

A Proximally Based Sural Fasciocutaneous Flap for the Treatment of Recurrent Peroneal Neuropathy: A Case Report

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Summary: Surgical treatment for recurrent, common peroneal neuropathy has not been reported. Herein, we describe a successfully treated case using the proximally based sural fasciocutaneous flap after reneurolysis of the adhesive common peroneal nerve. A 33-year-old man received a neurolysis operation for entrapment neuropathy of the common peroneal nerve 2 years before first admission in our clinic. Although motor nerve conduction studies showed a marked improvement after the primary operation, the patient always required the use of a crutch because of severe pain radiating to the lower leg during standing or walking. We diagnosed adhesive neuropathy of the common peroneal nerve, and performed reneurolysis by wrapping of the released nerve with a proximally based sural fasciocutaneous flap to prevent readhesion. The radiating pain was significantly reduced at 1-month post-operation. At 1-year postoperation, the patient could walk a long distance without a crutch. Wrapping the released common peroneal nerve with a proximally based sural fasciocutaneous flap is a useful option for the treatment of recurrent, common peroneal neuropathy. (*Plast Reconstr Surg Glob Open* 2016;4:e815; doi: 10.1097/GOX.0000000000000825; Published online 21 July 2016.)

Recurrent, adhesive neuropathy can occur after primary decompression surgery because of adhesive scar formation around the nerve.¹ In such cases, reconstruction of the gliding surface between the nerve and its surrounding tissue is required to relieve the tension generated by the adjacent joint movement.² To our knowledge, there are no reports of revision surgery for recurrent, adhesive, common peroneal neuropathy. Here, we report a case of reneurolysis with a proximally based sural fasciocutaneous flap for the treatment of recurrent, common peroneal neuropathy.

CASE REPORT

A 33-year-old man underwent neurolysis of the common peroneal nerve with a diagnosis of common peroneal nerve entrapment 2 years ago. Although sponta-

neous lower leg pain before surgery was alleviated, a new radiating pain that worsened during standing or walking emerged in the lower leg and gradually exacerbated after surgery. Thus, the patient consulted our clinic.

The patient showed a slight curved surgical scar on the lateral aspect of the popliteal fossa. Tinel's sign at the point of the surgical scar crossed the popliteal crease (Fig. 1A). Sensory examination revealed almost normal sensation in the lower leg and foot. Manual muscle tests of the common peroneal nerve innervated muscle using Medical Research Council grading were all grade 5, except for the tibialis anterior, which was grade 4 because of the radiating pain. The visual analog scale of pain (0–10) was 8 points. T1-weighted magnetic resonance imaging showed a low-intensity subcutaneous area surrounded by the lateral head of the gastrocnemius muscle, the biceps femoris tendon, and the common peroneal nerve, indicating scar tissue (Fig. 2). Although motor nerve conduction studies showed a marked improvement after the primary surgery, he always used a Lofstrand crutch because of severe pain radiating to the lower leg during standing or walking. We diagnosed him with adhesive neuropathy of the common peroneal nerve, and performed reneurolysis by wrapping of the released nerve with the proximally based sural fasciocutaneous flap to prevent readhesion.

