

Effect of Lower Extremity Nerve Decompression in Patients with Painful Diabetic Neuropathy on Narcotic Use and Ulceration Rates: A 10-year Follow-up from the Prospective, Controlled, Randomized, Double-Blinded DNND I and II Trials

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INTRODUCTION

- Diabetic peripheral neuropathy (DPN) is a disease of increasing incidence and prevalence.
- 45% of all diabetics are affected by DPN (ADA, 2016)
- 9-16% of patients report daily narcotic use to alleviate symptoms of allodynia (*Sullivan et al. 2009*)
- No treatment currently exists to address the underlying pathophysiology of the condition.
- The DNND (Diabetic Neuropathy Nerve Decompression) trial is a randomized, controlled, double-blinded prospective clinical trial established in 2009 at UT Southwestern to elucidate the role of surgical decompression on DPN
- DNND II is a 10-year follow-up on this original study population to evaluate long-term outcomes of decompression: pain, podiatric, and neurophysiologic parameters.

PATIENTS AND METHODS

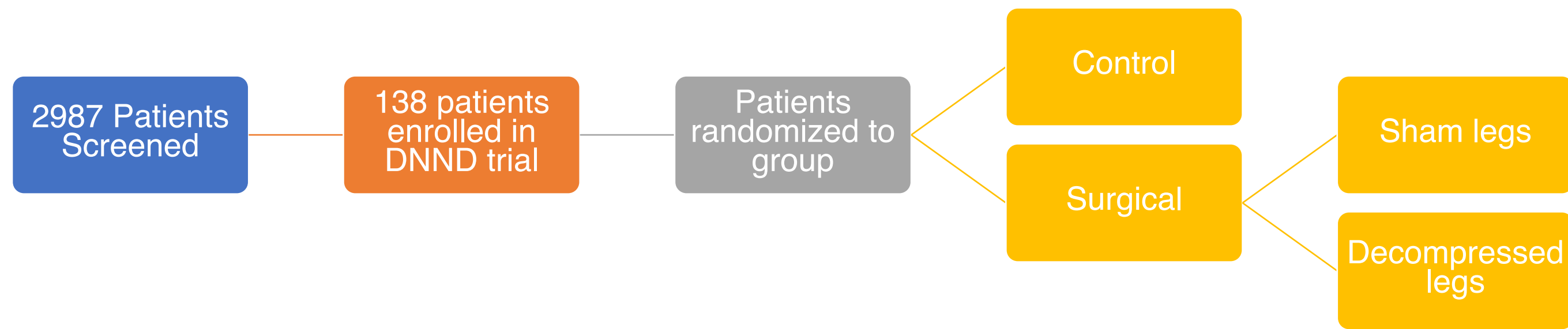


Figure 1- Schematic overview of the clinical trial design.

Patients:

- 2987 patients were screened for the initial DNND I trial, with 138 patients deemed eligible and enrolled in the trial.
- Enrolled patients were then randomized to either the control or surgical group.
- The legs of the patients randomized to the surgical group were randomized to receive either a sham surgery or the decompressive surgery, and patients were blinded to side.

Methods:

- **DNND I**
 - The following nerves were decompressed in surgical legs: common peroneal nerve at the fibular neck, deep peroneal nerve at the dorsum of the foot, and posterior tibial nerve at the tarsal tunnel.
 - Patients were followed for 1 year by plastic surgery, podiatry, neurology, and PM&R, and contacted at 56 months for a follow-up questionnaire on pain and quality of life (SF-36).
- **DNND II**
 - Patients were invited to return for a 10-year follow-up after completion of the initial DNND I trial.
 - Patients underwent assessment by podiatry and neurology including nerve conduction studies and quantitative sensory testing.
 - Patients additionally completed pain and quality of life (SF-36) questionnaires.
- **Statistical Analysis**
 - Pairwise testing was performed using the student t test, while omnibus testing was performed using the 2-way repeated measures ANOVA
 - All analyses were performed using GraphPad Prism software.

