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Exploring the mechanism of neural-function reconstruction by reinnervated nerves in targeted muscles

Key words: Neural function reconstruction, Targeted muscle reinnervation, Intramuscular myoelectric signal, Myoelectric prostheses

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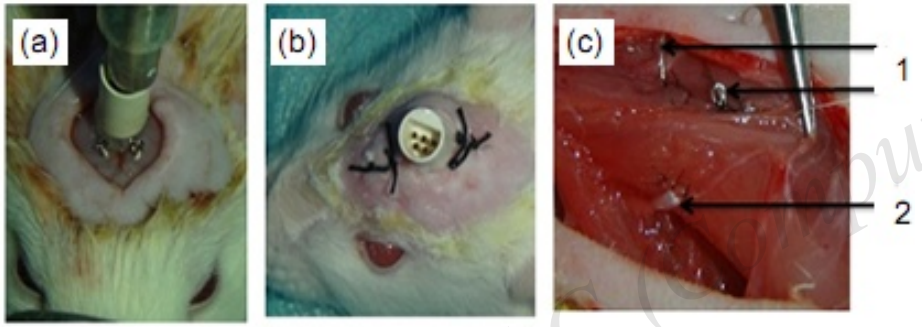
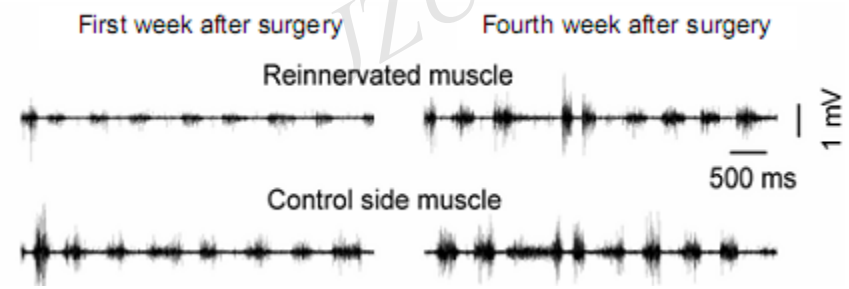
• To reconstruct myoelectric sources physiologically related to lost limbs, a newly proposed neural function construction method, targeted muscle reinnervation (TMR), appears promising.

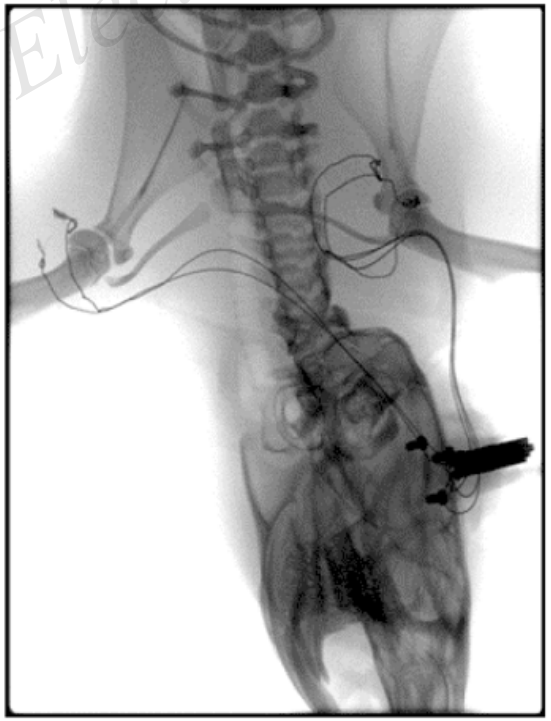
• In this study, we develop the TMR models in rats to investigate the physiological functional recovery of the reinnervated muscle after TMR surgery.



