Effect of Omega-3 and Essential Amino Acid Supplement on Standing and Walking Functional Tests in Post-ACL Reconstruction Individuals: A Pilot Study

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Summary

Anterior cruciate ligament (ACL) injuries lead to muscle atrophy. Physical therapy is the standard treatment both pre- and post-ACL reconstruction surgery. Nutritional intervention, along with physical therapy, may help reduce muscle atrophy and enhance functional recovery after surgery, but this approach has not yet been tested. Our aim is to assess the effects of combined omega-3 fatty acid (O-3FA) and essential amino acid (EAA) supplementation on muscle atrophy (quadricep volume and strength) and functional biomechanics (standing and walking stability and asymmetry) in individuals post-ACL surgery. This study is an ongoing, double-blind, randomized controlled trial (current enrolment: n = 23 of 30), involving a 12-week intervention and testing program. Here, we present preliminary results showing differences in our key functional biomechanical outcome metrics between injured and non-injured limbs. This novel nutritional approach to reduce muscle loss and improve function could enhance rehabilitation and expedite recovery.

Introduction

ACL injuries lead to significant muscle atrophy in the injured leg. Currently, pre- and post-surgical physical rehabilitation are the main methods of enhancing or regaining muscle function. A potentially complementary approach to reduce atrophy may be through nutritional intervention. Ingestion of O-3FA have been shown to reduce muscle atrophy in young, healthy females during a two-week period of voluntary unilateral immobilization [1]. While promising, this intervention is yet to be tested in post-ACL surgery individuals. It is also unclear if the achieved reductions in muscle atrophy affect functional measures like standing and walking stability, both of which affect injury and re-injury rates [2]. Therefore, the purpose of this study is to assess the effects of O-3FA and EAA supplementation on biomechanical performance in standing and walking trials in individuals undergoing ACL surgery.

Methods

This study is an ongoing, double-blind, randomized controlled pilot trial. Participants (current enrolment: n = 23 of 30) must be > 18 years old, have suffered a partial or total ACL tear, require surgery, and commit to a standard post-surgery physical rehabilitation program. Participants are randomly assigned to either the treatment (daily supplement of 5g of O-3FA and 40 g of EAA) or control group (same doses of placebo: safflower oil and non-essential amino acids). Both groups will consume their fatty acid supplement for 6 weeks (4 weeks pre-surgery to 2 weeks post-surgery) amino acid supplement for 3 weeks (1 week pre-surgery to 2 weeks post-surgery). Standing and walking functional biomechanical tests occur 4 weeks pre-operation (baseline) and eight weeks post-operation (post-intervention) on an instrumented treadmill (Bertec, Inc., USA). The standing tests include single leg standing on the injured and uninjured limb, with eyes open and closed for three repeats. Our key standing outcome metrics are center of pressure velocity in the mediolateral (X) and fore-aft (Y) directions (Fig. 1A). The walking tests include walking at both a set speed (1.25m/s) and a self-selected speed [3]. Key walking outcome metrics are step length, stance time, and peak vertical ground reaction force (vGRF) during heelstrike (Fig. 1B). For each metric, we will compute a symmetry ratio (SR) between the injured and uninjured limb and compare it between the two groups across the two time points using a mixed ANOVA. Post-hoc t-tests will be conducted with a Bonferroni correction (p = 0.05).

Expected Results and Conclusions

We hypothesize that the nutritional intervention will lead to decreased muscle atrophy post ACL reconstruction, which will in turn improve symmetry between the affected and unaffected limbs during both standing and walking.

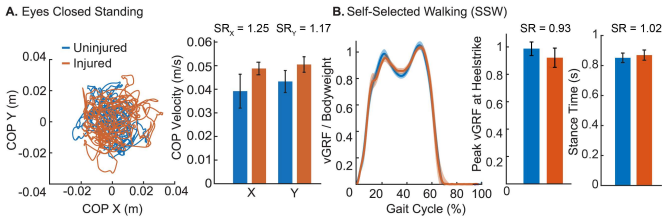

Figure 1: Standing (A) and walking (B) data from a representative ACL injured participant during post-intervention testing of the uninjured (blue) and injured (orange) legs.

Conclusions

Establishing a novel nutritional approach to prevent the loss of muscle mass and function after surgery could improve rehabilitation outcomes and accelerate the return to activity.

Acknowledgements

This work was supported by the Canadian Donner Foundation to C.M. (C-03-23) Natural Sciences and Engineering Research Council of Canada to J.C.S (RGPIN-2019-05677).

References

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