Superficial Peroneal Nerve (Superficial Fibularis Nerve): The Clinical Implications of Anatomic Variability

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The purpose of this study is to refine further the knowledge about the anatomic variability of the superficial peroneal nerve in the middle third of the leg. Approaching the superficial peroneal nerve in this location is required: 1) when either the deep or the superficial peroneal nerve must be resected for the treatment of dorsal foot pain; 2) when a neurolysis of the superficial peroneal nerve is required; 3) when a fasciotomy must be performed either for trauma or for exertional compartment syndrome surgery; and 4) during elevation of a fasciocutaneous or fibular flaps. Because of the variability encountered during these procedures, a prospective study was carried out via lower extremity cadaver dissection with fresh, frozen specimens. A total of 35 nonpaired lower extremities and 40 paired lower extremities were dissected with 3.5X loupe magnification. The superficial peroneal nerve was identified in the lateral compartment immediately adjacent to the fascial septum in 72% of the specimens (54 of 75), with a branch in both the anterior and the lateral compartment in 5% of the specimens (4 of 75), and located in the anterior compartment in only 23% of the specimens (17 of 75). The clinical implications of these anatomic findings are that the surgeon operating in the anterior and lateral compartments of the leg should be aware that the superficial peroneal nerve may be located in the lateral compartment and may also exhibit branches in both the anterior and lateral compartments. (The Journal of Foot & Ankle Surgery 45(3):174–176, 2006)

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Despite significant prior surgical success with the approach of treating dorsal cutaneous neuromas of the superficial and deep peroneal nerves by “translocating” them into the anterior or lateral compartments of the leg (1), there remains a subset of patients who continue to have significant pain and sensibility over the dorsum of the foot, regardless of resecting the superficial peroneal nerve in the lower one third of the leg. Preoperatively, nerve blocks at the ankle level abolish their pain and sensibility, suggesting that perhaps another pathway for the innervation of their painful skin territory exists. Our subsequent surgical procedures on these patients (Fig 1) demonstrated that there was a branch of the superficial peroneal nerve in the anterior compartment, or in both the anterior and the lateral compartments. A review of the literature identified a single publication in 1991 that evaluated 85 legs in 44 cadavers with regard to the superficial peroneal nerve (2). Those authors found that the nerve was within the lateral compartment in only 73% of specimens, with a branch in the anterior and lateral compartments in 14%, and in the anterior compartment in only 12%. In 1 specimen, the superficial peroneal nerve was never found beneath the fascia in the central third of the leg.

These initial anatomical variations and our surgical experience were the impetus for a more complete cadaveric anatomical investigation to further delineate the anatomical variations of the superficial peroneal nerve. These findings seek to better prepare the surgeon contemplating surgery on the superficial peroneal nerve.

Materials and Methods

A series of 35 nonpaired fresh, frozen adult lower extremities, and 40 paired embalmed specimens were...
dissected by the authors (S.L.B., G.D.R., A.L.D.). Each specimen included the knee and the foot. No attempt was made to distinguish whether the specimens came from a man or woman, or to learn the age of the donor. The specimens were random in the selection for these dissections. The cadavers were thawed and dissected with loupé magnification in the middle third of the leg, simulating an operative approach initially, but the dissection was carried out further proximally and distally than would be done with a living patient. The operative approach that the authors used includes a 4-to-6-cm linear incision on the anterolateral aspect of the middle one third of the leg, between the tibialis anterior and fibula. This usually correlates to the location of the intermuscular septum between the anterior and lateral compartments. No attempt was made to exhaustively dissect the superficial peroneal nerve from its origin at the common peroneal nerve or to record the exact site at which it pierced the fascia. However, a longitudinal incision was made midway between the anterior tibial crest and fibula at the level of the middle one third of the leg, which allowed full exposure of the superficial peroneal nerve from proximal to where it became superficial, to the deep fascia distally to its branching at the level of the ankle joint.

The goal of the investigation was to identify and record the location of the superficial peroneal nerve in either the anterior or lateral compartment, or both, in the middle one third of the leg corresponding to the usual anatomical approach for surgical denervation. Because this was an anatomical dissection study, the only selection criteria were that the tissue being examined was of sufficient quality to allow for identification of the neural structures, and that there was no evidence of prior surgical intervention into the area being studied.

Results

Of the 75 specimens dissected, the superficial peroneal nerve was found to be in the lateral compartment of the leg adjacent to the interfascicular septum in 72% of the specimens (Fig 2), in the anterior compartment in 23% of the specimens (Fig 3), and in both the anterior and the lateral compartments in 5% of the specimens (Fig 4).

Discussion

On review of the literature, the lack of attention given to the superficial peroneal nerve is remarkable. This nerve is simply not illustrated in the operative exposures in the 10th edition of Campbell's Operative Orthopedics (3) or in Mathes and Nahai's classic book in plastic surgery on lower
extremity flaps (4). Classics in anatomy illustrate the superficial peroneal nerve as a single nerve in the leg beneath the fascia in the lateral compartment on both longitudinal and cross-sectional views (5–7). Even textbooks and chapters written by surgeons for surgeons operating in this anatomical region do nothing more than describe this classic location (lateral compartment) of the superficial peroneal nerve (8–10). Early descriptions of variations in the superficial peroneal nerve have related only to the terminal distribution of its 2 branches to the skin of the dorsum of the foot (11, 12). Before the article by Adkison et al (2), we were able to locate just 1 photograph of the high division of the superficial peroneal nerve (13).

The results of the present anatomic investigation confirm the observation of Adkison et al (2) that in more than 20% of the cadavers, a branch of the superficial peroneal nerve lies in the anterior compartment of the leg. The need to perform a fasciectomy in both elective and traumatic circumstances has been documented for more than 3 decades (14, 15). However, the need to open both the anterior and lateral compartments to identify the presence of a superficial peroneal nerve in both, or to protect a superficial peroneal nerve in both, needs to be considered in light of these anatomical findings.

The present study did not attempt to measure the transition site of the peroneal nerve through the fascia. Previous studies have demonstrated the wide variability of this location (4–18 cm) and the variance in this site because of the length of the leg (2, 11, 12). The most frequent location for this transition site is 10 to 12 cm proximal to the lateral malleolus.

The need to appreciate the variations in the superficial peroneal nerve is more important than ever, because it is recognized that interruption of this nerve’s transmission of pain impulses can be critical to the successful outcome of patients with lower extremity pain (1). This study, taken together with that of Adkison et al (2), suggests that the fascial coverings of the anterior and lateral compartment be opened in every patient having surgery in this area to identify variations in the superficial peroneal nerve.

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References