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Previous anterior cruciate ligament injury compromises bone and muscle strength in collegiate athletes

K. Berglove

L. M. Scibora

Cartilage repair is still a major challenging issue after high impact sports injury. Extensive therapeutic exercises, such as continuous passive motion, or progressive weight bearing exercise, have been implemented in early clinical rehabilitation stage for cartilage injury. Above-mentioned exercises provide beneficial effects in the articular joint status and cartilage healing. However, the feasibility of osteochondral defects receiving early immediate weight-bearing exercise is not concluded.
PURPOSE: To investigate whether the osteochondral defects could be improved healing after early immediate weight-bearing conditioning treadmill exercise.
METHODS: All surgical procedures were approved by the Animal Care and Use Committee. Eight adults New Zealand White male rabbits were studied, providing 8 knees in each for treadmill exercise group (TRE) and sedentary control group (SED). An osteochondral cartilage defects, 3 mm in depth and 3 mm in diameter, in patellofemoral groove was created with drill. In TRE group, the rabbits were performed by a progressive exercise at postoperative week 4 for 2 weeks. In SED group, no exercise was given. All of rabbits' functional activity determined by observing behavior, drinking and eat, and body weight, skin wound condition, as well as body temperature indicating circulation changes were measured. The macroscopic cartilage and bone matrix determined by bone volume per tissue volume (BV/TV) and trabecular thickness (TbTh) using micro-CT analysis were evaluated at postoperative week 6.
RESULTS: After exercise, the body temperature was significant higher than resting status (post-exercise: 40.73 ± 0.97°C vs resting: 35.9 ± 0.43°C, $p<0.001$). At week 6, compared to the SED group, the TRE group had a significant increase body weight (TRE: 2.5 ± 0.18 kg vs SED: 2.23 ± 0.27 kg, $p=0.04$), obvious cartilage-like reparative matrix at defects, visible new osseous tissue formation, and a significant higher BV/TV (TRE: 25.82 ± 6.75% vs SED: 16.97 ± 8.05 %, $p=0.04$). No significant differences between groups regarding functional recovery time, wound condition and TbTh (TRE: 0.21 ± 0.03 mm vs SED: 0.16 ± 0.04 mm) were observed.
CONCLUSIONS: Early progressive weight-bearing treadmill exercise could potentially improve for healing of cartilage and bone defects in the rabbit model.

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103 Board #6 May 27, 9:30 AM - 11:30 AM

Previous Anterior Cruciate Ligament Injury Compromises Bone and Muscle Strength in Collegiate Athletes

Katie Berglove, Lesley M. Scibora. *University of Saint Thomas, Saint Paul, MN.*

(No relationships reported)

A growing body of research has shown that recreationally active individuals have decreased bone and muscle strength following anterior cruciate ligament (ACL) injury and reconstruction; largely attributed to immobility following reconstructive surgery. However, little research has examined musculoskeletal adaption to ACL injury among collegiate athletes.
PURPOSE: To examine limb-to-limb differences in muscle and bone strength parameters in collegiate athletes with a history of ACL injury and reconstruction.
METHODS: Peripheral quantitative computed tomography (pQCT) and a series of muscle function tests were used to assess bone and muscle strength, respectively, among 12 Division III college athletes (5 males, 7 females; age=20.7 ± 0.5 years) with an ACL injury in the previous five years. Total and cortical bone volumetric density (ToD and CoD), and cortical bone mineral content (CoCnt), bone area (CoA), thickness (CoTh) and estimated bone strength (SSIp), along with muscle cross-sectional area (MCSA) were measured using pQCT at the proximal tibia (66%), patella midline, and distal femur (20%) sites. Muscle function assessment included single-leg hop and isometric manual muscle tests. A Lysholm Knee Scoring Scale was also administered. Both limbs were measured and a leg symmetry index (LSI) was calculated for all assessments.
RESULTS: Tibia CoCnt (LSI=97.3%) was lower in the injured limb, along with patella ToD (LSI=89.7%; both $p<0.05$). At the femur, CoA (LSI= 94.4%) and CoTh (LSI= 94.4%) were lower in the injured limb (both $p<0.05$). MCSA was lower at the tibia (LSI=96.2%) and femur (LSI= 87.1%) of the injured limb, along with performance on the single leg (LSI= 78.2%) and cross hop (LSI=85.3%) patterns of the hop test (all $p<0.05$). No limb differences were found for manual muscle tests.
CONCLUSIONS: Our results showed less robust bone density and geometry parameters, along with lower muscle strength outcomes in ACL-injured limbs among collegiate athletes up to five years following injury. These differences, however, were less pronounced than deficits previously reported among older, recreational athletes. Future research should investigate the effect of pre-injury health and fitness status in athletes compared to the general population.
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104 Board #7 May 27, 9:30 AM - 11:30 AM

