

# Dose-dependent Effects of Botulinum Toxin on Functional Recovery in Sciatic Nerve Injured Rats

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## Introduction

- Recent regenerative studies are demonstrating the wide used of Botulinum neurotoxin A (BoNT/A).
- It is assumed that BoNT/A directly stimulates axonal regeneration in injured peripheral nerves, leading to neurological recovery.
- However, there is no research on the most appropriate dose of BoNT/A that produces an optimal neurological recovery.
- This study compared the degree of functional recovery using various doses of BoNT/A.

## Methods

- Twenty-five 6-week-old rats with sciatic nerve injury were randomly divided into three experimental groups, control, and a sham group.
- The experimental groups received a single session of intraneural BoNT/A (3.5U or 7U or 14U/kg) injection immediately after a nerve-crushing injury.
- The control group was treated with intraneural normal saline injection after sciatic nerve injury.
- Sham group received only skin and muscle incision.
- For functional assessment, electrophysiological studies and serial sciatic functional index (SFI) analysis were performed every week for 9 weeks.

## Result

- The electrophysiological study results demonstrated a gradual increase in compound muscle action potential amplitude (CMAP) in both experimental and control groups.
- In comparison with the control group, all BoNT/A (3.5U, 7U, 14U/kg) groups showed a statistically significant increase in CMAP amplitude after 2, 3, 4 weeks sequentially ( $p < 0.05$ ).
- Comparing the efficiency between the BoNT/A groups, larger CMAP amplitude was observed in 3.5U/Kg BoNT/A group than 14U/Kg BoNT/A group from eighth week.
- 7U/Kg BoNT/A group had a greater CMAP amplitude than the 14U/Kg BoNT/A group only at ninth week.
- In all results throughout the experimental period, 3.5U/Kg BoNT/A group and 7U/Kg BoNT/A group showed no significant difference in CMAP and SFI.

