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Some aspects concerning the patients′ rehabilitation after total hip artroplasty

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Abstract

Purpose: The objective of the article is to reports on the quality of rehabilitation after total hip arthroplasty by measuring the parameters of joint mobility of the hip in abduction. extension and flexion, at 2, 4 and 6 weeks in which recovery exercises proposed by the physiotherapist were performed.
Material and method: Joint mobility was measured by active (AROM) and passive (PROM) range of motion during abduction, extension and flexion of hip joint using a digital dynamometer called "Active Force 2". For the assessment of patients health status from a functional point of view, the WOMAC index (Western Ontario and McMaster Universities Osteoarthritis Index) was used.
Results: The experimental data acquired in the measurement of hip AROM and hip PROM during abduction, extension and flexion at 2, 4 and 6 weeks of exercises performed after total hip arthroplasty are presented.
Conclusions: The reported values can be used as indicators showing a better functional recovery of patients after total hip arthroplasty.

***Key words**: AROM, PROM, Hip mobility, abduction, extension, flexion*

Rezumat

Scop : Articolul are ca obiectiv aprecierea calităţii reabilitarii după artroplastia totală de şold prin măsuratori ale parametrilor mobilităţii articulare a şoldului în abducţie. extensie şi flexie, la 2,4 şi 6 săptămâni în care s-au efectuat exerciţiile de recuperare propuse de către fizioterapeut.
Material şi metodă: mobilitatea articulară a şoldului a fost măsurată prin amplitudinea de mişcare articulară activă (AROM) şi pasivă (PROM) în timpul abducţiei. extensiei şi flexiei şoldului cu ajutorul unui dinamometru digital denumit "Active Force 2". Pentru evaluarea pacienţilor din punct de vedere funcţional a fost utilizat indicele WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index).
Rezultate: Sunt prezentate datele experimentale achiziţionate prin măsurarea amplitudinii de mişcare a şodului active şi pasive, în timpul abducţiei, extensiei şi flexării la 2, 4 şi 6 săptămâni de exerciţii efectuate dupa artroplastia totală de şold.
Concluzii: Valorile raportate pot fi utilizate drept indicatori care arată o recuperare funcţională mai bună a pacienţilor după artroplastia totală de şold.

***Cuvinte cheie**: amplitudine de mişcare activă (AROM), amplitudine de mişcare pasivă (PROM), mobilitatea şoldului în abducţie. extensie. flexie*

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Introduction

People who complain of hip pain that restricts daily activities, such as walking or does not allow them to bend down to put on shoes or put on socks. have negatively affected their quality of life.

The occurrence of pain is most often due to various disorders of the hip joint. If after the prescribed medication and/or the use of some means of support such as: cane, crutches, frame, does not help to relieve the symptoms of pain, then hip arthroplasty is the only solution to get rid of pain and return to the comfort of a normal life. Recovering from a hip replacement takes time, and there are many rules to follow to keep people safe and healing.

The recovery process is firstly addressed to recover the articular mobility (deflection) and muscle strength of the stabilizing muscles of the hip.

Recovery start immediately after the surgical operation. are continued during the hospitalization. at home and may be needed up to a year after discharge from the hospital.

With the mention that there are not many systematic analysis that show the effectiveness of recovery exercises of recovery after hip arthroplasty, Lowe et al., (2009) initiated a review of studies focused on investigating the effectiveness of therapeutic exercise after primary unilateral total hip arthroplasty, in terms of improving functionality and hip joint range of motion as well as hip muscle strength.

Krastanova et al., (2017) implemented a postoperative recovery program after total hip replacement that included isometric exercises; focused isotonic included isometric exercises; focused isotonic exercises to maintain and increase the range of motion of the hip joint and knee joint and improve the strength of the gluteal muscles. Colibazzi et al (2020) emphasize the fact that it is necessary to systematize the scientific evidence of the appropriate methods for the functional rehabilitation of patients undergoing total hip artroplasty (THA). Thus, the potential of resistance exercise is not fully established and further studies are needed to elucidate the influence of resistance exercise on functional recovery of THA.

