

# Preliminary outcomes of arthroscopic anterior cruciate ligament reconstruction using the all-inside technique at Hai Phong University Of Medicine Hospital

Pham Tam Long<sup>1\*</sup>, Trinh Dinh Thanh<sup>1</sup>, Phan Van Tuan<sup>1</sup>, Duong Van Manh<sup>2</sup>

## ABSTRACT

**Objective:** To evaluate the preliminary outcomes of arthroscopic anterior cruciate ligament (ACL) reconstruction at the Department of Surgery – Hai Phong University of Medicine Hospital from October 2023 to August 2024. **Methods:** A retrospective descriptive study involving 12 patients who underwent arthroscopic anterior cruciate ligament reconstruction at the Department of Surgery, Hai Phong University of Medicine Hospital, from October 2023 to August 2024. **Results:** The mean age of the study population was  $23.03 \pm 8.28$  years (range: 18–39 years). Five patients had concomitant meniscal tears. The average graft diameter was  $8.22 \pm 0.64$  mm (range: 7–9.5 mm), and the average graft length was  $61 \pm 1.2$  mm (range: 60–65 mm). Knee function, assessed using the Lysholm score, improved from  $51.61 \pm 8.27$  preoperatively to  $83.38 \pm 4.78$  at three months postoperatively. **Conclusion:** Arthroscopic anterior cruciate ligament reconstruction at Hai Phong University of Medicine Hospital has shown promising initial outcomes.

**Keywords:** anterior cruciate ligament, knee arthroscopy, All-Inside

<sup>1</sup> Hai Phong University of Medicine and Pharmacy, Vietnam.

<sup>2</sup> Hai Phong University of Medicine Hospital

\* Corresponding author

Pham Tam Long

Email: [ptlong@hpmu.edu.vn](mailto:ptlong@hpmu.edu.vn)

Received: November 8, 2024

Reviewed: November 13, 2024

Accepted: December 16, 2024

## INTRODUCTION

The knee joint is one of the primary load-bearing joints of the body, featuring a complex, unique, and stable structure. Among the components that ensure knee joint stability, the anterior cruciate ligament (ACL) plays a crucial role in preventing anterior translation and internal rotation of the tibia relative to the femur. ACL rupture is a common injury, particularly in young athletes, often resulting from closed knee trauma. When the ACL is torn, knee instability occurs, leading to difficulties in movement and secondary injuries such as meniscal tears, ligament laxity, capsular damage, and early osteoarthritis. In such cases, ACL reconstruction surgery is essential to restore knee stability, regain

normal joint function, and preserve its range of motion.

With advancements in arthroscopic surgery and an improved understanding of ACL anatomy and physiology, innovations in tunnel drilling techniques, graft materials, and fixation devices have significantly enhanced surgical outcomes. Compared to older ACL reconstruction techniques, such as outside-in drilling—where tunnel length is harder to control—or the use of patellar tendon grafts, which can lead to postoperative extensor weakness and increased pain due to larger incisions, the All-Inside technique using hamstring tendon grafts has demonstrated clear advantages.

This technique allows for increased graft diameter without requiring excessive length, unlike traditional full tunnel drilling

methods. Surgeons can precisely control the femoral and tibial tunnel lengths to match the graft size, preventing excessive cortical bone removal and allowing for quicker bone ingrowth. Additionally, graft fixation is achieved using adjustable-loop cortical suspension buttons, ensuring strong biomechanical stability. As a result, this technique provides superior knee stability and leads to high rates of good to excellent functional recovery.

Currently, the All-Inside ACL reconstruction technique has been implemented at major orthopedic trauma centers in Vietnam, such as Viet Duc Friendship Hospital, 108 Military Central Hospital, and Ho Chi Minh City University of Medicine and Pharmacy Hospital. At Hai Phong University of Medicine and Pharmacy Hospital, we began performing this technique in October 2023. To assess the initial treatment outcomes during the early phase of implementation, we conducted this study: "Preliminary Outcomes of Arthroscopic Anterior Cruciate Ligament Reconstruction Using the All-Inside Technique at Hai Phong University of Medicine Hospital."

