Intramedullary nerve implantation in amputation and other traumatic neuromas

Technical note

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A simple and effective method of eliminating pain as a result of amputation and traumatic neuroma is described. Following excision of the neuroma, intramedullary long-bone implantation of the proximal nerve is performed. This technique has been used in five patients and there has been no recurrence of pain.

KEY WORDS • pain • neuroma • amputation • peripheral nerve

Neuromas resulting from nerve transections are often disabling and painful entities. The quality of life is usually reduced because of this pain and also, in cases of limb amputations, because of the inability to use a well designed prosthesis. Chemical and physical methods currently used in treatment often result in only temporary relief of pain, with later recurrence of the neuroma and pain. In 1943, Boldrey described and illustrated a technique whereby the nerve end is implanted in bone to effect pain relief. To date no series using this method or an adaptation thereof has been examined or reported. This paper summarizes the results of this procedure in five patients with traumatic neuroma.

Summary of Cases

Clinical Material

Five patients were treated for traumatic neuroma between 1975 and 1977. The ages of the patients ranged from 24 to 59 years. All the patients were men. Two patients had suffered nerve transections of the superficial branch of the radial nerve as a result of lacerations. In one patient, the right posterior tibial nerve had been transected as a result of a gunshot wound. The other two patients had undergone transection of the sciatic nerve following surgical above-the-knee leg amputations.

Both patients with surgical limb amputations were unable to wear properly fitted prostheses, and they could not sit in a chair or lie in the supine position. Each of these patients had undergone two resections of the neuroma, only to experience recurrence of their pain. The patient with the neuroma of the posterior tibial nerve suffered pain on plantar flexion, and had undergone seven previous revisions without relief of pain and paresthesia. In the other two patients, the neuroma of the superficial branch of the radial nerve had not been previously treated.

Surgical Procedure

Several days before surgical implantation of the nerve, a proximal block with 1% lidocaine was performed to determine if pain relief could be effected by elimination of the neuroma.

Each of the patients was placed under general anesthetic. The neuroma and 4 to 6 cm of proximal nerve were isolated surgically, then, the adjacent long bone (radius, tibia, or femur) was exposed. Two holes, 1.5 cm apart, were made with a perforator and twist drill (Fig. 1A). Following this, the neuroma was amputated by means of a razor-blade technique (Fig. 1B). A 2-0 silk suture was then passed through the end of the severed nerve and tied, to be used as a guide (Fig. 1C). The suture was then threaded to a half-circle needle which was passed into the medulla of the bone, and brought out through the twist-drill hole (Fig. 1D). When this had been accomplished, the nerve was gently pulled into the medulla for approximately 2 cm. The suture ligature which had been brought out of the
Nerve implantation in painful neuroma

Fig. 1. Diagrams showing the nerve implantation procedure, not drawn to scale. A: Preparation of bone. Perforations 1.5 cm apart are made in the cortex with a twist drill and a combination burr perforator. B: The neuroma is cleanly amputated with a razor blade. C: A 2-0 silk suture is passed through the severed proximal stump of the nerve. D: A half-circle needle is passed through the holes in the bone to guide the nerve to an intramedullary position. E: The nerve and ligature are secured into position by means of a silver clip and bone wax.

Operative Results

These five patients have been followed for intervals varying from 3 to 5 years. In no case has there been a recurrence of pain.

Discussion

This procedure permits the placement of an amputated nerve into a sheltered physiological environment. The tangled, unprotected axons are no longer exposed to noxious cutaneous stimuli. The neuroma which is assumed will form after implantation is no longer fixed to soft tissue, and it is not exposed to pressure or stretch stimulus.

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References


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