PHYSICAL THERAPY IN THE POSTOPERATIVE OF PROXIMAL FEMUR FRACTURE IN ELDERLY. LITERATURE REVIEW

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ABSTRACT

The proximal femoral fracture in the elderly is a serious public health problem. Surgical treatment of this fracture is used to reduce morbidity, together with postoperative physical therapy. The objective was to conduct a systematic review of physical therapy protocols in postoperative for fractures of the proximal femur in elderly. We selected randomized controlled trials in elderly in the past 10 years, in Portuguese and English. There were 14 articles in the literature. Physical therapy has an important role in functional recovery of the elderly. ***Level of Evidence I, Systematic Review RCTs (Study results were homogenous).***

Keywords: Aged. Hip fractures. Rehabilitation.

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INTRODUCTION

The survival of the world population has increased globally in recent decades. This longevity increase associated with the more active lifestyle of the elderly today and the comorbidities present in this population such as reduction of muscle strength, of balance, of reflexes and of bone mineral density, resulting in osteopenia and osteoporosis, has led to an increase in trauma cases and consequently fractures in the geriatric population.[1] These fractures are the main cause of disability, functional impairment and death in elderly people.[2]

Proximal femoral fractures are common in this age group, with special emphasis on the intracapsular (of the femoral neck) and extracapsular (transtrochanteric and subtrochanteric) types.[2]

There are studies citing that six months after a proximal femoral fracture, less than half of the individuals recover the physical function that they exhibited before the fracture.[3] Mobility limitations are very common and can be partially related to the lack of strength and muscle power. The fractured leg can be 20% weaker than the non-fractured leg between 3 and 36 months.[4]

The treatment currently recommended for these patients is preferably surgical, with the introduction of osteosynthesis material, as it generates stability and an earlier return of function, so that the elderly patient does not remain bedridden for long, with the resulting deterioration of his or her state of health, which may lead to severe functional decline and even death.[5]

The osteosynthesis materials available for the surgical approach of these fractures include cephalomedullary nails, sliding screw plate and hip prostheses.[5,6] Physical therapy following fracture fixation is extremely important to these patients, as it targets early mobilization, gait training and other treatment methods to maintain or restore possible deficits.[7]

Therefore, this study is aimed at performing a systematic review of the literature about physical therapy treatment protocols after proximal femoral fractures treated surgically in elderly patients.

MATERIAL AND METHODS

The method used was a systematic review of the literature, while the Medline and Pubmed databases were used for the search. The keywords had the DECs descriptors in Portuguese and English as a reference. Respectively: fratura do quadril, fratura proximal do fêmur, reabilitação, fisioterapia, exercício, idoso, hip fracture, proximal femur fracture, rehabilitation, physiotherapy, exercise and elderly.

The inclusion criteria were studies published in the last ten years, in the English and Portuguese languages, conducted on human beings, without distinction of gender and with individuals over 60 years of age who had suffered a proximal femoral fracture, treated with osteosynthesis. Controlled and randomized clinical trials were also considered as an inclusion criterion.

Studies that only cite and do not detail the rehabilitation program used on the elderly patients, proximal femoral fractures treated conservatively and hip arthroplasty protocols were excluded, as were case reports, study on cadavers, systematic reviews and non-controlled and/or nonrandomized clinical trials.

All the authors declare that there is no potential conflict of interest referring to this article.

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RESULTS

In the electronic search through the Medline and Pubmed databases, cross-referencing the words described in the method, the investigators found 1,428 articles, of which 54 were selected for reading in full. Based on this reading, 40 papers were excluded, 17 as they failed to describe the physiotherapeutic intervention, thus hindering reproducibility, 10 as they were literature review articles, 10 as they were not randomized and/or controlled and finally, the last three articles because they involved the closed treatment of fractures. At the end of the search for and reading of the articles, the investigators selected 14 clinical, controlled and randomized trials, all in the English language, about the effect of physical therapy on elderly individuals submitted to surgical fixation after proximal femoral fracture. (Figure 1) Among the selected articles, 10 performed muscle strength training. Five studies conducted this training in the patient's home, intercalating with activities of daily living (ADL) and instrumental activities of daily living (IADL) training and the other five studies are conducted in an outpatient setting, with three conventional strength training activities in the supine position or sedestation and two with inclusion of bipedestation exercises, with partial weight bearing. The other four remaining articles test the effect of early walking; transcutaneous electrical nerve stimulation (TENS) in pain control; strengthening using an electrical stimulation current for the quadriceps muscle; and aerobic exercise for gain of cardiopulmonary resistance. The description of the selected articles, their characteristics and their classifications according to the PEDro Scale are presented in Table 1.

