

## Exercise was Impeded by the Blood Flow after an Ankle Fracture

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### Abstract

This study was conducted to determine whether individuals who had broken only one ankle could benefit from blood flow restricted exercise (BFRE) as a form of rehabilitation. Investigation of plausibility utilizing a planned partner approach. The criteria included being over 18 years old and having unilateral ankle fractures. Rules for rejection: Considerations include cancer, diabetes, high blood pressure, and a family history of cardiovascular or vascular diseases. The three factors that went into determining the predetermined feasibility outcome were the patients' familiarity with the BFRE protocol and the absence of any serious adverse events.

**Keywords:** Blood Flow

### Introduction

Ankle fractures, which account for nearly 10% of all bone fractures, have an annual incidence of 169.7 per 100,000 people. The restoration of normal joint function is the primary objective of ankle fracture treatment. Depending on the classification of the fracture and any associated bone and ligament injuries, the acute management of ankle fractures can be either surgical or non-surgical. The majority of patients undergo a prolonged period of relative immobilization with partial or no weight bearing following the initial treatment to ensure accurate bone union. Skeletal muscle atrophy and joint range of motion loss are common side effects of prolonged immobilization [1-3]. In healthy college students, even a three-week knee immobilization in a cast and without weight bearing results in a 47% decrease in muscle strength. The primary objective of rehabilitation is to assist the patient in regaining strength and function to the level they had prior to surgery because these deficits can have a negative impact on daily activities and function.

The objectives of resistance training include physical function, muscle mass, and strength. The process of gradually overloading the muscle with external weights is the foundation of progressive strength training. It is known to increase muscle growth and strength. In any case, moderate over-burden and external loads may put an excess of weight on the healing tissues and delay the development of the bone in patients who are still recovering from a lower leg fracture [4-6]. As a result, "classic" progressive strength training of the lower limbs using more and more external weight may not be a good idea.

A clever procedure known as blood stream limited work out, or BFRE, has as of late been tried on patients who can't bear huge outer burdens. With low external weight loads (20-30% of one repetition maximum) and a pneumatic cuff inflation that partially reduces arterial blood flow and limits venous return while increasing metabolic stimulus in working muscles, this method emphasizes muscle strength training. BFRE appears to be helpful in the rehabilitation of patients with ankle fractures and may lessen the negative effects of immobilization due to its low external weight requirement [7].

The purpose of this pilot study was to determine whether or not BFRE could be used as a rehabilitation strategy for patients with one ankle fracture.

### Methods

#### Concentrate on Plan [8]

Utilizing pre-laid out plausibility models, this study utilized a

planned partner plan to explore the suitability of BFRE in patients with one-sided lower leg breaks. Unblinded data were collected at the beginning of the study, following each BFRE session, and after three weeks of BFRE. Patients were incorporated from the Branch of Muscular Medical procedure, Aalborg College Emergency clinic, Denmark, and evaluated for qualification between September 15 and December 17, 2020/2020.

The Danish Data Protection Agency and the Committee for Science Ethics of Northern Denmark approved the study (journal number N-20200052). After receiving oral and written information about the study, all patients signed a written informed consent form. The study was conducted in accordance with the principles outlined in the Helsinki Declaration [9]. The description of the intervention adheres to the Consensus on Exercise Reporting Template, and the study's reporting conforms to the statement Strengthening the Reporting of Observational Studies in Epidemiology (STROBE).

#### Participants [10]

Patients over the age of 18 and with unilateral ankle fractures (AO classification 44) met the inclusion criteria. Patients with a history of peripheral vascular disease, cancer, deep vein thrombosis or pulmonary embolus, arrhythmia or coronary disease, diabetes, hypertension of 160/95 mmHg, or a family history of cardiovascular or vascular disease were also excluded.

#### Intervention

A physiotherapist oversaw an individualized BFRE/exercise program that was given to each patient. The exercise program began approximately 14 days after surgery, and it included two sessions per week for three weeks of the BFRE program. A single unilateral tension band strength training exercise is included in each workout; knee-extension, which was done at approximately 30% of the 1RM.

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## Measuring Secondary Outcomes

On a 5-point Likert scale, one question (very much, much, niter/nor, not, not at all) was used to assess patients' acceptance of pain and discomfort during treatment after each BFRE session:

How acceptable did you find it to be in pain or discomfort during the BFRE session?

On a 5-point Likert scale, patients were asked how secure they felt after each BFRE session, and their responses were: very much, much, niter/nor, not, not at all.

How did you feel safe during today's BFRE session.

## Muscle Function Outcomes

While the patient was seated on an examination table with 60 degrees of knee flexion, a strap-mounted dynamometer attached to the wall (Mecmesin AFG2500, Mecmesin Ltd., West Sussex, UK) was used to measure the patient's bilateral maximum isometric knee-extension strength. At standard and following the most recent BFRE meeting, the most extreme isometric knee-expansion strength was achieved.

Things that are bad: Serious adverse events (SAEs) are those that result in hospitalization, prolonged inpatient care, re-surgery, or if the AE is life-threatening and causes death, permanent disability, or damage. Any undesirable occurrence that occurred during follow-up was considered an AE. AE and SAE were gathered at each BFRE session.

## Results

Baseline information like age, gender, height, weight, BMI, and AO classification were gathered at inclusion/baseline. Individual patient feasibility data were gathered following each BFRE session.

## Feasibility Outcome Questions and Criteria

Based on your current knowledge and experience, how likely is it that you would choose BFRE training if you had an ankle fracture tomorrow?

The reason for this question is to survey the patients' general involvement in partaking in the BFRE preparing after a lower leg break, as well as their viewpoints with respect to uneasiness and uncertainty during the preparation and their apparent and anticipated result.

How likely are you to recommend BFRE training to family and friends given your current knowledge and experience?

This question aims to find out how patients feel about how much BFRE training can be offered to people with ankle fractures in general.

At least 75% of patients answered both questions about their experience with the BFRE protocol with scores of 4 or higher on a 5-point Likert scale, which was a predefined feasible outcome. Following the conclusion of the final BFRE session, the feasibility result was evaluated. The response scale was as follows: very likely, very likely, neither/or, not likely, and not at all likely. Additionally, feasibility will be determined by the absence of any serious adverse events (SAE). At each BFRE session, SAE information was gathered. Events that cause damage, death, permanent disability, or life-threatening conditions were predefined.

## Conclusion

It appears possible to use BFRE early in patients with unilateral ankle fractures who do not have significant comorbidities. The BFRE intervention was highly regarded by the entire patient population. There were no serious antagonistic incidents that were revealed, regardless of the manner in which the review was not fueled for these results. Following unilateral ankle fractures, BFRE training may have the potential to speed up rehabilitation and improve outcomes. A large-scale confirmatory trial will benefit from this study's findings.

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