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Original Research Article

Pre and post operative physiotherapy in foot and ankle surgery: role, impact, and importance

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ABSTRACT

Background: The foot and ankle injuries require surgery to be fixed. The success of surgeries, in this case, is associated with appropriate physiotherapy before and after the surgery. The education, skills, capabilities, and expertise that physiotherapists possess are extremely beneficial to injuries to maximize their success. The expertise and competency of physiotherapists enable them to design functional rehabilitation regimens for these patients. The main objective of the study is to investigate the role, impact, and significance of pre- and post-operative physiotherapy in foot and ankle surgery.
Methods: The current cross-sectional, and descriptive study conducted to 120 (n=120) patients with foot and/or ankle surgery before and after the physiotherapy between September 2019 to February 2022, from five hospitals, King Fahad General Hospital (KFHJ) in Jeddah, King Abdullah Medical City (KAMC) in Makkah, King Fahad Armed Forces Hospital (KFAFH) in Jeddah, International Medical Center Hospital (IMC) in Jeddah, and Al-Noor Hospital in Makkah. The descriptive survey data was collected depended on questionnaire reports based on patient-reported outcomes measurement information system (PROMIS) physical function and pain interference scales.
Results: The results found the pain was interfered with patient daily activities (70.5%) and where unable to concentrate (69.8%), while 68.8% of them were unable to enjoy life. The results clearly indicated that most of the patients are unable to walk at normal speed (66.7%). Additionally, a considerable number of the patients had problems hiking or moving smoothly (60.8%).
Conclusions: The average data suggests that improvement in physical performance and discomfort plateaus at around 4 months after surgery, with only minor changes occurring after this time point in the future. So, the patients have the biggest change in function and discomfort during the first 4 months following surgery on average.

Keywords: Physiotherapy, Physical therapy, Physical function, Ankle fracture, Predictive outcome, Foot and ankle surgery

INTRODUCTION

Foot and ankle injuries are common especially amongst athletes; this has been thoroughly documented in the scientific literature conducted an epidemiology analysis in which they discovered that 25 per cent of the 12,681 injuries seen in a multispecialty sports medicine clinic happened in the foot and ankle.[4] In 1997, discovered that the majority of dance injuries in a Broadway ballet production happened in the foot and ankle, while in 2008, discovered that 53% of injuries in ballet dancers occurred in the foot and ankle.[1,3]

As patient-reported outcomes continue to grow beyond the scope of clinical research to include standard of care assessments throughout orthopaedic practices, the use of patient-reported outcomes is becoming more widespread. The use of these numbers to predict which patients might

benefit from a range of treatment options is the Holy Grail of medical research, and it is now a very active area of investigation. Using computerized adaptive testing based on item response theory, the patient-reported outcome instrumentation system (PROMIS) is a patient-reported outcome measure that may be administered in less time while still maintaining accuracy. Several published studies in the foot and ankle literature demonstrate the efficacy of the PROMIS system. Patients took an average of 44 seconds to complete the PROMIS physical function test, compared to 179 seconds for the Foot and ankle ability measure–activity of daily living subscale (FAAM ADL) and 194 seconds for the foot function index (FFI).[6]

In most cases, the foot and ankle injuries require surgery to be fixed. The success of surgeries, in this case, is associated with appropriate physiotherapy before and after the surgery. The education, skills, capabilities, and expertise that physiotherapists possess are extremely beneficial to injuries to maximize their success. The expertise and competency of physiotherapists enable them to design functional rehabilitation regimens for athletes, which according to title and is the most effective method of quickly returning the athlete to competition and extending their careers.[7]

The pre- and post-operative physiotherapy mitigate the functional limitations within the foot and ankle. Functional limitations are defined as the inability to perform the actions, tasks, and activities that are typical for a given individual's daily activities, whereas disability is defined as the inability or constricted ability to perform actions, tasks, and activities related to required self-care, home management, work, community, and leisure roles in the individual's socio-cultural context and physical environment.[9] When it comes to an athlete, a functional constraint is the inability to run, and the ensuing impairment is the inability to participate in sports such as soccer or compete in a running race as a result.