Rat TMR model



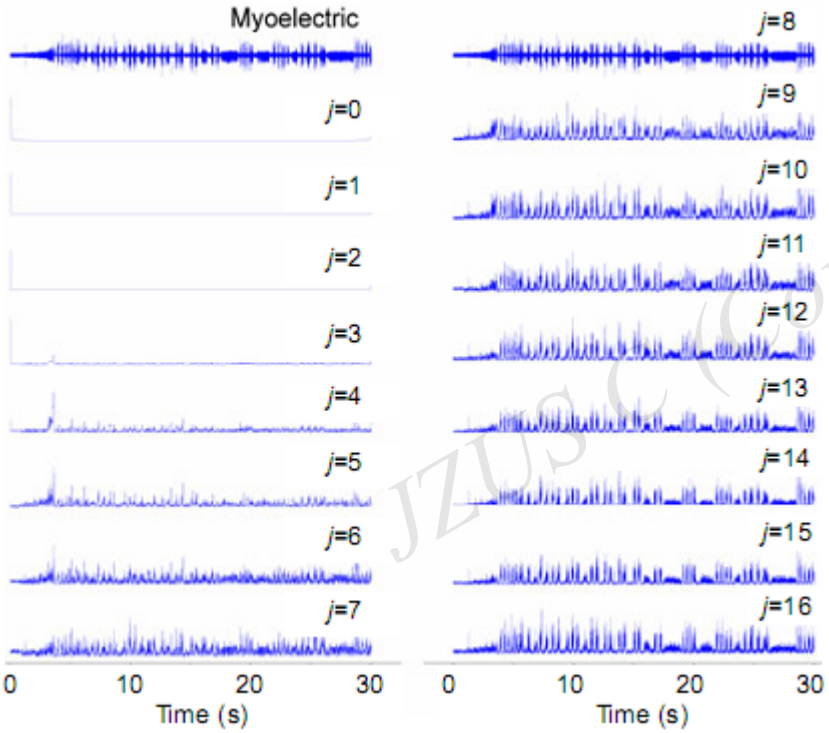
Recorded myoelectric signal from targeted muscles



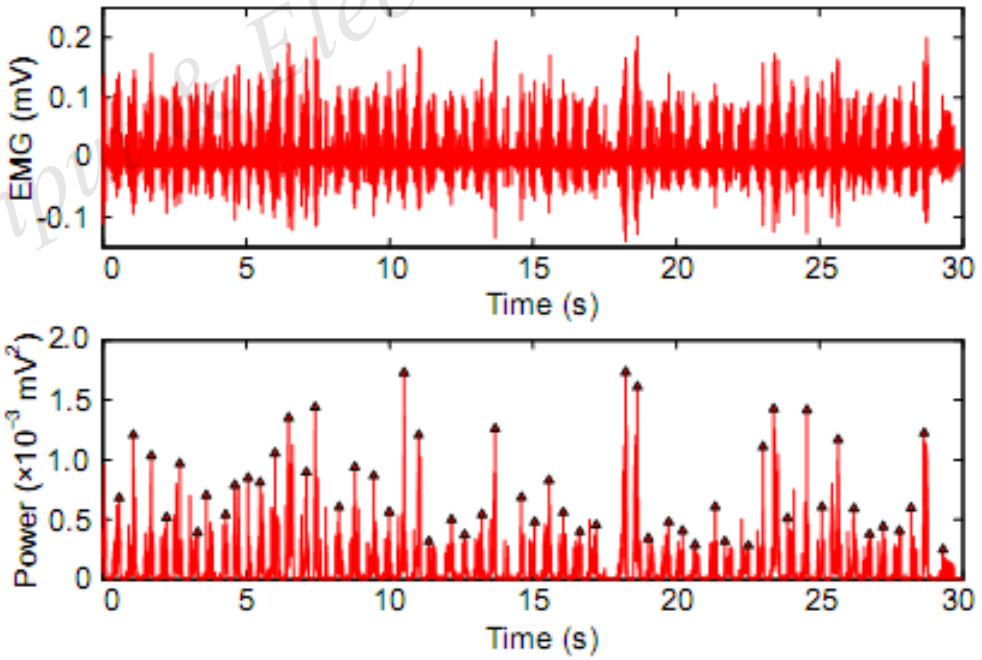
A rat with implanted intramuscular electrodes and head connector

• To evaluate muscle functional recovery, the active myoelectric signals from targeted muscles need to be extracted from the recordings.

• Myoelectric intensity analysis methods based on wavelet filter banks are developed to detect the onset and offset of the active myoelectric signals.



