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Original article

Risk of sural nerve injury during lateral distal Achilles tendinoscopy: A Cadaver Study

B. Appy-Fedida , J. Vernois , E. Krief , R. Gouron , P. Mertl , E. Havet*

Laboratoire d'anatomie, faculté de médecine, université Picardie Jules-Verne, centre hospitalier universitaire d'Amiens, 3, rue des Louvels, 80036 Amiens cedex 1, France

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ABSTRACT

Background: The risk of damage to cutaneous sensory nerves located near portals has been evaluated for both conventional arthroscopy and extra-articular posterior ankle endoscopy. The objective of the anatomic study reported here was to assess the risk of injury to the sural nerve or lateral calcaneal nerve while using the distal lateral portal for the Achilles tendinoscopy procedure described by Vega et al. in 2008.
Materials and methods: We dissected the sural nerve and its branch, the lateral calcaneal nerve, of 13 human cadaver ankles in the prone position. We defined *P* as the point where the Achilles peritendon was opened during the distal lateral approach used for the study technique. *P* was adjacent to the lateral edge of the Achilles tendon, 2 cm proximal to the postero-superior edge of the calcaneal tuberosity. *T* was defined as the attachment site of the most lateral fibres of the Achilles tendon to the postero-superior edge of the calcaneal tuberosity. We evaluated the origin of the lateral calcaneal nerve relative to *T* and we measured the shortest distances separating P from the sural nerve and lateral calcaneal nerve.
Results: A lateral calcaneal nerve was identified in 10 (77%) ankles and originated a mean of 39.1 mm (range, 25.0–65.0 mm) proximal to *T*. *P* was at a mean distance from the sural nerve of 12.3 mm (range, 5.0–18.0 mm) and from the lateral calcaneal nerve of 6.8 mm (range, 4.0–9.0 mm). The median difference between these two distances was statistically significant ($P = 0.002$).
Discussion: While using the distal lateral portal for Achilles tendinoscopy, the lateral calcaneal nerve is at greater risk for injury than is the sural nerve.
Level of evidence: Level IV. Anatomic Study.

1. Introduction

Nearly two decades ago, Maquirriain [1] described an endoscopic technique for the surgical treatment of non-insertional Achilles tendon lesions. Vega et al. [2] reported a detailed variant of this technique in 2008.

In addition to Achilles tendinoscopy, the array of endoscopic techniques for treating posterior ankle compartment disorders includes conventional (intra-articular) arthroscopy procedures and extra-articular endoscopy procedures (for posterior ankle impingement syndrome and Haglund's deformity) [3]. Riley et al. reported a lower overall complication rate after extra-articular endoscopy procedures than after open surgery [4]. Nerve injury is among the most common complications (Table 1) and is chiefly related to the creation and use of the portals [5,12]. The sural nerve or its branch, the lateral calcaneal nerve, can be injured while creating a posterolateral portal [13].

In a 2009 article, Bohu et al. [3] pointed out the lack of studies specifically designed to assess the risk of sural nerve injury during Achilles tendinoscopy. A comment written by Golanó and Vega [14] in 2013 underlines the importance of anatomy to avoid complications during endoscopic procedures.

Here, we used cadaver ankles to assess the distal lateral portal used in the Achilles tendinoscopy technique described by Vega et al. in 2008 [2]. Our objective was to evaluate the risk of injury to the sural and lateral calcaneal nerves.

2. Material and methods

2.1. Material

The cadavers were dissected at the anatomy laboratory of the school of medicine in Amiens, France. We dissected 13 well-preserved, embalmed, lower limbs harvested under the knee and

* Corresponding author. Tel.: +33 322 827 697.
E-mail address: havet.eric@chu-amiens.fr (E. Havet).

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Table 1
Retrospective studies of complications of endoscopic procedures on the posterior ankle.

Studies	Year	Number of patients	Incidence of complications	Incidence of nerve injury	Proportion nerve injuries/complications
Ferkel [5]	1996	612	11.1% (68/112)	4.4% (27/612)	40.0% (27/68)
Acevedo [6]	2000	29	17.2% (5/29)	0% (0/29)	0% (0/5)
Young [7]	2011	294	6.8% (20/294)	5.4% (16/294)	80.0% (16/20)
Ogut [8]	2011	60	3.3% (2/60)	3.3% (2/60)	100% (2/2)
Galla [9]	2011	36	29.0% (8/36)	6.6% (2/36)	25% (2/8)
Nickisch [10]	2012	189	8.9% (16/189)	4.0% (7/189)	44.0% (7/16)
Deng [11]	2012	405	7.69% (20/405)	3.46% (9/405)	45% (9/20)

free of posterior scars. The specimens were from 7 males and 6 females, all Caucasians. The right limb was harvested in 8 cases and the left limb in 5 cases.