RESULTS

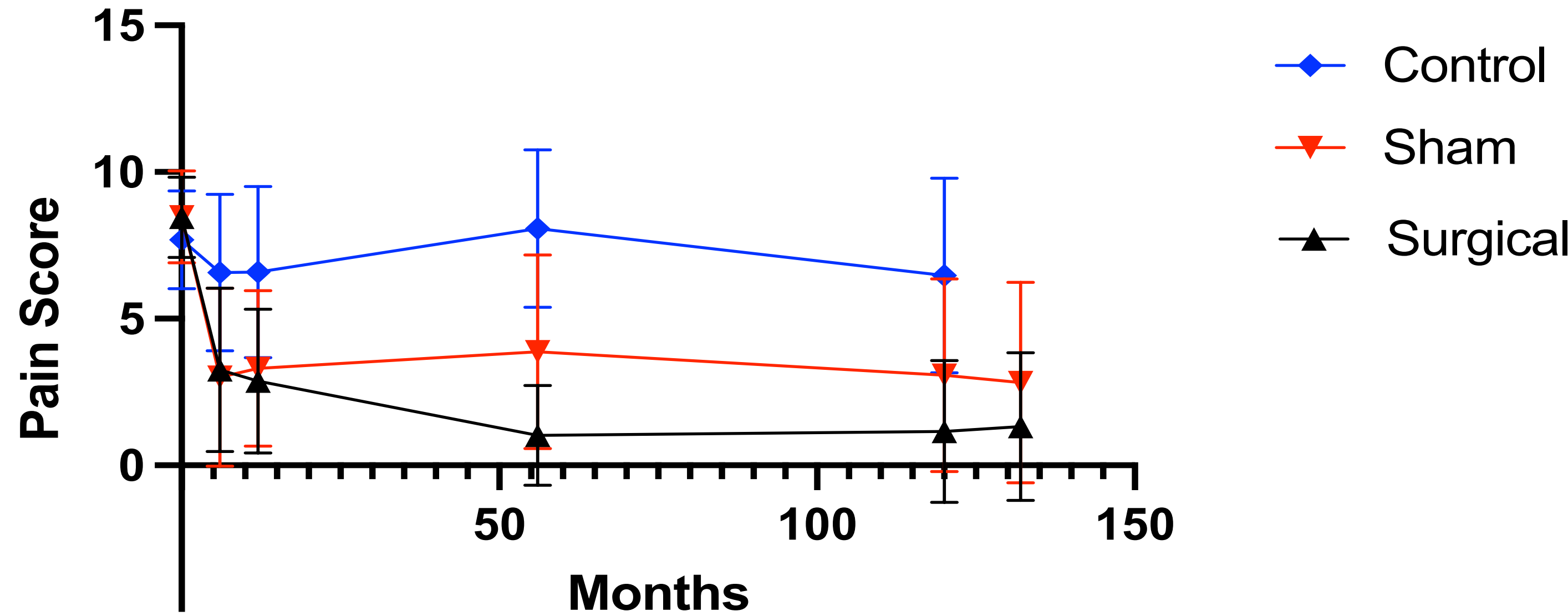


Figure 2- Quantitative pain score over the follow-up period.

