



The use of ultrasonography during minimally invasive Achilles tendon repair to avoid sural nerve injury

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Four patients with Achilles tendon ruptures underwent minimally invasive repair in our institution by the same surgeon (S.H.). With the patients positioned prone under general endotracheal anesthesia, a 3-cm transverse incision was made about 1 cm proximal to the rupture site. A Percutaneous Achilles Repair System (PARS; Arthrex, Florida, USA) jig was slid within the paratenon. With a sterile sleeve covering the transducer (12 MHz), a mobile ultrasound machine (Venue™50; GE Healthcare, Tokyo, Japan) was used to avoid the neurovascular bundle each time a needle passed through the lateral side of the tendon. The sutures were all retrieved as the jig was pulled out, and the tendon ends were approximated with the foot in plantarflexion. The procedure was well tolerated by all patients, with no complaints suggestive of sural nerve injury such as sensory disturbance and pain throughout their respective follow-up periods. The incision sites all healed well without any wound complications such as dehiscence or local infection.

Minimally invasive Achilles tendon repair continues to be accompanied by a risk of iatrogenic sural nerve injury despite the employment of measures to consciously protect the sural nerve during the repair. Some authors have recommended exposure and visualization of the sural nerve during repair to minimize injury by being able to avoid it with a

certain degree of confidence [1, 2]. Others have advocated performing the procedure under local anesthesia alone to facilitate a wide-awake surgery so that the patient can generate feedback if any neural disturbance is felt during puncture or infiltration [3–5]. We have shown that ultrasonography can be used to have indirect but real-time visualization during minimally invasive Achilles tendon repair. This can be achieved with the patient comfortable under general or spinal anesthesia, without having to ask for feedback regarding neural disturbances throughout the surgery. This also avoids additional incisions and soft tissue trauma just to directly visualize the sural nerve to avoid it. Under ultrasound guidance, it was ensured in our cases that the needle was always deep to the sural nerve each time it passed through the lateral side of the Achilles tendon (Fig. 1). With these encouraging results, we highly recommend this method to avoid iatrogenic sural nerve injury during minimally invasive repair of the Achilles tendon.

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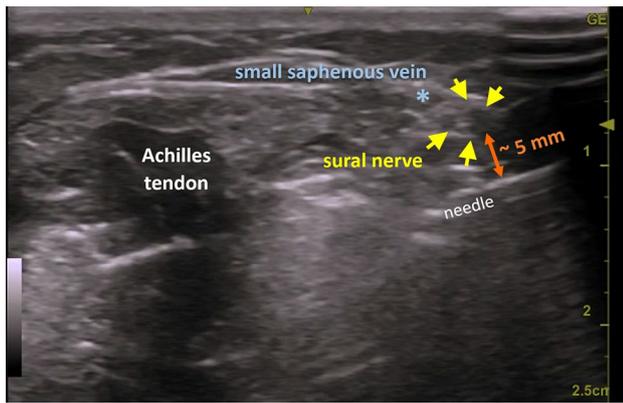


Fig. 1 Sonographic image showing the passing of the needle from the lateral side (right) of the Achilles tendon going medial (left). In this case, the distance of the needle from the sural nerve (yellow arrows) is approximately 5 mm. The small saphenous vein (blue asterisk) is superficial and medial to the sural nerve and serves as a useful landmark to aid in the visualization of the sural nerve

Compliance with ethical standards

Conflict of interest Joverienne Chavez declares that he has no conflicts of interest. Soichi Hattori declares that he has no conflicts of interest. Yuki Kato declares that he has no conflicts of interest. Shuzo Takazawa declares that he has no conflicts of interest. Shin Yamada declares that

he has no conflicts of interest. Hiroshi Ohuchi declares that he has no conflicts of interest.

Ethical statement All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and later versions. Informed consent was obtained from all patients for being included in the study.

References

1. Carmont MR, Rossi R, Scheffler S, et al. Percutaneous and mini invasive Achilles tendon repair. *Sports Med Arthrosc Rehabil Ther Technol.* 2011;3:28.
2. Majewski M, Rohrbach M, et al. Czaja Stephan Avoiding sural nerve injuries during percutaneous Achilles tendon repair. *Am J Sports Med.* 2006;34:793–8.
3. Čretnik A, Kosanović M, Smrkolj V. Percutaneous versus open repair of the ruptured Achilles tendon. A comparative study. *Am J Sports Med.* 2005;33:1369–79.
4. Maffulli N, Longo UG, Ronga M, et al. Favorable outcome of percutaneous repair of Achilles tendon ruptures in the elderly. *Clin Orthop Relat Res.* 2010;468:1039–46.
5. Assal M, Jung M, Stern R, et al. Limited open repair of Achilles tendon ruptures. A technique with a new instrument and findings of a prospective multicenter study. *J Bone Jt Surg Am.* 2002;84:161–70.

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