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Research Article

The effect of a preoperative physical therapy education program on short-term outcomes of patients undergoing elective total hip arthroplasty: A controlled prospective clinical trial

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ABSTRACT

Objective: The aim of this study was to determine the effect of a preoperative physical therapy education program on the short-term outcomes of patients undergoing elective Total Hip Arthroplasty (THA).

Methods: A prospective, parallel-group controlled clinical trial was conducted from September 2016 to July 2018. Fifty patients who were scheduled for a first elective THA procedure were recruited and were equally allocated into one of two groups: intervention and control groups. While all patients received the routine preparation for the procedure, the intervention group underwent an additional structured physical therapy education session. Functional status was evaluated using The Oxford Hip Score (OHS) preoperatively and 6 weeks after the operation. Length of Hospital Stay (LOS) was recorded. State anxiety was measured by the state-anxiety portion of the Spielberger's State-Trait Anxiety Inventory questionnaire preoperatively and on the second postoperative day. Gait and balance abilities were assessed using Tinetti Performance-Oriented Mobility Assessment (POMA) test on the second postoperative day. Pain at rest and during weight-bearing was measured by a Numerical Rating Scale (NRS) on the postoperative second day. Satisfaction rates were evaluated by the NRS 6 weeks after the operation.

Results: Forty-seven patients completed the study. The intervention group consisted of 24 patients (10 males, 14 females; mean age = 64.29 ± 6.7 years), and the control group consisted of 23 patients (7 males, 16 females; mean age = 65.91 ± 10.19 years). The mean postoperative OHS was significantly higher in the intervention group than in the control group (39.04 ± 3.99 vs 28.04 ± 7.23, $P < 0.001$). Both groups increased their functional abilities 6 weeks postoperatively; however, the intervention group showed a greater increase than the control group ($P = 0.001$). No significant difference was found in the LOS between the control (2.83 ± 0.71) and intervention groups (2.71 ± 0.62) ($P = 0.551$). Patients in the intervention group exhibited lower rates of anxiety two days after the operation compared with the controls (17.75 ± 6.50 vs 27.70 ± 10.32, $P < 0.001$). The intervention group showed higher postoperative POMA scores compared to the control group (19.67 ± 3.89 vs 15.39 ± 5.85, $P = 0.005$). Although no significant difference was observed in resting pain between groups ($P = 0.105$), the intervention group reported a lower pain intensity while walking compared to the control group (5.04 ± 1.68 vs 6.39 ± 2.62, $P = 0.041$). While both groups reported high satisfaction rates 6 weeks postoperatively, patients in the intervention group were more satisfied than those in the control group (9.67 ± 0.91 vs 8.35 ± 1.82, $P = 0.003$).

Conclusion: A structured interactive preoperative physical therapy education program for patients undergoing a THA may reduce anxiety, generate a faster recovery, reduce pain, and promote higher satisfaction. We recommend this program for routine use.

Level of Evidence: Level II, Therapeutic Study

Introduction

Preoperative education programs were established due to the belief that preoperative preparation may potentially reduce stress and anxiety, thus generating a faster recovery and lower length of hospital stay (LOS). A preoperative education program, targeted specifically toward healing, and a rehabilitation process presented by a physical therapist, may improve postoperative outcomes and patient satisfaction.[1-3]

The preoperative prevalence of anxiety and depressive symptoms in patients undergoing a primary total hip arthroplasty (THA) or total knee arthroplasty has been reported as 33.6% in hip and 22.7% in knee patients. Postoperatively ~50% of patients develop depressive symptoms at some point in time with an increase in the patient's LOS for at least one day. Anxious and depressed patients are less likely to actively participate in the rehabilitation process, thus experiencing worse outcomes.[4-6] Acute postsurgical pain and postsurgical anxiety have been shown to be significantly correlated, thereby suggesting that they share common psychological predictors that could be targeted in preoperative intervention planning.[7]