Individuals who have further training in functional biomechanical evaluation or who have finished a residency program and advanced studies to specialize in sports medicine and orthopaedics are more likely to provide the finest care possible to athletes in need of such services. Physiatrists can earn certification from the American board of physical therapy specialties (ABPTS) to demonstrate a deeper depth of knowledge and abilities linked to a specific area of practice. Specialists in orthopaedics and sports physiotherapy are officially recognized as having better knowledge, experience, and skills than no specialists in these fields.[9]

It is recommended that physicians, podiatrists, and other healthcare professionals cultivate positive working relationships with physiotherapists to whom they refer patients, as well as familiarize themselves with a specialist to maximize patient outcome and satisfaction when treating athletes with foot and ankle related problems.

Physical therapy that is specifically targeted to the foot and ankle condition is the most effective way to address the varied nature of foot and ankle issues. Electrotherapeutic modalities, orthotic fabrication, physical agents, application of therapeutic exercises, manual therapy, assistive device prescription (such as bracing), and neuromuscular re-education are all examples of physical therapy interventions that can be used in foot and ankle rehabilitation. As one proceeds through the healing process, the selection, timing, and proper application of appropriate treatment interventions are all dependent on the qualities of the tissue being treated. The inflammatory phase of healing is the first phase of the healing process. When an injury or surgery occurs, this phase is triggered, to prepare the injured area for repair because of the event. It is usual practice to apply the rest, ice, compression, and elevation (RICE) method to control the inflammatory process. Too little inflammation would cause healing to be slowed, while too much inflammation would increase the likelihood of excessive scarring.[2] Physiotherapists can utilize strategies to assist manage inflammation, such as the use of cryotherapy and intermittent compression devices, as well as other modalities, such as electrical stimulation, to help alleviate pain during this phase.

METHODS

Study design

The current study was cross-sectional, and descriptive study aimed to quantitatively and qualitatively evaluation of the of pre- and post-operative physiotherapy among patients with foot and ankle surgery.

Sample size and selection of samples

The current research was conducted to 120 (n=120) patients with foot and/or ankle surgery before and after the physiotherapy between September 2019 to February 2022, from five hospitals, King Fahad General Hospital (KFHJ) in Jeddah, King Abdullah Medical City (KAMC) in Makkah, King Fahad Armed Forces Hospital (KFAFH) in Jeddah, International Medical Center Hospital (IMC) in Jeddah, and Al-Noor Hospital in Makkah. Based on the following criteria the participants (patients) were chosen in this study.

Inclusion criteria

The criteria of the participants included: patients aged more than 18 years old, patients with foot and/or ankle surgery, did not receiving any physiotherapy yet, and registered in the following hospitals only, KFHJ in Jeddah, KAMC in Makkah, KFAFH in Jeddah, IMC in Jeddah, and Al-Noor Hospital in Makkah.

Exclusion criteria

Patients aged less than 18 years old, with other foot and/or ankle surgery, who did receiving any physiotherapy in any

healthcare center, and who were not registered in the one of the following hospitals only, KFHJ in Jeddah, KAMC in Makkah, KFAFH in Jeddah, IMC in Jeddah, and Al-Noor Hospital in Makkah were excluded.

Collection of data

The research depended on questionnaire sheets in collection of data by direct interviewing with patients to fulling these sheets.

Questionnaire tool

The questions were designed to answer, the researcher used the descriptive survey method, which expresses the social phenomenon that has been studied, and seeks to reveal the relationships between its dimensions to explain them and reach general conclusions that contribute to improving and developing reality. The researcher applied the PROMIS physical function and pain interference on the patients who received physiotherapy before and after the surgery. The mean pre-surgery and post-surgery and change (SDs) in PROMIS domains were calculated.

Data management

Date was sorted to groups according to the demographic information of patients.

