Objectives

Stump neuromas are a debilitating consequence of amputation. Although nerve surgery including targeted muscle reinnervation (TMR) may offer lasting improvement, many now advocate for TMR at the time of index amputation in order to avoid symptomatic neuroma formation. It is as of yet unknown which nerves are responsible for the majority of painful lower extremity neuromas, and how TMR outcomes compare to other surgical techniques.

Methods

A retrospective chart review was performed for 68 lower extremity above-knee (AKA) and below-knee (BKA) amputees who underwent surgery for symptomatic neuromas from 2010 to 2019 at a single institution. Patients were stratified by amputation level and surgical technique. The change in Visual-Analog-Scale (VAS) pain scores and rates of phantom limb pain were also gathered. Outcomes of interest included which nerves were involved and changes in pain.

Results

68 previously amputated limbs underwent secondary surgery for symptomatic neuromas. 150 painful neuromas were identified. In above-knee amputees (n = 16) who presented with postoperative neuroma pain, the sciatic nerve was affected in all patients (100%), followed by the posterior femoral cutaneous nerve (25%), saphenous nerve (13%), and anterior cutaneous (6%) and posterior cutaneous nerves (6%) of the thigh. In below-knee amputees (n = 51), the most commonly affected nerves were the superficial peroneal (76%) and saphenous nerves (68%) followed by the sural (16%), deep peroneal (8%), and tibial (4%) nerves (Figures below).

Overall, 60.9% of all neuromas were managed by neuroma excision with implantation into muscle and 19.2% by excision with TMR. Traction neurectomy, centro-central coaptation, nerve capping, and others comprised the remaining 19.9%. Average improvement in VAS pain at 30-day follow-up was 54% for the TMR cohort versus 38% for other techniques. (p > 0.05)

Significant pre-operative phantom pain was seen in 74% of patients. Of the patients with preoperative phantom pain, 78% of patients undergoing TMR no longer required use of narcotics or neuromodulators. Of the patients with preoperative phantom pain, 78% of patients undergoing TMR noted no longer requiring use of narcotics or neuromodulators in their phantom pain, vs 61% for non-TMR techniques. (p > 0.05)

Discussion

In this retrospective study the majority of patients undergoing surgery for lower extremity neuroma pain had multiple painful neuromas. The majority of AKA patients presented with sciatic neuromas. In BKA patients, neuromas were most often seen in the superficial peroneal and saphenous nerves.

Additionally, patients undergoing neuroma excision with TMR nerve transfer saw better postoperative VAS pain scores and phantom limb pain symptoms compared to those treated by other techniques.

Overall these findings support the case for using TMR to treat symptomatic amputation stump neuromas and prophylactically address nerves most commonly associated with painful neuromas at the time of primary amputation.