

Iliotibial Band Friction Syndrome: Effect of Home Exercises on Patients' Clinical and Functional Outcomes

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Abstract

Background: Iliotibial band friction syndrome is a common injury of lateral outer aspect of knee particularly in active people. **Aim:** Examined the effect of home exercises on clinical and functional outcomes of patients with iliotibial band friction syndrome. **Patients and methods:** Research design: Randomized controlled trial which is a true experimental design where patients are randomly allocated to groups. Sample and setting: Sixty-two adult patients with iliotibial band friction syndrome for more than 2 weeks attended to orthopedic department and orthopedic outpatients clinic at Assiut University hospitals. A computer based selection program was used to assign patients randomly into 2 equal groups (exercises group n=31) and (control group n=31) with ratio 1:1 assignment. Exercises group participated in home exercises (educational brochure) for stretching iliotibial band and strengthening hip abductors; while control group did not. Patients followed up for 8 weeks. Tools: patients assessment sheet, numeric pain rating scale, lower extremity functional scale and training schedule for exercises group patients (logbook). **Results:** Pain level of exercises group significantly decreased in intermediate (p. value 0.04) and final measurements (p. value 0.001) than control group. The mean scores of lower extremity functional scale for exercises group increased significantly in intermediate (p. value 0.02) and final measurements (p. value < 0.001) than control group. **Conclusion:** Home exercises for stretching iliotibial band and strengthening of hip abductors decreased pain and improved lower extremity function. **Recommendation:** Home exercises educational brochure have to be used by rehabilitation nurses as a guide in rehabilitation of patients with iliotibial band friction syndrome.

Keywords: Clinical and functional outcomes; Home exercises; Iliotibial band friction syndrome

Introduction

Knee pain has been reported to impair quality of life and limit mobility in 25% of adult patients. Iliotibial band friction syndrome (ITBFS) is one cause of the outer lateral knee pain. It seen first in United States in 1975 in runners, skiers, cyclists, basketball players, soccer, and hockey. These activities relayed on rapid and prolonged cycling of knee during flexion and extension (Hadeed and Tapscott, 2020). It is a common non-traumatic overuse injury as a result of inflammation of the distal portion of iliotibial band (ITB). The incidence of ITBFS ranges from 1.6% to 12%. It is more common in women and rarely occurs in non-active people (Hadeed and Tapscott, 2020).

Risk factors for the development of ITBFS include people who perform activities that require a great amount of flexion and extension of knees such as athletes, runners, abrupt changes in training intensity, preexisting ITB tightness, errors in training technique and knee extensors, flexors and hip abductors muscular weakness (Bergeson, 2019).

The most common complication of ITBFS is disease progression. Patients experience pain during activities and even at rest. Because of the attachment of ITB to lateral patella, disease progression may lead to patellofemoral syndrome (Scotti, 2017).

Patients education is a vital role of nurses in all health care settings. Nurses can

help patients to regain maximum level of function by adhering to the treatment strategies. Patients education and compliance to treatment plan is the key to managing ITBFS. They must change their shoes regularly in order to prevent uneven wear of soles. Also, patients can benefit from rehabilitation nurse to enhance their sport-specific biomechanics. It is definitive that patients with ITBFS are aware that the condition may sometimes relapse after returning to activities (Wyss, 2012).

It can be reduced if patients incorporate proper footwear and adhere to proper training program which permit for adaptation of the structures that supporting the pelvis, thigh and knee. It can usually be treated successfully with non steroid anti-inflammatory drug with a conservative rehabilitation program that includes stretching and strengthening home exercises (Cowden and Barber, 2014).

Occasionally ITBFS is resistant to conservative management, local injection of cortisone or surgery may be considered as an alternative options. Surgery involve lengthening iliotibial tract and remove a section of posterior aspect of iliotibial tract which impinging on tensor fascia lata (Takagi et al., 2020).

Successful management of ITBFS is only possible through interprofessional approach. Communication between patients, nurses, physical therapist and orthopedic surgeon is essential in order to limit progression or relapse. Physical therapy is essential to loosen ITB tension, strength abductors and teaching appropriate biomechanics throughout activity. Trainers should be knowledgeable on how to prevent or minimize activities that at high risk for developing this condition (Hadeed and Tapscott, 2020).

Early home exercises during the first 4-8 weeks after ITBFS onset improves performance, functioning and quality of life. It has greater impact on disability outcome and has cost effectiveness (Baker and Fredericson, 2016; Yan et al., 2016).