Data analysis strategies

After collection, data was analyzed by using statistical package of social science (SPSS) version 13 and specialist assessment, statistical examination was used such as Bonferroni test and one-way analysis of variance (ANOVA) test between and within groups, as well as the significance of the results such as p value, f value, and standard deviation significant values.

Ethics and human subjects' issues

The study had obtained approval from the Saudi Arabia health research ethics committee, which is a part of the National Institute for Medical Research and following the Helsinki instructions. The researcher was committed to honesty that is recommended by scientific forums. The researcher presented the research data, methods, procedures, and results in an honest manner. The researcher was careful to avoid any falsifications or data misrepresentation. Ethical approval was retrieved from all patients before the start of experiments where they were informed that all data used for research purposes only.

RESULTS

The post operative questionnaire, Table 1, contained 4 physical tasks, which are: pain interference in the last 7 days, walking, stair ascent, and set to stand tasks. The first task "pain interference in the last 7 days" contained 6 questions to measure it, and the scale of measurement was 5 choices which are: not at all, a little bit, somewhat, quite a bit, and very much. All questions got score between 62.2% and 70.5% and the total score for this physical task was 67.4%.

The highest score was 70.5% for the question ID: painin9 "how much did pain interfere with your day to day activities?", then 69.8% for the question ID: painin8 "how much did pain interfere with your ability to concentrate?", and 68.8% for the question ID: painin3 "how much did pain interfere with your enjoyment of life?", also the question ID: painin10 "how much did pain interfere with your enjoyment of recreational activities?" got a score of 67.5%, then the question ID: painin14 "how much did pain interfere with doing your tasks away from home (e.g. getting groceries, running errands)?", lastly, the question ID: painin26 "In the past 7 days…how often did pain keep you from socializing with others?" got a score of 62.2% (Figure 2). Regarding the other 3 physical tasks which are: walking, stair ascent, and set to stand, each of them has 3 PROMIS item wordings as questions, and the answer for each question is either yes or no. the total score for all the 3 physical tasks was 53.3% (Table 2).

The walking physical task has the highest score of all the 3 tasks, as it got a mean of 61.4%, the first question of this task was: "are you able to walk at a normal speed?" has 80 yes answers out of 120, which are about 66.7% of all answers. The third question "does your health now limit you in hiking a couple of miles (3 km) on uneven surfaces, including hills?" came second in rank with 73 yes answers, which are about 60.8%, and lastly the second question "are you able to walk briskly for 20 min without stopping to rest?" came third in rank with 68 yes answers, which are about 56.7% of the answers.

The set to stand physical task came second in rank of the physical tasks, as it got a mean of 49.7%, the second question of this task was: "are you able to sit down in and stand up from a low, soft couch?" has 63 yes answers out of 120, which are about 52.5% of all answers. The first and the third questions "are you able to stand up from an armless straight chair?" and "are you able to squat and get up?" both came second in rank with 58 yes answers, which are about 48.3%.

Lastly, the stair ascent physical task has the least score of all the 3 tasks, as it got a mean of 48.9%, the third question of this task was: "are you able to climb the stairs of a 10-story building without stopping?" has 62 yes answers out of 120, which are about 51.7% of all answers. The second question "are you able to climb up 5 flights of stairs?" came second in rank with 61 yes answers, which are about 50.8%, lastly the first question "are you able to go up- and downstairs at a normal pace?" came third in rank with 53 yes answers, which are about 44.2% of the answers.

Table 1: Pain interference.