## METHOD

### Subjects, Location, and Study Period

The study included 12 patients who met the following *inclusion criteria*:

Age: 18 years or older

Clinical examination: Positive Lachman test, anterior drawer test, and pivot shift test

MRI findings: Confirmed anterior cruciate ligament rupture

Surgical technique: Underwent ACL reconstruction using the All-Inside technique

### *Exclusion Criteria:*

Patients with injuries to other knee ligaments, such as: Posterior cruciate ligament, medial collateral ligament, lateral collateral ligament, posterior medial or posterior lateral corner injuries

Patients with associated knee fractures

Patients with ACL avulsion fractures

### Methods

*Study Design:* A retrospective descriptive case series study.

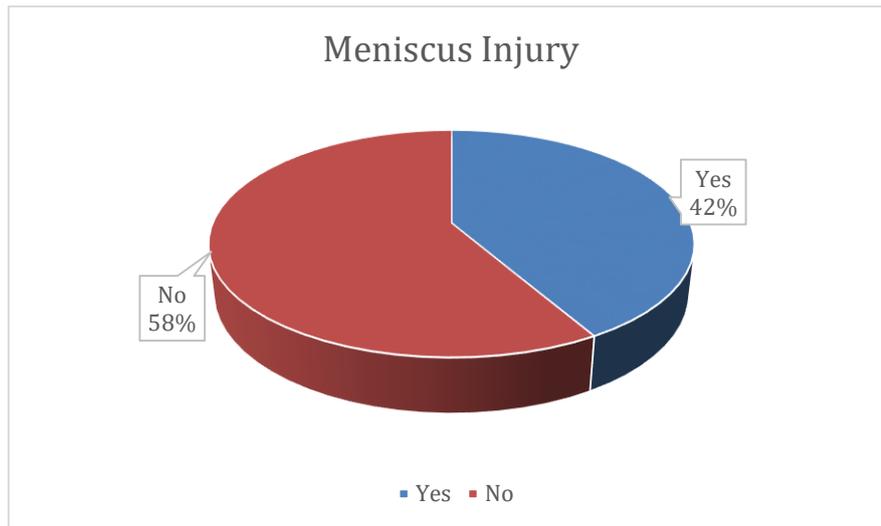
*Sample Size:* A convenience sample of 12 patients meeting the inclusion and exclusion criteria.

*Study Variables:* Mean age, time from injury to surgery, graft diameter and length, bone tunnel dimensions, postoperative pain level, knee flexion and extension range, postoperative knee function.

## RESULTS

*Table 3.1. Mean age*

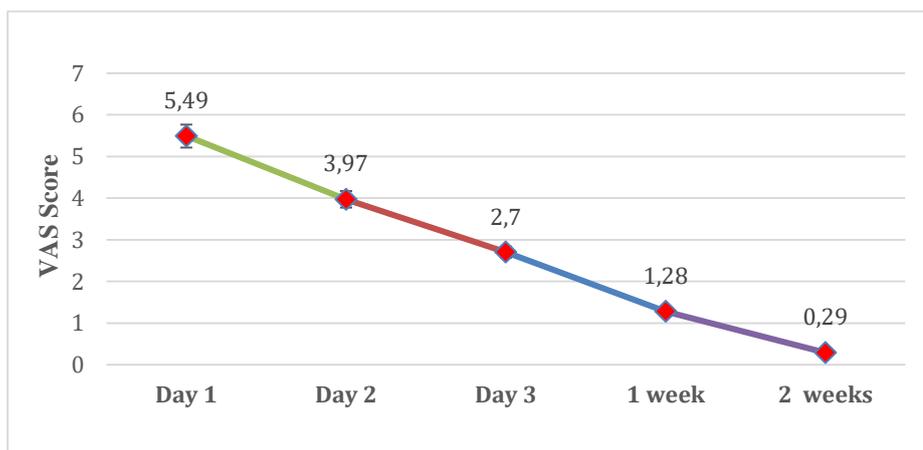
Age	Number of Patients (n=12)	Percentage (%)
18 - 30	7	58,33
31- 40	4	33,33
> 40	1	8,34
<b>Mean age</b>	<b>23,03 ± 8,28 (18 – 39) years old</b>	