A study by Umpierres et al., (2014) who documented that three sets of 12 repetitions improved muscle strength of the hip abductors, adductors and rotators, as well as the knee flexors and extensors. Protocols of 2 to 3 sets of 8 to 12 repetitions are thought to be more effective for both healthy individuals and total hip arthroplasty patients.

Materials and Methods

To determine the most efficient methods for delivering the physical therapy intervention, both in terms of structure and content, physical activity has a therapeutic function in hip arthroplasty recovery.

The research involved an experimental design that evaluates the effect of the independent variable (the time of testing - T1, T2, T3) on the articular mobility and muscle strength of the stabilizing muscles of the hip (dependent variables).

Group allocation was based on patient choice of location of postoperative therapy. Patients who chose a recovery center were assigned to the experimental group (application of the experimental protocol). Patients who chose home recovery were included in the control group and the therapeutic protocol was similar to that applied in the gym but was not monitored as strictly.

Patients in the control group received the recovery program in PDF format and the total number of session was not limited.

The experimental group performed 23-25 physical therapy sessions in total during 12 weeks.

Inclusion criteria: total hip replacement surgery, 35 to 50 years of age, and voluntary study participation

Exclusion criteria: major postoperative problems. such as hemarthrosis, a broken or infected hip joint. or a mental health diagnosis.

In the second week following surgery. the postoperative exercise regimen starts.

Manual muscle testing (MMT) has been used several times to evaluate muscle strength (Avers & Brown, 2018).

However, MMT for strength assessment has been criticized for its subjectivity in quantifying muscle force analysis (Bohannon, 2005; Cuthbert & Goodheart Jr, 2007).

Hand-held dynamometers (HHD) are an alternative to MMT for objectively tracking patients' strength improvement over time. They are capable of reliably measuring muscle force and muscle

deflection analysis (Kolber, & Cleland, 2005; Sørensen et al., 2020).

The ActivForce 2 digital dynamometer is a new HHD, which has been used in this paper as a monitoring muscle deflection testing instrument.

Peak force, average force, range of force, range of motion, both AROM and PROM, and comparison of right and left symmetry for strength and range of motion measurements are all measured by ActivForce 2. (Karagiannopoulos et al., 2022).

The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) used a set of standardized questionnaires to evaluate the condition of patients with osteoarthritis of the knee and hip including physical function, pain, and stiffness of the joints. The test questions are scored on a scale of 0-4. which correspond to: none (0), mild (1), moderate (2), severe (3), and extreme (4) (Bellamy, 1988; Filip et al., 2012).

All participants provided written informed consent, had their rights respected, and had their eligibility checked.

The patients were tested with the HHD while standing upright after 2, 4 and 6 weeks after THA recovery exercises. To stabilize that side, the hip and leg exactly opposite the one being tested were placed up against a wall. The dynamometer was positioned on the lateral epicondyle of the patient's leg, which was abducted 10°. The examiner was braced to help them resist the patient's forceful abduction while maintaining control of the dynamometer.

Results

Experimental data acquisition of deflection in abduction, extension and flexion during a period of 2, 4 and 6 weeks after THA recovery exercises can be synthesized in the table below (Table I).

Table I. Descriptive statistics for hip mobility in abduction, during a period of 2, 4 and 6 weeks after THA recovery exercises

No.		***Abduction***			
	Period (weeks)	***AROM***	***PROM***	***Angle difference***	***Percentage difference %***
1	2	11.7°	13.97°	2. 27°	17.73
2	4	27.83°	32.66°	4.83°	15.97
3	6	25.47°	31.97°	6.50°	22.93
Average		21.65°	26.2°	4.53°	18.78
6-4growth		0.92	0.97	1.35	1.42
8-4 growth		2.18	2.28	2.86	1.27
Average		1.55	1.63	2.11	1.35

Table II. Descriptive statistics for deflection in extension, during a period of 2, 4. 6 weeks after THA recovery exercises