Physical task	Question	Not at all (%)	A little bit (%)	Some-what (%)	Quite a bit (%)	Very much (%)	Mean (%)	Score (%)
Pain interference in the last 7 days	How much did pain interfere with your enjoyment of life?	9 (7.5)	19 (15.8)	28 (23.3)	38 (31.7)	26 (21.7)	3.44	68.8
	How much did pain interfere with your ability to concentrate?	6 (5.0)	18 (15.0)	33 (27.5)	37 (30.8)	26 (21.7)	3.49	69.8
	How much did pain interfere with your day-to-day activities?	3 (2.5)	21 (17.5)	29 (24.2)	44 (36.7)	23 (19.2)	3.53	70.5
	How much did pain interfere with your enjoyment of recreational activities?	12 (10.0)	15 (12.5)	33 (27.5)	36 (30.0)	24 (20.0)	3.38	67.5
	How much did pain interfere with doing your tasks away from home (e.g. getting groceries, running errands)?	13 (10.8)	19 (15.8)	31 (25.8)	34 (28.3)	23 (19.2)	3.29	65.8
	In the past 7 days… how often did pain keep you from socializing with others?	17 (14.2)	19 (15.8)	37 (30.8)	28 (23.3)	19 (15.8)	3.11	62.2
	Mean	10 (8.3)	18.5 (15.4)	31.83 (26.5)	36.17 (30.1)	23.5 (19.6)	3.37	67.4

Table 2: Walking, stair ascent, and set to stand.

Physical task	PROMIS item wording	N		Mean	Score (%)
Walking	Are you able to walk at a normal speed?	80	(66.7)	73.67	(61.4)
Walking	Are you able to walk briskly for 20 min without stopping to rest?	68	(56.7)		
Walking	Does your health now limit you in hiking a couple of miles (3 km) on uneven surfaces, including hills?	73	(60.8)		
Stair ascent	Are you able to go up- and downstairs at a normal pace?	53	(44.2)	58.67	(48.9)
Stair ascent	Are you able to climb up 5 flights of stairs?	61	(50.8)		
Stair ascent	Are you able to climb the stairs of a 10-story building without stopping?	62	(51.7)		
Set to stand	Are you able to stand up from an armless straight chair?	58	(48.3)	59.67	(49.7)
Set to stand	Are you able to sit down in and stand up from a low, soft couch?	63	(52.5)		
Set to stand	Are you able to squat and get up?	58	(48.3)		
Mean		64	(53.3)	64	(53.3)

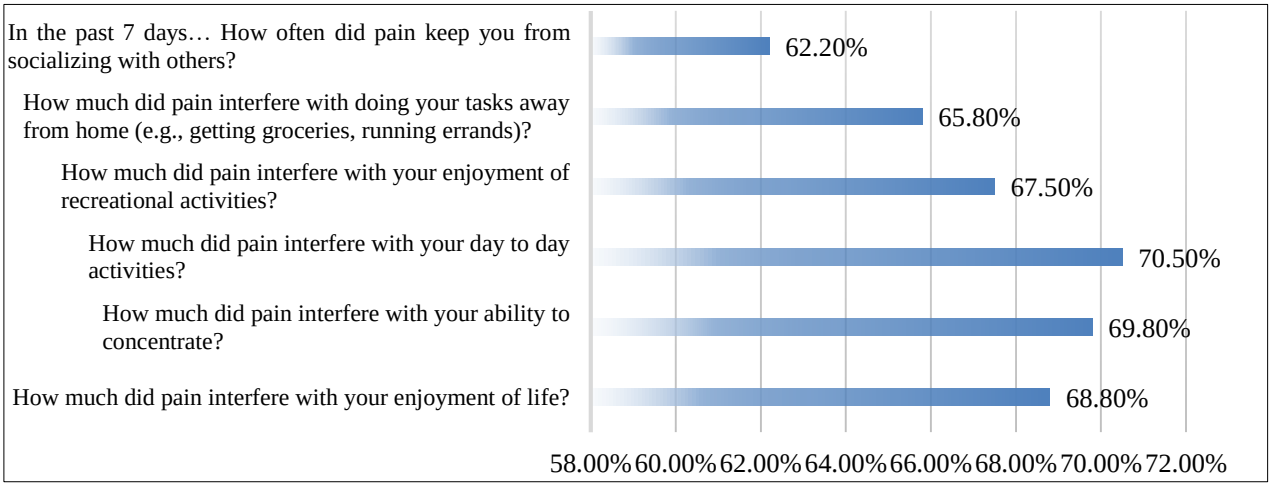

Figure 1: Pain interference.

