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Original Research

Comparison of Supervised Exercise and Home Exercise After Ankle Fracture

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ABSTRACT

Ankle fractures are common fractures of the lower extremities that have an incidence rate of 101 fractures per 100.000 person-years. It is not clear which rehabilitation intervention should be performed after an ankle fracture. The aims of this study are to compare the effectiveness of a supervised exercise program with that of a home exercise program and to determine and compare the costs of these programs. A supervised exercise program and a home exercise program were performed for 8 weeks. The supervised exercise group consisted of 35 patients (mean age 39.23 years), and the home exercise group consisted of 73 patients (mean age 41.78 years). The average follow-up was 27.86 ± 9.88 months. Demographic information, injury details, type and classification of fracture, pain severity, and ankle range of motion were recorded. The clinical outcomes were determined by using the Pain Disability Index, the American Orthopaedic Foot and Ankle Society Ankle-Hindfoot Score, and the Short-Form 36 Health Survey. Surgical and rehabilitation satisfaction was evaluated with the use of a numeric scale. American Orthopaedic Foot and Ankle Society Ankle-Hindfoot Scores were statistically significantly higher in the home exercise group ($p = .036$), and rehabilitation satisfaction of the supervised exercise group was statistically significantly better ($p = .047$). The total rehabilitation crude cost of a patient in the supervised exercise group is 1113.63 Turkish lira (310.25 U.S. dollars) versus 182.31 Turkish lira (50.79 U.S. dollars) in the home exercise group. Considering that the crude cost of the home exercise program is very low and clinical outcomes are satisfactory, we recommend that patients with surgically treated isolated ankle fractures be followed up with a postoperative home exercise program.

Ankle fractures are common fractures of the lower extremities and have an incidence rate of 101 fractures per 100.000 person-years. They occur most commonly in middle-aged females and young males (1). Stabilized fractures are treated conservatively, but instable fractures require surgical treatment (2,3). The goal of treatment is to achieve pain-free ankle motion with adequate reduction (4).

Rehabilitation may begin during the period of immobilization or after this period, with an aim to restore range of motion, strength, proprioception, and function (5). After an ankle fracture, patients often experience pain, stiffness, weakness and swelling at the ankle, limitations during daily activities, reduced ability to participate in recreational activities, and occupational concerns (6).

Even though various rehabilitation interventions (usual care, advice, supervised exercise program, standardized training program) have been conducted regarding the treatment of patients with a surgically treated ankle fracture, there is no consensus on the most appropriate rehabilitation intervention. Hence, further research is necessary to determine the most effective intervention (3). In a recent study by Moseley et al (7), a supervised exercise group (the suggested schedule was 2 sessions in week 1 and a single session in each of weeks 2 to 4) and an advice group (a single session of self-management advice about exercise and return to activity) were compared. The authors reported that supervised exercise programs show similarity in patient outcomes compared with advice but may be more effective in older females and in patients with more severe fractures (7). Despite the extensive review describing rehabilitation for ankle fractures in adults, we could not find a study on the effects of home exercise program after an ankle fracture (3).

Therefore, the purposes of this study were to compare the effectiveness of a supervised exercise program and a home exercise program in the reduction of pain and in improving functional status and quality of life in patients with a surgically treated isolated ankle fracture and to determine and compare the physical therapy and rehabilitation crude cost of each type of intervention programs.

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Patients and Methods

Study Design and Eligibility Criteria

This study is a prospective, assessor-blind clinical trial. The study was approved by the Pamukkale University Non-invasive Clinical Researches Ethics Committee. All patients gave written informed consent. The data collection started in May 2013 and ended in April 2017. All physiotherapy interventions (N.B.) and outcome assessments (R.S.) were performed by the same observers. Crude cost analysis, data processing, and statistical analysis were performed by another author (N.O.).