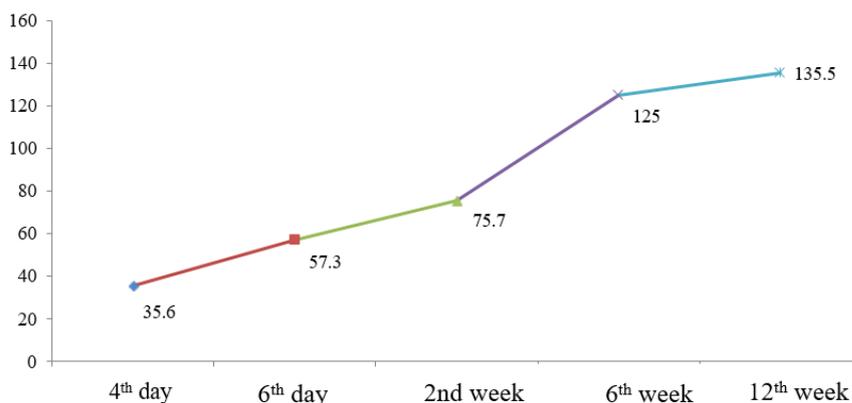
**Figure 3.1.** Associated Meniscal Injuries

**Table 3.2.** Intraoperative Measurements

Parameter	Mean Value
Graft diameter	8,22 ± 0,64 (7 – 9,5) mm
Graft length	61 ± 1,2 (60 – 65) mm
Femoral tunnel length	50, 24 ± 0,22 (44 – 55) mm
Tibial tunnel length	41,63 ± 0,17 (40 – 46) mm



**Figure 3.2.** Changes in Postoperative Pain Levels



**Figure 3.3.** Postoperative Knee Flexion Range

**Table 3.3.** Postoperative Knee Function Outcomes According to Lysholm Score

<i>Time</i>	<i>TB ± SD</i>	<i>Min</i>	<i>Max</i>
<i>Preoperative</i>	<i>51,61 ± 8,27</i>	<i>34</i>	<i>75</i>
<i>3 months posoperative</i>	<i>83,38 ± 4,78</i>	<i>66</i>	<i>91</i>

## DISCUSSION

### General Characteristics

The mean age of our study group was  $23.03 \pm 8.28$  years (range: 18–39 years). The indication for ACL reconstruction is not based on age but rather on the severity of the injury and the patient’s activity demands. Older patients typically have lower activity levels and may also present with knee osteoarthritis, making ACL reconstruction less commonly indicated, especially in individuals over 60 years old. In our study, most cases fell within the 18–30 age group, which aligns with the fact that this age group is highly active, particularly in sports such as football, volleyball, and basketball. In reality, all patients in this age group in our study sustained ACL injuries due to sports-related trauma. Additionally, five patients (42%) had associated meniscal injuries. During surgery,

these patients underwent partial meniscectomy to address the torn meniscus.

### Graft Length and Diameter

The mean graft length was  $61 \pm 1.2$  mm, with the shortest being 60 mm and the longest 65 mm. Compared to other studies, Dương Đình Toàn [2] reported a mean graft length of  $60.5 \pm 3.2$  mm, while Tăng Hà Nam Anh [1] reported  $60.7 \pm 2.04$  mm. Mark Schurz [3] and colleagues, in a study on 92 patients undergoing All-Inside ACL reconstruction, reported a mean graft length of 6.67 cm.

Graft length is crucial in the All-Inside technique. A short graft may not provide sufficient tunnel length for secure fixation and proper graft integration, while an excessively long graft may result in slackness, leading to knee instability and surgical failure.

The mean graft diameter was  $8.22 \pm 0.64$  mm, ranging from 7 mm to 9.5 mm. The most

common graft diameters were 7.5–8.5 mm (78.1%), while 9–9.5 mm accounted for 18.3%. Tãng Hà Nam Anh [1], using the All-Inside technique with semitendinosus and gracilis tendons, reported a mean graft diameter of  $9.4 \pm 1.3$  mm (8–10 mm). Mark Schurz [3] and colleagues reported a quadrupled graft diameter of 7.9 mm.