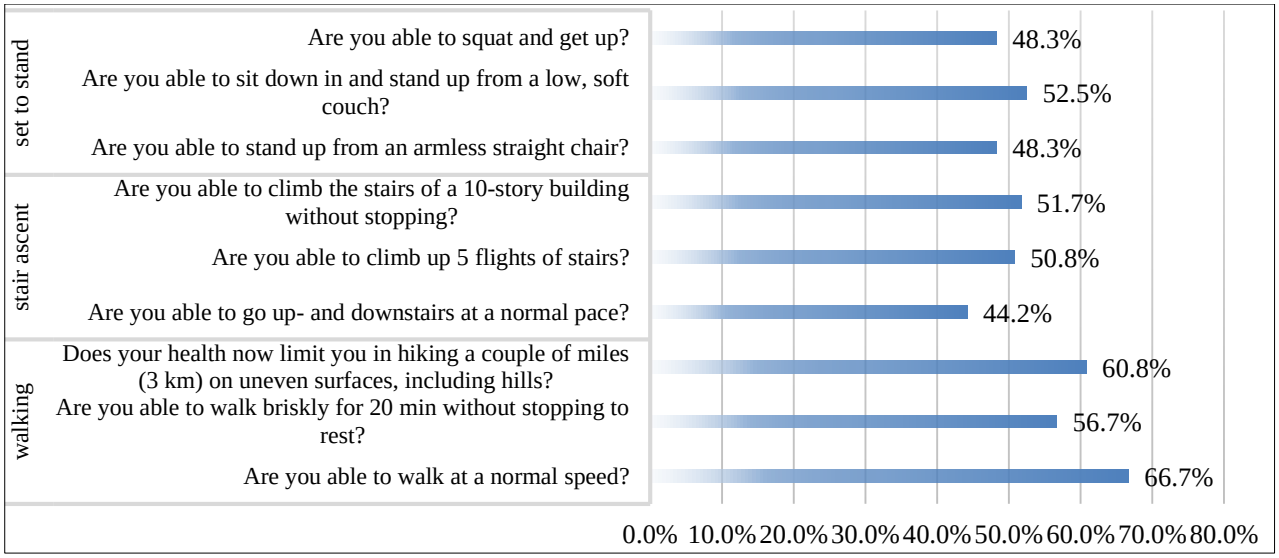

Figure 2: Walking, stair ascent, and set to stand.

DISCUSSION

The majority of patients indicated that pain interfered with their daily activities (70.5%) and where unable to concentrate (69.8%), while 68.8% of them were unable to enjoy life. The results clearly indicated that most of the patients are unable to walk at normal speed (66.7%). Additionally, a considerable number of the patients had problems hiking or moving smoothly (60.8%).

Patient-reported outcome measurements give patients the ability to have a say in their own healthcare decisions. This information can be collected in an orthopaedic practice using the PROMIS, which has been verified, is accurate, and is efficient. There is a lack of understanding and validation of how these scores might be used to assist patients and physicians, particularly surgeons, in making treatment decisions. Preoperative PROMIS scores for physical function and pain interference were found to be predictive of postoperative outcomes in this study, which concluded the following.

Our patient population was indicative of a Saudi foot and ankle practice that provided a wide variety of diagnoses and procedures to its patients. According to the results of the American board of orthopaedic surgery (ABOS) oral examination, the most prevalent operations performed by orthopaedic foot and ankle specialists were flatfoot, ankle arthritis, ankle instability, hallux rigidus, hallux valgus and hammertoes.[6]

In Saudi Arabia, there is a great deal of heterogeneity in the management of patients who have undergone hind/midfoot fusion and reconstructive surgery. The availability of high-quality research and guidance in this field is very limited. This is in accordance with a recent evaluation of studies on the subject.[2] This study found a wide range of times at which patients were instructed to begin weight bearing, and only half of patients were usually referred to physiotherapy following surgery, which was particularly interesting. In addition, a wide range of rehabilitation treatment strategies and outcome assessments are being used in this setting.

