score	Very good (95-100đ)	Good (84-94đ)	Average (65-83đ)	Bad (<65đ)	Total
Number	4	16	10	2	32
%	12.5	50	31.3	6.2	100

Factors affecting treatment outcome (by Lyscholm score)

Age

Among the patients, 61.1% with very good/good outcome were > 31 of age; 64.3% with very good/good outcome were ≤ 30 age. No statistical difference, $p > 0.05$.

Relationship between gender and outcomes

Among the patients, 66.7% with very good/good outcome were male, 57.1% with very good/good outcome were female. No statistical difference, $p > 0.05$.

Reconstruction material

- 14 (66.67%) patients with autologous material had very good/good outcome.
- 55.6% of patients with homologous material had very good/good outcome.

Follow-up visit

- 18 of 32 patients that returned for follow-up were on time, and 17 of them had very good/good outcome.

Table 8 Age and treatment outcome (n=32)

Age	Very good and good	Average and bad	Total
> 31	11	7	18
≤ 30	9	5	14
Total	**20**	**12**	**32**

Table 9 Gender and treatment outcome (n=32)

Age	Very good and good	Average and bad	Total
Male	12	6	18
Female	8	6	14
Total	**20**	**12**	**32**

Table 10 Reconstruction material (n=32)

Ligament	Very good and good	Average and bad	Total
Autologous	14	7	21
Homologous	5	4	9
Both	1	1	2
Total	**20**	**12**	**32**

Table 11 Associated injury (n=32)

Associated injury	Very good and good	Average and poor	Total
Presence	8	10	18
Absence	12	2	14
Total	**20**	**12**	**32**

- 14 of 32 patients that returned for follow-up were late, only 1 had very good result and 11 (78.6%) patients had average and poor outcome.

Associated injury

- 85.7% of patients without associated injuries had very good/good outcome.

- 44.4% of patients with associated injuries had very good/good outcome.

Discussion

Most people have had a minor knee problem at one time or another. Most of the time our body movements do not cause problems, but it is not surprising that symptoms develop from everyday wear and tear, overuse, or injury. Knee problems and injuries most often occur during sports or recreational activities, work-related tasks, or home projects.

Most dislocated knees involved tears in the two cruciate ligaments and were often accompanied by other collateral ligament complexes. Surgical repair or reconstruction seems to achieve results superior to conservative treatment. Various methods of reconstructing anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) after knee dislocation have been described.

The age of the patients in our study ranged from 20 to 57 (Table 1), with a mean age of 34.9. Most patients were in within the age of 20-30 (42.4%) or 31-45 (36.4%) (together 78.8%); only 21.2% were above 45. Therefore, knee injuries often occurred in patients at the working age who are physically active. The result was the same as when Phùng Văn Tuân in 2010 conducted on patients with isolated PCL injury[1]. Recently, 15 patients in a study conducted by Nguyên Manh Khánh[2] had a mean age of 36.1.

The injured knee was not associated with leg dominance (Table 2). Among 33 patients, the number of patients with left knee and right knee injury did not show any significant difference (15 and 18, respectively; $p > 0.05$).

Eighteen patients had meniscal injury, 8 had medial meniscus tear (44.4%), 5 had lateral meniscus tear (27.8%), and 5 had both. Medial meniscus tear appears more common than lateral meniscus tear, probably because medical meniscus is less mobile, and hence is more at risk for trauma. The similar result was observed by Trân Trúng Dâng (2011) where 26.4% and 11.8% of patients had medial and lateral meniscus injury, and by Nguyên Manh Khánh (2015)[2] with 46.7% of 15 patients.

In addition, the force that can cause trauma to both ligaments is often relatively high, or twisting; hence the high incidence of both meniscus injury.

Two patients had lateral ligament and one patient had both lateral ligaments and two menisci; these are severe associated injury in a complex knee injury, leading to low recovery ability and even the need for multiple surgeries. Among 35 patients, Fanelli[4] found 19 with injury of associated posterolateral angle, 9 with injury of medical collateral ligament (MCL), and 6 with injury of both ligaments. Phùng Vân Tuân[1] found 4 of 11 patients having associated MCL injury.

In addition, four patients had a history of knee dislocation and were treated with knee fixation or vascular grafting. These patients are often severe and likely to have more sequelae. Our patients followed a preoperative exercise regimen to restore normal range of movement of the knee joint to optimize the operation outcome[2].

