

The outcome of simultaneous arthroscopic anterior cruciate ligament and posterior cruciate ligament reconstruction using hamstring tendon, and peroneus longus autograft

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Abstracts

Introductions: Simultaneous anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) tears are severe injuries to the knee. Therefore, early diagnosis and simultaneous arthroscopic reconstruction of the ligaments are crucial in returning knee function and reducing the risk of disabilities. The purpose of this study is to evaluate simultaneous cruciate ligaments arthroscopic all-inside reconstruction using semitendinosus, gracilis, and peroneus longus autograft.

Materials and methods: We prospectively described 45 patients with simultaneous cruciate ligament tears who underwent one-stage arthroscopic reconstruction using semitendinosus, gracilis, and peroneus longus autograft for one period from January 2019 to June 2022.

Results: Mean age was 36.4; follow-up at 3,6,12,15 months post-op showed good results in knee function and a significant increase of pre and post-op Lysholm score. The mean diameter and length of the ACL graft were 7.52mm and 60mm, and for PCL were 7.68mm and 70mm. Lysholm's score consistently improved over time. The pre-op mean score was 41 ± 7.2 , and the min was 24, while the last follow-up mean score was 85.5 ± 8.4 , and the max was 98. The difference is significant ($p < 0.001$).

Conclusion: Simultaneous cruciate ligaments arthroscopic all-inside reconstruction using semitendinosus, gracilis, and peroneus longus autograft is a safe and effective treatment for both cruciate ligament injuries.

Keywords: Arthroscopic, Hamstring, Simultaneous ACL/PCL Reconstruction.

Introduction

The knee is one of the main weight-bearing joints in the body; therefore, it is vulnerable to injury. Simultaneously, cruciate ligament tears are a rare but severe injury that causes significant knee instability and substantially affects knee function and patients quality of life. International as well

and domestic authors such as Wascher [1] (1999), Faneli [2] (2002), and Nguyen Manh Khanh [3] (2015),... concluded that simultaneous ligaments reconstruction is necessary for good results, rehabilitation of the knee as well as daily activities or the ability to return to work and sports. However, graft choice is still one of the most debatable surgery

factors. Some surgeons prefer allograft or artificial ligaments for their availabilities; hence, they can avoid taking grafts from patients, reduce surgery time, and are more flexible in choosing graft size. On the other hand, those choices pose some drawbacks, such as high cost, longer healing time, and sources of allograft, depending on the availability of the donors. For those reasons, semitendinosus, gracilis, and peroneus longus autografts are still very common.

Materials and methods

Patients diagnosed with simultaneous anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) underwent one stage of both ligaments' arthroscopic "all-inside" reconstruction in Viet Duc University Hospital.

The hamstring grafts were for ACL reconstruction, and the peroneus longus was for PCL reconstruction.

Selection criteria:

Patients between 18 and 60 years old diagnosed with ACL and PCL tear in a single knee with clinical examination and imaging.

Time from accident to surgery over four weeks, post-op flexion of more than 90 degrees, and full range extension.

Exclusion criteria:

Patients had concomitant injuries such as posterolateral corner, medial collateral ligament, or lateral collateral ligament tears, fractures about the knee, and neurovascular compromises.

Evident of infection in the knee joint, profound knee effusion.

Less than three weeks from the accident, limited pre-op knee ROM.

Patients with severe knee osteoarthritis or ankle osteoarthritis.

Research duration: from January 2019 to June 2022.

Research site: Department of upper limb surgery and sport medicine

Surgical technique:

The patient underwent spinal anesthesia in the supine position.

Assess the knee through 2 anterior ports using

the C-arm to check and identify the lesions of the ACL and PCL as well as other injuries.

Harvest the autograft, of which the semitendinosus and gracilis are for ACL reconstruction, and the peroneus longus is for PCL reconstruction.

Debridement and irrigation.

Femoral and tibial tunnels were drilled for both grafts using the "all-inside" technique with a tibial guide and Flipcutter.

The PCL graft was fixed first in 90-degree flexion. Then, the ACL was fixed in 30-degree knee flexion.

Skin closure.

RICE (rest, ice, compression, and elevation) for 3-4 weeks post-op, and the patient underwent rehabilitation.

Assessments of results:

Short-term for about 30 days after surgery: Wounds evaluation, signs of infection, degree of knee effusion.

Long-term: Follow-up at 3,6,12, and 15 months, knee function according to Noyes and Lysholm score.

Results

General features:

Tab 1. General features

Variables	Values
Male/Female	27/18
Age	36.4
Accident-Surgery interval	
1-2 months	33
2-12 months	9
> 12 months	3
Causes of accident	
Traffic accident	31
Sports accident	6
Other accident	8
Surgical duration (mins)	84.7 ± 22.7

Short-term results:

The mean diameter and length of the ACL graft were 7.52mm and 60mm, and for PCL were 7.68mm and 70mm.

No infection complication at both graft harvest sites was observed.

