Iatrogenic Transection of the Peroneal and Partial Transection of the Tibial Nerve During Arthroscopic Lateral Meniscal Debridement and Removal of Osteochondral Fragment

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Abstract

Knee arthroscopy is a common orthopedic procedure that is generally considered relatively safe, with overall complication rates reported between 1% and 8%. Approximately 0.01% to 0.06% of these complications involve neurovascular structures.

While peroneal nerve and tibial artery complications are well reported, to our knowledge, injury to the tibial nerve has not been reported. We report a case of injury to the tibial and peroneal nerves during routine meniscal debridement and osteochondral fragment removal in a 17-year-old high school athlete. The likely mechanism of injury was violation of the posterolateral corner by powered arthroscopic instrumentation during the attempt at removal of the loose body. The peroneal nerve was repaired with an interpositional sural nerve graft. Management of these injuries should consist of following patients closely with electromyograms and nerve exploration and repair in those cases that do not show interval improvement. Clinicians should exercise extreme care while using powered instruments in the posterolateral corner.

Knee arthroscopy is a common orthopedic procedure that provides a minimally invasive option for the diagnosis and treatment of intra-articular pathology. It is considered a relatively safe procedure with overall complication rates reported between 1% and 8%.[1-4] Neurovascular complications are rare and represent approximately 0.01% to 0.06% of complications of knee arthroscopy.[2-4]

Peroneal nerve injury during knee arthroscopy due to direct injury from arthroscopic instruments has been ascribed to various mechanisms including needle puncture during meniscal repair,[5] placement of a posterolateral portal,[6,7] entrapment by meniscal sutures,[8,9] and disruption by arthroscopic instruments that had penetrated the posterior capsule.[6] The trauma usually occurs in the lateral aspect of the knee where the nerve crosses the fibular neck, and rarely is the peroneal nerve injured where it is contiguous with the tibial nerve as the distal portion of the sciatic nerve. Injury to both the tibial and peroneal nerves in the popliteal fossa as a result of direct trauma is exceedingly rare and has not been reported to our knowledge.

The purpose of this case report is to describe an injury to the peroneal and tibial nerve from arthroscopic instrumentation as well as to discuss its management and prevention. The patient provided written informed consent for print and electronic publication of this case report.

Case Report

A 17-year-old high school athlete sustained a right knee injury during a weight-lifting session. He was evaluated at an outside institution and diagnosed with a posterolateral femoral condyle osteochondral injury as well as a lateral meniscal tear based on clinical examination and magnetic resonance imaging (MRI) evaluation (**Figure 1**).

Knee arthroscopy performed several weeks after the injury confirmed the diagnosis of a lateral meniscus tear with an osteochondral injury and loose fragment in the lateral compartment of the knee (**Figure 2**). Through an anteromedial and anterolateral peripatellar portal, a full radius shaver was used to debride the lateral meniscus to a stable rim and a single loose body (approximately 1 mm x 10 mm x 5 mm) was removed. Tourniquet time for the procedure was 119 minutes. Following surgery, the patient awoke with severe dysesthetic pain and right-sided foot drop as well as paresthesias of the dorsal foot and the lateral leg. He was diagnosed with a neuropraxia of the peroneal nerve secondary to fluid extravasation or positioning of the knee during surgery, and a period of