In the All-Inside technique, the bone tunnels are designed as closed-ended, reducing the need for excessively long grafts. Consequently, a thicker graft can be used, enhancing graft stability and strength.

### **Bone Tunnel Length**

The mean femoral tunnel length through the lateral femoral condyle was  $50.24 \pm 0.22$  mm (range: 44–55 mm), allowing for RetroButton sizes of 20–25 mm. The femoral tunnel was drilled 10 mm away from the cortical bone, ensuring that no patients experienced insufficient tunnel length, which could prevent the button from securing properly outside the femoral cortex.

The remaining graft length was 40–45 mm, while the mean tibial tunnel length was  $41.63 \pm 0.17$  mm (range: 40–46 mm). The tibial socket was created as a closed-ended tunnel with a length of 30–35 mm, positioned at least 10 mm away from the cortical bone.

Based on previous studies [6], [7], the graft length inside the tibial tunnel should be around 15–25 mm. In our study, all patients had sufficient tunnel length, with no need for tunnel redrilling. The grafts were properly tensioned, and their intra-tunnel length was adequate for successful fixation.

### **Postoperative Pain**

Most patients in the study experienced the highest pain levels on the first postoperative day, with a mean VAS score of  $5.49 \pm 0.86$ . The pain gradually decreased over the following days. By postoperative day 3, the mean VAS score was  $2.7 \pm 0.8$ , and patients

only required oral analgesics. By week 2, pain had completely resolved.

We observed that with this technique, postoperative pain was minimal, and pain relief improved significantly after surgery. This allowed early rehabilitation, enabling patients to return to daily activities more quickly.

### **Postoperative Range of Motion**

All patients underwent rehabilitation therapy and were instructed on postoperative exercises. By week 4, most patients achieved knee flexion greater than  $90^\circ$ , and full range of motion was restored within 12 weeks.

In our study, rehabilitation began immediately after surgery with the assistance of the rehabilitation department. Knee flexion exercises were introduced gradually to prevent excessive strain on the graft. Research suggests that rapid and excessive early flexion can lead to graft elongation and knee instability over time [5].

Evaluation of knee function using the Lysholm score showed significant improvement, with a mean preoperative score of  $51.61 \pm 8.27$  and a mean postoperative score of  $83.38 \pm 4.78$  at 3 months.

## **CONCLUSIONS**

Arthroscopic anterior cruciate ligament reconstruction using the All-inside technique is a safe and effective surgical method.

## **REFERENCES**

1. Tãng Hà Nam Anh (2013). "Evaluation of arthroscopic ACL reconstruction using the All-inside technique with hamstring graft." Vietnam Orthopedic Trauma Conference Journal, pp. 109-114.
2. Dương Đình Toàn, Nguyễn Trọng Tài (2021). "Outcomes of ACL reconstruction using the All-inside technique with autologous hamstring graft." Vietnam Medical Journal, 504(2).

3. Schurz, Mark, et al. (2016). "Clinical and Functional Outcome of All-Inside ACL Reconstruction at a Minimum of 2 Years' Follow-up." *Arthroscopy: The Journal of Arthroscopic and Related Surgery*, 32(2), pp. 332-337.
4. Yasen, Sam K, et al. (2017). "Clinical Outcomes of Anatomic, All-Inside ACL Reconstruction." *The Knee*, 24(1), pp. 55-62.
5. Shantanu, Kumar, et al. (2016). "A Comparative Study of the Results of the Anatomic Medial Portal and All-Inside Arthroscopic ACL Reconstruction." *J Clin Diagn Res*, 10(11), p. RC01.
6. Ibtihal Al Kindi, Salim Al Rawahi (2024). "Primary ACL Repair in a Selected Patient Cohort: A Prospective Single Cohort Study." *Journal of Orthopaedics*.
7. Zhongyu Jia, Johannes Greven, Frank Hildebrand, et al. (2024). "Conservative Treatment Versus Surgical Reconstruction for ACL Rupture: A Systematic Review." *Journal of Orthopaedics*, Volume 57, Pages 8-16.