The long-term Postoperative Pain Course Following Primary and Secondary Targeted Muscle Reinnervation in Amputees

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INTRODUCTION: Targeted muscle reinnervation (TMR) has been demonstrated to be effective in the surgical treatment of neuropathic pain for amputees. However, data on the long-term postoperative pain course for patients that undergo Primary, prophylactic (<14 days since amputation), or Secondary (≥14 days) TMR surgery for preexisting pain, and their difference, remains insufficiently described. This study aims to describe the long-term postoperative pain course for these patients to aid in managing postoperative expectations.

METHODS:

Chart review was performed for major limb amputees who underwent Primary and Secondary TMR and who were prospectively enrolled between January 2018 and January 2024, with a minimum follow-up up of 12 months. Pain scores reported on the Numerical Rating Scale (NRS, pain on a 0-10 scale) were collected up to latest follow-up. Mean NRS pain levels were compared between Primary and Secondary TMR cohorts. For Secondary TMR patients, it was assessed whether the difference in baseline and post-operative pain reached the Minimally Clinically Important Difference (MCID, ΔNRS=3.0). Multilevel mixed-effects models were utilized to analyze the difference in pain and visualize average postoperative pain courses.

RESULTS: A total of 144 amputees (60.4% male; 60.4% Secondary TMR patients) were included. The median follow-up was 2.4 years (IQR: 1.5-3.3). Primary TMR patients demonstrate a more rapid decline in pain, typically achieving average mild pain levels at 12 months (3.0, versus 4.1 for Secondary TMR patients (p<0.001)) before stabilizing. Secondary TMR patients demonstrate a less rapid, yet consistent decrease in pain, reaching an average mild pain level at the 36-month mark (NRS=2.7, versus 2.3 for primary TMR patients (p<0.001). The difference in pain between Primary and Secondary TMR patients is significantly different over the complete trajectory (p<0.001). On average, Secondary TMR patients reach the MCID at the 36-month mark, compared to pain at baseline (NRS=6.0 to NRS=2.7, ΔNRS=-3.3, p<0.001).

DISCUSSION AND CONCLUSION:

Primary TMR patients illustrated a consistent postoperative decrease in pain score, reaching low levels of pain at 12 months before stabilizing. Secondary TMR patients demonstrate slower but consistent decline in pain levels, and reach the MCID at the 36-month mark. Primary TMR patients demonstrate lower pain levels over the whole trajectory. These trends may assist in illustrating and understanding the long-term postoperative pain course and counseling patients in pain expectations following TMR. This data reinforces the durability of both Primary and Secondary TMR over a long timeframe.