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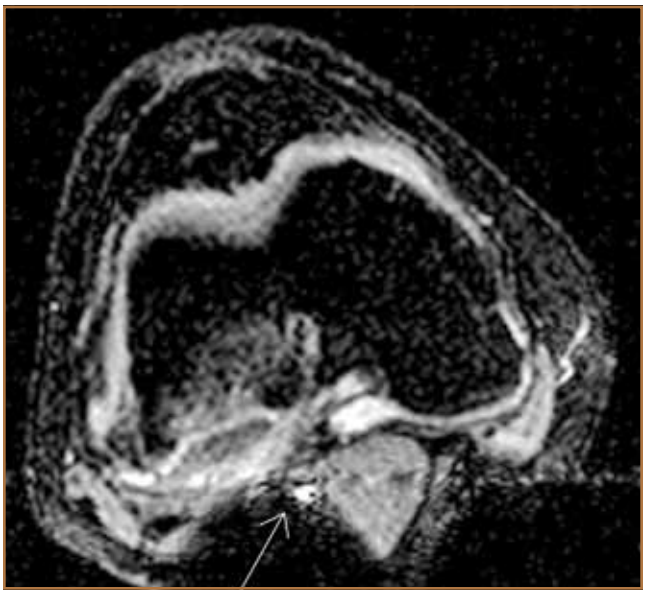

Figure 1. Axial MRI demonstrating the osteochondral fragment and its relationship to the sciatic nerve (arrow).

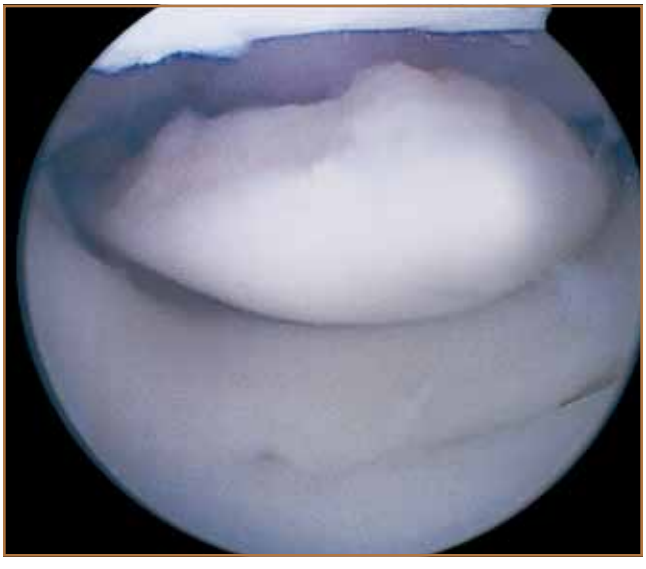

Figure 2. Arthroscopic pictures demonstrating the large osteochondral fragment.

observation was recommended. After 2 months of observation, there was no return of peroneal motor function or sensation. An electrodiagnostic study was performed that demonstrated no peroneal motor response and was consistent with a severe peroneal nerve dysfunction. He was subsequently referred to our institution 4 months after the arthroscopy.

Our clinical examination at that time found no peroneal nerve function and limited tibial nerve function. We did, however, observe a Tinel's sign for the peroneal nerve posteriorly, just above the popliteal fossa, and a Tinel's sign for the tibial nerve in the popliteal crease. The patient had 0/5 motor

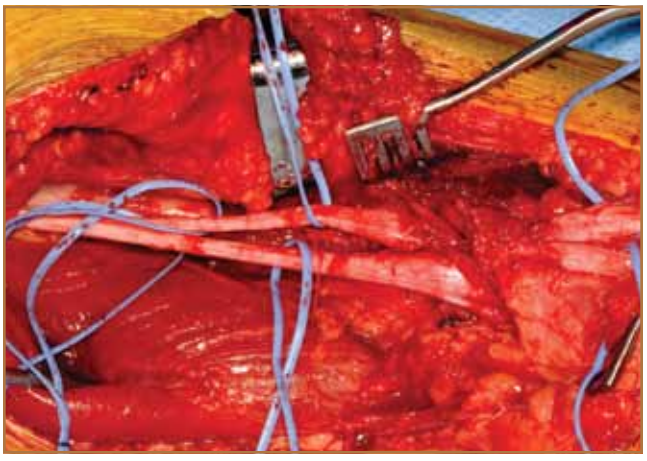

Figure 3. Intraoperative photograph of the posterior approach at the popliteal fossa demonstrating the injured peroneal and tibial components of the sciatic nerve (distal is to the left, proximal to the right. The peroneal nerve is superior to the tibial nerve, distally the deep and superficial peroneal nerves can be seen).

strength (British Medical Research Council Grading, BMRC) in the tibialis anterior and peroneal muscles. His gastrocnemius soleus complex was 3/5 motor strength. He had dense sensory loss on the dorsum and dorsal medial aspect of the foot but showed no signs of vascular compromise.