Two patients had complicated knee effusion at post-op day 2, well treated with knee aspiration and RICE.

The mean hospital stay was 5.9 ± 1.9 days.

Long-term results:

Tab 2: Range of motion of the knee after 12 weeks

ROM	N	Value (%)
Limited flexion	7	15.6%
Limited extension	2	4.4%
Limited flexion and extension	1	2.2%
Normal	35	77.8%
Total	45	100

3-6-12-15 months follow-up results were demonstrated in the following tables:

Tab 3. Lysholm score

	Mean	Min-Max
Pre-op	41.0 ± 7.2	24-59
3-month post-op	58.6 ± 5.6	46-78
6-month post-op	69.4 ± 7.6	55-85
12-month post-op	78.1 ± 5.6	68-90
15-month post-op	85.5 ± 8.4	74-98

p < 0.001

Lysholm's score has consistently improved over time. The pre-op mean score was 41 ± 7.2, and the min was 24, while the last follow-up mean score was 85.5 ± 8.4, and the max was 98. The difference is significant (p<0.001).

Tab 4. Noyes score

Noyes Score	Pre-op	Post-op 3 months	Post-op 6 months	Post-op 12 months	Post-op 15 months
2	20 (44.4%)	8 (17.8%)	0	0	0
4	25 (55.6%)	37 (82.2%)	33 (73.3%)	18 (40.0%)	6 (13.3%)
6	0		12 (26.7%)	22 (48.9%)	18 (40.0%)
8	0		0	5 (11.1%)	15 (33.3%)
10	0		0	0	6 (13.3%)

P value p < 0.001

The patient's ability to return to sport, according to Noyes's score was significantly increased after surgery, with most of the patients scoring very good to excellent (46%) and good (40%). While patients only had fair and poor scores pre-operatively.

Discussions

General features:

The mean age was 36.4, ranging from 18-60 years old. Most patients were 18 to 30 years old (40%), while only 24.4% of the patients were older than 45 years old. The main causes of injury were traffic and labor accidents compared to sport-related accidents in isolated ACL/PCL injuries. It is evident that simultaneous ACL and PCL tear typically occurs in the context of significant traumatic forces, often accompanied by knee dislocation. This type of injury is more common among individuals of working age. These findings are consistent with other research. In Vietnam, some studies on simultaneous ACL and PCL injury showed similar results. The mean age in Duong Dinh Toans research [4] was 35, and in Tran Hoang Tungs [5] was 36.44 years old (from 19-57 y/o). The mean age in Nguyen Manh Khanhs study (N= 15) was 36,1 years old [3], and in another study on 33 patients, the average age was 34.9 years old. [6] Mohsen Mardani-Kivi published research on Achilles allograft for both ACL and PCL in 2019 (n = 28) also had a similar mean age to our series (30.86) [7] In research compared the result of isolated PCLR

and one stage of both ligaments reconstruction of Ravi Gupta [8], the mean age was 30.12 years old. The male/female ratio in Mohsen Mardani-Kivis research (2019) [7] was 75/25, slightly different with Strobel MJ's research (2006) [9] was 76.5%/23.5, Fanilli G's published in 2002 [2] was 74.3%/25.7%. This research had more males than our previous study conducted in 2015; the male/female ratio was 54.6/45.4 [6]. The reason for the higher number of male patients is that men are more involved in traffic, sport, or labor activity. Therefore, they are more prone to injury. Besides, women tend to be more conservative on surgical decisions.

Time from accident to surgery was mainly in the 1-2 months group (33 patients – 73.3%). One patient left the injury for three years. This could be due to most of the patients having traffic accidents; therefore, they are more concerned with follow-up. However, in our opinion, surgery should only be indicated when the injury is more than three weeks without knee effusion, excessive pain, knee ROM restriction, or bleeding, which will make knee examination and surgery more accessible. Some patients had surgery late after they had plaster herbal medicine... which will affect the knee, increase laxity, osteoarthritis, meniscal tear, or cartilage defect. Therefore, it is crucial to diagnose and make a treatment plan on time.

Surgical techniques:

For specialized hospitals and experienced surgeons, simultaneous arthroscopic ACL and PCL reconstruction help create favorable patient conditions. The use of autologous Hamstring tendon and peroneus longus tendon is appropriate because of the inadequate tissue bank and cost issues. The all-inside technique also helps the surgeon be proactive about the size and length of the tendon.

Graft choices include autograft, allograft, or artificial graft. In Vietnam, the autograft is the most common, consisting of the hamstring, peroneus longus, patella, and quadriceps tendon. We chose the peroneus longus and the hamstring tendon, in which the hamstring grafts were for ACL reconstruction,

and the peroneus longus was for PCL reconstruction. The mean diameter and length of the ACL graft were 7.52mm and 60mm, and for PCL were 7.68mm and 70mm, respectively. The results were similar to other international and domestic research with graft diameters around 7- 8mm [3], [4], [9].

