Blood Flow Restriction Therapy and a Comprehensive Home Exercise Program Following an ACL and Meniscal Repair: A Case Report

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Introduction

- Every year in the United States, up to 60 per 100,000 people sustain an anterior cruciate ligament (ACL) tear.[1]
- Medial meniscus tears have been reported in roughly 60% of the ACL tear population, while lateral meniscus tears have been reported in approximately 30%.[2]
- Blood flow restriction therapy (BFRT) has shown improved strength and muscle hypertrophy with low load exercises by occluding blood flow at the proximal thigh.[3]
- A minimally structured physical therapy (PT) program with a home exercise program (HEP) has been shown to be more effective at 3 months after ACL reconstruction (ACLR) compared to standard PT sessions alone.[4]
- Currently there is a lack of research on the combined effects of a comprehensive HEP and BFRT for patients who have had an ACLR and meniscal repair.

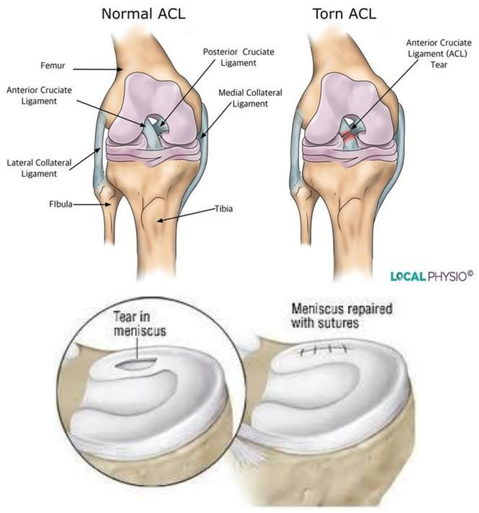

Figure 1: Knee Anatomy[5]

Purpose

The purpose of this case report was to investigate the effects of BFRT and a comprehensive lower extremity (LE) strengthening HEP for a patient following an ACL and meniscal repair.

Patient Description

- The patient was a 43-year old woman who sustained a left ACL and meniscal tear while playing tennis.
- Surgical interventions included an ACLR and meniscal repair using an ACL allograft.
- Past medical history includes a right ACLR four years prior to current injury.
- The patient's goals were to increase LE strength, regain function, and to return to tennis.
- At initial evaluation, the patient demonstrated decreased left knee range of motion, edema, gait impairments, strength and hypertrophy deficits.

Interventions

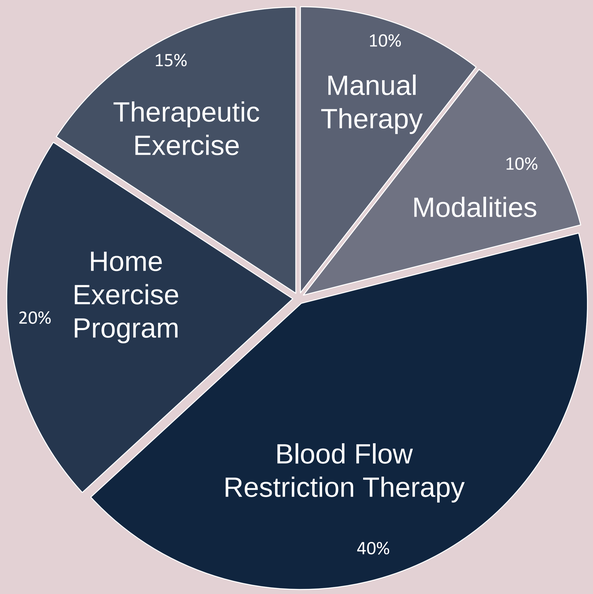

Figure 2: Distribution of Interventions

Home Exercise Program	Intensity
Heel Slides	20x5 seconds
Quadricep Sets	3x10
Short Arc Quad	3x10
Straight Leg Raise	3x10
Side Lying Hip Abduction	3x10
Prone Hip Extension	3x10
Supine Bridge	3x10
Standing Heel Raise	3x10
Stationary Bicycle	10 minutes

Figure 3: Example of HEP

Example of In Clinic PT Session

Modalities
- Neuromuscular electrical stimulation

Manual Therapy
- Patellofemoral and tibiofemoral glides

Therapeutic Exercise
- Additional LE strengthening and balance exercises

Blood Flow Restriction Therapy
- 80% occlusion of the left lower extremity blood flow at the proximal thigh (figure 4)
- Protocol for each individual exercise:
  - 2 sets of 15 repetitions
  - 30-second break
  - 1 set of 15 repetitions
  - 30-second break
  - 1 set of 15 repetitions
  - 1-minute break

Figure 4: Placement of BFRT cuff

Plan of Care

- **Injury**: Left ACL tear, full medial meniscus tear, partial lateral meniscus tear. Referred for surgery
- **Surgery**: ACLR with allograft ACL, medial and lateral meniscal repair. Referred to outpatient PT
- **Initial Evaluation**: Plan of care established. Deficits in range of motion, strength, gait mechanics, and activities of daily living
- **Week 2**: Initiation of BFRT protocol
- **Week 6**: Patient starts two-week hiatus from PT. Lower extremity strengthening HEP initiated
- **Week 8**: Final Assessment. Increases in range of motion, strength, gait mechanics, and functional abilities

Outcome Measures

Tests and Measures	Initial Examination	Final Examination
Numeric Pain Rating Scale (0/10)	Best: 1/10 Worst: 6/10 Current: 3/10	Best: 0/10 Worst: 1/10 Current: 0/10
Range of Motion (degrees)	Extension: -4 Flexion: 60	Extension: 0 Flexion: 125
LEFS (0-80/80)	22/80	40/80
Quadriceps Girth (cm)	42.2 cm @ 10 cm above joint line 52.0 cm @ 20 cm above joint line	45.4 cm @ 10 cm above joint line 54.5 cm @ 20 cm above joint line
Manual Muscle Testing (0-5/5)	Left LE	Left LE
Quadriceps	2-/5	4+/5
Hamstrings	Not tested	4+/5
Gluteus maximus	4/5	4+/5
Gluteus medius	4-/5	4/5

Conclusion

- The use of BFRT and a comprehensive LE strengthening HEP was effective in the treatment of a 43-year-old female following an ACL and meniscal repair.
- Further studies may want to consider researching the most effective combination of BFRT and HEP to be used together, in a larger population of surgical patients.

Acknowledgements

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