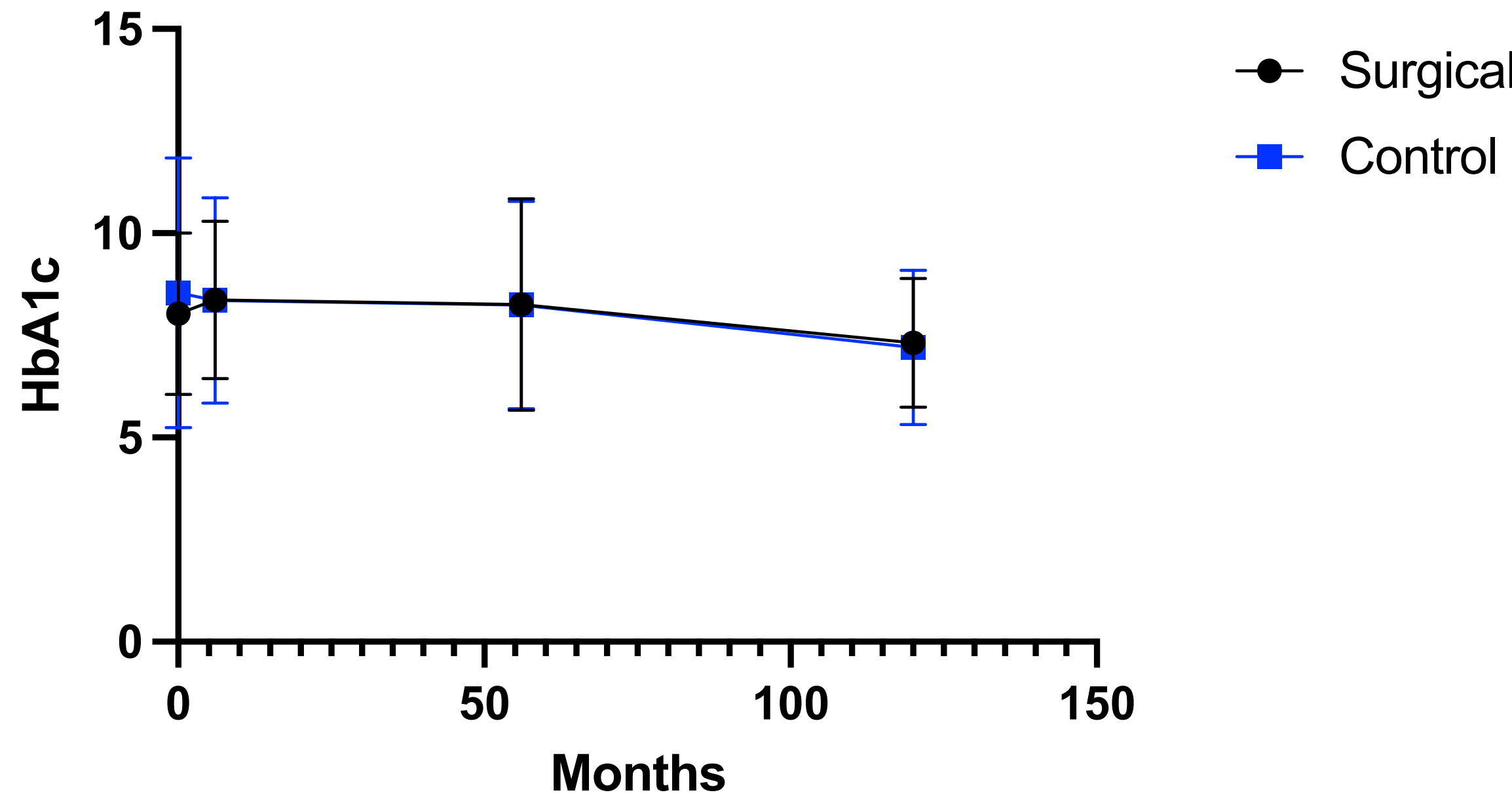


Figure 3- HbA1c levels over the follow-up period.

