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Appendix A. Current surgical technique for nerve interface procedures performed in conjunction with transtibial amputation. In our relatively young, active patient population, a transtibial amputation with a residual tibial length of 14.5-16cm is preferred in order to optimize prosthesis fitting and leverage for terminal device control. The nerve interface procedures are either performed simultaneously or in series with the amputation procedure depending on surgeon availability. To facilitate access to the lateral lower leg without complicating the transtibial amputation, the procedure is performed with the patient placed in the pseudo-lateral position using a beanbag. This position facilitates a two-team approach despite the proximity of the surgical sites. The majority of the nerve interface procedures are performed through a 6-8cm longitudinal access incision oriented 2cm posterior to the fibula and extending distally from the fibular head. The common peroneal nerve is identified posterior to the lateral compartment and the overlying fascia of the lateral compartment is released as necessary to gain access to the divergent superficial and deep peroneal branches. The motor branch to the tibialis anterior is identified using a handheld nerve stimulator and then preserved. The superficial peroneal nerve is transected and then coapted to deep peroneal motor branches of the extensor hallucis longus or extensor digitorum longus using 8-0 epineurial sutures (TMR). Dissection then proceeds posteriorly in the plane just deep to the crural fascia of the superficial posterior compartment in order to identify and mobilize the tibial and peroneal contributions to the sural nerve. Once the sural nerve branches have been identified, a new plane of dissection is developed between the soleus and gastrocnemius muscles, accessing this laterally in the interval between the lateral gastrocnemius, the flexor hallucis longus (superficially and distally), and the soleus (deep). The tibial nerve and its branches to the soleus are accessed in this space. The distal tibial nerve is transected and transferred into a single soleus motor branch or the entire soleus “trunk” using a combination of a single centralizing 8-0 suture and several 6-0 epineurial to epimysial sutures (TMR). The sural nerves are transected and then sutured to 1cm x 3cm segments of muscle harvested from the distal lower leg using 8-0 epineurial to epimysial sutures that are then reinforced with 4-0 vicryl sutures designed to plicate the muscle graft (RPNI); alternatively, the sural nerves are tunneled through the lateral gastrocnemius and embedded into the distal lateral soleus (vascularized RPNI) remote from the site of the proximal TMR. Finally, the saphenous nerve is identified during performance of the amputation and protected until the nerve interface procedure can be performed. Using a similar technique to the sural nerve management described above, the saphenous nerve is transected and sutured to a 1cm x 3cm segment of muscle harvested from the distal lower leg (RPNI). The sural and saphenous nerve RPNI constructs are transposed deep within the superficial deep compartment. The transtibial amputation procedure then proceeds in standard fashion, with performance of a distal myodesis and transposition of a posteriorly based myocutaneous flap for closure with the incision running transversely over the anterior aspect of the distal tibia. A single surgical drain is used. Both procedures are performed under tourniquet in less than 120 min, typically just over 60 minutes

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if performed concurrently.