The results obtained in the current study are expected to contribute to the determination of the effect of home exercises aiming to improve clinical and functional outcomes; eliminate pain and difficult in carrying out physical functions. Also, the results are expected to raise nurses' awareness of the importance of instructions in outpatients clinic including home exercises and to utilize home exercises when providing nursing care.

Significance of the study

Through the researchers' observations and according to the literature, patients with ITBFS experienced a lot of pain throughout the treatment plan and medications alone were not enough to relieve pain completely and this pain affect their functional abilities to perform everyday tasks. So, those patients are in essential need for additional and supported management to gain better outcomes. The researchers developed an educational brochure (home exercises) aiming to improve patients' outcomes; better pain relieve and enhance their functional abilities to perform everyday tasks.

Aim of the Study

This study examined the effect of home exercises on clinical and functional outcomes of patients with ITBFS.

Hypothesis

This study hypothesized that home exercises would improve clinical and functional outcomes of patients with ITBFS.

Operational definition:

Clinical and functional outcomes: pain, lower limb function (ability to perform everyday tasks).

Patients and Methods

Research design

The study is a randomized controlled trial. It is a true experimental study design where patients are randomly allocated to different groups.

Study variables

The independent variable (home exercises), while the dependent variables (pain and lower limb function; ability to perform everyday tasks) of patients with ITBFS.

Setting

The study was carried out in orthopedic department and orthopedic outpatients clinic at Assiut University Hospitals.

Sample size

G power software was used to calculate sample size as 62 patients (31 per group). Effect size [0.8], α error [0.05] and power [95 %].

Sampling

A random sample of newly diagnosed patients with ITBFS (for more than 2 weeks) were recruited from the orthopedic department and orthopedic outpatients clinic at Assiut University Hospitals. The inclusion criteria included both gender from 18 years and older, having outer lateral knee pain and having a clinical diagnosis of ITBFS confirmed by history, physical and radiological assessment. Patients over 65 years old with past history of knee injection or surgery and those with other knee pathology or trauma were excluded.

Sixty-two patients were met the inclusion criteria and gave informed consent to participate in the study. A computer based selection program was used to assign patients randomly into 2 equal groups (exercises group n=31) and (control group n=31) with ratio of 1:1 assignment.

Tools

Tool I. Patients assessment sheet

It was developed by the researchers to assess demographic and medical data of the studied patients. It included age, gender, duration of pain, level of education, occupation, activity habits and affected side.

Tool II. Numeric pain rating scale

It was developed by (McCaffery and Beebe, 1989) to measure pain intensity in adults. It consists of 11-item ranging from 0 to 10. Zero means no hurt whereas the upper limit means the worst hurt. Zero (no pain), 1-3 (mild pain), 4-6 (moderate pain) and 7-10 (severe pain).

Tool III. Lower extremity functional scale (LEFS)

It was developed by (Binkley et al. 1999). It is a scale containing 20 questions. It used for measuring patient ability to perform everyday tasks; initial function, ongoing progress, and outcome. Each item consisting of five-point likert scale ranging from (0 to 4); extreme difficulty = 0, while no difficulty = 4.

Minimum total score was 0 (poor) and maximum total score was 80 (excellent). The lower score indicates greater disability.

Tool IV. Training schedule for the exercises group patients (logbook)

It was developed by the researchers to follow patients commitment to home exercises.

Ethical considerations

The University Research Ethical Committee approved the study design and also approved by the hospital authorities of orthopedic department at Assiut University Hospitals. Patients were informed of the study, oral informed consent was obtained from patients after a detailed explanation for the study purpose and nature. Also, all patients were informed that their personal data would be confidential and they can withdraw at any time if they want.

Validity and reliability:

The content validity of the study tools was tested for comprehensiveness, clarity, appropriateness and relevance. It was reviewed by five experts (2 orthopedic staff and 3 medical-surgical nursing staff). The recommended modifications to the study tools were done. The reliability of tool II (numeric pain rating scale) assessed by intraclass correlation coefficients was (0.95). The reliability of tool III (LEFS) assessed by correlation coefficients was (0.96).

Pilot study:

It was applied on 10% (3) of each group of the studied patients. It was conducted to ensure clarity, relevance and comprehension of the applicability of the study tools. In addition to testing wording questions and estimate the required time for data collection.