Previous research has discovered a link between patient satisfaction and discomfort following ankle arthrodesis surgery. In a study of 26 patients who underwent ankle arthrodesis for ankle arthritis, Thomas et al discovered great patient satisfaction and consistent pain alleviation. However, as compared to a control group, this patient cohort demonstrated a continuous and statistically significant decline in hindfoot function and gait impairments after surgery.[8] The same results have been reproduced in several investigations, with consistent improvement in pain and high levels of satisfaction, but with less improvement in function.[5,10] Following the findings of this study and earlier publications, patients should be informed prior to surgery that they are more likely to have an improvement in pain relief than function, allowing them to control their expectations for the outcome of the procedure more effectively. Additionally, patients should be informed that they will not be pain-free after ankle fusion, but that they will notice a significant reduction in their pain level while doing normal activities after undergoing the procedure.

This study contributes to the recovery curve or roadmap for the average improvement in physical function and pain interference outcome measures following ankle fusion was also discovered in previous studied, which can be used to guide future research. This type of recovery curve is beneficial for assessing average rather than individual improvement over time because each time interval does not contain all of the participants in the previous interval. The average data suggests that improvement in physical performance and discomfort plateaus at around 4 months after surgery, with only minor changes occurring after this time point in the future. Consequently, it is reasonable to

conclude that patients have the biggest change in function and discomfort during the first 4 months following surgery on average. As stated by insurance companies and workers' compensation, one year follow-up is required to maximize surgical improvement. This is in direct opposition to the ideology. It may be reasonable, and perhaps preferable, to have patients return to clinic on an as-needed basis after this time point if they demonstrate an appropriate level of improvement, which would result in significant savings in healthcare dollars for both the patients and the healthcare system overall. Patient reported outcome measures enable a healthcare clinician to assess a patient's response to therapy and track their progress through a typical healing process. Patients in our study who underwent ankle arthrodesis exhibited increasing improvement over the course of the first four months following surgery. Alternative patterns suggesting a decline may aid in the prediction of difficulties following surgery, according to the researchers.

During the past few years, there has been an increased emphasis placed on understanding the patient's perspective on the outcomes following an orthopaedic surgery or procedure. Until recently, the bulk of research examining outcomes after therapy for end-stage ankle arthritis relied on non-validated patient questionnaires to evaluate changes in pain and physical function. One of the study's strengths was the use of the validated PROMIS outcome measures to assess pre- and postoperative physical function and pain in ankle fusion patients before and after the procedure.

There are significant limitations of this study, including the small number of patients who participated and the lack of consistency in preoperative and postoperative time points. Patients' preoperative and postoperative data are inconsistent due to the practical demands placed on surgeons to balance tracking patient status with the need for greater efficiency (patient and provider time) and lower costs to patients and the healthcare system, as well as other factors. Because ankle arthrodesis is considered an end-stage elective procedure, it is not uncommon for the pre-operative visit, during which the choice to proceed with surgery is made, to take place several weeks before the procedure itself. Consequently, even though the data that was closest to the surgery date was used in the study, the pre-operative visit occurs at a different time than the surgical date.

In a similar vein, although follow-up appointments are scheduled during the healing period, a variety of practical obstacles render the timing of these appointments inconclusive.

This explains why there are only a small number of follow-ups PROMIS data available at more than 6 months after surgery, compared to other procedures. The use of standardized longer-term follow-up and a bigger patient group will improve the power and therapeutic importance of future such trials; yet, it is possible that the overall initial course of treatment will remain unchanged.

CONCLUSION

The average data suggests that improvement in physical performance and discomfort plateaus at around 4 months after surgery, with only minor changes occurring after this time point in the future. so, the patients have the biggest change in function and discomfort during the first 4 months following surgery on average.

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