Table 2 describes the type of fracture and the osteosynthesis used in each study, with the respective percentage of the sample.

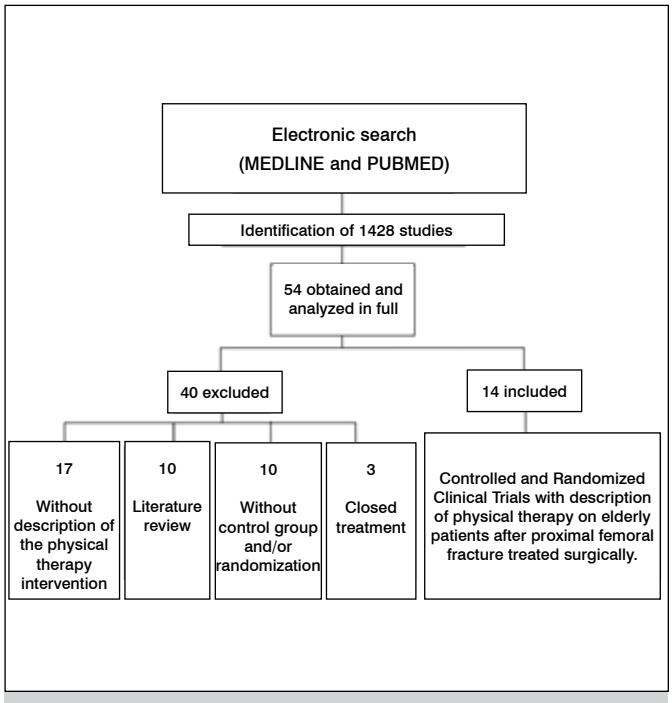

Figure 1. Flowchart with result of the search carried out in the Medline and PubMed databases.

DISCUSSION

Proximal fracture of the femur is the main cause of morbidity, institutionalization and mortality in the elderly. Its global incidence should increase from 1.7 million people in 1990 to about 6.3 million in 2050. Mortality is estimated at 24% up to 12 months after the hip fracture. Moreover, a significant number of these patients do not return to the prefracture functional state. A year after surgery, less than 50% of the survivors can walk without help, and only 40% can perform independent ADLs.[8]

With reduced muscle strength these individuals tend to present a decrease in the postoperative walking capacity, which make them vulnerable to further falls and to the risk of sustaining a contralateral hip fracture. In the literature the odds of a new fracture are six to 20 times higher than the initial fracture within the first year of recovery.[9]

Knowing this, the goal of physical therapy in the postoperative treatment of patients with a proximal femoral fracture is to increase muscle strength, and to improve walking safety and efficiency, thus enabling the elderly patient to become more independent.[10]

To ensure a safe start for physical therapy it is extremely important for the professional to know the type of fracture, as well as the material used for surgical fixation. These data will interfere in the conduct, which includes walking time, weight bearing on the limb, and restrictions in some movements.

It is of crucial importance, regardless of the type of fracture and material used for fixation, for this patient to remain orthostatic and to walk as early as possible to avoid respiratory complications and other complications inherent to immobility, yet sometimes this is not possible due to the patient's general state of health. In a study, conducted in the hospital ward, where the patients were divided into 2 groups, one for early walking and the other for late walking, the professionals found evidence that cardiovascular stability is one of the main determinants of success of early walking after hip fracture surgery and this early gait was determinant for an increase of the subjects' functionality, when compared with the late gait group.[11]

Aerobic fitness is something the physiotherapist should think about when developing a treatment plan, as it can increase the patient's physical function, because cardiorespiratory fitness can result in an increase in walking capacity. This is what was reported in a pilot study that performed aerobic exercise with arm ergometer over a 4-week period.[8]

It is estimated that in 12 months after a hip fracture, the patient presents a loss of 6% of the lean body mass. A study conducted with 90 elderly individuals tested a 6-month intensive rehabilitation program compared with a control group that performed exercises of lower intensity and besides increasing the muscle strength of the patients from the intervention group, also increased gait speed, balance and ADL performance.[9]

Another similar study resulted in an increase in gait speed in the group of higher exercise intensity, yet only in patients with cognitive deficit. This shows that besides the physical benefits, strength exercises can also produce advantages in the psychosocial area, which is often altered in the elderly individual who has sustained a fracture and that can be one of the causes of low physical function in the post-trauma period.[12]

This gain of muscle strength has proven effective both through

Table 1. Description and characteristics of each study and scores of the PEDro Scale.