Post-op results:

All patients underwent post-op rehabilitation and were scheduled for 1, 3, 6, 12, and 15 months follow-up. At three months post-op or phase 3 of rehabilitation, 35/45 patients had near-normal knee ROM. One patient had limited knee flexion to 90 degrees and extension to 10 degrees, and he was admitted to the Rehabilitation Department to manage the restricted ROM, especially the extension. Seven patients had flexion less than 100 degrees; they were prescribed intense exercise, and knee ROM was improved after three weeks. Knee laxity was improved markedly. For Lysholm's score, all patients had poor scores pre-op; however, after the surgery, no patient had a poor score, 44.5% of the patients were fair, and the rest were good. There was a consistent increase in Lysholm's score through the follow-up duration. Mean Lysholm score changed from $41 \pm 7.2(24-59)$ to $85.5 \pm 8.4(74 - 98)$ in 9 months. The difference was significant pre-op vs. post-op. The result was similar to other authors [4], [6], [8], [9], [10].

Pre-operatively, no patient had a good or excellent score; 90% had a fair score. Post-op, 46.6% achieved good and excellent scores, and fair scores accounted for 40%.

Autograft and allograft are suitable for graft choice. The advantages of autografts are avoiding taking grafts from patients, reducing surgery time, and being more flexible in choosing graft size. In contrast, the autograft poses some drawbacks, such as high cost, longer healing time, and higher risk of infection if the graft needs to be prepared. On the other hand, allograft is safer and helps shorten graft healing time. Research proved that simultaneous one-stage ACL and PCL reconstruction with allograft is effective, safe, and reduces costs compared to allograft or artificial graft.

Conclusion

A study on patients with ACL and PCL operated a simultaneous arthroscopic anterior cruciate ligament and posterior cruciate ligament reconstruction using hamstring tendon, and peroneus longus autograft provided good results for 34/45 patients. Pre-op and post-up Lysholm and Noyes scores significantly increased. So, we concluded this is a feasible choice for simultaneous ligament tear.

References

1. Wascher D.C., Becker J.R., Dexter J.G., et al. (1999). Reconstruction of the anterior and posterior cruciate ligaments after knee dislocation. Results using fresh-frozen nonirradiated allografts. *Am J Sports Med*, 27(2), 189–196.
2. Fanelli G.C. and Edson C.J. (2002). Arthroscopically assisted combined anterior and posterior cruciate ligament reconstruction in the multiple ligament injured knee: 2- to 10-year follow-up. *Arthrosc J Arthrosc Relat Surg Off Publ Arthrosc Assoc N Am Int Arthrosc Assoc*, 18(7), 703–714.
3. Nguyen Manh Khanh (2015). Arthroscopic surgery simultaneously reconstructs the anterior and posterior cruciate ligaments of the knee joint with autologous Hamstring tendon graft and long lateral peroneal tendon, *Vietnamese medical journal*, 131–134.
4. Duong Dinh Toan (2021). Results of arthroscopic surgery to simultaneously reconstruct the anterior and posterior cruciate ligaments by all-inside technique using autologous semitendinosus and peroneus longus tendon grafts. *Vietnamese medical journal*, 207–210.
5. Tran Hoang Tung., Thuy Dinh Cong., and Hai Vu Minh. (2022). Results of laparoscopic surgery of simultaneous reconstructions of the anterior and posterior crossial lines using allographic long periodontal tendon plaster at Viet Duc hospital. *Vietnamese medical journal*, 521(1).
6. Nguyen Hoang Quan (2015). Evaluation of the results of arthroscopic surgery to simultaneously reconstruct the anterior and posterior cruciate ligaments of the knee joint. *Vietnamese medical journal*, No. 1.
7. Mardani-Kivi M., Karimi-Mobarakeh M., and Hashemi-Motlagh K. (2019). Simultaneous arthroscopic ACL and PCL reconstruction using allograft Achilles tendon. *J Clin Orthop Trauma*, 10(Suppl 1), S218–S221.
8. Gupta R., Singhal A., Kapoor A., et al. (2021). Similar functional outcomes of arthroscopic reconstruction in patients with isolated Posterior Cruciate Ligament (PCL) and combined Anterior Cruciate Ligament (ACL) and PCL tears. *J Clin Orthop Trauma*, 16, 65–69.
9. Strobel M.J., Schulz M.S., Petersen W.J., et al. (2006). Combined anterior cruciate ligament, posterior cruciate ligament, and posterolateral corner reconstruction with autogenous hamstring grafts in chronic instabilities. *Arthrosc J Arthrosc Relat Surg Off Publ Arthrosc Assoc N Am Int Arthrosc Assoc*, 22(2), 182–192.
10. Panigrahi R., Kumari Mahapatra A., Priyadarshi A., et al. (2016). Outcome of Simultaneous Arthroscopic Anterior Cruciate Ligament and Posterior Cruciate Ligament Reconstruction With Hamstring Tendon Autograft: A Multicenter Prospective Study. *Asian J Sports Med*, 7(1), e29287.