The inclusion criteria were as follows: isolated ankle fracture treated with surgically (10th revision of the International Statistical Classification of Diseases and Related Health Problems codes: S82.5 and S82.6), age >18 years, and ability to cooperate (e.g., alcohol and drug addiction, senility excluded). Exclusion criteria were revision surgery due to deep infection, nonunion, or implant failure; ankle fractures associated with ankle ligament injury; musculoskeletal injury in upper extremities and other lower extremity (e.g., upper extremity injury may prevent the use of walking assistant during ambulance); and concurrent pathologies that affect the ability to perform everyday tasks or the measurement procedures used in this study (e.g., peripheral vascular disease, symptomatic osteoarthritis, stroke, other fractures).

Participants

A total of 153 patients were enrolled in this study. Two groups were formed: a supervised exercise group and a home exercise group. This study was planned as a randomized controlled study, but randomization could not be performed because of patient-related issues (transportation problems, financial opportunities, desire for physiotherapist supervision, etc). Therefore, patients were informed about both programs and asked to choose 1 of these programs. In the supervised exercise group, 16 patients excluded because of revision surgery (n = 1), being directed to different treatments (n = 1), unwilling to come to treatment (n = 1), inability to maintain contact because of a change in telephone number (n = 10), and incomplete data (n = 3). In the home exercise group, 19 patients were excluded because they were directed to different treatments (n = 2), inability to maintain contact because of a change in telephone number (n = 12), and incomplete data (n = 5). The final study sample consisted of 108 patients, with 35 in the supervised exercise group and 73 in the home exercise group (Fig.).

Interventions

All patients received usual care during the hospitalization period (i.e., ice, transfer activities, mobilization, exercise). None of the patients underwent cast immobilization after surgery.

Patients in the 2 groups received the same exercise program: ankle mobility and strengthening exercise (0 to 2 weeks), passive exercises (0 to 2 weeks), active-assistive/active exercises (2 to 4 weeks), progressive resistive exercises (4 to 6 weeks), and proprioceptive, balance/coordination and gait training, and encouragement to return to function activities and work (6 to 8 weeks). Patients started walking exercises in tolerated weightbearing at the 2nd week and full weightbearing at the 8th week. Each exercises consisted of 2 sets of 15 repetitions. The exercise program was performed for 8 weeks, 3 times per week, either under the supervision of a physiotherapist (supervised exercise group) or at home without supervision (home exercise group). In the supervised exercise group, a physiotherapist applied massage and mobilization techniques in addition to the exercise program. In the home exercise group, patients were called to physical therapy clinics to ensure that they understood how to perform the exercises.

Outcome Assessment

Outcome measurements were performed by an assessor who was blind to treatment allocation. Demographic information, injury details, and type and classification of fracture were recorded. A visual analogue scale was used to evaluate pain during rest, walking, and stair climbing. Ankle range of motion was assessed by the use of a universal goniometer. The degree to which aspects of patient life were disrupted by chronic pain was determined based on the Pain Disability Index (8). The American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Score was used to assess pain, function, and alignment (9,10). The Short-Form 36 Health Survey (SF-36) was used to evaluate the patients' quality of life. Surgical and rehabilitation satisfaction was evaluated with the use of a numeric scale (0 to 10).

Total Rehabilitation Costs

Crude cost analyses of rehabilitation applications were charged according to the Turkish Social Security Institute (SGK) Healthcare Implementation Communique (SUT) public health care services fee schedule in 2010 and as Turkish lira (TL). The crude costs