Myoelectric envelopes computed by the Morlet wavelet banks



A representative myoelectric signal and detected burst peaks

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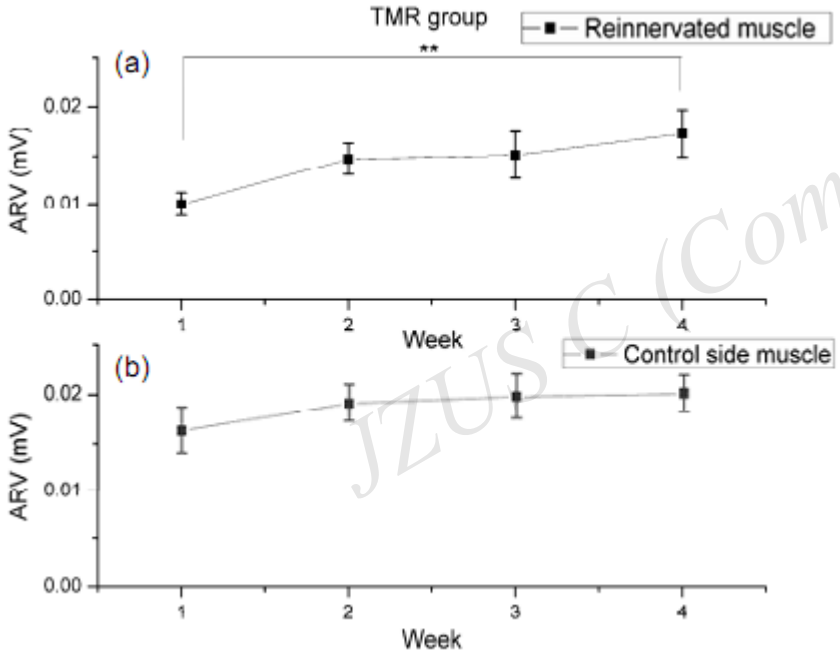
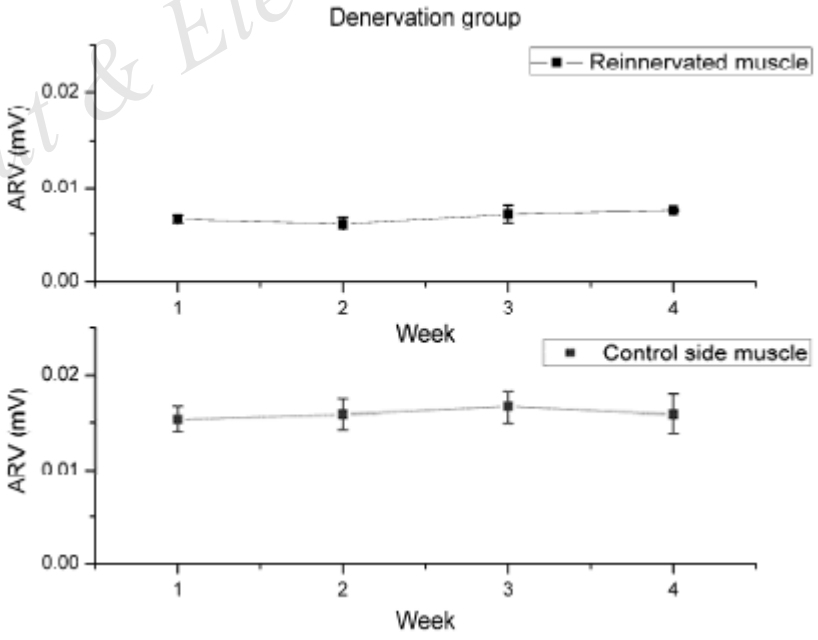
• The average rectified value (ARV) of the active myoelectric signals was used to characterize the activity levels of the targeted muscles.

• Statistical analysis of extracted myoelectric information from TMR rats showed a gradual improvement in myoelectric activity, and a statistically significant difference was found between the fourth and the first weeks in the reinnervated muscle after TMR surgery.



ARVs of active myoelectric signals from targeted muscles averaged over the six TMR rats



ARVs of active myoelectric signals from targeted muscles averaged over the six denervated rats

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