Several studies have suggested that patients' education should focus only on anatomy and biomechanics, which is limited in effect on postoperative outcomes. However, educational sessions that endeavor to enhance patient knowledge as to medical procedures before, during, and postoperation may help patients

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experience less fear and anxiety,[2] decrease LOS,[3,8] encourage home discharge,[3] reduce state anxiety,[3] improve functional recovery, and decrease pain.[9] A previous study assessed the role of patient education prior to performing a total joint arthroplasty.[3] Other studies have evaluated the advantages of multidisciplinary education programs[2,8]; however, to the best of our knowledge, no study has yet reported on the specific contribution of a preoperative education program, presented by a physical therapist, to specifically improve the healing process, postoperative outcomes, and patient satisfaction.

The aim of this study was to evaluate the effect of a physical therapy preoperative education program on short-term postoperative outcomes.

Materials and Methods

A parallel-group controlled prospective clinical trial was conducted between 9/2016 and 7/2018. The study comprised patients who were scheduled for a first elective THA procedure at the Barzilai Medical Center, Ashkelon, Israel. Fifty patients were recruited, with 25 in each research group.

Sample size estimation

The Oxford Hip Score (OHS) was used for sample size estimation (differences in population means is 5.5 and standard deviation means is 8.0).[8] Nineteen pairs of subjects rejected the null hypothesis (power of 0.8 and type I error probability of 0.05). Since we analyzed the additional outcome measures, our aim was to recruit 25 subjects for each (intervention and control) group, with 50 subjects in total.

Ethical considerations

Participation in the study was voluntary. The study was approved by the Ethical (Helsinki) Committee of the Barzilai Medical Center, Ashkelon, Israel. All patients signed an informed consent form prior to participation.

Procedures

Two to four weeks presurgery, the patients were requested to arrive at the hospital and meet the operating room staff (anesthesiologist, orthopedic surgeon, and nurse). The meetings were scheduled every week on the same day (Tuesdays). A physical therapist arrived every other week to provide preoperative education relating to the functional outcomes and physical rehabilitation after the total joint replacement. During the preoperative visit, two study groups of those undergoing a THA were generated. One group met the operating room staff and, also, received information relating to a preoperative physical therapy education program; the second group met the operating room staff without receiving information relating to the physical therapy education program. The leader of the session was a senior orthopedic physical therapist with 8 years of specific experience in THA rehabilitation. The session was based on prior studies relating to the patients' expectations, educational needs,[2,3,8,10–14] and body mass index (BMI) (Table 1).

Table 1. Preoperative education session topics

1. Simple anatomy and movement of the hip.
2. Osteoarthritis and its effect on the musculoskeletal system.
3. What is a total hip arthroplasty?
4. Possible complications and revisions.
5. The importance of early mobilization.
6. What items are to be brought to the hospital?
7. Information regarding the hospital stay and the staff.
8. Functional limitations and self-care after the operation.
9. Walking aids and rehabilitation equipment.
10. Preparing the home environment, optimizing the home, and modifications to home facilities, if needed.
11. Postoperative pain and pain management after surgery.
12. What to expect relating to function, walking pattern, independence, returning to work, and physical activity.
13. The rehabilitation process.
14. Length of recovery and estimated time for various life activities (independent walking, swimming, driving, etc.).

HIGHLIGHTS

- Proper education before a total hip arthroplasty can affect patient anxiety, help prepare for discharge, and improve functional recovery.
- Similar programs for other surgical procedures may be effective in improving patient satisfaction and postoperative outcomes.
- A physical therapy preoperative education program is a valuable, low-cost, easy to implement, and useful adjuvant for patients undergoing total hip arthroplasty. We recommend this program for routine use.

The educational session led by a physical therapist ran for ~20 to 30 minutes including an oral and PowerPoint presentation and the answering of any patient's questions. In addition, the patients received an information booklet relating to the hip operation to be performed.

The topics that were chosen were based on data from prior studies as to the patients' expectations and educational needs.

