



Enhancing Functional Recovery with Local FK506 Hydrogel Treatment in Peripheral Nerve Injury

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INTRODUCTION

Peripheral nerve injuries result in loss of function and can be associated with long durations of recovery.

FK506 (tacrolimus) accelerates the rate of nerve regeneration, however, systemic effects limit its clinical applications.

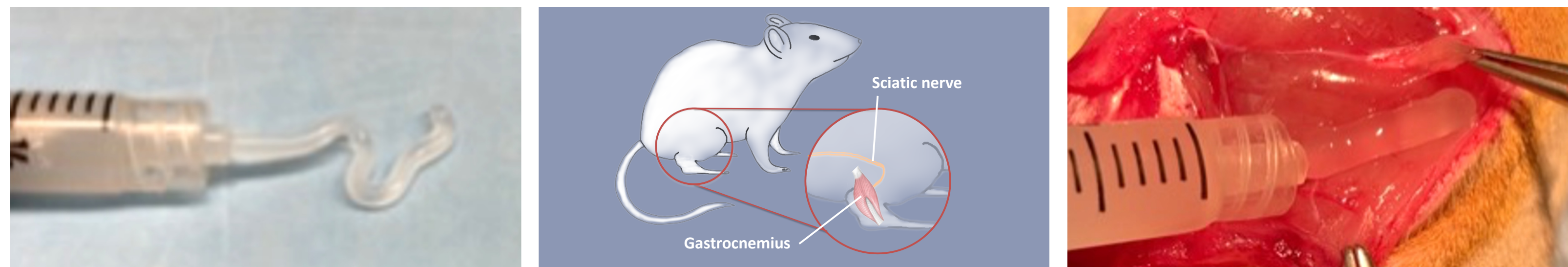
Drug delivery approaches hold promise for local FK506 delivery without systemic side effects.

This study aimed to assess functional recovery after systemic and local FK506 therapy with hydrogel.

METHODS – 1

Phase-changing poloxomer hydrogel was created with increased cross-linking for extended release.

Sciatic nerve transection and repair surgery was performed in rats.



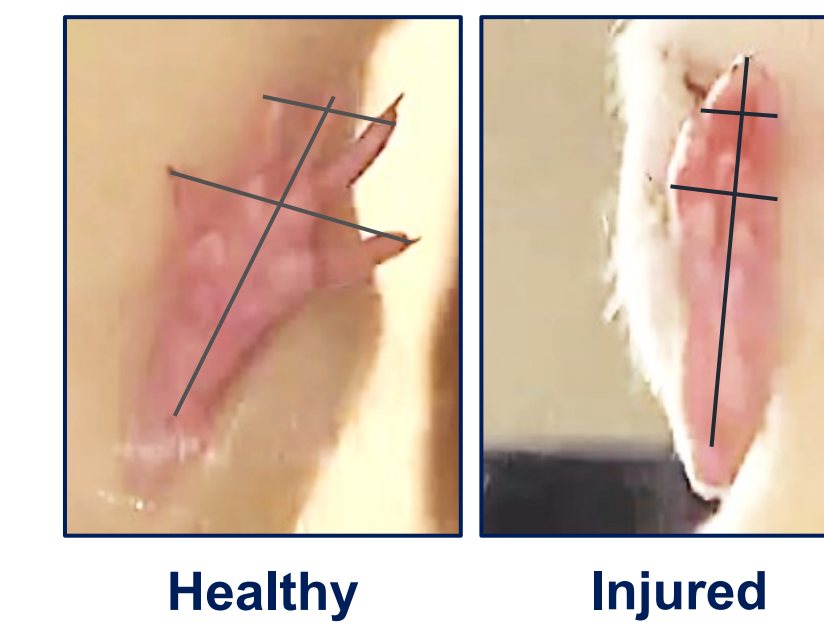
Rats were divided into four groups:

Control No additional treatment	Systemic Injection Daily subcutaneous injections of 2mg/kg FK506
Empty Hydrogel 0.2mL/1.5cm of hydrogel over the repair site	FK506 Loaded Hydrogel 0.8mg/0.2mL/1.5cm FK506 hydrogel over the repair site