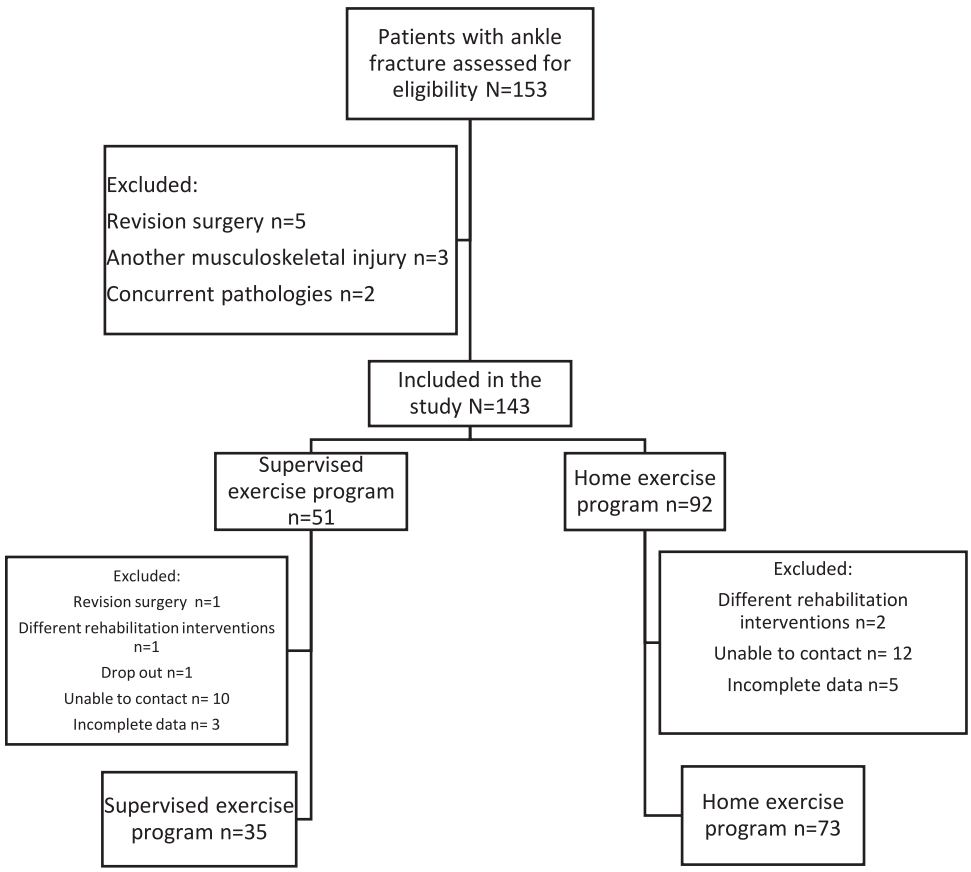

Fig. Flowchart of the study.

were converted from TL to U.S. dollars (USD) at the average exchange rate per July 5, 2017 (1 TL = 3.58 USD).

Statistical Analysis

Obtained data were analyzed by using the Statistical Package for Social Scientist (version 21; SPSS Inc., Chicago, IL). Continuous variable values are given as mean ± standard deviation. Categorical variable values are presented as absolute numbers and percentages. Categorical data were compared with use of the χ^2 test. Student's 2-sample *t* test was used to compare the means of groups. Statistical significance was defined at the 5% ($p \leq .05$) level.

Results

The supervised exercise group consisted of 35 patients (mean age 39.23 years; 11 women and 24 men), and the home exercise group consisted of 73 patients (mean age 41.78 years; 22 women and 51 men). The average follow-up of period was 27.86 ± 9.88 months. According to fracture type, the supervised exercise group consisted of 12 (34.3%) patients with a medial malleolus fracture, 13 (37.1%) patients with a lateral malleolus fracture, and 10 (28.6%) patients with a bimalleolar fracture. The home exercise group consisted of 26 (35.6%) patients with a medial malleolus fracture, 25 (34.2%) patients with a lateral malleolus fracture, and 22 (30.1%) patients with a bimalleolar fracture. The most common causes of fracture were a traffic incident (supervised exercise group 24.7%, home exercise group 42.9%) and a fall (supervised exercise group 61.6%, home exercise group 42.9%). Descriptive characteristics of patients are provided in Table 1.

The comparisons of clinical outcome scores of the groups are shown in Table 2. AOFAS Ankle-Hindfoot Scores were statistically significantly higher in the home exercise group ($p = .036$), whereas rehabilitation satisfaction of the supervised exercise group was statistically significantly higher ($p = .047$). There was no statistically significant difference between groups in pain, ankle range of motion, pain disability index, and quality of life scores.

Comparisons of ankle range of motion of the patients are shown in Table 3. The range of motion of the injured side was lower than that of the healthy side in both groups ($p \leq .05$).