Throughout the study, the examiners were blinded to patient allocation status and the patients to their group allocation (double-blinded). Demographic data were obtained from the patient's medical chart and a self-reported questionnaire. Baseline questionnaires were distributed in the preoperative clinic. Outcome measures were evaluated by physical examinations, together with the completed questionnaires by a different physical therapist, blinded to the preoperative education status.

Primary outcome measures

1. OHS: A short, twelve-item questionnaire with a scale ranging from 0 to 48 (a higher score meaning better function).[15] The purpose of this questionnaire was to assess the patients' subjective functional status and postoperative outcome. The OHS was evaluated preoperatively and 6 weeks postoperation.
2. LOS is measured in days and obtained from the patients' medical charts.

Secondary outcome measures

1. State anxiety was measured by the state-anxiety portion of the Spielberger's State-Trait Anxiety Inventory (STAI) questionnaire, due to the temporary nature of our intervention that may affect state anxiety, but was unlikely to affect personality traits (trait anxiety). The items assessing state anxiety encompass a range of emotional states. The responders were asked to rank different aspects of their state anxiety on a scale of 1 (not at all) to 4 (very much). The scale ranged from 20 to 80, with a high score indicating higher anxiety.[16] State anxiety was evaluated preoperatively and on the second postoperative day (POD2).
2. Tinetti Performance-Oriented Mobility Assessment (POMA) is a task-oriented test consisting of two parts: gait and balance. The POMA measures an older adults' gait and balance abilities using an ordinal scale of 0 (most impairment) to 2 (independence).[17] The scale ranges from 0 to 28. A score < 19 denotes a high fall risk, between 19 and 24 a medium fall

risk, and > 25 indicates a low risk of falling. The POMA test was evaluated on POD2.

3. Pain at rest and during weight-bearing was measured by a Numerical Rating Scale (NRS) on POD2 at rest in a sitting position and during weight-bearing.
4. Walking distance was measured in meters on POD2. The floor tiles in the department were marked to measure the walking distance for assessment of gait endurance.
5. Satisfaction rates were evaluated by the NRS ranging from 0 to 10, 6 weeks postoperation.
6. Discharge destination after being discharged from the hospital was obtained from the patients' medical chart.

Statistical analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) (Version 23 for Windows) (IBM SPSS Corp., Armonk, NY, USA). Significance levels were set at $P < 0.05$. Descriptive statistics characterized the study sample. The normal distribution of parameters: age, gender, BMI, NRS pain score, OHS questionnaire, state anxiety questionnaire, balance and gait score (POMA), walking distance, and satisfaction rate, were evaluated by the Shapiro–Wilk statistics to test the normality of data. The outcome variables were compared using a one-way analysis of variance (ANOVA) for parametric variables, Chi-square test for the nonparametric variables, mixed ANOVA approach for the main effect of time, and the group-by-time interaction (with age, sex, BMI, cause of the operation and operation approach, as covariances).

Result

Fifty patients were recruited preoperatively: 19 males, 31 females, age range 45–88 years (mean 65.3 ± 8.7). Forty-seven patients completed the study, 3 dropped out (1 patient from the intervention group decided after the intervention not to undergo the operation due to severe cardiac disease and 2 from the control group dropped out due to operative complications that prevented follow-up examinations) (ie, intestinal obstruction and interoperational fracture).

Demographic and baseline characteristics of the groups

No statistical differences were found in baseline characteristics between groups (Table 2.).

Outcome measures postoperative data

The postoperative data are presented in Table 3.

POMA: The intervention group scored higher on the POMA on POD2 compared to the control group (19.67 ± 3.89 vs 15.39 ± 5.85, $P = 0.005$).

Pain: No significant difference was observed in resting pain on POD2 between groups ($P = 0.105$). However, the intervention group reported a lower pain intensity while walking on POD2 compared to the controls (5.04 ± 1.68 vs 6.39 ± 2.62, $P = 0.041$).

Walking distance: No significant difference was observed in walking distance between groups on POD2 ($P = 0.118$).

