UPDATE: PERIPHERAL ENTRAPMENT NEUROPATHY

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Many patients suffer from the symptoms caused by peripheral entrapment neuropathy. Unfortunately, the disorder of peripheral entrapment neuropathy often goes unrecognized, and the ailing patient is forced to endure a variety of well-intended treatment regimens aimed at eliminating symptoms associated with an incorrect diagnosis. Even when the correct diagnosis is made, treatment can be difficult. Nonetheless, proper treatment can yield very satisfying results in many cases. Much pain and suffering can be alleviated by increasing our awareness and knowledge of this disabling condition.

The author has previously described the surgical anatomy of the peripheral nerve and its pathophysiological response to entrapment (1, 2). Recent reports (3, 4) have emphasized the detrimental influence of ischemia affecting the peripheral nerve's soft tissue bed making more severe the "stress anatomy" to which the injured nerve trunk is subjected. A dysvascular soft tissue bed can create perineural necrosis and subsequent fibrosis, often associated with nerve trunk adherence and re-entrapment. Perineural scar formation can also incarcerate the crucial microvascular nutrient cords vital to the maintenance of intraneural structure and function.

Recent laboratory and clinical evidence has indicated the potentially beneficial effects of surgical entubulation of the peripheral nerve trunk for painful lesions incontinuity (Fig. 1) (4). Our own experience has been primarily with the use of 0.02 inch thick silicone elastomere (Silastic) for nerve trunk ensheathment in cases of recalcitrant tarsal tunnel syndrome. The proposed goals of entubulation are for reduction of the pathological influence of adjacent fibro-osseous structures on the entrapped nerve trunk. Ideally, the potential space between the nerve and the surrounding Silastic sheath fills with a loose areolar, well vascularized, connective tissue that allows the nerve trunk to glide within the resultant pseudosheath. We have experienced mixed results with this technique and have come to the conclusion that nerve trunk entubulation using silicone elastomere as the sheathing material has two major complicating factors (Fig 2):

1. Impingement of the nerve trunk by the sheathing material itself, primarily at the proximal and distal margins of the synthetic sheath.
2. Dysvascularity of the soft tissue cuff surrounding the nerve trunk within the synthetic sheath.

More recently we have utilized the silastic material as a protective barrier between the mobilized (status-post external neurolysis) posterior tibial nerve trunk and the deeper osseous structures of the tarsal tunnel, thereby leaving the superficial surface of the nerve uncovered. This technique appears to enhance perineural vascularity in comparison to complete entubulation.

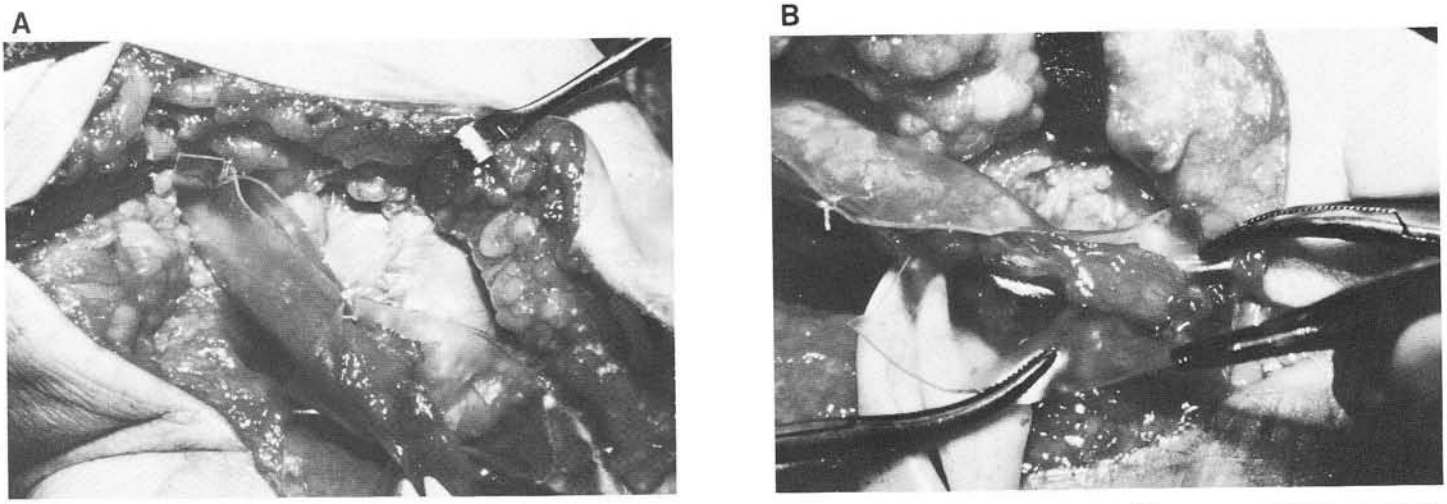

Fig. 1. A. Entubulation of posterior tibial nerve trunk in tarsal canal. **B.** Note that edges of Silastic sheet are sutured in apposition within an interrupted fashion to avoid "telescoping" of sheath.

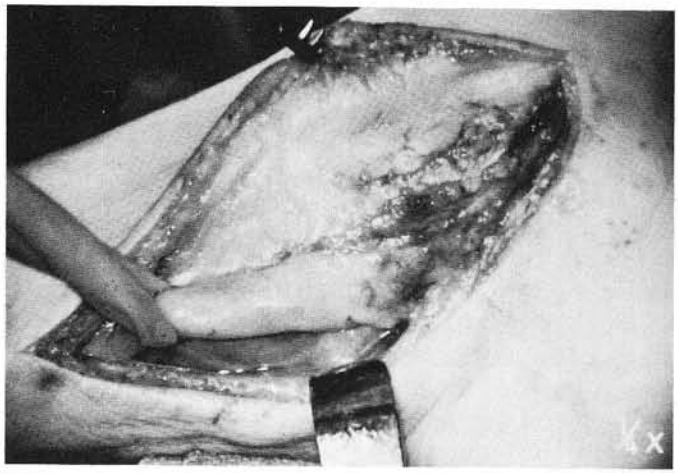

Fig. 2. Hypertrophied posterior tibial nerve trunk following entubulation within Silastic sheath for treatment of recalcitrant tarsal tunnel syndrome. Recurrence of symptomatology prompted surgical revision involving removal of synthetic sheath and placement of protective sheet of Silastic between nerve and deeper structures within tarsal tunnel.

We feel that it is crucial to emphasize the *experimental* and salvage nature of posterior tibial nerve trunk entubulation for the treatment of recalcitrant, painful peripheral entrapment. This fact should be well understood by the surgeon and the patient. Peripheral nerve trunk entubulation is a salvage procedure and results, in our hands, have ranged from satisfying to complete failure and even worsening of symptoms. Obviously, the most satisfying results in the immediate postoperative period have been obtained following peripheral nerve surgery in patients suffering from significant daily pain without concurrent electromyoneurographic evidence of axonal degeneration. Preoperative evidence of significant axonal degeneration indicates the need for patience during the healing phase, as the axons regenerate within the nerve trunk.

Future success in the treatment of peripheral entrapment neuropathy will depend on surgical techniques that adequately enhance the vascularity of the nerve trunk's soft tissue bed, while simultaneously decreasing extrinsic stress placed upon the nerve. Recent techniques utilizing transplantation of all autogenous adipose tissue about the mobilized nerve trunk do show some promise. Moreover, the development and use of biologic entubulation materials, such as tendon sheath as well as nerve tissue handling have given us a greater appreciation of the peripheral nerve trunk's micro-environment, and should enhance our treatment of peripheral entrapment neuropathy.

References

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