Comparisons of clinical outcome scores of the patients by age group are shown in Table 4. Plantarflexion range of motion in the supervised exercise group ($p = .045$) and eversion range of motion in the home exercise group ($p = .048$) were better in patients <40 years old. In the home exercise group, sexual behavior ($p = .036$) and life support activity ($p = .018$) scores were higher in patients <40 years old. In both the supervised and the home exercise groups, AOFAS Ankle-Hindfoot Scores and SF-36 scores for physical functioning ($p = .029$), role physical ($p = .011$), and role emotional ($p = .089$) were better in patients <40 years old. The SF-36 score for pain and both surgical and rehabilitation satisfaction were not affected by age ($p > .05$).

The patients returned to their jobs on average by the 3rd month. Job changes and job-related problems were not reported at the average 28-month follow-up period. In addition, no statistically significant difference was observed when clinical outcomes were compared according to the occupations ($p > .05$).

Patient rehabilitation crude cost analysis is shown in Table 5. The total rehabilitation cost per patient is 1113.63 TL (310.25 USD) in the

Table 1
Descriptive characteristics of patients (N = 108)

Variable	Supervised Exercise Group (n = 35)		Home Exercise Group (n = 73)		*p* Value
	Minimum, Maximum	Mean ± SD	Minimum, Maximum	Mean ± SD	
Age (y)	20, 60	39.23 ± 11.72	20, 66	41.78 ± 13.70	.346
Body mass index (kg/m^2)	16.49, 37.55	25.62 ± 4.61	15.41, 37.98	27.37 ± 4.65	.120
Education	0, 18	9.56 ± 5.11	0, 16	8.63 ± 5.22	.318
	n	**%**	**n**	**%**	
Sex					.892
Female	11	31.4	22	30.1	
Male	24	68.6	51	69.9	
Dominant extremity					.467
Right	31	88.6	68	93.2	
Left	4	11.4	5	6.8	
Affected extremity					.942
Dominant side	17	48.6	38	52.1	
Nondominant side	18	51.4	35	47.9	
Fracture type					.957
Medial malleolus fracture	12	34.3	26	35.6	
Lateral malleolus fracture	13	37.1	25	34.2	
Bimalleolar fracture	10	28.6	22	30.1	
Cause of fracture					.154
Traffic incident	18	24.7	15	42.9	
Work incident	3	4.1	3	8.6	
Fall	45	61.6	15	42.9	
Other	7	9.6	2	5.6	
Occupation					.170
White collar worker	10	28.6	6	8.2	
Self-employment	8	22.9	18	24.7	
Blue collar worker	6	17.1	20	27.4	
Retired	3	8.6	9	12.3	
Student	1	2.9	5	6.8	
Housewife	7	20	14	19.2	
Unemployed			1	1.4	

Abbreviation: SD, standard deviation.

Table 2
Comparison of clinical outcome scores of the groups (N = 108)

Variable	Supervised Exercise Group	Home Exercise Group	*p* Value
Pain (cm)			
Rest	1.46 ± 2.55	1.31 ± 2.25	.774
Walking	2.74 ± 3.18	2.30 ± 2.55	.451
Stair climbing	2.34 ± 2.92	2.09 ± 2.62	.682
Ankle range of motion (°)			
Dorsiflexion	11.29 ± 8.89	14.40 ± 7.80	.070
Plantar flexion	33.24 ± 9.09	33.24 ± 8.02	.897
Inversion	19.29 ± 10.47	17.52 ± 8.73	.367
Eversion	12.44 ± 9.36	12.12 ± 7.39	.854
Pain Disability Index			
Family/home responsibilities	2.78 ± 3.32	2.28 ± 2.83	.441
Recreation	3.06 ± 3.26	2.40 ± 2.92	.311
Social activity	3.33 ± 3.73	2.15 ± 3.19	.102
Occupation	2.00 ± 2.92	1.72 ± 2.69	.647
Sexual behavior	1.00 ± 2.03	0.81 ± 2.16	.679
Self-care	1.87 ± 2.67	1.05 ± 2.15	.098
Life support activities	1.24 ± 2.73	0.60 ± 1.61	.139
Total	13.93 ± 15.20	11.05 ± 13.87	.341
AOFAS Ankle-Hindfoot Score	76.63 ± 17.46	83.75 ± 15.15	.036*
SF-36			
General health perceptions	66.91 ± 18.91	66.62 ± 20.75	.946
Physical functioning	70.76 ± 25.04	73.40 ± 26.02	.623
Mental health	65.05 ± 19.72	63.72 ± 23.40	.774
Social functioning	71.02 ± 28.20	77.84 ± 24.12	.202
Role physical	53.67 ± 42.69	62.50 ± 43.60	.330
Role emotional	56.86 ± 44.59	62.03 ± 44.15	.576
Pain	62.72 ± 30.70	70.72 ± 24.96	.156
Energy/vitality	55.88 ± 22.77	60.64 ± 36.39	.485
Surgical satisfaction	9.06 ± 1.58	8.36 ± 2.68	.166
Rehabilitation satisfaction	9.40 ± 1.01	8.41 ± 2.60	.047*

