Blood Flow Restriction Therapy for the Treatment of an ACL Reconstruction with a Meniscal Repair: A Case Report

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Background

- ACL tears make up ~50% of all knee injuries.[1]
- Meniscal tears are second to ACL injuries in regards to prevalence.[1]
- Following an ACL reconstruction, high-load resistance training is often used to increase muscle strength.[2]
- However, rehabilitation after a meniscal repair calls for a longer period of immobilization in order to prevent early loading of the meniscus.[3]
- Blood Flow Restriction Therapy (BFRT) used in conjunction with low intensity resistance training can produce increased muscle mass of the quadriceps muscles without adding load and stress to the meniscus.[4]
- While evidence has shown positive results with the use of BFRT after an ACLR, there is limited evidence for using BFRT after a meniscal repair and after both surgeries concomitantly.

Purpose

- The purpose of this case report was to investigate the use of BFRT in a comprehensive PT rehabilitation plan for a patient following an ACLR and meniscal repair.

Case Description

- 50-year-old male who tore his left ACL and medial meniscus while downhill skiing.
- Had an ACLR and meniscal repair, and was referred to outpatient physical therapy eight days after surgery.
- No comorbidities or significant PMH.
- Main goals:
  - Reduction of pain in the knee
  - Improving knee ROM and strength
  - To return to his previous high level of function and adventurous lifestyle

Timeline

INJURY
- Sustained injury to left knee
- Underwent an ACLR to re-attach the torn ACL & a medial meniscus repair. A 2nd synthetic ACL was attached for extra support

INITIAL EVALUATION
- Patient presented to outpatient PT eight days after surgery with crutches, an immobilizer, and a NWB status
- NPRS was administered and measures were taken for flexibility, MMT, knee AROM, and special tests

VISIT 2
- BFRT combined with low-load resistance exercises were initiated on the patient's left lower extremity
- BFRT with open kinetic chain strengthening exercises was initiated

VISIT 7
- First day of WB with crutches and no knee immobilizer
- Gait training was initiated with crutches

VISIT 8
- BFRT with closed kinetic chain strengthening exercises was initiated
- Initiation of gait training without crutches

VISIT 9
- Aerobic exercise was initiated using the stationary bike
- Initiation neuromuscular re-education exercise (left single-leg stance for balance)

VISIT 13
- BFRT was used with resistive standing hamstring curls while using ankle cuff weights

VISIT 15
- Functional warm-up was initiated consisting of walking exercises with hip and knee flexion
- Initiation of standing lateral lunges for strengthening

VISIT 16
- Initiation of lateral closed chain strengthening exercise (lateral steps)
- Initiation of balance exercises (single leg stance with ball taps on wall)

VISIT 21
- Last session with patient

Interventions

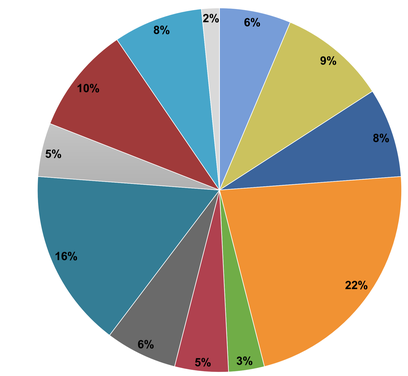


Figure 1: BFRT Strengthening Exercises (% Used)

- Quad set
- Short arc quads (SAQ)
- Sraight leg raise (SLR) flexion
- Long arc quads (LAQ)
- Standing lateral wt shift
- Heel raises
- Squats
- Standing hamstring curls
- Backward lunges
- Single leg squat
- Goblet squat
- Forward box step-ups

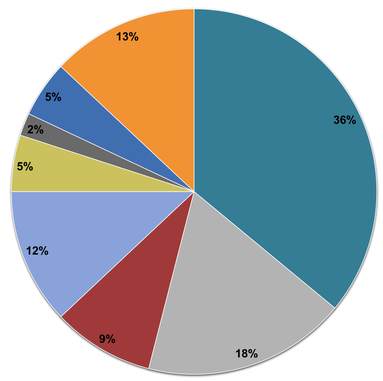


Figure 2: Interventions

- BFRT
- STM
- Cryotherapy
- Aerobic exercise
- Funtional warm-up
- Gait training
- Balance/Proprioception
- Strengthening (No BFRT)

Figure 3: BFR Machine

Figure 4: BFRT with straight leg raise

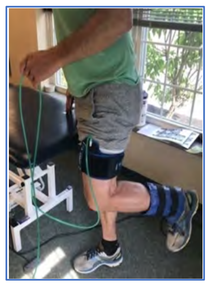
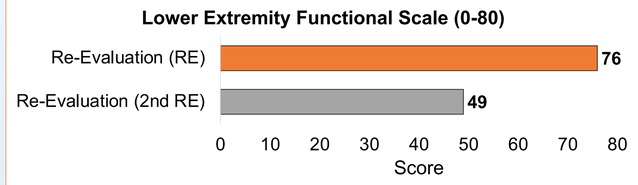


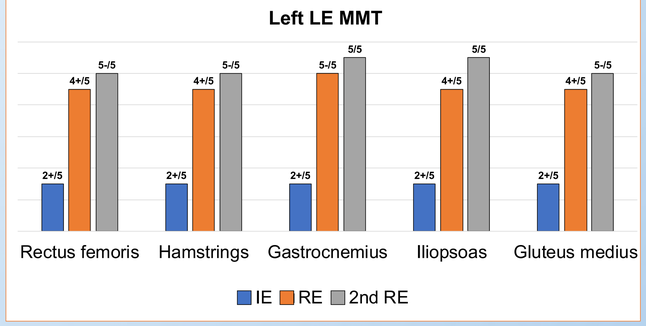
Figure 5: BFRT with Hamstring Curls

Outcomes



Left Knee Flexion & Extension ROM

Left Knee AROM	IE	RE	2nd RE
Flexion	45°	125°	140°
Extension	-5°	-1°	0°



Discussion & Conclusion

- The patient appeared to have benefited from the use of BFRT with resultant strength gains in his left LE, gain of normal knee flexion and extension ROM, and decreased pain.
- The outcomes of this case report suggest that a POC involving early resistance training with the use of BFRT in the PT rehabilitation of a patient with an ACLR and a meniscal repair was effective.
- Future research may want to consider the most effective BFRT protocol in patients with both an ACLR and a medial meniscal repair.

Acknowledgements & References

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1. Jordan M, Aagaard P, Herzog W. Anterior cruciate ligament injury/reinjury in alpine ski racing: a narrative review. *J Sci Med Sport*. 2017;(8):71-83. doi: 10.2147/OAJSM.S106699
2. Hughes L, Rosenblatt B, Haddad F, et al. Comparing the effectiveness of blood flow restriction and traditional heavy load resistance training in the post-surgery rehabilitation of anterior cruciate ligament reconstruction patients: a UK national health service randomised controlled trial [published online July, 12, 2019]. Sports Med. 2019;1-19. doi: 10.1007/s40279-019-01137-2
3. Cavanaugh J, Killian S. Rehabilitation following meniscal repair. *Curr Rev Musculoskelet Med*. 2012;5(1):46-58. doi: 10.1007/s12178-011-9110-y
4. Slysz J, Stultz J, Burr JF. The efficacy of blood flow restricted exercise: a systematic review & meta-analysis. *J Sci Med Sport*. 2016;19(8):669-675. doi:10.1016/j.jsams.2015.09.005

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