Instrument Assisted Soft Tissue Mobilization Increases Vertical Jump Power in Athletes with Ankle Joint Injury

Oscar A. Achiardi[1], Álvaro R. Barrientos[2]. *[1]Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile. [2]Universidad Católica de la Santísima Concepción, Concepción, Chile.*

(No relationships reported)

Sports practice increases the risk of musculoskeletal injury, which negatively affects mechanical properties of soft tissues, such as tendons and fascia. To enhance athletic performance, rehabilitation interventions need to be both effective and efficient, when recovering the capacity of passive components to transmit tension from muscles to bones. Instrument Assisted Soft Tissue Mobilization (IASTM) techniques have shown to be a good tool to reduce pain and recover range of motion, in a short period of time after injury, but it is not clear whether this effect might be translated into a better physical performance, by affecting the mechanical properties of passive tissues.
PURPOSE: To determine the acute effects of an IASTM technique on the physical performance of athletes with history of ankle joint soft tissue injury, during vertical jumps.
METHODS: 16 subjects (12 male, 4 female; 21.5±1.41 years) were assessed in four stages: 1) demographic data collection and explanation of vertical jumps, 2) execution of 2 squat jumps (SJ) and 2 countermovement jumps (CMJ), 3) application of the IASTM technique on the soft tissues of the ankle and lower leg, and 4) the same set of vertical jumps as on stage 2). During stages 2 and 4, the vertical position of the body center of mass (CoM) and the ground reaction force (GRF) were recorded, with an online system of 6 infrared cameras and a force plate, respectively. Paired-t tests were performed to compare jump height, maximal jump power, maximal GRF, and velocity of CoM, before and after the use of the IASTM, for SJ and CMJ. Both GRF and maximal jump power were normalized to body weight.
RESULTS: Significant differences between pre and post IASTM application were found for both jumps in jump height (SJ: 32.80±6.26cm vs 34.47±4.82cm, $p=0.028$; CMJ: 35.88±5.41cm vs. 37.09±4.37cm, $p=0.048$) and only for SJ in maximal jump power (4.36±1.08W/N vs 4.78±1.01W/N, $p=0.031$) and velocity of CoM (2.25±0.28m/s vs 2.37±0.36m/s, $p=0.012$). No differences were found in GRF.
CONCLUSIONS: Considering that power and velocity of CoM increased only for SJ, it might be that IASTM techniques affect the slack of passive tissues, reducing the mechanic delay from the contractile component, but reducing its ability to store elastic potential energy.

A-28 Free Communication/Slide - **Assessing and Managing the Concussed Brain**

Wednesday, May 27, 2015, 9:30 AM - 11:30 AM
Room: 30A

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105 **Chair:** Margot Putukian, FACSM. *Princeton University, Princeton, NJ.*
(No relationships reported)

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106 May 27, 9:30 AM - 9:45 AM

Relationship Between High School Football And Neurocognitive Changes

Richelle M. Williams, Ashley Rettmann, Andrea Almeida, Steven Broglio. *University of Michigan, Ann Arbor, MI.*

(No relationships reported)