Abbreviations: AOFAS, American Orthopaedic Foot and Ankle Society; SD, standard deviation; SF-36, Short-Form 36 Health Survey.
Values given as mean ± SD.
* $p < .05$

supervised exercise group and 182.31 TL (50.79 USD) in the home exercise group.

Discussion

This study was planned to compare the effectiveness of a supervised exercise program and a home exercise program in the reduction of pain and in improving functional status and quality of life and to determine and compare the physical therapy and rehabilitation cost of these programs. According to the results of this study, although the total rehabilitation cost was much higher for the supervised exercise program, the pain, ankle range of motion, pain disability index, quality of life, and surgical satisfaction outcomes of the supervised exercise program were similar to those of the home exercise program. However, the AOFAS Ankle-Hindfoot Scores of the home exercise group were significantly higher and the rehabilitation satisfaction of the supervised exercise group was significantly higher for average 28-month follow-up period.

Positive social connection, collaboration, communication, empathy, and mutual respect between the patient and the therapist are called therapeutic alliances in the literature and are thought to increase the patient's compliance with treatment (11). This may be the reason for the high level of rehabilitation satisfaction of the supervised exercise group.

In recent years, it has been reported that self-management advice programs can be used instead of supervised exercise programs (7,12,13). Nevertheless, in these studies, 36% (7) and 76% (13) of the patients in the advice group received out-of-trial physiotherapy that could potentially affect the outcomes. Therefore, we believe that this conclusion does not reflect the actual results. In the present study, none of patients received out-of-trial physical therapy, and our results clearly reflect the clinical outcomes of the patients.

Although physical function recovery after ankle fracture is initially rapid (approximately 80% function at 6 months), the recovery slows with time and remains incomplete at 24 months after the injury (14). Despite this knowledge, studies have 6-month (7) and 1-year (13) follow-up periods. We found only 1 study with 3-year results with a small sample size (12). The average follow-up period of our study is 28 months, and the ankle range of motion of the affected side was lower than that of the healthy side.

The results of previous research on the effect of age on functional outcomes are contradictory. Nilsson et al (13) and Karam et al (12) concluded that patients <40 years old had a significantly better outcome, but Moseley et al (7) showed that the effect of rehabilitation was not moderated by age. In our study, pain, function, and alignment (AOFAS) scores were higher in patients <40 years old. We believe that increasing age negatively affects outcomes.

In cost-analysis studies of ankle fracture, the main cost determinants were reported as in-hospital care, rehabilitation/nursing care, and physical therapy (15). The authors suggested that to fully assess the cost of ankle fracture to the National Health Service, future research should measure the relevant rehabilitation costs after hospital discharge (16,17). Rehabilitation costs vary widely among countries but are generally considered to be expensive interventions. Many countries are investigating how to reduce the cost of rehabilitation services, whether usual care, advice, self-management, supervised exercise, or other. One-day inpatient rehabilitation cost in Norway was determined to be 126.0 euros. A study conducted in Australia showed that outpatient physiotherapy accounted for the highest costs in both direct healthcare (39%) and out-of-pocket (42%) costs. The total rehabilitation costs of ankle fracture at 24 weeks after cast removal were, on average, 331 Australian dollars (AUD; 239 USD) per person: 159 AUD (115 USD) in direct costs to the public healthcare system and 172 AUD (124 USD) in out-of-pocket costs

