significant difference in age (p=0.49), pre-op (p=0.19) or post-op (p=0.72) pain between patients with high and low subsidence. Sixty-eight percent of patients had high subsidence (69.2±13.6%). The average age was 60±10.6 years (range 18-86 years) and 80.9% were female. Pain decreased significantly from 6 (5-8) to 1 (0-2)(p<0.001) after surgery. Based on Connolly-Rath scores 25.7% had good, 48.7% fair, and 25.7% poor outcomes. Thirty-two percent of patients had low subsidence (34.6±12.1%). In this group, the average age was 61±8.7 years (range 37-84 years) and 87.4% were female. Pain decreased significantly from 7 (6-9) to 0 (0-3) (p<0.001) in this group and there were 8.9% good, 33.9% fair, and 57.1% poor outcomes. There were 7 revisions in 5 patients (revision rate 3.3%). There was one male and 4 female patients. All patients were right-handed. Right side was revised in 3 cases and left side in 4. In this cohort, after primary trapeziectomy, the average subsidence was 76.7±24.0% (range 33.1%-100%). In 4 cases, the trapezial space increased after revision surgery (subsidence decreased from 72.0±28.0% to 56.9±0.1% after revision); in 1 case the subsidence increased (from 59.2% to 70.2%). One hundred percent subsidence persisted in 2 cases. Three patients had good outcomes, 1 fair, and 3 poor outcomes based on Conolly-Rath scores after revision.

Conclusions: Post-trapeziectomy, pain scores improved significantly in patients with both high and low subsidence. While all patients subside after surgery, it is rare that subsidence is symptomatic and requires revision.

6

Nerve Blocks With Targeted Muscle Reinnervation Reduce Acute Postoperative Opioid Use in Major Lower Extremity Amputation

Manas Nigam, MD1, Kevin G. Kim, BS1, Patrick Harbour, MD1, Paige K. Dekker, BA1, Elizabeth G. Zolper, BS2, Areeg A. Abu El Hawa, BA1, Ivy CO, DO1, Jay Patel, MD1, Christopher E. Attinger, MD1, Kasra A. Razmjou, MD1, Grant M. Kleiber, MD1

1MedStar Georgetown University Hospital, Washington, DC, USA, 2Georgetown University School of Medicine, Washington, DC, USA.

Purpose: Major amputations of the lower extremity, specifically through and below the knee, are morbid procedures requiring general anesthesia typically followed by high doses of postoperative opioids. Many are performed on highly comorbid, chronic wound patients with a potential for increased opioid use following surgery. Given the current opioid epidemic, perioperative narcotic-reduction strategies are paramount. Our center instituted a protocol for major amputations that includes continuous regional anesthesia, for intraoperative and postoperative pain control, and targeted muscle reinnervation (TMR) nerve transfers to mitigate long-term pain. The aim of this study was to analyze the impact of continuous regional anesthesia and TMR on early postoperative opioid requirements after major lower extremity amputation at our limb salvage center.

Methods: We retrospectively reviewed our center’s below-knee and through-knee-amputations from 2017-2019 for utilization of regional pain catheters and TMR nerve transfers. Opioid usage as morphine milligram equivalents (MMEs) was tracked for the first seven postoperative days. Baseline opioid dose was defined by the documented opioid use one day before amputation. Patients were categorized into one of four groups, based on whether regional pain catheter and/or TMR were used. Kruskal-Wallis testing was used to assess baseline opioid use between groups. Bivariate linear regression was used to assess postoperative opioid use of each group compared to the control group. Logistic regression analysis was conducted to examine association between TMR and changes in opioid use postoperatively versus baseline.

Results: 198 patients were reviewed. 95 patients received perioperative regional anesthesia, of which 81 underwent TMR. 103 patients did not receive regional anesthesia, of which 30 underwent TMR. Average baseline opioid use was 40.6 MME in patients treated with TMR and regional anesthesia, 60.2 MME with TMR and without regional anesthesia, 28.7 MME without TMR and with regional anesthesia, and 132.6 MME without TMR and regional anesthesia (p=0.0004). Multivariate analysis showed that undergoing TMR, without regional anesthesia, significantly decreased postoperative opioid use by 111.7 MME, compared to the control group (p=0.006). Use of regional anesthesia, with TMR, provided an additive effect, significantly decreasing postoperative opioid use by 124.3 MME, compared to control (p<0.0001). Interestingly, regional anesthesia without TMR decreased postoperative opioid use by 93.4 MME, but without significance (p=0.08).
Odds of decreased opioid use postoperatively compared to baseline was 1.91 times higher with TMR than without TMR (p=0.04).

