ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

Use of tourniquet in anterior cruciate ligament reconstruction: is truly necessary? A prospective randomized clinical trial

Riccardo D’Ambrosi, MD

Federico Valli, MD

Pietro Marchetti, MD

Faculty Disclosure Information

- The authors declare they have nothing to disclose

Purpose

- The aim of the present study was to examine the effects of tourniquet use in arthroscopic anterior cruciate ligament reconstruction in terms of (1) intraoperative visualization, (2) surgical time, (3) consumption of sterile saline, and (4) postoperative pain.

Methods

- We conducted a prospective, randomized, controlled trial to assess the effect of tourniquet use on patients who were assigned to undergo ACL reconstruction via a 4-strand hamstring autograft. The included subjects were all patients who had undergone unilateral primary ACL reconstruction under subarachnoid anesthesia and who were aged older than 16 years. Patients with bilateral knee injury, other knee ligament injuries (such as anterolateral ligament injury, posterior cruciate ligament, medial collateral ligament, or lateral collateral ligament), or a history of previous knee surgeries were excluded. Concomitant meniscal treatment (meniscectomy or meniscal repair) was not considered an exclusion criterion. Patients with contraindications to tourniquet use or symptomatic peripheral vascular disease were also excluded. Patients with allergies or with systemic disease that presented contraindications to tranexamic acid, mepivacaine or adrenaline were also excluded.

Methods

- Thus, 146 patients were included in the study; 75 patients were randomized to surgery with a tourniquet, and 71 were randomized to surgery without a tourniquet but with a local injection of adrenaline and mepivacaine. All patients provided written informed consent for participation in this study, which was approved by the ethics committee of our hospital.

Methods

- The primary outcomes were intraoperative visualization (divided into 7 different surgical methods: suprapatellar; medial compartment; lateral compartment; central pivot; femoral tunnel; tibial tunnel; and graft passage), with scores ranging from 0 to 10 (0=no visibility; 10=clear and perfect display), surgical time (from the moment of the skin incision to the time of suturing), and the consumption of sterile saline measured in liters. An assessment of visualization was performed during surgery by an assistant who was not involved in the surgery and was not aware of the patient assignment group; furthermore, a second analysis was performed by looking at videos recorded by another assistant.

Methods

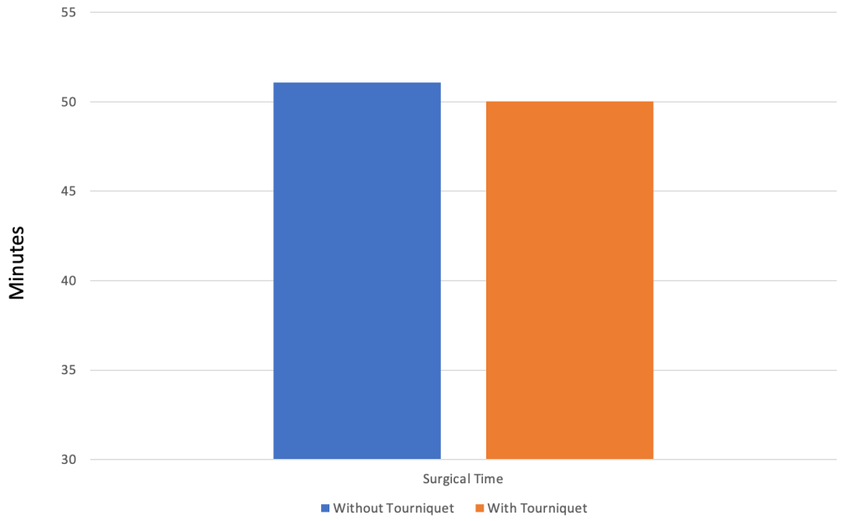
- The secondary aim was to measure postoperative pain (24 hours after surgery) with the visual analog scale (VAS) for pain. ranging from 0 to 10, with greater scores indicating greater pain intensity. A score of 0 indicated no pain; a score of 1 to 3 indicated mild discomfort; a score of 4 to 6 indicated moderate pain; and a score of 7 to 10 indicated severe pain. VAS evaluations were performed by an orthopedic surgeon not involved during surgery

Results

- No difference between the two groups was found in terms of visibility at each stage of arthroscopy, total visibility score, or saline consumption ($p>0.05$)

- Patients without a tourniquet experienced significantly less pain 24 hours after surgery ($p<0.001$).

