

Editorial Commentary: Suspensory Fixation of Displaced Tibial Posterior Cruciate Ligament Avulsions: A Novel Application of a Familiar Technique

Joshua S. Everhart M.D., M.P.H. (Editorial Board), Robert G. Klitzman M.D.

<https://doi.org/10.1016/j.arthro.2021.03.039>

Abstract: Isolated tibial posterior cruciate ligament avulsion fractures, although rare, are becoming increasingly common in regions of the world with frequent 2-wheel motor vehicle accidents.

Arthroscopic-assisted suture fixation has become a popular fixation method for these injuries. Suspensory metal button fixation of tibial posterior cruciate ligament avulsion fractures, although commonly used for other applications, has until recently been limited to isolated reports of a few patients.

Incremental advances in surgical techniques often require adequate case volume. Surgeons can adapt to meet the technical circumstances of a rare injury, but repetition and reportable data are needed to allow other providers to learn from one's previous experience and to replicate results. Isolated high-grade posterior cruciate ligament (PCL) injuries are, depending on the region, typically less common than anterior cruciate ligament injuries, and PCL tibial avulsion fractures are rarer still.¹ Tibial PCL avulsions have a tendency to further displace due to the continued pull of the PCL, which can lead to soft-tissue entrapment in the fracture site, nonunion, and clinically important chronic instability.¹

In our practice in the Midwestern United States at a hospital system with 2 busy level 1 trauma centers, the vast majority of high-grade PCL injuries we encounter have no bony avulsion and are a component of a multiligament injury due to athletic trauma, high-speed car accidents, or low-energy trauma in adults with morbid obesity. However, in some regions of the world with heavy use of 2-wheeled motorized

This is the author's manuscript of the work published in final form as:

Everhart, J. S., & Klitzman, R. G. (2021). Editorial Commentary: Suspensory Fixation of Displaced Tibial Posterior Cruciate Ligament Avulsions: A Novel Application of a Familiar Technique. *Arthroscopy: The Journal of Arthroscopic & Related Surgery*, 37(6), 1881–1882.
<https://doi.org/10.1016/j.arthro.2021.03.039>

vehicles for transportation, tibial PCL avulsion fractures are becoming increasingly common.^{2,3} Collision with an object resulting in a dashboard injury or any traffic accident resulting in a kneeling injury on the ground are typical mechanisms.⁴ There are urban centers in South Korea and China that treat a relatively high volume of isolated high-grade PCL injuries (including tibial PCL avulsions) with correspondingly a high output of isolated PCL surgical outcome studies in the past decade.⁵

The hospital center represented in the article “Arthroscopic Treatment of a Tibial Avulsion Fracture of the Posterior Cruciate Ligament With the Use of a Suspensory Device”⁶ by Zheng, Hou, Zhang, Li, Zhou, Li, and Pan is based in Xuzhou, a large city in Eastern China. The treating surgeon (Dr. Zheng) had sufficient PCL injury volume to identify and treat a cohort of 35 displaced PCL tibial avulsions with a novel suspensory fixation technique over a period of roughly 5 years. Excluding 2 multiligament knee injuries and 3 patients lost to follow-up (9% loss to follow-up), the authors present promising outcome data on a homogenous group of patients. Arthroscopic-assisted suture fixation of tibial PCL avulsions allows surgeons to avoid the open posterior approach needed for open reduction and internal fixation, but previous reports of suspensory fixation have been limited to very small samples sizes of 2 to 4 patients.^{7, 8, 9}

The technique and rehabilitation protocol are well-described by Zheng et al. In our opinion, the accompanying figures and written description are adequate to reproduce this technique. A key aspect of this technique is use of the metal button on the posterior surface of the avulsed tibial fragment to increase the surface area of fixation, as a low surface area can theoretically increase the risk of pull-out or fragmentation of the avulsion fragment. With the knee flexed to 70 to 90° and with application of an anterior drawer force, the button is secured by a high tensile strength suture through a bone tunnel to the anteromedial tibia with an interference screw and, if needed, a supplementary staple. Passive range of motion in a hinged knee brace was incrementally increased over the first 8 postoperative weeks, and patients were non-weight-bearing for the first 6 postoperative weeks.

Clinical outcomes in the study by Zheng et al. were excellent. The patients had profound preoperative functional limitations, with a mean preoperative International Knee Documentation Committee subjective score of 17.5 (the highest was 25.2). At mean 32 months' (minimum 24 months) follow-up, the mean International Knee Documentation Committee subjective score was 96.8 (the lowest was 87.3), and there were no issues with fragmentation of the tibial avulsion or fixation failure in all 30 patients with follow-up. In summary, the data provided by Zheng et al. provide a strong argument for the use of a suspensory fixation technique in the increasingly less rare tibial PCL avulsion injury variant.

References

1. Katsman A, Strauss EJ, Campbell KA, Alaia MJ. Posterior cruciate ligament avulsion fractures. *Curr Rev Musculoskelet Med* 2018;11:503-509.
2. Chen LB, Wang H, Tie K, Mohammed A, Qi YJ. Arthroscopic fixation of an avulsion fracture of the tibia involving the posterior cruciate ligament: A modified technique in a series of 22 cases. *Bone Joint J* 2015;97-B: 1220-1225.
3. Hooper PO, Silko C, Malcolm TL, Farrow LD. Management of posterior cruciate ligament tibial avulsion injuries: A systematic review. *Am J Sports Med* 2018;46:734-742.
4. Song JG, Nha KW, Lee SW. Open posterior approach versus arthroscopic suture fixation for displaced posterior cruciate ligament avulsion fractures: Systematic review. *Knee Surg Relat Res* 2018;30:275-283.
5. Rhatomy S, Utomo DN, Suroto H, Mahyudin F. Publication trends on the posterior cruciate ligament over the past 10 years in PubMed: Review article. *Ann Med Surg (Lond)* 2020;55:195-199.
6. Zheng W, Hou W, Zhang Z, Li P, Zhou B, Li H, Pan B. Arthroscopic treatment of a tibial avulsion fracture of the posterior cruciate ligament with the use of a suspensory device. *Arthroscopy* 2021;37:1872-1880.
7. Wajsfisz A, Makridis KG, Van Den Steene JY, Djian P. Fixation of posterior cruciate ligament avulsion fracture with the use of a suspensory fixation. *Knee Surg Sports Traumatol Arthrosc* 2012;20:996-999.
8. Gwinner C, Hoburg A, Wilde S, Schatka I, Krapohl BD, Jung TM. All-arthroscopic treatment of tibial avulsion fractures of the posterior cruciate ligament. *GMS Interdiscip Plast Reconstr Surg DGPW* 2016;5:Doc02.
9. Han F, Pearce CJ, Lee BCS. Short-term clinical outcomes of arthroscopic fixation of displaced posterior cruciate ligament avulsion fractures with the use of an adjustable loop suspensory device. *J Orthop Surg (Hong Kong)* 2019;27: 2309499019849745.