

Minimally Invasive, Non-Terminal *In Vivo* Muscle Testing of a Porcine Tibia Fracture Model

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Background and Hypothesis: Soft tissue injury surrounding tibia fractures is a key determinant of surgical care decisions and healing outcomes. We have established a porcine tibia fracture model with a corresponding volumetric muscle loss (VML) injury in the adjacent peroneus tertius (PT) muscle. Herein, we test the hypothesis that tibia fracture without VML induces an initial strength deficit that recovers within three months post-injury, while VML injuries present chronic strength deficits.

Experimental Design or Project Methods: 15 castrated Yucatan minipigs pigs will be evaluated in the following groups: Tibia defect (TD)-only, TD+small VML, and TD+large VML. To date, 12 have undergone injury, and 3 have completed the study (TD-only, n=2; TD+small VML, n=1).

In vivo muscle testing of the anterior compartment of the lower hindlimb was performed before and 1, 2, and 3 months post-injury.

Results: Before injury the non-operative and operative limbs had similar peak muscle strength (11.8 ± 1.0 vs. 10.8 ± 0.6 Nm; $p=0.42$), and non-operative limb strength did not change during the study (ANOVA $p=.89$). Relative to pre-injury values, the tibia defect with VML injury presented 71, 77, and 79% strength loss, while the tibia defect-only limbs presented 46, 60, and 48% strength loss at 1, 2, and 3 months post-injury, respectively.

Conclusion and Potential Impact: The data are limited by low sample sizes as this project is ongoing. Preliminary data do not appear to support the hypothesis, as limbs with TD-only presented persistent strength deficits, though potentially of lesser magnitude than VML injured limbs. The mechanism of strength loss following TD-only may be related to disuse.