An electromyography (EMG) at our institution demonstrated absent right peroneal motor and sensory response and reduced right tibial motor response consistent with a distal, right sciatic neuropathy with a complete lesion of the peroneal division and partial injury to the tibial division. These findings were consistent with a complex injury of the distal sciatic nerve at or above the popliteal fossa with complete division of the peroneal nerve and partial injury to the tibial nerve.

Surgical exploration through a posterior popliteal approach revealed a complete transection of the peroneal nerve and a partial transection of the tibial nerve at the level of the distal sciatic nerve (**Figure 3**). The peroneal and tibial nerves were injured over a 3-cm to 5-cm segment proximal to the joint line. In the immediate vicinity of the lesion, there was a 2-cm to 3-cm osteochondral fragment encased in dense scar (**Figure 4**). The lateral sural nerve was also injured and a neuroma in continuity was found at the level of the osteochondral fragment.

Our team resected the entire bony fragment and decompressed the common peroneal nerve at the level of the fibular neck. We resected the proximal and distal stumps of peroneal nerve until good fascicular detail was observed and a 5 strand 7.5 cm sural nerve cable graft (harvested from the same leg) was sutured in place using 8-0 nylon to bridge the peroneal nerve defect (**Figure 5**).

Postoperatively the knee was immobilized in extension for 3 weeks followed by physical therapy for restoration of range of motion. Twenty three months post surgery the patient demonstrated reinnervation of the tibialis anterior (4-/5), peronei (1-2/5), and posterior tibialis (1/5) on examination and EMG.

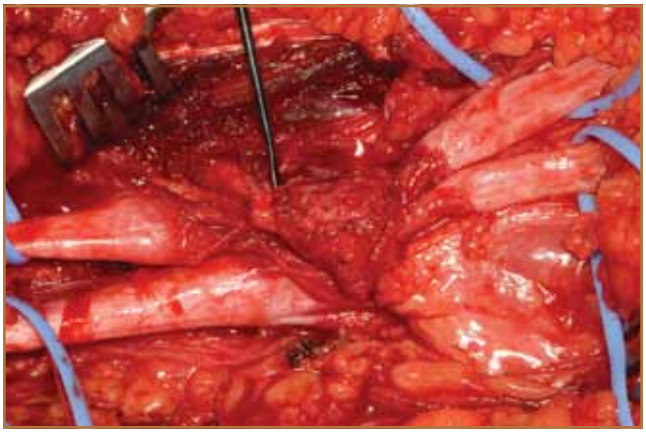

Figure 4. The osteochondral fragment is encased in scar at the level of the nerve injury.

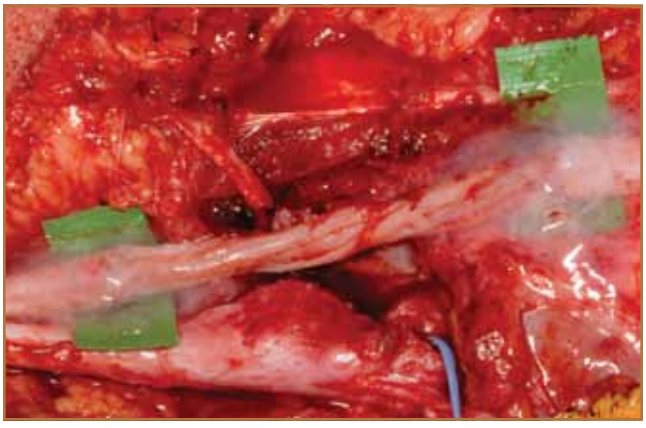

Figure 5. Sural cable bridging peroneal nerve defect.