LOS: No significant difference was observed in the LOS between the controls (2.83 ± 0.71 and the intervention group (2.71 ± 0.62) ($P = 0.551$).

Discharge destination: There were more home discharges in the intervention group than in the control group (95.8% vs 52.2%, $P = 0.001$). All other patients were discharged to inpatient rehabilitation centers for their initial recovery.

Table 2. Demographic and Baseline Characteristics of the Groups

Variables	Control ($n = 23$) (mean ± SD)	Intervention ($n = 24$) (mean ± SD)	Comparison[a] (F, P)
Age (years)	65.91 ± 10.19	64.29 ± 6.7	$F = 0.42$, $P = 0.521$
Weight (kg)	81.26 ± 19.17	83.42 ± 16.84	$F = 0.17$, $P = 0.684$
Height (cm)	164.13 ± 9.03	168.54 ± 11.56	$F = 2.11$, $P = 0.153$
BMI (kg/m²)	29.97 ± 5.74	29.39 ± 5.64	$F = 0.12$, $P = 0.729$
OHS	17.09 ± 6.79	20.79 ± 5.99	$F = 3.95$, $P = 0.053$
STAI	27.74 ± 8.36	27.75 ± 10.43	$F = 0.00$, $P = 0.997$
	%	%	Comparison* (χ^2, P)
Sex	Male 30.43 Female 69.57	Male 41.67 Female 58.33	$\chi^2 = 0.64$, $P = 0.423$
Smoking	Yes 21.74 No 78.26	Yes 25 No 75	$\chi^2 = 0.07$, $P = 0.792$
Preoperative function	With aid 34.78 Without aid 65.22	With aid 12.5 Without aid 87.5	$\chi^2 = 3.25$, $P = 0.071$
Physical activity	No 73.91 Yes 26.09	No 87.5 Yes 12.5	$\chi^2 = 1.4$, $P = 0.237$
Cause of operation	OA 86.96 DDH + AVN 13.04	OA 95.83 DDH + AVN 4.17	$\chi^2 = 2.19$, $P = 0.335$
Operation approach	Lateral 82.61 Anterior 17.39	Lateral 62.5 Anterior 37.5	$\chi^2 = 2.37$, $P = 0.123$

[a]One-way ANOVA for continuous and chi-square test for categorical variables.
BMI, Body Mass Index; OHS, Oxford Hip Score; STAI, State-Trait Anxiety Inventory; OA, Osteoarthritis; DDH, Developmental Dysplasia of the Hip; AVN, Avascular Necrosis. No statistical differences were found in baseline characteristics between groups. Statistical significance was set for $P < 0.05$.

Table 3. Outcome Measures Postoperative Data

Outcome Measure	Control ($n = 23$) (mean ± SD)	Intervention ($n = 24$) (mean ± SD)	Comparison[a] (F, P)
STAI	27.70 ± 10.32	17.75 ± 6.50	$F = 15.749$, $P < 0.001$
POMA	15.39 ± 5.85	19.67 ± 3.89	$F = 8.760$, $P = 0.005$
Pain at rest (NRS)	3.35 ± 2.870	2.17 ± 1.82	$F = 2.740$, $P = 0.105$
Pain at walking (NRS)	6.39 ± 2.62	5.04 ± 1.68	$F = 4.448$, $P = 0.041$
Walking distance (meters)	16.26 ± 14.79	23.33 ± 15.60	$F = 2.538$, $P = 0.118$
Length of stay (days)	2.83 ± 0.71	2.71 ± 0.62	$F = 0.362$, $P = 0.551$
OHS	28.04 ± 7.23	39.04 ± 3.99	$F = 42.116$, $P < 0.001$
Satisfaction (NRS)	8.35 ± 1.82	9.67 ± 0.91	$F = 9.932$, $P = 0.003$
	%	%	Comparison* (χ^2, P)
Discharge destination	Home 52.2% RC 47.8%	Home 95.8% RC 4.2%	$\chi^2 = 11.775$, $P = 0.001$
Time × group			Comparison[a] (F, P)
STAI 1	27.74 ± 8.36	27.75 ± 10.43	$F = 8.05$, $P = 0.007$
STAI 2	27.70 ± 10.32	17.75 ± 6.50	
OHS 1	17.09 ± 6.78	20.79 ± 5.98	$F = 13.41$, $P = 0.001$
OHS 2	28.04 ± 7.23	39.04 ± 3.99	