Fieldwork:

This study was completed through 3 phases: assessment, implementation and evaluation.

Assessment phase:

This phase involved collecting assessment data; demographic and the baseline medical data. The researchers met the selected studied patients in orthopedic department and orthopedic outpatients clinic at Assiut University Hospitals. The researchers introduced themselves in the beginning and explained the purpose of this study briefly to

patients. Participants' verbal consent was obtained. A computer based selection program was used to assign patients randomly into 2 equal groups (exercises group n=31) and (control group n=31) with ratio of 1:1 assignment. Demographic and baseline medical data of the studied patients were assessed using tools I, II and III.

Implementation phase:

All patients received instructions in the acute phase focused on activity modification and measures (such as ice and oral non steroid anti-inflammatory drugs) to relieve pain and inflammation.

Each patient in the exercises group received additionally one individualized session lasted 1 hour for education and training by the researchers about home exercises; stretching the ITB and related structures and strengthening the hip abductors. A copy of educational brochure was given to each patient of the exercises group.

Home exercises (Educational brochure)

Informed patients with ITBFS to take rest as the first step and stopping activities that stimulate pain followed by gradual return in order to avoid recurrence of symptoms. Treatment strategy included stretching ITB and related structures and strengthening hip abductors to ensure complete recovery.

Exercises group received home exercises educational brochure including stretching ITB and related structures and strengthening hip abductors. The researchers trained patients on how to do the home exercises every day. These exercises were implemented once a day, seven days a week for 8 weeks. Each exercise was performed 3 sets of 10 repetitions.

Stretching of the ITB and related structures:

- Trunk side bend ITB stretch.
- Side-lying leg raises.
- Iliotibial band hip abductor stretch.
- Wall isometric.

Strengthening of the hip abductors:

- Hip external rotation clamshell.
- Side-lying hip abduction.
- Reverse hip internal rotation clamshell.
- Supine bridge.

The training schedule (logbook) for patients of the exercises group (tool IV) was used to ensure commitment to home exercises. Each home exercise was recorded by patients,

making it possible to confirm their adherence status to the home exercises.

Evaluation phase:

Patients were followed up for 8 weeks. Follow up was done in orthopedic outpatients clinic at Assiut University Hospitals. Evaluation of the clinical and functional outcomes of the studied patients were first done at assessment and then after 4 weeks of implementation of the home exercises (follow up) and finally after 8 weeks of implementation of the home exercises (follow up) using study tools (II and III).

Statistical analysis

Statistical analysis for the study data was done using SPSS software (version 20.0). Frequency, chi-square test, and an independent sample t- test were used. Statistical difference was considered significant when p.value <0.05.

Results

Table (1): The mean age of patients in exercises group was 34.72 ± 9.60 . Of them, 70.96% were female, 80.64% were university graduates, 80.64% were officer, 77.41% were do exercises (activity habits), all of them had outer lateral knee pain for more than 2 weeks, 58.06% had pain in right knee. The mean age of patients in control group was 32.89 ± 11.52 . Of them, 80.64% were female, 67.74% were university graduates, 90.32% were officer, 67.74% were do exercises (activity habits), all of them had outer lateral knee pain for more than 2 weeks, 51.61% had pain in right knee. Non statistical significant difference was found between the exercises and control groups in terms of these variables (p. value >0.05).

Table (2): Non statistical significant difference was determined between the exercises and control groups in terms of numeric pain rating scale scores in the first measurements (p. value >0.05). There were statistically significant differences in the intermediate (after 4 weeks) and final measurements (after 8 weeks) (p. value <0.05).

Table (3): Non statistical significant difference was determined between the exercises and control groups in terms of total LEFS scores in the first measurements (p. value >0.05) with mean score 35 (SD 16) for

exercises group and 37 (SD 14) for control group. Statistical significant difference was determined between the exercises and control groups in terms of total LEFS scores in the intermediate (after 4 weeks) (p. value <0.05) with mean score 49 (SD 18) for exercises group and 38 (SD 15) for control group. Also, statistical significant difference was determined between the exercises and control groups in terms of total LEFS scores in the final measurements (after 8 weeks) (p. value <0.05) with mean score 62 (SD 18) for exercises group and 41 (SD 16) for control group.