No.		***Extension***			
	Period (weeks)	***AROM***	***PROM***	***Angle difference***	***Percentage difference %***
1	2	11.47°	15.73°	1. 26°	8.34
2	4	11.26°	17.99°	6.73°	46.02
3	6	16.90°	25.05°	8.15°	38.86
Average		14.21°	19.59°	5.39°	31.07
6-4 growth		1.5	1.39	1.21	0.84
6-2 growth		1.16	1.59	6.47	4.66
Average		1.33	1.49	2.11	3.84

Table III. Descriptive statistics for deflection in flexion during a period of 2. 4. 6 weeks after THA recovery exercises

No.		*Flexion*			
	Period (weeks)	*AROM*	*PROM*	*Angle difference*	*Percentage difference %*
1	2	11.03°	18.46°	7. 43°	50.39
2	4	49.58°	72.79°	23.21°	37.93
3	6	84.14°	96.27°	12.13°	13.45
Average		48.25°	45.84°	14.26°	33.92
6-4 growth		1.70	1.32	0.52	0.35
6-2 growth		7.63	5.22	1.63	0.27
Average		4.66	3.27	1.68	0.31

In order to verify the results of the experimental data acquisition of deflection in abduction, extension and flexion during a period of 2, 4 and 6 weeks after THA recovery exercises, a WOMAC test has been used.

The results of WOMAC tests are shown in the table below (table IV).

Table IV. Descriptive statistics for WOMAC tests

WOMAC	**Before surgery (THA)**		**After 6 weeks of recovery exercises**		**Mean Percentage difference %**
	Mean	**SD**	**Mean**	**SD**	
Pain	3.02	0.603	1.19	0.507	39.40
Physical difficulties	3.17	0.580	1.01	0.709	3.86
Stiffness joint	3.25	0.886	0.60	0.608	18.46

Discussions

Analyzing the tables I - IV, we can state:

1. Deflection increments of 2.18 over the first week are seen in AROM abduction after 6 weeks.
2. Deflection improvements of 2.28 above the first week are seen in PROM abduction after 6 weeks.
3. Deflection increases of 1.16 over the first week are seen in AROM extension after 6 weeks.
4. Deflection increases of 1.59 above the first week are seen in PROM extension after 6 weeks.
5. Deflection increases of 7.63 over the first week are seen in AROM flexion after 6 weeks.
6. Deflection increases of 5.22 over the first week are seen in PROM flexion after 6 weeks.
7. The mean percentage difference after 6 weeks of recovery exercises of the patient are: 39.40 % for pain. 31.86 % for physical difficulties and 18.46 % of stiffness joint.

The reported results in the study are congruent with the ones reported in very recent studies (Arias-de la Torre et al., 2018; Chaudhry et al., 2022; Huang et al., 2020 ; Karagiannopoulos et al., 2022; Madara et al., 2019 ; Salas-Gómez et al., 2022; Tanghe et al., 2022),

The results obtained should be viewed with caution due to some limitations. A theoretical limitation of the research was the lack of research carried out in Romania on this topic to be able to compare the operationalization of the concepts and the results.

Methodologically, a limitation may come from the experimental use of the Digital Force 2 device, with which the patients were not familiar. Other limitations may stem from the fact that the intervention therapist was also the researcher who recorded/collected data and from the small enough sample size to allow a reliable and direct assessment of the effects of the recovery programs. With all these limitations, I allow the statement that the objectives of this preliminary study were achieved (for details Mihajlov, 2021, 2022).

The measured deflection can be utilized as a measurement for the effectiveness of rehabilitation following THA. Increased deflection values translate into improved mobility, decreased pain, and faster walking.

Conclusions

Our research highlights how crucial a physiotherapist's actions are to a patient's favorable outcome following THA surgery. Patients who underwent THA showed functional improvement as a result of the designed physiotherapy treatment regimen that was applied in preventative checkups. The study's findings show that this therapy reduced discomfort, aided patients' recovery, and improved patients' quality of life by helping them return to normal life.

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