

Clinical Trial Protocol

Iranian Registry of Clinical Trials

23 Jul 2026

Effects of Aquatic Exercises on Knee proprioception and Altered Motor Control of the Knee Muscles after Anterior Cruciate Ligament Reconstruction

Protocol summary

Study aim

Determine the effects of aquatic exercise on knee proprioception and altered motor control of the knee muscles after anterior cruciate ligament reconstruction

Design

This study is a prospective, randomized, and controlled study. 38 subjects will be randomized into two groups: the hydrotherapy group (HT) and the land therapy group (LT)

Settings and conduct

This is a control clinical trial research. This research will be carried out at the Research Center of Rehabilitation Faculty and swimming pool of Tehran University of Medical Sciences. After selection of subjects that meet to the study criteria and giving proper explanations of the goals and methods of the study for patients, they will be asked to sign a consent form to participate in the study. Personal information will be collected by a questionnaire. After the randomization, subjects will be allocated into two intervention groups. Assessments including joint position sense, voluntary response index analysis and international knee documentation committee (IKDC) questionnaire will be used pre and post-test. The proprioception exercises applied in both groups will be identical in terms of type, intensity and duration.

Participants/Inclusion and exclusion criteria

Inclusion criteria: Subjects aged 18- 35 years, underwent a unilateral ACL reconstruction, ROM is greater than 100° flexion and complete extension and 9 weeks after ACL reconstruction; exclusion criteria: Contraindication to aquatic physiotherapy

Intervention groups

Hydrotherapy group (HT) and land therapy group (LT). Patients in the HT group will follow proprioception aquatic exercises training in water. While the patients in the LT group will follow proprioception exercises training on land.

Main outcome variables

active joint position sense; voluntary response index analysis using electromyography (EMG)

General information

Reason for update

Acronym

IRCT registration information

IRCT registration number: **IRCT20090301001722N21**

Registration date: **2019-11-09, 1398/08/18**

Registration timing: **prospective**

Last update: **2019-11-09, 1398/08/18**

Update count: **0**

Registration date

2019-11-09, 1398/08/18

Registrant information

Name

Samira Karimpour

Name of organization / entity

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Recruitment status

Recruitment complete

Funding source

Expected recruitment start date

2020-01-09, 1398/10/19

Expected recruitment end date

2021-01-09, 1399/10/20

Actual recruitment start date

empty

Actual recruitment end date

empty

Trial completion date

empty

Scientific title

Effects of Aquatic Exercises on Knee proprioception and Altered Motor Control of the Knee Muscles after Anterior Cruciate Ligament Reconstruction

Public title

Effects of Hydrotherapy on proprioception after Anterior Cruciate Ligament Reconstruction

Purpose

Treatment

Inclusion/Exclusion criteria**Inclusion criteria:**

Aged between 18 and 35 years Undergone a unilateral ACL reconstruction No history or signs of injury in the contralateral knee 9 weeks after ACLR ROM is greater than 100° flexion and complete extension (zero degrees) Reconstruction using STG autograft No previous history of lower limb surgery before the lesion and absence of neurological disorders

Exclusion criteria:

Inability to understand and/or perform the required maneuvers fear of water uncontrolled epilepsy chlorine sensitivity infected open faecal incontinence myocardial infarction

AgeFrom **18 years** old to **35 years** old**Gender**

Both

Phase

N/A

Groups that have been masked*No information***Sample size**Target sample size: **34****Randomization (investigator's opinion)**

Randomized

Randomization description

The patients will be randomly divided into two groups by a closed envelope method. The allocation of the subjects will be concealed by using sequentially numbered, sealed and opaque envelopes. On the first day of treatment, the envelope allocated will be opened by the participant

Blinding (investigator's opinion)

Not blinded

Blinding description**Placebo**

Not used

Assignment

Parallel

Other design features**Secondary Ids**

empty

Ethics committees**1****Ethics committee****Name of ethics committee**

Ethics committee of Tehran University of Medical Sciences

Street address

6th floor, Tehran University of Medical Science building, Ghods Ave., Keshavarz blvd., Tehran, Iran