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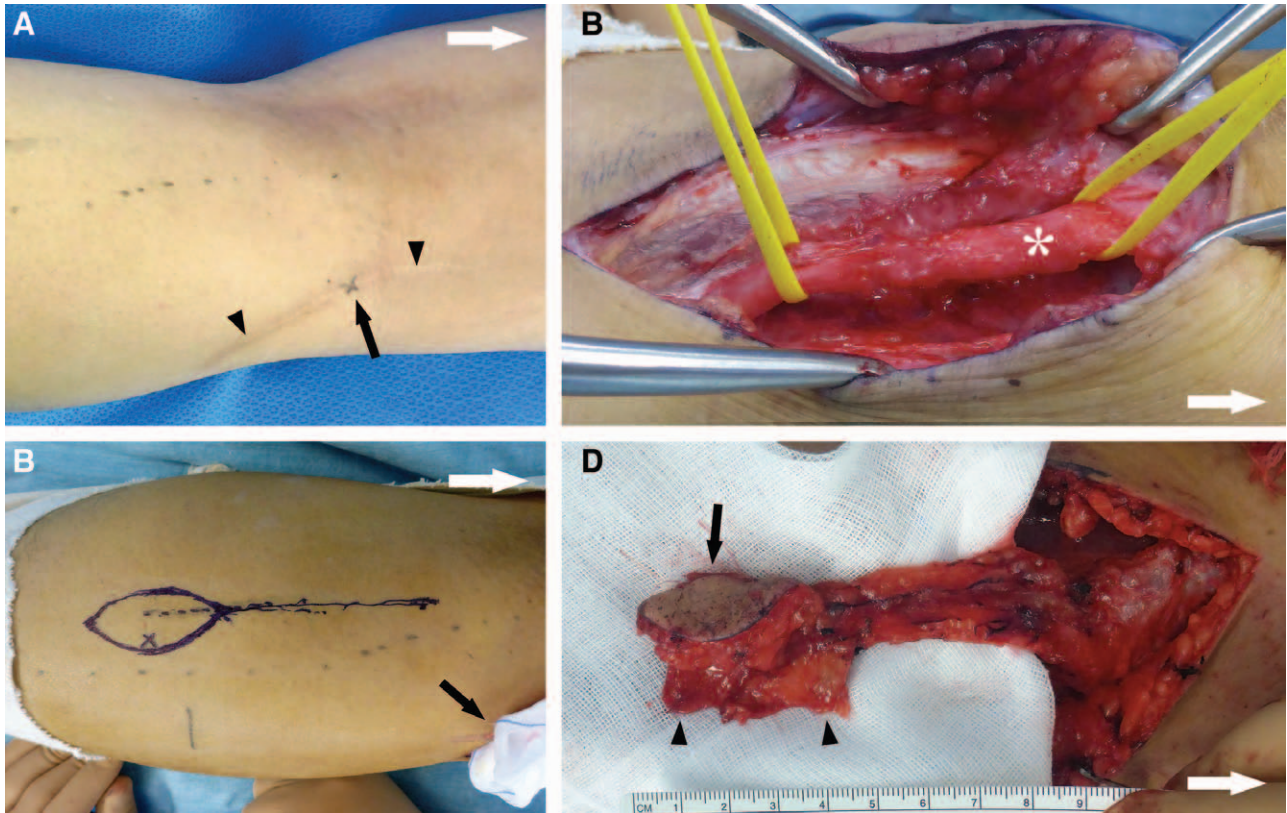


Fig. 1. The intraoperative pictures: white arrows indicate cephalad direction. A, Preoperative view of the posterior aspect of the knee. Black arrowheads indicate former operation scar. The black arrow indicates a point at which Tinel's sign was elicited. B, The released common peroneal nerve is indicated by asterisk. C, A design of the skin incision in the calf. The black arrow indicates a gauze over the released common peroneal nerve. D, The raised fasciocutaneous flap. Black arrowheads indicate fascia. The black arrow indicates overlying skin.

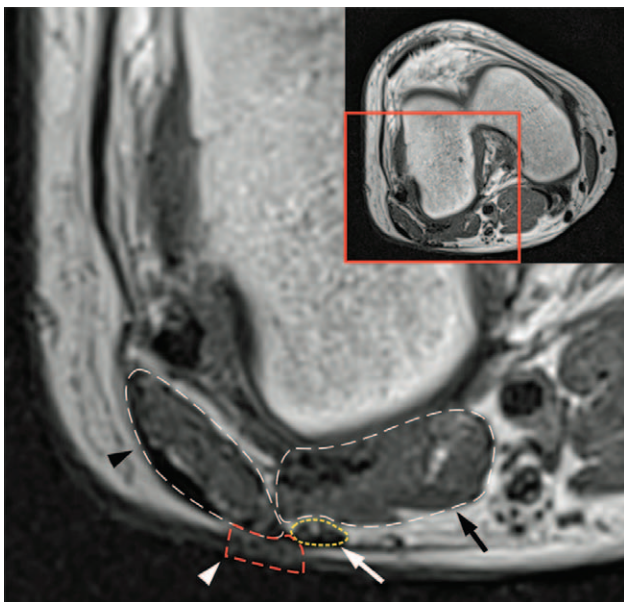


Fig. 2. Preoperative axial T1-weighted magnetic resonance imaging of the knee. The lateral head of the gastrocnemius muscle is indicated by the black arrow. The biceps femoris tendon is indicated by the black arrowhead. The common peroneal nerve is indicated by the white arrow. The white arrowhead indicates a low-intensity subcutaneous area indicating the scar tissue.