Two materials preferred in surgery were autologous graft (tendon of gracillis or semitendonosus muscle, 23 (72.2%) patients) and homologous graft (Achilles tendon, 10 (27.8%) patients) (Table 3). In concomitant reconstruction of ACL and PCL, use of hamstring tendon was not adequate, therefore we had to use the ipsilateral lateral fibularis longus tendon or contralateral hamstring tendon. In VDUH, reconstruction with homologous tendon had been performed since 2008 and the result was very positive (88.2% with very good/good outcome). However, despite advantages (shorter duration of surgery, adequate graft for reconstruction, less postsurgical pain), there is an increase in the risk for infection, graft rejection, high cost, and unavailability of the material. Fanelli[4] only used homologous Achilles tendon for

reconstruction of 6 ACL injuries and 26 PCL injuries, and homologous patellar tendon for 6 ACL injuries. Lysholm Knee Scoring Scale is a patient completed questionnaire where each possible response to each of the eight items has been assigned an arbitrary score on an increasing scale. Apart from knee ligment injury, the score can be used for meniscal tears, knee cartilage lesions, osteochondritis dissecans, traumatic knee dislocation, patellar instability, patellofemoral pain, and knee osteoarthritis[4]. Postsurgical Lyscholm score was 31-95 (mean 88.1) (Table 7) and 4 (12.5%), 16 (50%), 10 (31.3%), and 2 (6.2%) patients had a very good, good, average, and bad outcome, respectively (Table 8). Strobel MJ (2006)[8], Fanelli GC (2002)[4], Zhao J (2006)[5], and Dentil M (2015)[6] found a mean Lyscholm score of 71.8, 91.2, 91.8, and 93.8, respectively.

There are few domestic studies on ACL and PCL injuries. The study of Nguyên Manh Khánh (2015)[2] on 15 patients showed a remarkable improvement on knee function, with a mean Lyscholm score of 89.4, 8 patients had very good outcome, 6 good outcome, 1 average outcome, and no bad outcome. Phùng Vân Tuân, [1] found the mean Lyscholm score were 82.4 in 7 patients with reconstruction of both ligaments (out of 10 patients in total).

Age and sex were not associated with treatment outcome, however, in our study, age range was 20-54 and the sample size was small, so it was possible that the study did not have enough power to demonstrate a difference. However, we do not favor PCL reconstruction for patients over 60.

In our study, 8 out of 32 patients used homologous tendons; among those, 4 patients had loose knee, 2 patients still had pain, and 1 patient required reoperation due to degeneration of both ligaments after 2 years. In 2014, this patient's ACL was reconstructed with autologous tendon and the outcome was favorable. The degeneration could be attributed to graft rejection or storage condition in the previous hospitals. Twenty-four patients used autologous tendons, and only one required reoperation due to wrong tunnel position.

Eighteen of 32 patients returned for follow-up on time and had very good outcome without any complications such as loose knee, joint stiffness, significant pain or atrophy of the quadriceps femoris muscle. But among 14 patients that returned late for follow-up, 11 had complications (7 loose knee). Among retrospective patients, there was a patient that had only one follow-up visit.

Therefore, rehabilitation assumes an important role in recovery. Patients without regular and timely follow-up visits are often associated with less positive outcomes. Besides, during our survey with patients who used homologous tendons, we found some patients who did not want to come back for follow-up due to the fear of reoperation.

Many factors might affect treatment outcome, including duration of surgery, surgical methods, timing of surgery, associated injuries, and timing of postsurgical rehabilitation. However, since these are rare injuries, our study did not have an adequate sample for profound discussion on this issue.

In total, 44.4% of patients with associated injuries and 85.7% of patients without associated injuries had a very good or good outcome, this difference was statistically significant ($p < 0.05$). Concomitant ACL and PCL injury might be associated with meniscal tear, medial and lateral collateral ligament injury, and knee degeneration if surgery is late. In our study, patients with associated injuries had a worse outcome, and it also affected the efficiency of pre- and postsurgical rehabilitation. Among 18 patients with associated injuries, 10 had an average or bad outcome, and one patient with bad outcome had four associated injuries. Hence, associated injuries can affect the treatment outcome in patients with concomitant ACL and PCL reconstruction.

Conclusion

Concomitant injury of ACL and PCL is a serious injury and significantly affects patients' quality of life. Successful surgery can markedly improve patients' function and quality of life, and enable them to resume daily activities.

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