2.2. Dissection protocol

The lower limbs were maintained in the prone position by a clamp with the ankle hanging free over the edge of the table. A transverse incision was made two fingerbreadths under the tip of the lateral malleolus, to the middle of the postero-superior edge of the calcaneal tuberosity. A 90° extension to this incision was then made along the midline toward the proximal end of the limb (Fig. 1). The cutaneous plane of the posterior ankle was detached along the upper surface of the fascia superficialis covering the Achilles tendon. We identified the small saphenous vein, sural nerve, and lateral calcaneal nerve [13]. Our objective was to make no changes to the positions of the sural and lateral calcaneal nerves relative to the lateral edge of the Achilles tendon (Fig. 2).

2.3. Measurement of the study variables

We defined two points, *P* and *T*. *P* was the site at which the Achilles peritenon was opened via the distal lateral portal as described by Vega et al. [2] in 2008. *P* was 2 cm proximal to the postero-superior edge of the calcaneal tuberosity and adjacent to the lateral edge of the Achilles tendon. *T* was the site of attachment of the most lateral Achilles tendon fibres on the postero-superior edge of the Achilles tendon.

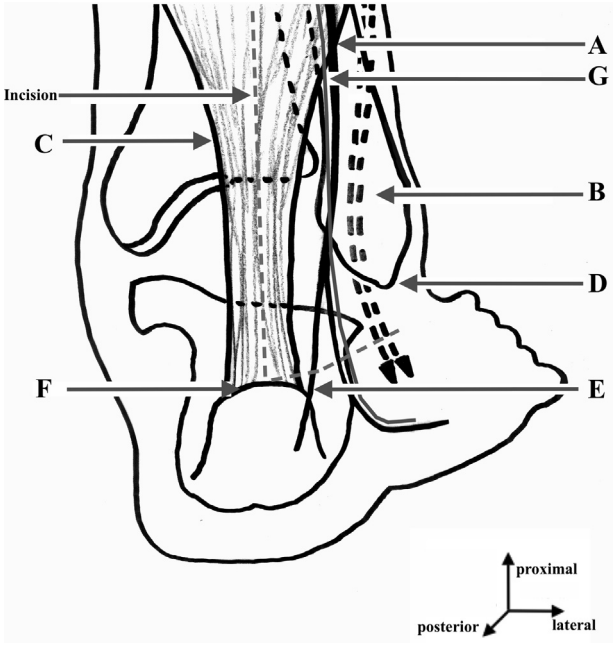

Fig. 1. Diagram of the posterior aspect of the right ankle. Anatomic landmarks used to create the postero-lateral portal for ankle endoscopy. A. Sural nerve; B. Fibular tendon trajectories; C. Achilles tendon; D. Tip of the lateral malleolus; E. Lateral calcaneal nerve; F. Postero-superior edge of the calcaneal tuberosity; G. Small saphenous vein.

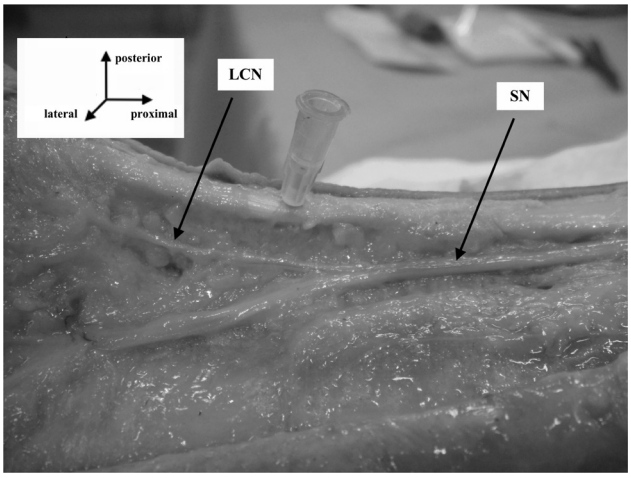

Fig. 2. Lateral view of the sural nerve (SN) and lateral calcaneal nerve (LCN) identified after dissection of a cadaveric right ankle. The small saphenous vein has been resected. The subcutaneous needle indicates the point where the calcaneal bursa is opened during the tendinoscopy procedure described by Vega et al. [2].

We used callipers graduated in millimetres to measure three distances: from *T* to the point of intersection between the edge of the Achilles tendon and a line perpendicular to that edge and starting at the origin of the lateral calcaneal nerve (Fig. 3) and the shortest distances separating *P* from the sural nerve and from the lateral calcaneal nerve (Fig. 4).

2.4. Statistical analysis

Each of the three distances measured was described as the mean value and the qualitative variable, i.e., presence of absence of a lateral calcaneal nerve, as *n* (%). To determine whether median differences between two series of distances differed significantly, we chose the Wilcoxon signed rank test performed using Stat View 5.2 software (SAS Institute Inc., Cary, NC).

3. Results

A lateral calcaneal nerve was identified in 10 (77%) of the 13 ankles. It arose from the posterior aspect of the sural nerve then coursed more posteriorly and closer to the midline than the main sural nerve branch, which was directed towards the lateral edge of the foot. The mean distance from the origin of the lateral calcaneal nerve and *T* proximally was 39.1 mm (range, 25–65 mm).