METHODS – 2

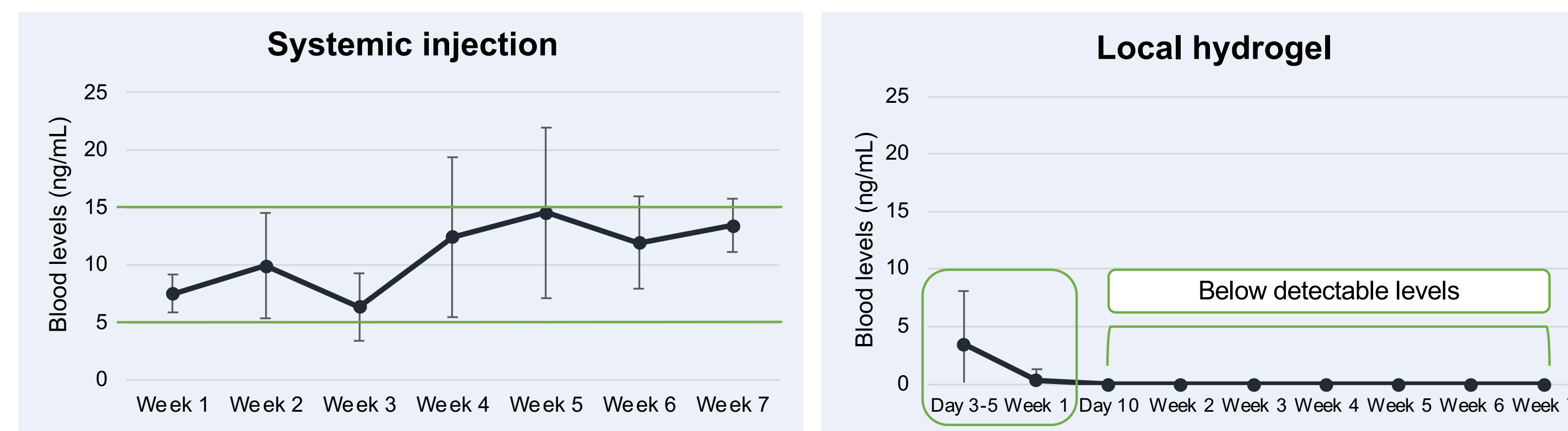
Followed for 7 weeks with weekly FK506 blood level and walking track/gait analysis.

Gastrocnemius tetanic force was assessed at the endpoint and normalized by body weight.

