Denervation of the Sinus Tarsi for Chronic Post-Traumatic Lateral Ankle Pain

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Fractures and sprains that injure joints may also cause nerve damage. Indications for sinus tarsi denervation include pain refractory to conventional treatment after inversion sprains.

Joints are innervated through ligaments and capsules. Fractures and sprains that injure joints also may damage these nerves. During the normal process of wound healing, regenerating nerve fibers may become entrapped in the collagen of the ligaments and joint capsule. Due to one or both of these, a painful neuroma may occur. Each time this joint or ligament is stressed, the neuroma may mechanically stimulate sensory fibers sending a pain signal to the brain. If the nerve transmitting the pain signal can be identified, it can be resected, partially denervating the joint and relieving pain. This process has been documented extensively for the wrist joint, and also has been observed for the knee joint and the proximal interphalangeal finger joint. The innervation of the human shoulder joint has been delineated, but a surgical approach to shoulder denervation has not yet been reported.

One challenge associated with joint pain is distinguishing a true neural origin from a structural problem. This is compounded by the usual absence of joint innervation from standard anatomy textbooks. Reports have demonstrated that the terminal branches of the anterior and posterior interosseous nerves carry pain and proprioceptiveafferent fibers from the central portion of the wrist. Medial and lateral retinacular nerves of the knee carry similar fibers. Neurectomy or neurotomy of these nerves has been successful in controlling chronic pain.

Lateral ankle sprains injure ligaments in the sinus tarsi. The nerves that innervate these ligaments also may be damaged at injury, resulting in painful neuromas. These sources may be one cause of sinus tarsi syndrome.

Recently, it was believed that innervation of the sinus tarsi occurred from the branches of the deep peroneal nerve with some overlap from the sural nerve. This article demonstrates a surgical approach that allows denervation of the sinus tarsi while preserving the terminal branch of the deep peroneal nerve supplying the first dorsal web-space and the extensors hallucis brevis and digitorum brevis.

CASE REPORT

An 18-year-old man presented with persistent ankle pain after experiencing a fall while running 3 years previously. His toes bent inward under his foot and he felt a tear on the outside of his ankle. The ankle was swollen and bruised, but no fractures were identified. He was immobilized and was treated for a severe sprain, but pain never ceased. He was placed on long-acting morphine-like drugs until being referred to our clinic 2 years later.

On initial presentation, the patient was wearing a rigid support brace for his left foot and ankle and a plaster cast on his right arm for a fracture that occurred from a recent fall that he attributed to his level of narcotic intake. He had previously fallen and broken his left arm for the same reason.

Physical examination demonstrated severe pain when gentle pressure was placed at the sinus tarsi. He had severe pain with inversion of the ankle.

A block with 1% plain xylcaine and 0.5% plain marcaine was performed 3 cm proximal to the ankle joint, just lateral to the extensor hallucis longus tendon to determine the origin of pain. Five minutes after the block, the patient was able to walk in bare feet without pain, and ankle inversion was not painful.

The patient was subsequently treated with...
DISCUSSION

It is now anatomically and technically possible to selectively denervate the sinus tarsi. Recent reports suggest possible indications for sinus tarsi denervation. Pain refractory to conventional treatment after inversion sprains is the most common indication. This approach to sinus tarsi pain may replace the “clean out” approach of directly excising all scar tissue and soft tissue within the sinus tarsi, or even subtalor arthrodesis.

The proximal denervation of this articular branch will not result in a Charcot foot because it is a partial denervation of one set of ankle ligaments. Experience with >300 partial knee denervations for pain has not resulted in this problem, nor has it been reported for denervation of the wrist with >300 cases reported in a single literature survey.

Persistent pain after a sinus tarsi nerve block may be due to innervation of the sinus tarsi from a second source such as the sural nerve. This secondary source of innervation may occur in 17%-24% of patients. Persistent pain after block of the deep peroneal nerve must be followed by a block at the lateral malleolar sural nerve to identify this source. Neurotomy of the sural nerve branches to the lateral ankle may then be added to the procedure.

If intraoperative electrical stimulation results in muscle contracture from more than one fascicle of the deep peroneal nerve, it is possible that nerve fibers that innervate the sinus tarsi may travel with the motor fibers. Considering the extensor brevis muscles are not critical muscles for foot function, and that treating calcaneal ankle pain is an acceptable goal, it may be necessary to make an intraoperative decision that requires loss of this muscle function to achieve pain relief. It is even conceivable that in some patients, these joint innervation fibers will travel with the terminal sensory branches to the first dorsal webspace. Such intraoperative decision making requires careful preoperative discussions with the patient. Finally, denervation of the lateral branch of the peroneal nerve may fail, owing to the persistence of afferent pain fibers in the remaining branches.

REFERENCES


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