
Muscle stem cell activation in a mouse model of rotator cuff injury.

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Public Summary:

This report describes the response of satellite cells to rotator cuff injury and denervation. The findings show that muscle stem cells become activated in response to rotator cuff injury and are not depleted. This information helps direct research to better aid the rotator cuff muscles in recovery.

Scientific Abstract:

Rotator cuff (RC) tears are frequently complicated by muscle atrophy. Muscle stem cells (MuSCs) repair damaged myofibers following injury, but their role in the prevention or pathogenesis of atrophy following RC tears remains undefined. We hypothesized that the RC MuSC population would be affected by supraspinatus (SS) and infraspinatus (IS) tendon transection (TT) compared to uninjured muscle in a mouse model of RC tear. C57BL6/J mice underwent unilateral SS and IS TT and contralateral sham surgery. At 3, 8, or 14 weeks after injury, mice were euthanized, and SS and IS were harvested for FACS sorting of CD31-/CD45-/Sca1-/ITGa7+/VCAM+ MuSCs or histological analysis. Ki-67+ MuSCs from injured muscle increased 3.4-fold at 3 weeks ($p = 0.03$) and 8.1-fold at 8 weeks ($p = 0.04$) following TT injury, but returned to baseline by 14 weeks ($p = 0.91$). Myod1 remained upregulated 3.3-fold at 3 weeks ($p = 0.03$) and 2.0-fold at 14 weeks ($p = 0.0003$), respectively. Myofiber cross-sectional area was decreased at both 3 and 14 weeks after injury, but the number of MuSCs per fiber remained relatively constant at 3 ($p = 0.3$) and 14 ($p = 0.6$) weeks after TT. In this study, we characterized the longitudinal effect of RC tendon injury on the MuSC population in supraspinatus and infraspinatus muscles. MuSCs are transiently activated, and are not depleted, in spite of persistent muscle atrophy. (c) 2017 Orthopaedic Research Society. Published by Wiley Periodicals, Inc. J Orthop Res 36:1370-1376, 2018.

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