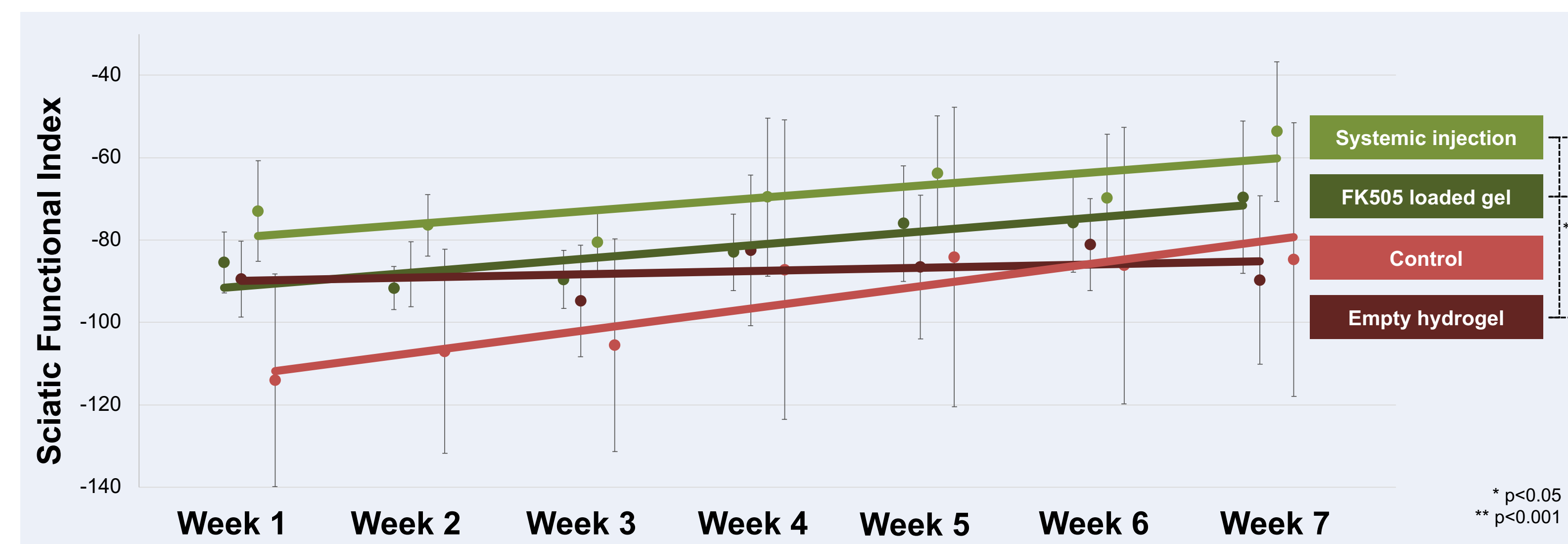


RESULTS – 1

Blood FK506 levels in the systemic group were within the therapeutic range throughout the experiment. Levels were not detectable in the hydrogel-treated group, after a mild initial burst.



Both systemic and hydrogel treated groups had a higher functional index than their respective control groups.

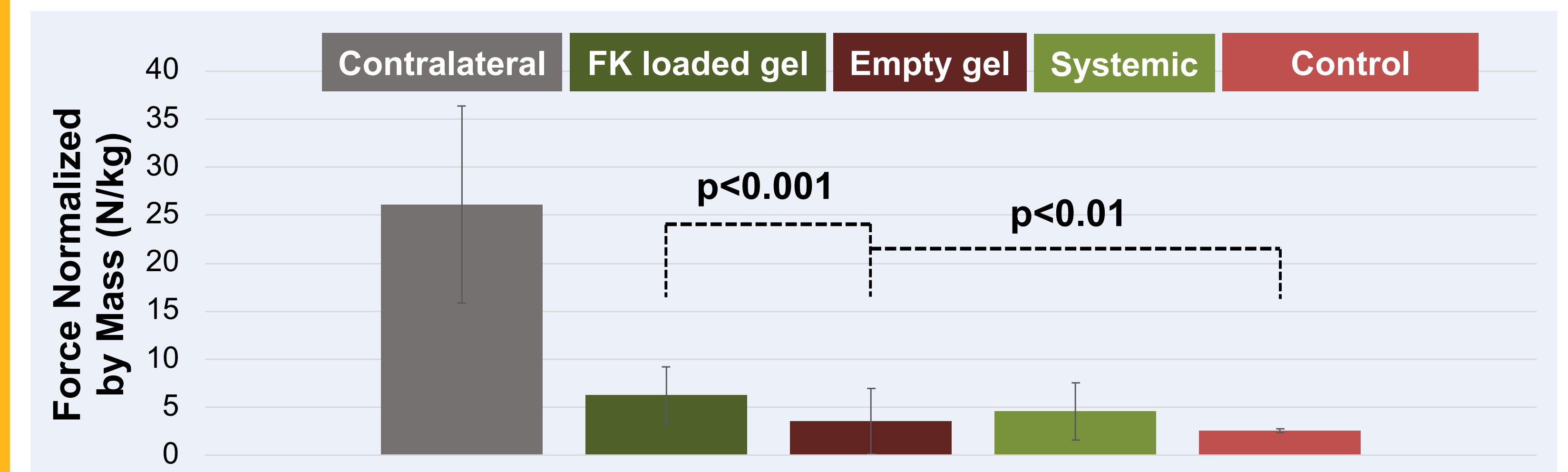


RESULTS – 2

The hydrogel and the systemic groups generated similar forces.

The hydrogel group had greater force than its respective control.

All contralateral uninjured gastrocnemii showed higher force relative to the injured limbs.



The neural tissues still had detectable levels of FK506 at the 5- and 7-week time points.

CONCLUSION

Local FK506 delivery with hydrogel **improves functional outcomes** after nerve injury, while negating systemic side effects.

This hydrogel can be easily applied **under direct visualization** and could be **injected under ultrasound guidance**.

Future studies on molecular mechanisms of nerve regeneration and local drug dosing **can help identify the optimal treatment**.

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