[a]One-way ANOVA for continuous and chi-square test for categorical variables, and mixed ANOVA for the time by group comparison.
STAI, State-Trait Anxiety Inventory; POMA, Performance-Oriented Mobility Assessment; NRS, Numerical Rating Scale (0–10); OHS, Oxford Hip Score; RC, Rehabilitation Center. Statistical significance was set for $P < 0.05$.

STAI: Patients in the intervention group exhibited lower rates of anxiety two days postoperation compared with the control group (17.75 ± 6.50 vs 27.70 ± 10.32, $P < 0.001$). Furthermore, a significant interaction through time by group was observed. The intervention group showed a reduction in state anxiety postoperation, whereas the controls exhibited a similar anxiety rate before and after the THA procedure ($P = 0.007$).

OHS: Patients in the intervention group scored higher on a functional questionnaire, 6 weeks post-operation, compared with the control group (39.04 ± 3.99 vs 28.04 ± 7.23, $P < 0.001$). Furthermore, a significant interaction through time by the group was observed. Both groups increased their functional abilities 6 weeks postoperatively; however, the intervention group showed a greater increase than the control group ($P = 0.001$).

Satisfaction: Both groups reported high satisfaction rates, 6 weeks post-operatively; however, patients in the intervention group were more satisfied than those in the control group (9.67 ± 0.91 vs 8.35 ± 1.82, $P = 0.003$).

Discussion

This study demonstrates that a structured preoperative physical therapy education program generates a significant effect on postoperative anxiety, function, walking pain, patient satisfaction, and home discharge destination. Most (83%) of the patients involved in this study were satisfied with the THA experience; however, the intervention group displayed higher satisfaction rates, better physical function, lower anxiety, and walking pain. These findings are consistent with the data from previous studies reporting that preoperative education and managing patient's expectations are highly correlated with better satisfaction rates, lower state anxiety, better physical function, and a decrease in postsurgical pain.[9,12,18,19]

Interestingly, the 2014 Cochrane review on this topic concluded that preoperative education yielded a small benefit above the standard patient care for hip or knee arthroplasty. Some studies have used written, audiovisual, or a combination of these methods to educate the patient. Better outcomes are expected when information and education as to a patient's upcoming orthopedic surgery are provided in a live classroom setting, with in-person educators promptly answering any questions.[20] We created a structured preoperative education session based on recommendations from previous studies.[2,3,10–14]

Postoperative management immediately after hip or knee arthroplasty, in acute hospitals, includes physical therapy, which in most countries is accepted as the standard treatment. The main focus of physiotherapy treatment is mobilization on the first or second postoperative day, as well as a minimization of complications (eg, wound infection, deep vein thrombosis, or pulmonary embolism). Data from the Global Orthopaedic Registry in 2010 specified that after a THA, performed in the United States, 53% of patients were discharged to an inpatient rehabilitation center, 81% in Japan, and only 3%–6% in the United Kingdom.[21] Other patients were discharged home to recover and receive rehabilitation services at home or in an outpatient clinic. No significant differences were observed in functional and pain scores in the various posthospital therapy settings; therefore, intensive therapy and round-the-clock medical care did not automatically lead to a difference in pain or functional improvements.[22] Furthermore, discharge to continued inpatient care following a THA was found associated with increased odds of postdischarge respiratory, urinary, and septic complications; morbidity; venous thromboembolism; and unplanned readmissions, compared to home-discharged patients, after adjustment for predischarge chara-cteristics.[23,24] We found that more home discharges occurred in the intervention group than in the control group (95.8% vs 52.2%); all other patients were discharged to inpatient rehabilitation centers for their initial recovery. These outcomes may result in reduced postoperative anxiety following the education session but may also be due to a higher score on the OHS at baseline (higher self-reported functional score). Although the difference between groups at baseline was not significant, it still may affect the readiness for home discharge.