Table 3
Comparison of ankle range of motion of the patients (N = 108)

Variable (°)	Supervised Exercise Group (n = 35)			Home Exercise Group (n = 73)		
	Healthy Side	Injured Side	*p* Value	Healthy Side	Injured Side	*p* Value
Dorsiflexion	17.58 ± 7.67	11.29 ± 8.89	.003*	19.38 ± 6.49	14.40 ± 7.80	.000*
Plantarflexion	38.84 ± 7.22	33.24 ± 9.09	.001*	38.22 ± 8.58	33.24 ± 8.02	.000*
Inversion	24.55 ± 8.57	19.29 ± 10.47	.027*	23.50 ± 8.14	17.52 ± 8.73	.001*
Eversion	17.32 ± 7.64	12.44 ± 9.36	.021*	16.07 ± 7.64	12.12 ± 7.39	.002*

Abbreviation: SD, standard deviation.
Values given as mean ± SD.
* $p < .05$

Table 4
Comparison of clinical outcome scores of the patients by age group (N = 108)

Variable	Supervised Exercise Group			Home Exercise Group		
	Age <40 y (n = 20)	Age ≥40 y (n = 15)	*p* Value	Age <40 y (n = 34)	Age ≥40 y (n = 39)	*p* Value
Pain (cm)						
Rest	0.81 ± 1.83	2.32 ± 3.14	.083	1.20 ± 2.12	1.41 ± 2.39	.696
Walking	1.97 ± 2.98	3.77 ± 3.23	.098	2.32 ± 2.33	2.29 ± 2.77	.693
Stair climbing	1.79 ± 1.14	2.95 ± 1.87	.055	1.52 ± 2.37	2.51 ± 2.75	.147
Ankle range of motion (°)						
Dorsiflexion	13.21 ± 8.46	8.86 ± 9.10	.160	13.88 ± 8.04	14.87 ± 7.66	.598
Plantarflexion	36.42 ± 8.41	29.18 ± 8.58	.045*	33.96 ± 8.46	32.66 ± 7.74	.527
Inversion	20.89 ± 11.55	17.26 ± 8.89	.324	18.67 ± 8.91	16.47 ± 8.57	.301
Eversion	13.42 ± 10.67	11.20 ± 7.55	.501	13.96 ± 8.92	10.48 ± 5.30	.048*
Pain Disability Index						
Family/home responsibilities	2.11 ± 2.98	3.64 ± 3.65	.201	1.91 ± 2.63	2.62 ± 3.00	.298
Recreation	2.55 ± 2.87	3.66 ± 3.69	.339	2.57 ± 3.13	2.25 ± 2.76	.652
Social activity	1.61 ± 2.45	2.50 ± 3.48	.403	1.42 ± 2.56	2.00 ± 2.81	.376
Occupation	2.38 ± 3.53	2.46 ± 3.75	.112	1.78 ± 2.91	2.48 ± 3.43	.365
Sexual behavior	0.83 ± 1.33	1.20 ± 2.67	.613	0.24 ± 1.00	1.32 ± 2.73	.036*
Self-care	1.44 ± 2.38	2.40 ± 2.99	.315	0.84 ± 1.60	1.24 ± 2.55	.448
Life support activities	0.55 ± 1.46	2.06 ± 3.63	.116	0.12 ± 0.41	1.02 ± 2.11	.018*
Total	11.50 ± 14.92	16.86 ± 15.51	.320	8.91 ± 11.20	12.96 ± 15.79	.225
AOFAS Ankle-Hindfoot Score	82.57 ± 15.60	70.67 ± 18.37	.049*	87.91 ± 10.54	80.02 ± 17.64	.026*
SF-36						
General health perceptions	67.36 ± 19.02	66.33 ± 19.40	.877	69.41 ± 21.69	64.13 ± 19.82	.287
Physical functioning	79.00 ± 22.79	60.33 ± 24.52	.029*	78.08 ± 21.10	69.21 ± 29.39	.150
Mental health	63.57 ± 19.54	66.93 ± 20.47	.630	65.76 ± 22.02	61.89 ± 24.72	.488
Social functioning	73.15 ± 32.14	68.33 ± 23.08	.628	79.92 ± 23.62	75.98 ± 24.72	.493
Role physical	69.73 ± 39.59	33.33 ± 38.57	.011*	64.70 ± 40.87	60.52 ± 46.36	.688
Role emotional	68.42 ± 42.27	42.22 ± 44.48	.089	68.62 ± 42.59	56.14 ± 45.25	.234
Pain	69.86 ± 30.31	53.66 ± 29.72	.128	72.13 ± 24.68	69.47 ± 25.48	.655
Energy/vitality	61.31 ± 20.46	49.00 ± 24.36	.119	59.45 ± 25.39	61.71 ± 44.31	.795
Surgical satisfaction	9.20 ± 1.57	8.88 ± 1.63	.575	8.30 ± 3.21	8.41 ± 2.18	.870
Rehabilitation satisfaction	9.40 ± 0.86	9.41 ± 1.20	.998	8.33 ± 2.81	8.52 ± 2.42	.841