Results



ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

Discussion

- The most important findings of the present study are that the use of a tourniquet during anterior cruciate ligament reconstruction does not improve intraoperative visibility, does not reduce surgical time or lead to greater pain in the short term after surgery.

Limitations

- Our study had several limitations that should be acknowledged.
- First, this study was a single-institution, randomized controlled trial, and the groups were similar in their baseline characteristics.
- Second, only very short-term follow-up was considered.
- Third, the postoperative development of hemarthrosis is a concern in ACLR but was not evaluated in this study. Fourth, indicators of soft tissue damage were not recorded.

Conclusions

- Tourniquet use during ACL reconstruction does not improve intraoperative visualization and does not reduce surgical time but leads to greater postoperative pain with a risk of well-known tourniquet-related complications.

References

1. Sharma JP, Salhotra R (2012) Tourniquets in orthopedic surgery. Indian J Orthop 46:377-383. https://doi.org/10.4103/0019-5413.98824.
2. Farhan-Alanie MM, Boutefnouchet T (2023) Tourniquet-less arthroscopic anterior cruciate ligament reconstruction: a technical guide & narrative review of the evidence. Acta Orthop Belg. 89:449-453. https://doi.org/10.52628/89.3.11747. PMID: 37935228.
3. Reda W, ElGuindy AMF, Zahry G, Faggal MS, Karim MA (2016) Anterior cruciate ligament reconstruction; is a tourniquet necessary? A randomized controlled trial. Knee Surg Sports Traumatol Arthrosc. 24:2948-2952. https://doi.org/10.1007/s00167-015-3582-z.
4. Arciero RA, Scoville CR, Hayda RA, Snyder RJ (1996) The effect of tourniquet use in anterior cruciate ligament reconstruction. A prospective, randomized study. Am J Sports Med. 24:758-764. https://doi.org/10.1177/036354659602400610.
5. Rorabeck CH, Kennedy JC (1980) Tourniquet-induced nerve ischemia complicating knee ligament surgery. Am J Sports Med. 8:98-102. https://doi.org/10.1177/036354658000800207.
6. Nagashima M, Takeshima K, Origuchi N, Sasaki R, Okada Y, Otani T, Ishii K (2021) Not Using a Tourniquet May Reduce the Incidence of Asymptomatic Deep Venous Thrombosis After ACL Reconstruction: An Observational Study. Orthop J Sports Med. 9:23259671211056677. https://doi.org/10.1177/23259671211056677.
7. Cuschieri S (2019) The CONSORT statement. Saudi J Anaesth. 13:S27-S30. https://doi.org/10.4103/sja.SJA_559_18.
8. D'Ambrosi R, Ursino N, Di Feo F (2023) Quadrupled Semitendinosus Anterior Cruciate Ligament Reconstruction Without the Use of Tourniquet and Minimal Instrumentation: The "Double D" Technique. Arthrosc Tech. 12:e1589-e1593. https://doi.org/10.1016/j.eats.2023.05.008.
9. van Melick N, van Cingel RE, Brooijmans F, Neeter C, van Tienen T, Hullegie W, Nijhuis-van der Sanden MW (2016) Evidence-based clinical practice update: practice guidelines for anterior cruciate ligament rehabilitation based on a systematic review and multidisciplinary consensus. Br J Sports Med. 50:1506-1515. https://doi.org/10.1136/bjsports-2015-095898.
10. Heller GZ, Manuguerra M, Chow R (2016) How to analyze the Visual Analogue Scale: Myths, truths and clinical relevance. Scand J Pain. 13:67-75. https://doi.org/10.1016/j.sjpain.2016.06.012.
11. Zaid HHG, Hua X, Chen B, Yang Q, Yang G, Cheng W (2023) Tourniquet Use Improves Intraoperative Parameters, Leading to Similar Postoperative Outcomes Compared With No Tourniquet Use in Anterior Cruciate Ligament Reconstruction: A Prospective, Double-Blind, Randomized Clinical Trial. Arthroscopy. 39:626-637.e3. https://doi.org/10.1016/j.arthro.2022.10.033.
12. Nagashima M, Sasaki R, Tanaka K, Takeshima K (2023) The use of tourniquet is useful in terms of blood loss and soft tissue damage in arthroscopic anterior cruciate ligament reconstruction: a retrospective study. Sci Rep. 13:17798. https://doi.org/10.1038/s41598-023-45159-3.