LOS is also an important measure after elective orthopedic surgery resulting from its effect on hospitalization costs. In this study, preoperative education did not significantly affect LOS; the intervention and controls demonstrated a mean stay of 2.71–2.83 days, respectively, which is in contrast to other studies reporting a significant effect of preoperative education sessions on LOS. This finding may be atypical due to the short hospital stay that is customary in our medical center; 3.1–10.5 days in previous studies vs 1–4 days postoperation in our study, regardless of the educational status.[3,8]

Postoperative anxiety and functional status are very significant short-term outcome measures. In our study, patients in the intervention group exhibited lower rates of anxiety at POD2 compared with those in the control group. The intervention group showed a significant reduction in state anxiety postoperation, whereas the controls exhibited a similar anxiety rate before and after the THA. Hip fractured patients suffering from preoperative anxiety and depressive symptoms exhibited lower change scores on the functional questionnaire, pain, activities of daily living, and quality of life. Furthermore, patients who were anxious before the operation presented with lower satisfaction rates and less pain reduction a year postsurgery and poorer improvements in mobility compared to patients without anxiety symptoms.[4,25] Studies have shown that preoperative education reduces state anxiety and pain, improves mobility, and functions experienced shortly after the surgery and even 6 months postoperatively.[2,9,12,19] Moreover, preoperative uncertainty raises preoperative anxiety, which negatively affects postoperative recovery, thereby reducing the uncertainty which may positively affect recovery postsurgery.[1]

We observed a reduction in walking pain and better functional recovery in the physical therapy education group. These data are consistent with other studies reporting that short-term preoperative physical therapy and education achieved an early functional recovery, 3 days postoperatively and at discharge. Furthermore, receiving preoperative pain management information, ie, optimal use of prescriptions and nonmedical approaches to managing joint pain, was found to be associated with less pain 2 weeks postoperatively, a greater use of nonnarcotic pain care strategies, and improved functional scores 6 months postoperatively.[9] We determined that without proper preoperative education, patients' anxiety rates do not decline postoperatively, although the intervention group demonstrated a significant decrease in state anxiety already on the second postoperative day. Depression and anxiety negatively affect mental and physical recovery after joint arthroplasty, positively correlates with acute pain measures, and are associated with the patients' subjective unreadiness to be discharged, and a higher LOS.[1,6,7]

The primary limitation of this study is its un-randomized structure. Although there were no significant differences between groups, there

is still some risk of selection bias which cannot be ruled out. Additionally, the heterogeneity of the posthospitalization treatment in outpatient and inpatient rehabilitation settings may affect functional outcomes and patient satisfaction. The low number of dropouts at follow-up is the strength of this study. It is important to note that this study included only patients who were elected to undergo THA surgery. Further research is needed to test the effect of preoperative physical therapy education on other surgical interventions.

The results of this study suggest that a physical therapy structured and interactive education session, based on the recommendations presented in this study, significantly reduces short-term postoperative anxiety and walking pain, improves mobility and function, encourages home discharge, and elevates patients' satisfaction rate post-THA. Patient satisfaction is believed to be a derivative of patient expectations; thus, the coordination of these expectations might lead to better postoperative outcomes. We demonstrated that precise physical therapy education, before an elective procedure, can affect patient anxiety, help prepare for discharge, and improve functional recovery. Similar educational programs for other surgical procedures may be effective in improving patients' satisfaction and postoperative outcomes. The preoperative physical therapy education program is an effective, low-cost, easy to implement, and useful adjuvant for patients undergoing a THA. We definitely recommend it for routine use.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of the Barzilai Medical Center, Ashkelon, Israel (No. of approval 0032-16-BRZ).

Informed Consent: All patients signed an informed consent form prior to participation.

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