**Conclusion:** TMR nerve transfers were found to be independently effective at reducing postoperative opioid requirements after major lower extremity amputation. Concurrent use of regional anesthesia compounded this effect. Minimizing baseline opioid use prior to amputation may decrease opioid use postoperatively. TMR nerve transfer with continuous regional anesthesia protocol can decrease reliance on postoperative pain control with opioids in lower extremity major amputation patients.

**QUICK SHOTS**

**QS2**

Schwann Cell Characteristics, Myelination Parameters and Histomorphometric Analysis of Nerve Biopsies in Polyneuropathy Patients Compared to Controls

**Eva Györi, MD PhD, Lea Maria Brandstetter, cand. med., Jakob Zemann-Schälss, cand. med., Sonja Wolf, BA, Christine Radtke, Univ. Prof. Dr., MBA, FEBOPRAS**

**Medical University of Vienna, Vienna, Austria.**

**Purpose:** Polyneuropathy is a debilitating condition characterized by distal sensory and motoric deficits. Common risk factors in Western countries include diabetes, alcohol abuse, cytostatic drugs and cardiovascular disease. Vascular and neurochemical factors affect cells of the peripheral nervous system. Schwann cell dysfunction and impaired nerve regeneration are important pathophysiological mechanisms that are associated with changes in cellular metabolism, signal transduction and neurotrophic signaling. In experimental models of polyneuropathy, Schwann cell dysfunction and altered myelination were described. Clinically, there is very limited knowledge about Schwann cell characteristics and function in polyneuropathy patients. In this study, we investigated Schwann cell characteristics, nerve fibers and myelination parameters in nerve biopsies obtained from polyneuropathy patients compared to controls.

**Methods:** Nerve tissue was obtained from polyneuropathy patients (n = 10) undergoing diagnostic sural nerve biopsies. Biopsies of healthy peripheral nerves (n = 10) were harvested during reconstructive procedures (e.g. sural nerve grafts, denervation of muscle flaps). Exclusion criteria for the healthy control group included recent neurological trauma, diabetes, neurological and cardiovascular disease, as well as treatment with cytotoxic medication in the previous 12 months. The over-all architecture of nerve sections and myelination parameters were histomorphometrically analyzed. Immunofluorescent imaging was used to evaluate Schwann cell phenotypes, senescence markers and myelination parameters. Immunofluorescent signals were quantified using NIS-Elements imaging software (Nikon Instruments Inc.).

**Results:** The mean age of the included polyneuropathy patients (7 male and 3 female) undergoing diagnostic sural nerve biopsy was 57.3 years (SD 13.04; range 29 - 76 years). Control biopsies were obtained from patients undergoing reconstructive procedures. Three sural nerves, 3 obturator nerves, 2 thoracodorsal nerves, 1 superficial peroneal nerve and 1 medial antebrachial cutaneous nerve were analyzed. In the control group which included 2 male and 8 female patients, the mean age was 46 years (SD 13.384; range 28 - 64 years). Histomorphometric analysis of nerve biopsies showed a significant reduction in axon numbers from 3184 in the control group to 1373.3 in the polyneuropathy group (p = 0.035). Axon density and G-ratio were also significantly lower in polyneuropathy patients (p = 0.001 and p = 0.015, respectively). Immunofluorescent staining concurred with histomorphometric findings, as S-100 (p = 0.0017) and Neurofilament-H (p < 0.0001) signals were significantly reduced compared to controls. Immature p75-positive Schwann cells were identified in nerve biopsies of polyneuropathy patients. Myelin-basic protein was significantly reduced in the polyneuropathy group compared to the control (p < 0.0001).

**Conclusion:** Significantly lower axon numbers, reduced myelination and the presence of immature Schwann cell phenotypes were identified in nerve biopsies of polyneuropathy patients compared to control patients. This underlines the clinical importance of Schwann cell dysfunction in polyneuropathy.