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The Diagnosis and Treatment of Joplin's Neuroma

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ABSTRACT

Joplin's neuroma is a rare perineurial fibrosis of the medial plantar digital proper nerve arising from various etiologies but most commonly after bunion surgery. Treatment for this painful great toe problem remains controversial. It is our purpose to describe our experience with this chronic pain problem, considering it to be a neuroma requiring resection. A retrospective medical record review of 8 patients with medial hallux pain related to the digital nerve was performed. Each patient had failed to respond to >6 months of nonoperative therapy. At surgery, the medial digital nerve to the hallux was identified distally, the neuroma was resected distally, and the proximal end of the nerve was implanted into the arch of the foot in 7 (87.5%) of the 8 patients. At a mean follow-up of 25 (range 13 to 43) months, 6 results (75%) were excellent, 1 (12.5%) was good, and 1 (12.5%) was fair. The 1 fair result was in the only patient in whom the distal end of the divided nerve was not implanted proximally, according to the patient's request. In conclusion, surgical resection of the medial plantar nerve to the hallux with implantation of the proximal end of the nerve into the arch of the foot, can be expected to result in good to excellent relief of pain in 80% of the patients.

In 1971, Joplin (1) described injury to the medial plantar digital nerve to the hallux in 3 patients related to surgery to correct a bunion but did not discuss the treatment for the pain problem that now bears his name. He did illustrate the excised and fibrotic portion of the nerve in 1 patient (1). The pathophysiology relates to entrapment or compression neuropathy from repeated athletic trauma or to a true neuroma related to previous trauma or surgery (2,3). Additional confusion occurs with considering medial plantar hallux pain a "Morton's neuroma" (4). In the present report, we have discussed our long-term experience with the surgical management of Joplin's neuroma in a series of patients.

Patients and Materials

A computer database search was performed in our office for the *International Classification of Diseases,* 9th edition, code 355.6, plantar digital nerve injury, and these patients' medical records were reviewed retrospectively, specifically for those whose interdigital nerve was the one to the medial side of the hallux. This search identified 8 patients. They underwent surgery from October 2006 to May 2012. In each of these 8 patients, the physical examination demonstrated pain over the medial plantar nerve to the hallux, and a nerve block of this nerve relieved that specific pain. Each of these patients was, therefore, considered to have a Joplin's neuroma.

Of the 8 patients, 2 (25%) were males and 6 (75%) were females. Their mean age was 39.7 (range 16 to 54) years. The etiology for Joplin's neuroma consisted of excision of the medial sesamoid in 3 (37.5%), bunionectomy in 4 (50%), and crush injury in 1 (12.5%), with the diagnosis determined from the history and physical examination findings. The duration of the pain before consultation with us was a mean of 63.5 (range 15 to 120) months. Before their referral for surgery, each patient had undergone ≥1 corticosteroid injection, topical corticosteroid massage, and foot orthotic treatment, and had taken anti-inflammatory and neuropathic pain medications. Of the 8 patients, 3 (37.5%) had undergone a trial of radiofrequency ablation that proved ineffective.

Each patient underwent a local anesthetic block of the proper digital nerve of the medial plantar digital nerve to the hallux, with surgery performed on those appreciating alleviation of their symptoms. Specifically, after preparation of the skin just proximal to the point of pain at the medial hallux, 4 mL of 1% lidocaine and 0.5% bupivacaine, without epinephrine, mixed 50:50, was infiltrated into the subcutaneous tissue along the course of the medial plantar nerve branch to the medial hallux. Each of the 8 patients responded to the block with pain relief. The surgical approach was modified from that