He continues to wear an ankle foot orthosis, although he occasionally forgoes this, and remains active in sporting activities. He will continue to be evaluated periodically over the next several years with EMG and clinical examinations.

Discussion

Several large series exist in the literature tabulating nerve complications after knee arthroscopy. DeLee[2] reviewed 118,850 knee arthroscopies and found 63 nerve injuries (25 peroneal, 23 saphenous, 7 femoral, 4 tibial, and 4 sciatic). Small[4] reported a retrospective review of 375,069 knee arthroscopies that produced 121 nerve injuries (97 saphenous, 11 peroneal, 7 femoral, and 6 sciatic), and a prospective study of 8,791 knee arthroscopies that resulted in only 1 saphenous nerve injury. Small[3] attributed the low incidence in the second series to increased surgeon experience in this group along with improved techniques. Sherman and colleagues[10] reported 15 cases of hyperesthesias/paresthesias of the saphenous nerve in 2,640 knee arthroscopies.

Recognizing that nerve injuries secondary to arthroscopic knee surgeries are extremely rare, it is important to carefully evaluate the cases in which nerve injuries do occur. To our knowledge, no cases of surgical trauma to the tibial nerve due to knee arthroscopy have been reported. However, 2 cases of popliteal artery trauma during arthroscopic meniscectomy are in the literature. Both injuries were due to powered suction instruments in the posterior lateral knee joint during routine meniscectomies. The tibial nerve traverses the popliteal fossa in proximity to the popliteal artery and is theoretically at risk from penetration of the capsule by powered arthroscopic instruments.[11,12]

A literature search revealed only 3 case reports analyzing direct trauma to the peroneal nerve due to arthroscopic instruments. Two of these were felt to be due to violation of the posterior capsule by motorized instrumentation[6,13] and 1 was due to injury from a posterolateral trochar during an inside-out meniscal repair.[14] The authors advised caution in the use of motorized instruments in the posterolateral aspect of the knee and recommended that instruments should be withdrawn before movements of the joint.[6,13] In the third case, the authors felt the peroneal nerve was in an anomalous position making it vulnerable to damage.

Repair techniques reported for peroneal injuries due to arthroscopic injury are variable. Two patients underwent neuroma resection and sural nerve grafting,[6,13] 1 bypass sural nerve graft[15] and 1 neuroma resection and primary repair.[14] One of the patients that underwent sural nerve grafting regained tibialis anterior function and extensor digitorum longus function after 16 months of follow-up, and the other did not regain function. Follow-up was not provided for the primary nerve repair or the sural nerve bypass.

The current body of literature on closed peripheral nerve injury suggests that waiting for recovery for up to 6 months with close clinical and EMG follow-up is appropriate in cases where some recovery is expected.[5,16,17] However, in cases where no recovery has occurred by 4 to 6 months, surgical intervention is recommended. Kim and colleagues[18] report 75% return of grade 3 function after a nerve graft of 6 cm or less for peroneal laceration. Care must be taken as subtle signs of recovery may not indicate an eventual return of useful function, and waiting for longer periods can degrade outcomes due to the irreversible motor endplate degeneration that occurs with motor nerve injury. We recommend physical therapy during the interim to prevent muscle contractures.[5,16,17]

Injury to the distal sciatic nerve (peroneal and tibial nerves) during arthroscopy is extremely uncommon. In the evaluation of the mechanism of injury for our patient, we can only postulate what occurred. The altered anatomy secondary to the osteochondral fragment may have brought the posterior capsule more anterior, tethering the nerves and exposing them to injury. It is also apparent on the preoperative MRI that there was damage to the posterior capsule in the posterolateral corner that may have allowed powered instruments to violate the capsule more easily.