## Result

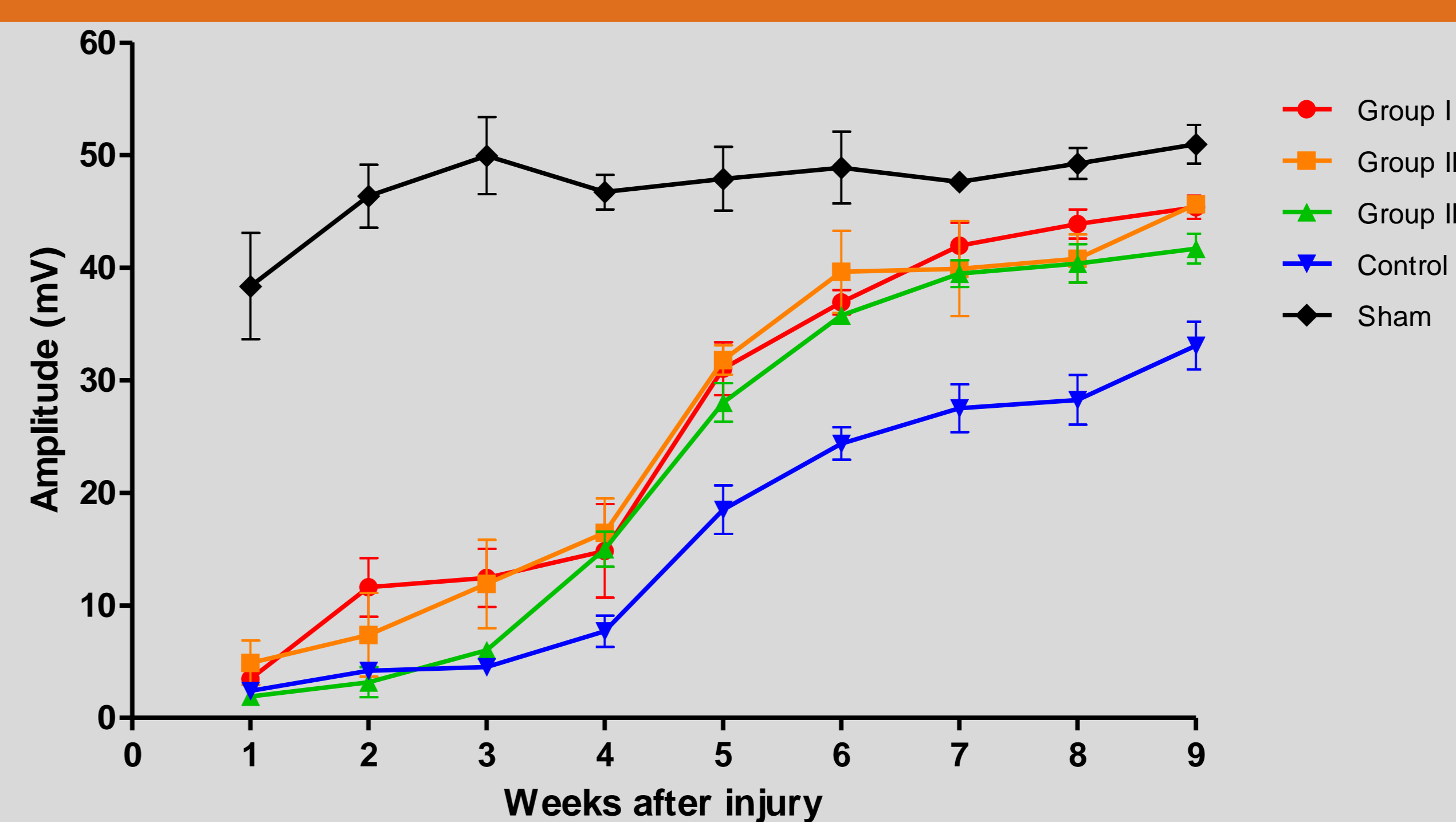


Figure 1. CMAP amplitude of each group, weekly

- In 3.5U/Kg BoNT/A and 7U/Kg BoNT/A groups, SFI results showed a significant increase, compared to the control group after 2, 3 weeks sequentially ( $p < 0.05$ ).
- 14U/Kg BoNT/A group was found significant compared to the control group in SFI only at ninth week.
- While comparing the effectiveness of the BoNT/A groups, it was found that starting in the eighth week, both the 3.5U/Kg BoNT/A group and 7U/Kg BoNT/A group had a greater SFI results than the 14U/Kg BoNT/A group.

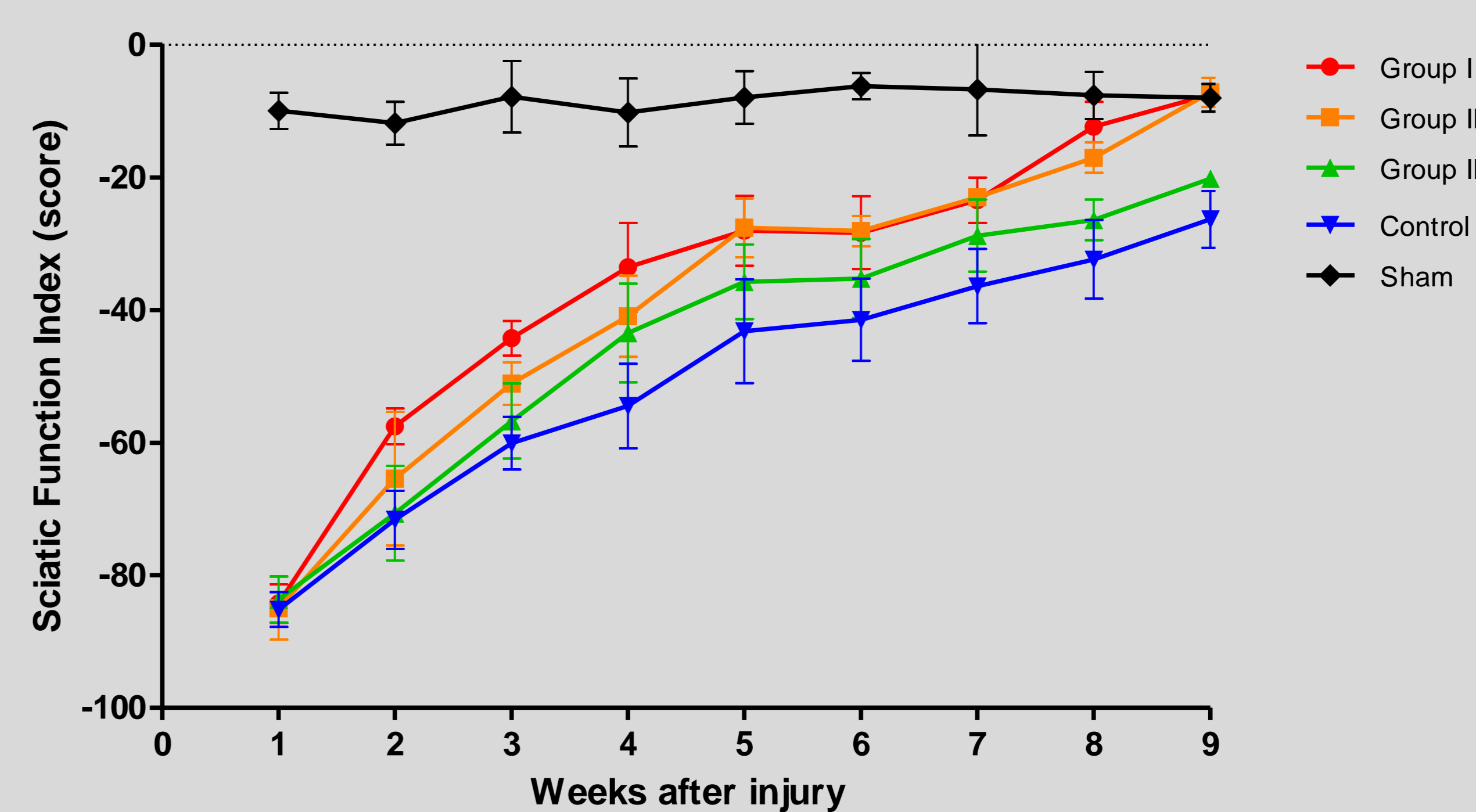


Figure 1. SFI score result of each group, weekly

## Conclusion

- These findings indicate that all BoNT/A injected groups revealed a better functional recovery than the control group.
- Comparing within the BoNT/A injected groups, 3.5 U/Kg and 7.0 U/Kg BoNT/A group reported a better functional recovery than 14U/Kg BoNT/A group at ninth week.
- As 3.5U/Kg BoNT/A group and 7U/Kg BoNT/A group showed no statistical difference, we recommend using 3.5U/Kg BoNT/A for the cost effectiveness.
- Further studies are needed to evaluate the effect of BoNT/A in various doses on molecular level.

## Reference

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