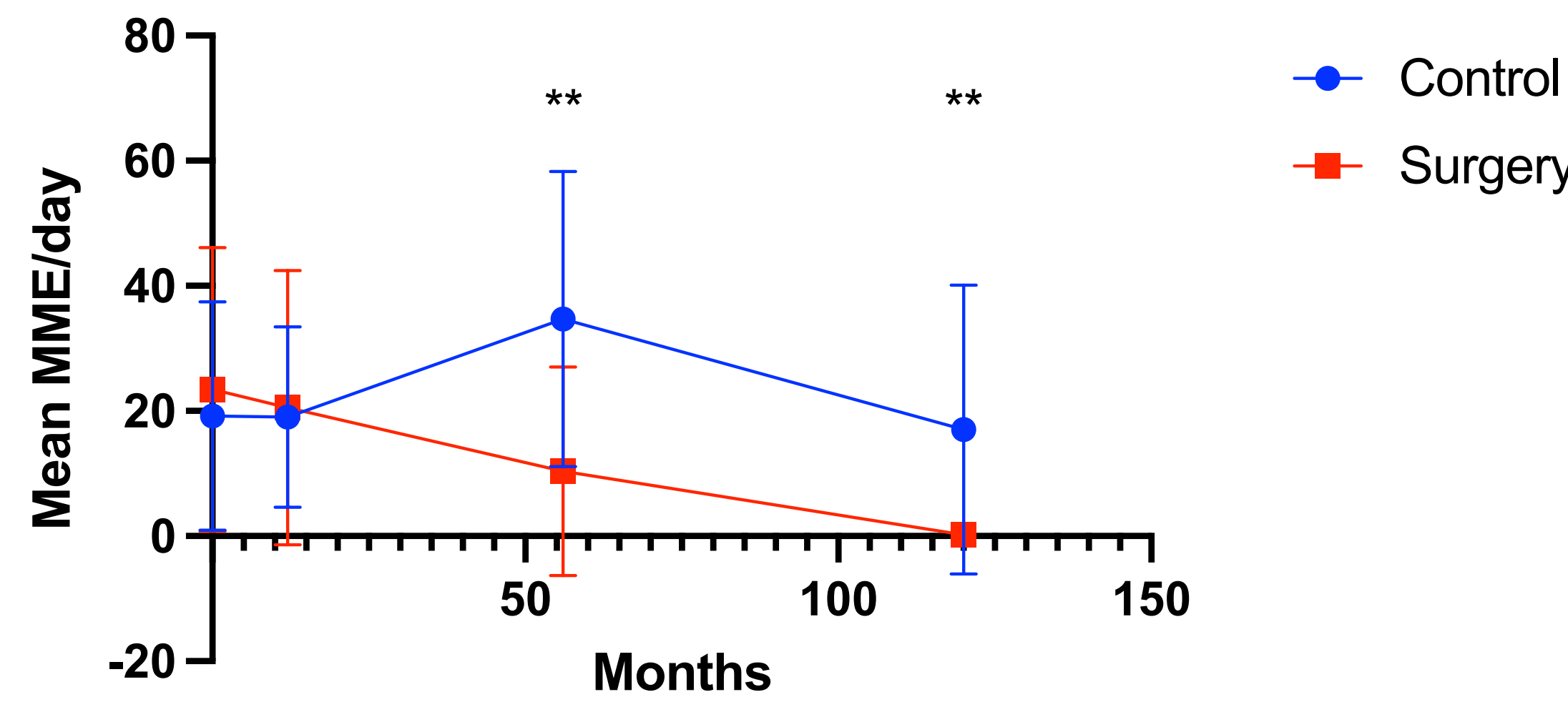


Figure 4- Narcotic analgesic use over the follow-up period. Narcotic dosages were calculated in terms of Milligrams Morphine Equivalents per day (MME/day) according to standard conversions. Asterisks denote significance at the p=0.01 level.