First, external neurolysis of the common peroneal nerve was performed after removal of the surgical scar in the lateral aspect of the popliteal fossa. The common peroneal nerve was tightly adhered to the surrounding scar tissue. Next, we carefully elevated a $4 \times 5\text{-cm}^2$ fascial flap of the gastrocnemius muscle with $4 \times 4\text{-cm}^2$ overlying skin from the middle of the calf (Fig. 1). The flap was raised from distal to proximal with a 3-cm-wide subcutaneous fascial pedicle including the median sural artery and small saphenous vein. The sural nerve was divided at the superior and lower border of the flap. The flap was transferred to the popliteal fossa through a subcutaneous tunnel. The pivot point of the pedicle was located 5 cm distal to the popliteal crease. The released common peroneal nerve was placed into the folded fascia in contact with the deep surface of the fascia (Fig. 3). The fascia was loosely secured to the surrounding tissues although we prevented the fascia from rolling completely around the released nerve. The cutaneous part of the flap was then placed between the surgical wound margins. The knee was immobilized for 3 weeks after surgery and then an active range of motion exercises were allowed.

The radiating pain to the lower leg was drastically reduced at 1-month postoperation. At 1-year postoperation, the patient experienced significant improvement from preoperative subjective pain levels of 8 to postoperative

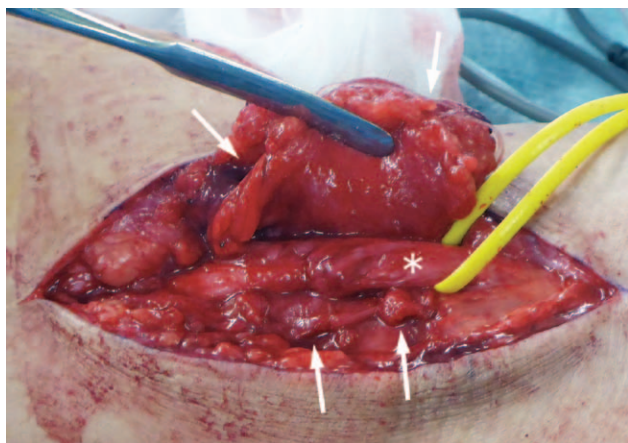


Fig. 3. The wrapping of the released common peroneal nerve is indicated by asterisk. Arrows indicate fascia.

levels of 1, and he could walk a long distance without a crutch (Fig. 4). The radiating pain caused by Tinel's maneuver was almost terminated. Informed consent for publication was obtained from the patient.

DISCUSSION

At the posterior side of the knee, the common peroneal nerve runs along the medial side of biceps femoris tendon on the surface of the lateral head of the gastrocnemius muscle. When the common peroneal nerve is adhered to the biceps femoris tendon, the nerve is susceptible to a proximal pulling force from the adhered tendon as the knee joint is extended during standing or walking. Moreover, because the nerve is sandwiched and adhered between the overlying firm subcutaneous scar tissue and the underlying lateral head of the gastrocnemius muscle, the nerve is easily compressed as the transverse diameter of the gastrocnemius muscle increases with muscle contraction in the fully extended position during standing or walking. Repetition of this condition can occasionally induce traction neuritis followed by progression of interfascicular scarring and segmental devascularization of the nerve.¹



Fig. 4. Posterior view of the lower leg at 1 y after revision surgery. The asterisk indicates the cutaneous part of the flap.

To resolve this condition, simple external neurolysis is insufficient to prevent the recurrence of perineural scar formation. In case of severely injured or adherent nerves, the use of local or free flaps is recommended.³ For recurrent entrapment neuropathy in the upper extremity, such as carpal tunnel syndrome or cubital tunnel syndrome, the use of pedicle muscle, adipofascial flap, or free flap was previously reported.^{1,4-7} However, there are no reports on surgical treatment for those in the lower extremity.

A proximally based sural artery flap was used for skin defects around the knee joint or proximal thigh.^{8,9} In our case, the fascia of the gastrocnemius muscle with overlying skin was used as a pedicled island fasciocutaneous flap to wrap the released common peroneal nerve. The fascia is a thin and pliable structure of connective tissue with an areolar tissue layer on the deep side surface. This areolar tissue layer includes some adipocytes and a hyaluronic acid-rich layer, and it is considered to have an important role as a gliding surface of the wrapped common peroneal nerve.¹⁰ Furthermore, the thin and pliable structure of the fascia is suitable for wrapping the released nerve at the popliteal side of the knee joint, which is subjected to the compression force during deep flexion of the knee. The full thickness of the skin and subcutaneous tissue over the fascial flap also plays an important role as a cushion to alleviate the compression or traction force to the released nerve during knee motion.

In conclusion, the proximally based sural artery fasciocutaneous flap is a useful option for common peroneal nerve coverage without microvascular anastomosis after neurolysis in the treatment of recurrent, adhesive, common peroneal neuropathy.

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