13. Hao N, Cui M, Shi Y, Liu Z, Li X, Chen Y, Zhao G (2022) Measurement of tissue oxygen saturation during arthroscopic surgery of knee with a tourniquet. J Orthop Surg Res. 17:532. https://doi.org/10.1186/s13018-022-03431-8.
14. Ekdahl V, Stålman A, Forssblad M, Samuelsson K, Edman G, Kraus Schmitz J (2020) There is no general use of thromboprophylaxis and prolonged antibiotic prophylaxis in anterior cruciate ligament reconstruction: a nation-wide survey of ACL surgeons in Sweden. Knee Surg Sports Traumatol Arthrosc. 28:2535-2542. https://doi.org/10.1007/s00167-020-05851-7.
15. Struijk-Mulder MC, Ettema HB, Verheyen CC, Büller HR (2013) Deep vein thrombosis after arthroscopic anterior cruciate ligament reconstruction: a prospective cohort study of 100 patients. Arthroscopy. 29:1211-1216. https://doi.org/10.1016/j.arthro.2013.04.015.
16. Sun Y, Chen D, Xu Z, Shi D, Dai J, Qin J, Jiang Q (2014) Incidence of symptomatic and asymptomatic venous thromboembolism after elective knee arthroscopic surgery: a retrospective study with routinely applied venography. Arthroscopy. 3:818-822. https://doi.org/10.1016/j.arthro.2014.02.043.
17. Joo YB, Kim YM, Song JH, An BK, Kim YK, Kwon ST (2022) The incidence of deep vein thrombosis after anterior cruciate ligament reconstruction: An analysis using routine ultrasonography of 260 patients. PLoS One. 17:e0279136. https://doi.org/10.1371/journal.pone.0279136.
18. Beynnon BD, Pius AK, Tourville TW, Endres NK, Failla MJ, Choquette RH, DeSarno M, Toth MJ (2022) The Duration of Thigh Tourniquet Use Associated With Anterior Cruciate Ligament Reconstruction Does Not Produce Cellular-Level Contractile Dysfunction of the Quadriceps Muscle at 3 Weeks After Surgery. Am J Sports Med. 50:2925-2934. https://doi.org/10.1177/03635465221115823.
19. Na Y, Jia Y, Shi Y, Liu W, Han C, Hua Y (2022) Administration of Tranexamic Acid to Reduce Intra-articular Hemarthrosis in ACL Reconstruction: A Systematic Review. Orthop J Sports Med. 10:23259671211061726. https://doi.org/10.1177/23259671211061726.
20. Alkhatib N, AlNouri M, Abdullah ASA, Ahmad Alzobi OZ, Alkaramany E, Sasaki E, Ishibashi Y (2022) Tranexamic Acid Use in Anterior Cruciate Ligament Reconstruction Decreases Bleeding Complications: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Arthroscopy. 38:506-518.e6. https://doi.org/10.1016/j.arthro.2021.07.030.
21. Çağlar C, Akçaalan S, Akçaalan Y, Akcan G, Tufan AC, Akkaya M, Doğan M (2024) Tranexamic acid administered intraarticularly to the knee is safer for the articular cartilage and anterior cruciate ligament compared to intravenous administration: Histological analysis of an experimental rat model. Naunyn Schmiedebergs Arch Pharmacol. 397:1045-1051. https://doi.org/10.1007/s00210-023-02666-4.
22. Convery PN, Milligan KR, Quinn P, Sjövall J, Gustafsson U (2001) Efficacy and uptake of ropivacaine and bupivacaine after single intra-articular injection in the knee joint. Br J Anaesth. 87:570-576. https://doi.org/10.1093/bja/87.4.570.
23. Buchko JZ, Gurney-Dunlop T, Shin JJ (2015) Knee chondrolysis by infusion of bupivacaine with epinephrine through an intra-articular pain pump catheter after arthroscopic ACL reconstruction. Am J Sports Med. 43:337-344. https://doi.org/10.1177/0363546514555667.
24. Ravnihar K, Marš T, Pirkmajer S, Alibegović A, Koželj G, Stožer A, Drobnič M (2021) The Influence of a Single Intra-Articular Lidocaine Injection on the Viability of Articular Cartilage in the Knee. Cartilage. 13:456S-463S. https://doi.org/10.1177/1947603520904759.
25. Davis-Wilson HC, Thoma LM, Longobardi L, Franz JR, Blackburn JT, Hackney AC, Pietrosimone B (2022) Association of Quality of Life With Moderate-to-Vigorous Physical Activity After Anterior Cruciate Ligament Reconstruction. J Athl Train. 57:532-539. https://doi.org/10.4085/1062-6050-0670.20