

Sri Ramachandra Faculty of Sports & Exercise Sciences

Effect of Blood Flow Restriction Training on Quadriceps Muscle Strength, Morphology, Physiology, and Knee Biomechanics Before and After Anterior Cruciate Ligament Reconstruction protocol – literature review

Aim of study :

To evaluate the effect of BFRT on quadriceps strength and knee biomechanics, and to identify the potential mechanism of action of BFRT at the cellular and morphological levels of the quadriceps.

Study design :

- **Design:** This will be a randomized, double-blind, placebo-controlled clinical trial.
- **Participants:** 60 ACL injured patients, age : 15 to 40. only 48 stayed committed to the research, 24 participants per treatment group.

- **Intervention:** Participants will be randomly assigned to: (1) physical therapy plus active BFRT (BFRT group) or (2) physical therapy plus placebo BFRT (standard of care group). Pre-surgical BFRT will involve sessions 3 times per week for 4 weeks, and post-surgical BFRT will involve sessions 3 times per week for 4 to 5 months.

Purpose of study :

The **primary objective** is to evaluate the effect of BFRT training on quadriceps strength, assessed via peak quadriceps torque and rate of torque development, in patients who have had an ACL reconstruction.

The **secondary objectives** are measuring changes in (1) knee biomechanics; (2) quadriceps muscle morphology; and (3) quadriceps muscle physiology after using BFRT in patients who have had an ACL reconstruction. Our hypothesis is that BFRT will restore quadriceps strength, knee biomechanics, and quadriceps morphology and cellular composition in patients who have had an ACL tear and reconstruction.



Intervention – physiotherapy:

Both groups will receive standard pre- and post-surgical physical therapy which will focus on range of motion, muscle activation, functional mobility, hip strengthening, core stability, balance, and gait training.

Stage 1: POD 3 to 2-6 weeks post-surgery. This stage involves effusion management, muscle activation, range of motion, and returning to walking without the use of crutches.

Stage 2: 4-6 weeks post-surgery. This stage involves progression of strengthening, proprioception exercises, and functional movement patterns.

Stage 3: 3-5 months after surgery. This stage will involve introduction to dynamic agility, running, and impact training in preparation for return to activity and sport

Blood flow restriction training: Blood flow restriction training will use one of two systems. Brand 1 will be utilized as the active unit for the BFRT group with the restriction pressure set per manufacturer's instructions, whereas Brand 2 will be utilized as the placebo unit for the standard of care group with minimal restriction pressure (less than 20mmHg). Each BFRT session will last for approximately 20 minutes. Participants will receive BFRT for 4 weeks pre-surgery. Blood flow restriction training will resume 2 weeks post-surgery and finish 4-5 months post-surgery.

Outcome measures: primary – isometric test, isokinetic test; secondary – knee biomechanics, quadriceps muscle morphology and physiology.

Discussion : The administration of BFRT before surgery will allow us to assess the potential it has to reverse or even stop previously reported negative alterations such as muscle fiber type switching, expansion of the extracellular matrix, and reduction of muscle satellite cell abundance impede skeletal muscle plasticity.

Reference : Effect of Blood Flow Restriction Training on Quadriceps Muscle Strength, Morphology, Physiology, and Knee Biomechanics Before and After Anterior Cruciate Ligament Reconstruction: Protocol for a Randomized Clinical Trial – lauren N Erickson, kathryn C Hickey.

By: **J.PREETHI**

MPT Sports – 1st year