



Pediatric TMR/RPNI Improves Patient-reported Pain And Reduces Narcotic Use: Temporal Trends And Comparison With Adults

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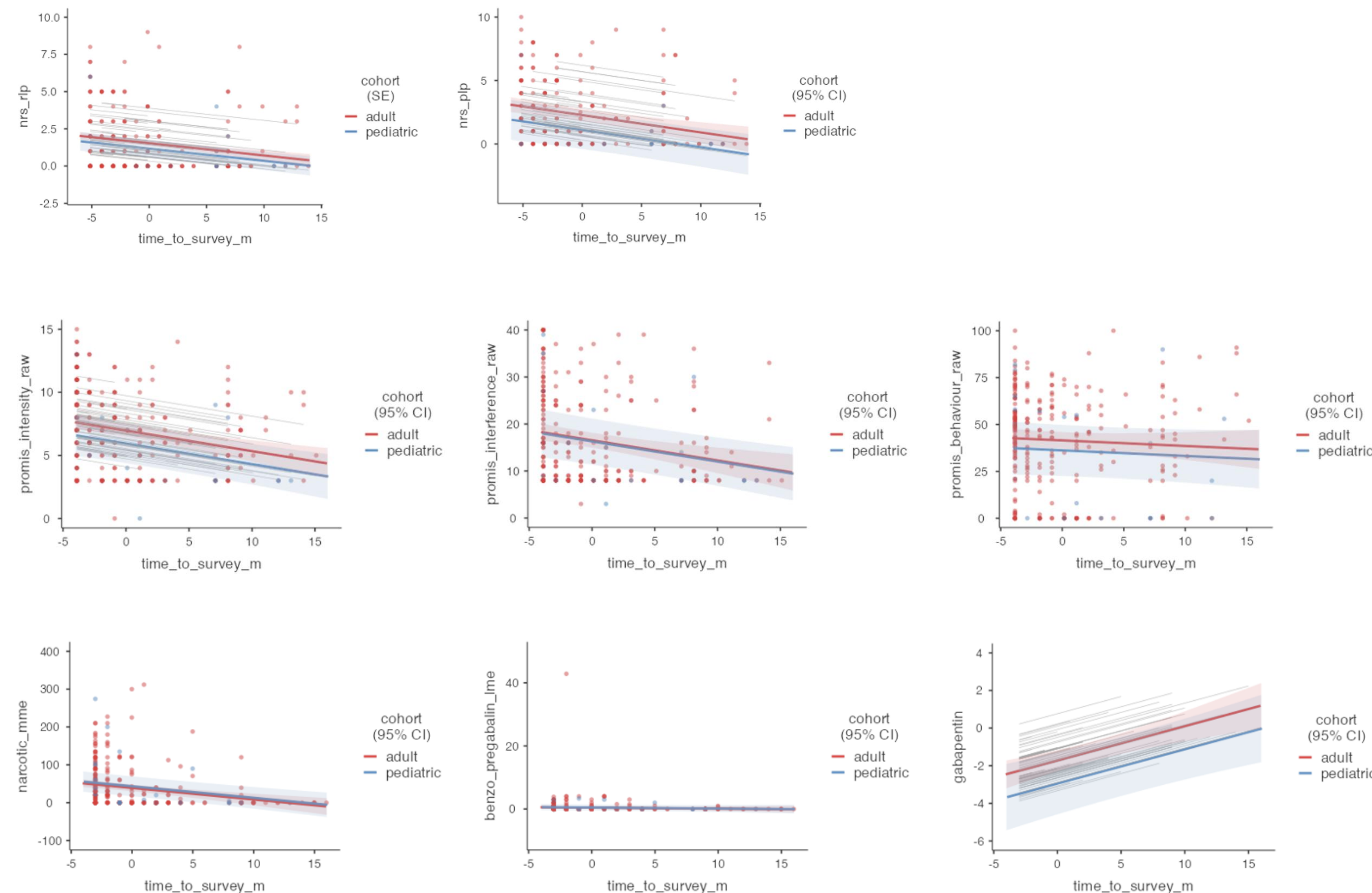
Purpose

Targeted muscle reinnervation (TMR) is an established technique for reducing postamputation pain in adults, but its role in pediatric oncologic amputees remains undefined. This study represents the largest comparative evaluation of TMR outcomes between pediatric and adult oncologic patients.

Methods

A retrospective review was conducted of patients undergoing primary oncologic amputation with targeted muscle reinnervation. Twelve pediatric patients (11%) were compared with 94 adults (89%). Long-term pain and medication use were assessed using both patient-reported outcomes (Numeric Pain Scale; PROMIS Pain Intensity, Interference, and Behavior) and prescription records for opioids, benzodiazepines/pregabalin, and gabapentin. Longitudinal data were analyzed with linear and generalized mixed-effects models to account for repeated measures and variable follow-up intervals.

Figure. Mixed effects plot of temporal patient-reported **A.** residual limb pain (RLP) and phantom limb pain (PLP); **B.** Pain Intensity (left), Pain Interference (middle), and Pain Behavior (right) ; and **C.** morphine milligram equivalents (MME, left), lorazepam milligram equivalents (LME; benzodiazepine/pregabalin, middle), and gabapentin use (right). Grey lines represent random effects.



Results

Mixed-effects modeling demonstrated significant reductions in residual limb pain ($\beta = -0.082$, $p = 0.002$), phantom limb pain ($\beta = -0.136$, $p < 0.001$), and overall pain intensity ($\beta = -0.429$, $p < 0.001$) over time. Narcotic use declined by approximately 3 MMEs per month ($p < 0.001$), while benzodiazepine use remained stable and gabapentin use increased modestly ($p < 0.001$). Pain and medication trajectories were statistically indistinguishable between pediatric and adult cohorts, indicating comparable improvements in pain reduction and analgesic tapering following targeted muscle reinnervation.

Conclusions

Pediatric oncologic amputees experience comparable reductions in pain and medication dependence following TMR as adults. These findings support early physiologic nerve reconstruction as a safe and effective strategy for mitigating chronic postamputation pain in pediatric oncologic amputees .