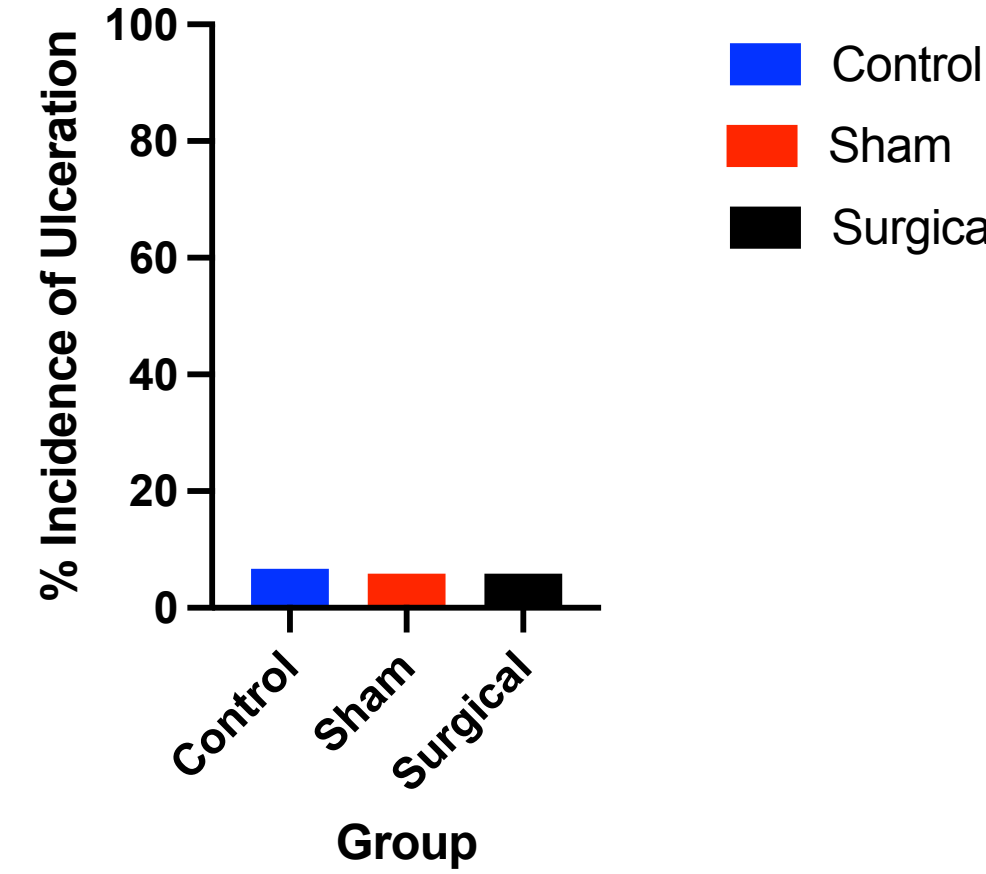


Figure 5- Incidence of ulceration at the 10-year follow-up calculated as the quotient of the number of incidences over the total population per group.

SUMMARY OF RESULTS

- **Pain**
 - No statistically significant changes observed in pain score in control legs over the follow-up period (p=0.277)
 - Statistically significant improvement in both sham (p<0.0001) and surgical legs (p<0.0001) from baseline, however, surgical legs showed greater improvement in pain score at the 56 month follow-up (p=0.03)
 - No significant differences in pain score between the 56 month follow-up and the 10-year follow-up (p=0.65)
 - Glycemic control stayed constant throughout all groups over the entire follow-up period (p=0.45)
- **Narcotic Analgesic Use**
 - From baseline to the 56 month and 10-year follow-ups, surgical patients experienced a significant reduction in MME/day requirements of -2.8 and -23.3 MME/day, respectively (p=0.0001)
 - Control patients experienced no change in MME/day (p=0.98) over the study period.
- **Ulceration**
 - No significant differences in incidence of ulceration between control, sham, and surgical legs (p=0.67)

DISCUSSION

- Peripheral decompression in patients with painful DPN is associated with **long-term improvement in quantitative pain scores** and **decreased reliance on chronic narcotic analgesic use**.
- While sham legs did experience improvement in pain score from the 0-56 month follow-up period, surgical legs experienced greater, sustained improvement over the entire follow-up period.
- These findings are supported by results obtained from the first phase of the trial.
- While incidence of ulceration was not found to have significant differences between study groups, this may be attributed to floor effects in this dataset.

CONCLUSIONS

1. **Pain-** Peripheral nerve decompression may provide meaningful benefit toward pain and quality of life in certain patients with painful DPN despite optimization of glycemic control.
2. **Ulceration-** Peripheral nerve decompression provides unclear benefit towards reduction of ulceration incidence.

REFERENCES

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