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1417653761

Approval date

2019-09-29, 1398/07/07

Ethics committee reference number

IR.TUMS.VCR.REC.1398.571

Health conditions studied**1****Description of health condition studied**

anterior cruciate ligament

ICD-10 code

S83.51

ICD-10 code description

Sprain of anterior cruciate ligament of knee

Primary outcomes**1****Description**

knee joint position sense

Timepoint

pre and post-test

Method of measurement

Biodex Isokinetic System

2**Description**

voluntary response index analysis

Timepoint

pre and post-test

Method of measurement

Surface EMG by Biometrics (Ltd) data Log

3**Description**

knee function

Timepoint

pre and post-test

Method of measurement

international knee documentation committee questionnaire (IKDC)

Secondary outcomes

empty

Intervention groups

1

Description

Intervention group 1: hydrotherapy. All subjects will undergo 2 sessions of proprioception aquatic exercises for 6 weeks. Each hydrotherapy session will be last 30-45 minutes consisting of three parts: warm-up, main practice, and cooling down. The pool water temperature will be ranged from 28° to 30° C. During the exercises, the individual will be asked to remain at a depth where the water is between the waist and the sternum. The hydrotherapy intervention will be conducted in a professional swimming pool equipped with all needed equipment for aquatic exercises. The main exercises will be done according to individual ability and the patient's response to training. The progression of the training protocol as following: 1- Single leg stance with eyes open. 2- Single leg stance with eyes closed. 3- Single leg stance with leg swing and eyes open. 4- Single leg stance with leg swing and eyes closed. 5- Single leg squat with eyes open. 6- Single leg squat with eyes closed. 7- Rollover walking back and forth on Foam Roll. 8- Rollover walking forward with crossed arms.

Category

Rehabilitation

2

Description

Intervention group 2: land therapy. The proprioception exercises applied to land group will be identical in terms of type, intensity and duration to those exercises applied to hydrotherapy group. The leg that will undergo training is the injured leg and must be wearing a sneaker during the exercises, with the knee semi-flexed at approximately 30°. In addition, the individual will not be allowed to support by the contralateral limb or hands. If the subjects lost their balance, they will be asked to lean on the contralateral limb. All patients in both groups are going to begin the same conventional rehabilitation protocol according to evidence-based rehabilitation accelerated protocol by Van Grinsven 2010.

Category

Rehabilitation

Recruitment centers

1

Recruitment center

Name of recruitment center

Rehabilitation clinic of Tehran University of Medical Science

Full name of responsible person

Dr Mohsen Mir

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Sponsors / Funding sources

1

Sponsor

Name of organization / entity

Tehran University of Medical Sciences

Full name of responsible person

Mohammad Ali Sahraian, Vice chancellor for research of Tehran University of Medical Sciences

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Tehran University of Medical Sciences, Keshavarz Blvd, Kods street Tehran, Islamic Republic Of Iran

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Grant name

Grant code / Reference number

Is the source of funding the same sponsor organization/entity?

No

Title of funding source

Vice chancellor for research of Tehran University of Medical Sciences

Proportion provided by this source

100

Public or private sector

Public

Domestic or foreign origin

Domestic

Category of foreign source of funding

empty

Country of origin

Type of organization providing the funding

Academic

Person responsible for general inquiries

Contact

Name of organization / entity

Tehran University of Medical Sciences

Full name of responsible person

Mohammad Reza Hadian Rasanani

Position

Professor

Latest degree

Ph.D.

Other areas of specialty/work

Physiotherapy

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Sharing plan

Deidentified Individual Participant Data Set (IPD)

Undecided - It is not yet known if there will be a plan to
make this available

Study Protocol

Undecided - It is not yet known if there will be a plan to
make this available

Statistical Analysis Plan

Undecided - It is not yet known if there will be a plan to
make this available

Informed Consent Form

Undecided - It is not yet known if there will be a plan to
make this available

Clinical Study Report

Undecided - It is not yet known if there will be a plan to
make this available

Analytic Code

Undecided - It is not yet known if there will be a plan to
make this available

Data Dictionary

Undecided - It is not yet known if there will be a plan to
make this available