Table (1): Demographic characteristics and baseline assessment of medical data of the studied patients

| Variables | Exercises group (n=31) | | Control group (n=31) | | p. value |
|--------------------------------|---------------------------|-------|-------------------------|-------|----------|
| | No. | % | No. | % | |
| Age (years) (20-54) | | | | | |
| Mean ± SD | 34.72 ± 9.60 | | 32.89 ± 11.52 | | 0.306 |
| Gender | | | | | |
| Male | 9 | 29.03 | 6 | 19.35 | 0.740 |
| Female | 22 | 70.96 | 25 | 80.64 | |
| Level of education | | | | | |
| Read and write | 2 | 6.45 | 3 | 9.67 | 0.459 |
| Middle School | 1 | 3.22 | 2 | 6.45 | |
| High school | 3 | 9.67 | 5 | 16.12 | |
| University | 25 | 80.64 | 21 | 67.74 | |
| Occupation | | | | | |
| Officer | 25 | 80.64 | 28 | 90.32 | 0.587 |
| Student | 6 | 19.35 | 3 | 9.67 | |
| Activity habits | | | | | |
| Did do exercises | 24 | 77.41 | 21 | 67.74 | 0.386 |
| Did not do exercises | 7 | 22.58 | 10 | 32.25 | |
| Duration of pain (days) | | | | | |
| Less than 2 weeks | - | - | - | - | 100 |
| More than 2 weeks | 31 | 100 | 31 | 100 | |
| Affected side | | | | | |
| Right knee | 18 | 58.06 | 16 | 51.61 | 0.431 |
| Left knee | 13 | 41.93 | 15 | 48.38 | |

Chi-square test for independence

Independent t-test

Non significance p > 0.05

Table (2): Comparison of the groups at time of assessment, after 4 weeks, and after 8 weeks in terms of numeric pain rating scale scores

| Pain level | Exercises group (n=31) | | Control group (n=31) | | Exercises group (n=31) | | Control group (n=31) | |
|----------------|---------------------------|---------|-------------------------|---------|---------------------------|---------|-------------------------|---------|
| | Time of assessment | | After 4 weeks | | After 8 weeks | | | |
| | No. | (%) | No. | (%) | No. | (%) | No. | (%) |
| No pain (0) | 0 | (0.0) | 0 | (0.0) | 7 | (22.58) | 0 | (0.0) |
| Mild (1-3) | 0 | (0.0) | 0 | (0.0) | 14 | (45.16) | 6 | (19.35) |
| Moderate (4-6) | 26 | (83.87) | 23 | (74.19) | 7 | (22.58) | 19 | (61.29) |
| Severe (7-10) | 5 | (16.12) | 8 | (25.80) | 3 | (9.67) | 6 | (19.35) |
| p.value | 0.326 | | 0.04* | | 0.001** | | | |

Chi-square test for independence

* p < 0.01

Table (3): Comparison of the groups at time of assessment, after 4 weeks, and after 8 weeks in terms of LEFS scores

| LEFS scores | Exercises group (n=31) | | Control group (n=31) | | Exercises group (n=31) | | Control group (n=31) | |
|------------------|---------------------------|------|-------------------------|------|---------------------------|------|-------------------------|------|
| | Time of assessment | | After 4 weeks | | After 8 weeks | | | |
| | Mean | (SD) | Mean | (SD) | Mean | (SD) | Mean | (SD) |
| Mean (SD) | 35 | (16) | 37 | (14) | 49 | (18) | 38 | (15) |
| | | | | | 62 | (18) | 41 | (16) |

| | | | |
|--------------------|-------|-------|--------------|
| p.value | 0.214 | 0.02* | < 0.001** |
| Independent t-test | | | ** p < 0.001 |

Discussion

The comparison of the characteristics of the patients in the exercises and control groups in the present study revealed that the groups were similar. The majority of patients were young adult, females and do exercises (activity habits).

Similar literature indicated that ITBFS occur frequently in active young adults aged 15-50 years specifically in athletes who performed frequent flexion and extension activities of knee, extreme friction and potential irritation results in pain (**Beals and Flanigan, 2013; Mellinger and Neurohr, 2019**).

Similar literature mentioned that because of anatomical differences of thigh and knee in females, as genu varum and excessive internal tibial rotation, females are slightly more susceptible to develop ITBFS. The anatomical differences result in weakness of quadriceps muscle and excessive varus angle of femur in relation to knee (**Foch and Milner, 2014; Foch et al., 2015**). The female's genu varum exhibited a higher ITB pressure during weight-bearing, led to the high incidence of ITBFS in active females (**Kim et al., 2020**).