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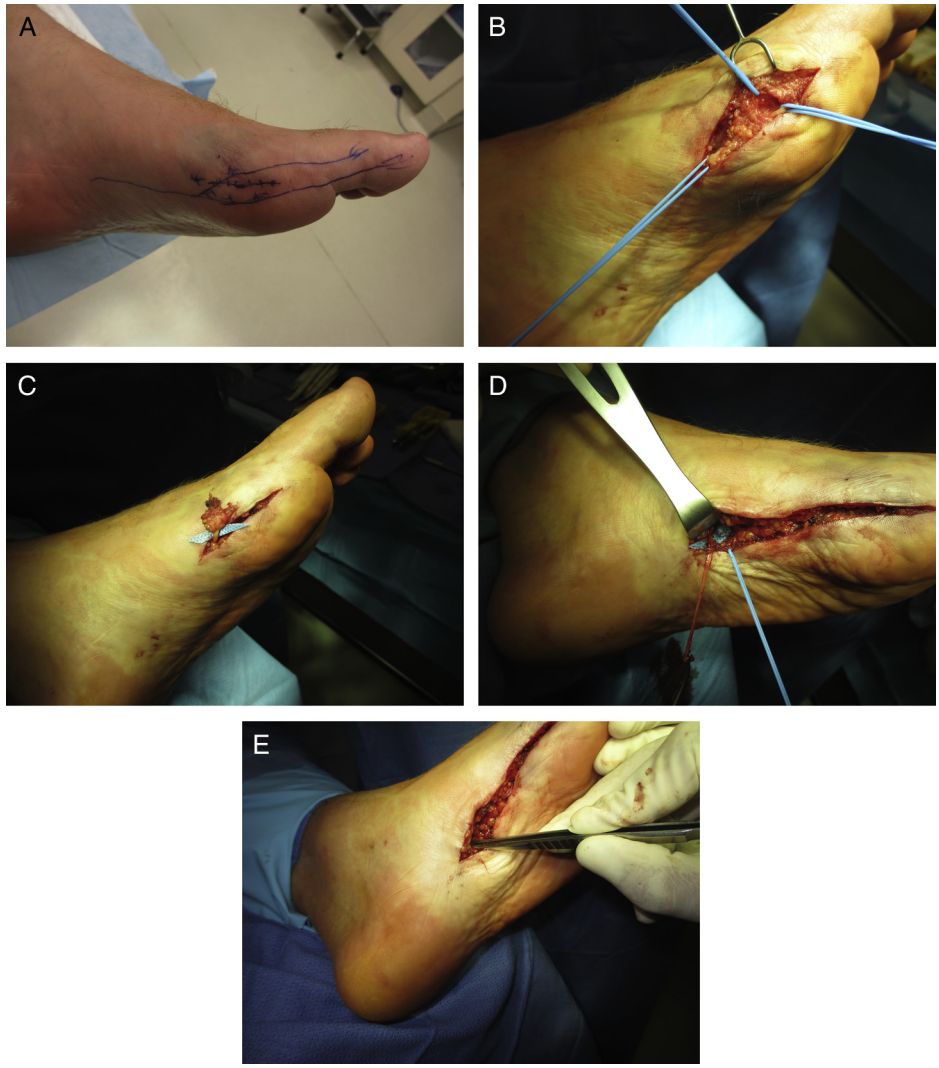

Fig. 1. Surgical approach for the patient with pain after medial sesamoidectomy. (*A*) The previous surgical incision is shown cross-hatched, with the digital nerve branches outlined. (*B*) Digital nerve branches identified with vessel loops. (*C*) Neuroma attached to nerves at previous surgical site. (*D*) Extended proximal incision to identify the proximal medial plantar nerve to the hallux. (*E*) Proximal end turned and implanted blindly into the fibrous structures of the arch, cephalad to the muscle layer.

described by Dellon in 1989 for a recurrent Morton's neuroma (5). After identifying the distal portion of the injured digital nerve at the level of the first metatarsophalangeal joint, the nerve was injected with a local anesthetic to shield the central nervous system from neural impulses. Then, the nerve was cauterized to prevent bleeding and divided using scissors. The neuroma itself was not dissected and was not submitted for pathologic examination. A new incision was made in the medial plantar arch, and the proximal portion of this nerve was identified. The plantar nerve was pulled through this tunnel and then dissected proximally toward its origin from the medial plantar nerve. A clamp was then inserted into the arch above the plantar quadratus muscle to create a tunnel and to estimate the length required for a nerve to be placed into this location. That distance was measured to the dissected plantar nerve from the medial hallux. The most distal portion of this nerve, which did not have the neuroma, was submitted to the pathologist for examination. The proximal end, after cauterization to prevent bleeding, was blindly implanted into the space dorsal to the pronator quadratus muscle, without physically attaching it to anything (5,6) (Figs. 1 and 2). The same surgeon (A.L.D.) performed each of the surgeries and used as many small incisions as necessary to ensure proper identification of the nerve being dissected and then resected. The wound was dressed with a bulky, supportive Robert-Jones type dressing, allowing immediate ambulation using a walker. The dressing was removed on postoperative day 7, the sutures were cleansed with povidone iodine twice a day, and the stockinette was reapplied by the patient, with ambulation in a slipper allowed. The sutures were removed at 21 days postoperatively, after which the patient began 1 to 3 weeks of water walking, 3 to 4 times per week, progressing to walking on land in sneakers, as tolerated.

The patients determined their own level of pain relief and postoperative status. An excellent result after surgery was defined as complete relief of pain and a return to normal activities or work without special footwear. A good result entailed some residual pain with occasional use of pain medication and some limitation of function. Failure entailed the lack of improvement after surgical treatment of the nerve.

Results

Of the 7 patients who had undergone neuroma excision with proximal implantation of the nerve into the arch of the foot, 6 (85.7%) had excellent relief of pain, resumed walking without special shoes, and had discontinued the use of narcotic analgesic medication. The