Abbreviations: AOFAS, American Orthopaedic Foot and Ankle Society; SD, standard deviation; SF-36, Short-Form 36 Health Survey.
Values given as mean ± SD.
* $p < .05$

(18). In another study, the exact cost could not be determined because one-third of the patients in the advice group received out-of-trial physical therapy (7). In our study, we found that the rehabilitation cost was 1113.63 TL (310.25 USD) in the supervised exercise group and 182.31 TL (50.73 USD) in the home exercise group, without any difference in functional results. In our country, rehabilitation interventions are often applied as a supervised exercise program, thus increasing healthcare costs.

Table 5
Comparison of treatment crude cost analysis of the patients

	Supervised exercise group	Home exercise group
Outpatient control cost, TL (cost per session × number of controls)	75 (15.00 × 5)	75 (15.00 × 5)
Treatment cost, TL (cost per session × total number of sessions)		
Cold pack cost	57.60 (2.40 × 24)	-
Massage (classic-regional) cost	43.20 (3.60 × 12)	-
Mobilization cost	178.80 (14.90 × 12)	-
Range of motion exercises cost	100.80 (4.20 × 24)	-
Stretching exercises cost	115.20 (4.80 × 24)	-
Proprioceptive neuromuscular facilitation cost	86.40 (3.60 × 24)	-
Progressive resistive exercises cost	43.20 (3.60 × 12)	-
Balance and coordination training cost	178.80 (14.90 × 12)	-
Walking exercises cost	160.92 (13.41 × 12)	-
Patient education cost	16.80 (8.40 × 2)	50.40 (8.40 × 6)
Postoperative assessment cost (TL)		
Range of motion measurement cost	8.90	8.90
Gait analysis cost	14.90	14.90
Balance / coordination test cost	13.41	13.41
Daily life activities test cost	14.90	14.90
Muscle test cost	4.80	4.80
Total cost (TL)	1113.63	182.31
Total cost (USD)	310.25	50.79

Abbreviations: TL, Turkish lira; USD, American dollar.

The main limitations of this study are that it was a nonrandomized trial and that the number of patients in the groups differed, because the patients made the decision regarding the program in which they wanted to participate. This could have led to bias. However, there is no difference between the descriptive data of the groups, and the homogeneous distribution of both groups reduces the bias risk. The other limitation of our study is that only tangible item costs are calculated in the cost analysis. The strengths of our study are that a standard program has been performed and that none of the patients receive out-of-trial of physical therapy or exercise programs, the follow-up period was relatively long (average 2 years), and a cost analysis was performed. Further randomized studies could be done by increasing the sample size and comparing different rehabilitation interventions with cost analyses. In future studies, instead of crude cost analysis, disability-adjusted life-years, healthy year equivalents, or quality-adjusted life-years can be calculated. In addition, the effects of age on clinical and functional outcomes can be investigated.

In conclusion, this study showed that for patients with a surgically treated isolated ankle fracture, patients participating in a home exercise program had similar clinical outcomes as patients participating in a supervised exercise program. Considering that the cost of rehabilitation is very low, we recommend that these patients be followed with a home exercise program after surgery.

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