Conclusion

This case serves to highlight the importance of understanding both neural anatomy and knee anatomy during arthroscopy.

The surgeon must realize that distortions of anatomy may place surrounding structures at risk during routine arthroscopic procedures. Excellent visualization should be obtained prior to the use of motorized instruments during arthroscopy, especially in the posterolateral corner. In this case, use of a posterolateral portal may have improved visualization and prevented this complication.

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References

1. Collins JJ. Knee-joint arthroscopy--early complications. *Med J Aust*. 1989;150(12):702-703, 706.
2. DeLee JC. Complications of arthroscopy and arthroscopic surgery: results of a national survey. Committee on Complications of Arthroscopy Association of North America. *Arthroscopy*. 1985;1(4):214-220.
3. Small NC. Complications in arthroscopic surgery performed by experienced arthroscopists. *Arthroscopy*. 1988;4(3):215-221.
4. Small NC. Complications in arthroscopy: the knee and other joints. Committee on Complications of the Arthroscopy Association of North America. *Arthroscopy*. 1986;2(4):253-258.
5. Spinner RJ, Kline DG. Surgery for peripheral nerve and brachial plexus injuries or other nerve lesions. *Muscle Nerve*. 2000;23(5):680-695.
6. Rodeo SA, Sobel M, Weiland AJ. Deep peroneal-nerve injury as a result of arthroscopic meniscectomy. A case report and review of the literature. *J Bone Joint Surg Am*. 1993;75(8):1221-1224.
7. Rodeo SA, Forster RA, Weiland AJ. Neurological complications due to arthroscopy. *J Bone Joint Surg Am*. 1993;75(6):917-926.
8. Jurist KA, Greene PW 3rd, Shirkhoda A. Peroneal nerve dysfunction as a complication of lateral meniscus repair: a case report and anatomic dissection. *Arthroscopy*. 1989;5(2):141-147.
9. Miller DB Jr. Arthroscopic meniscus repair. *Am J Sports Med*. 1988;16(4):315-320.
10. Sherman OH, Fox JM, Snyder SJ, et al. Arthroscopy--"no-problem surgery." An analysis of complications in two thousand six hundred and forty cases. *J Bone Joint Surg Am*. 1986;68(2):256-265.
11. Bernard M, Grothues-Spork M, Georgoulis A, Hertel P. Neural and vascular complications of arthroscopic meniscal surgery. *Knee Surg Sports Traumatol Arthrosc*. 1994;2(1):14-18.
12. Jeffries JT, Gainor BJ, Allen WC, Cikrit D. Injury to the popliteal artery as a complication of arthroscopic surgery. A report of two cases. *J Bone Joint Surg Am*. 1987;69(5):783-785.
13. Peicha G, Pascher A, Schwarzl F, Pierer G, Fellinger M, Passler JM. Transsection of the peroneal nerve complicating knee arthroscopy: case report and cadaver study. *Arthroscopy*. 1998;14(2):221-223.
14. Krivić A, Stanec S, Zic R, Budi S, Milanović R, Stanec Z. Lesion of the common peroneal nerve during arthroscopy. *Arthroscopy*. 2003;19(9):1015-1018.
15. Kasabian A, Karp N, Margiotta M. Treatment of a neuroma-in-continuity of the peroneal nerve with nerve bypass grafts--a case report. *Ann Plast Surg*. 1999;42(4):449-451.
16. Kim DH, Kline DG. Management and results of peroneal nerve lesions. *Neurosurgery*. 1996;39(2):312-319.
17. Shin AY, Spinner RJ, Steinmann SP, Bishop AT. Adult traumatic brachial plexus injuries. *J Am Acad Orthop Surg*. 2005;13(6):382-396.
18. Kim DH, Murovic JA, Tiel RL, Kline DG. Management and outcomes in 318 operative common peroneal nerve lesions at the Louisiana State University Health Sciences Center. *Neurosurgery*. 2004;54(6):1421-1428.