The current study showed that, in the first measurement before starting the home exercises for stretching of the ITB and strengthening of the hip abductors, the mean scores obtained from the numeric pain rating scale and the LEFS in the exercises and control groups were close to each other; no significant difference between them. It was determined high numeric pain rating scale scores and low LEFS scores of patients in both groups due to the effect of ITBFS on pain and lower limb function (ability to perform everyday tasks).

This result is similar to the results of other studies, which indicate that patients with ITBFS experience high level of pain that forced them to modify their daily activities and low LEFS scores indicating decreased lower

extremity function (**Brandon and Patla, 2013; Panse et al., 2018; Shamus and Shamus, 2015**).

The current study showed that there were differences in the exercises and control groups in terms of intermediate and final measurements. The exercises group showed significant pain reduction and improvement in lower extremity function than the control group.

From the researchers point of views, this could be due to the effect of home exercises for stretching of the ITB and strengthening of the hip abductors which applied in the exercises group that significantly decreased pain and improved lower extremity function. These exercises were effective in improving patients' outcomes in intermediate and final measurements. It helped in modifying tissue dysfunction, increasing ITB flexibility, strengthening the glutes and strengthening hip muscles and these reflected in symptoms improvement; reduced pain and improved lower extremity function of patients in the exercises group.

In the same line with the present study result, a study of **McKay et al., (2020)** stated that there were no statistical significant differences between the three groups. Group A [stretching exercises], group B [conventional exercises] and group C [experimental hip strengthening exercises]. Experimental hip strengthening exercises is recommended as a good intervention for patients with ITBFS rely on overall improvement in pain, strength and function.

The study result of **Sieunarine-McKay, (2016)** is in the same line with the current study result. Patients with ITBFS who participated in exercises rehabilitation program showed pain reduction, increased flexibility, increased core strength and faster return to pain free running.

Other similar studies on the effects of using exercises rehabilitation program on patients with ITBFS obtained similar results related to numeric pain rating scale and LEFS scores. Patients who enrolled in exercises rehabilitation program showed significant improvement in pain and lower extremity function (**Shamus and Shamus, 2015; Zmadanis and Betsos, 2017**).

Other similar study indicated that patients presenting with ITBFS had a tight ITB in the painful knee. A tight ITB is one of the factors which lead to ITBFS. Hence, stretching and strengthening ITB can be effective and useful in treating ITBFS and showed significant improvement in terms of pain and lower extremity function (**Malarvizhi, 2017**).

In rehabilitation, nurses have an active role in meeting the basic needs of patients, supporting their functional abilities and aiding them in taking protective measures for daily routine. Rehabilitation nurses determine the care needs of patients and provide education and support for them (**Koç, 2012**). Rehabilitation nurses/physical therapists should instruct patients in a home exercise program to improve strength and endurance of knee and hip. Strengthening of the knee flexors and extensors and hip abductors is important component of rehabilitation. Once the patients is capable of complete all strengthening exercises without discomfort, they can return to the previous training regimen gradually (**Noehren et al., 2014**). Rehabilitation services which provided to patients by rehabilitation nurses have positive effects on physical function, motivation and quality of life (**Kwon and Lee, 2017**).

The present study hypothesis was supported as home exercises for stretching of the ITB and strengthening of the hip abductors improved clinical and functional outcomes of patients with ITBFS; pain and lower extremity function. The exercises group showed significant improvements in intermediate and final measurements regarding pain and and lower extremity function than the control group.

Conclusion

This study concluded that 8 weeks of home exercises for stretching of the ITB and strengthening of the hip abductors were effective in reducing pain and improving lower extremity function of patients with ITBFS.

Recommendations

The present study findings recommend disseminating the educational brochure of home exercises to stretch the ITB and strength the hip abductors of patients with ITBFS in the orthopedic and rehabilitation and physical therapy departments as a guiding tool for rehabilitation nurses and patients about stretching and strengthening exercises. This could be useful to aid independent living at home and improve patients' clinical and functional outcomes. Education is important in preventing recurrence of ITBFS, education and training should focus on instructing patients in appropriate stretching and strengthening and techniques. Nurses should teach and train patients with ITBFS to perform and adhere to the home exercises (educational brochure). More importantly, the patients with ITBFS should learn to identify symptoms that indicate when training volume should be decreased.

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