Author/year	PEDro*	Objective	NP	Follow-up time	Results
Mitchell et al.[20], 2001	6	Determine whether a high-intensity program involving the quadriceps muscle increases extension power and reduces functional incapacity.	80	16 weeks	The power of the quadriceps muscle, the Barthel index and the Mobility Scale increased significantly in the intervention group, while in the other scales there were no differences between the groups.
Lamb et al.[10], 2002	9	Study the viability and the effect of neuromuscular stimulus on the recovery of mobility.	24	13 weeks	The intervention group achieved faster mobility recovery, yet the power of the quadriceps muscle and pain did not present significant differences.
Binder et al.[9], 2004	6	Determine whether prolonged outpatient rehabilitation improves physical function and reduces functional incapacity.	90	6 months	The intervention group obtained a better result in terms of increase of muscle strength, gait speed, balance and ADLs.
Sherrington et al.[13] 2004	7	Compare the effects of the exercise program with and without weight bearing.	120	4 months	The exercises with weight bearing presented better functional results, especially in balance and functional performance.
Mangione et al.[16] 2005	9	Determine the effects of a home exercise program, from moderate to high intensity.	33	3 months	All the groups presented an improvement in the distance covered, strength produced, gait speed and physical function. The improvement of isometric strength was greater in the intervention groups.
Tsauo et al.[19] 2005	4	Evaluate the effects of a home physical therapy program.	25	3 months	Mobility, muscle strength and walking speed did not differ between the groups, yet the intervention group obtained a better score in all the Harris Hip Score categories.
Oldmeadowet al.[11] 2006	7	Verify the effect of early walking.	60	10 months	The patients from the early walking group presented significant functional improvement in relation to the postponed walking group.
Gorodetskyi et al.[18] 2007	7	Verify whether TENS reduces pain, thus improving functionality.	60	9 months	Pain decreased significantly in the intervention group, with considerable reduction of analgesic intake, and the Range of Motion (ROM) increased.
Mendelsohn et al.[8] 2008	7	Evaluate the effect of aerobic exercise on cardiorespiratory fitness.	20	4 weeks	Peak VO2 increased significantly in the training group and both groups had an improvement in all the functional scales.
Portegijs et al.[4] 2008	7	Study the effects of resistance training on muscle strength, mobility and balance.	46	3 months	In 83% of the participants, the fractured leg was the weaker leg. The intervention group obtained an increase in strength and power of the quadriceps muscle, yet in relation to walking speed, balance and physical performance there was no significant difference between the groups.
Zidén et al.[14] 2008	8	Investigate whether home rehabilitation can improve confidence, balance and physical function, compared with conventional care.	102	1 month after the end of the physical therapy.	The intervention group achieved greater confidence, balance, physical function and better performance in the ADLs and IADLs.
Moseley et al.[12] 2009	9	Compare the effects of a high and low intensity exercise program.	150	4 months	Increase in gait speed in the group with high intensity of exercise among the patients who already presented some cognitive dysfunction. In the other measurements there were no statistically significant differences.
Mangione et al.[17] 2010	8	Compare the efficacy of a short-term strengthening program for the lower limb, one year after the hip fracture.	70	1 year	The intervention group presented an improvement in all the items evaluated.
Bischoff-Ferrari et al.[15], 2010	9	Determine the benefit of extended physical therapy and vitamin D (cholecalciferol) in rates of falls and hospital readmissions in the first year after hip fracture.	173	12 months	Physical therapy reduced the number of falls, but not hospital readmissions, while cholecalciferol reduced hospital readmissions, but not falls.

* PEDro Scale; NP: Number of participants; SD: Study design; TENS: Transcutaneous Electrical Nerve Stimulation.

Table 2. Type of fracture and osteosynthesis used in the surgery.

Author/year	Type of fracture	Osteosynthesis
Mitchell et al.[20], 2001	Femoral neck (35%)	Not informed
	Extracapsular (65%)	
Lamb et al.[10], 2002	Femoral neck (41.7%)	Arthroplasty (41.7%)
	Extracapsular (33.3%)	
	Comminutedfracture (25%)	DHSandplate (58.3)
Binder et al.[9], 2004	Femoral neck (52.2%)	Arthroplasty (41.1%)
	Trochanteric (43.3%)	
	Others (4.4%)	ORIF (58.9%)
Scherrington et al.[13], 2004	Not informed	Not informed
Mangione et al.[16], 2005	Not informed	Arthroplasty (27.3%)
		DHS (54.5%)
		Intramedullary nail (18.2%)
Tsauo et al.[19], 2005	Femoral neck (64%)	Arthroplasty (72%)
	Trochanteric (28%)	
	Others (8%)	Internal fixation (28%)
Oldmeadow et al.[11], 2006	Not informed	Not informed
Gorodetskyi et al.[18], 2007	Trochanteric (100%)	DHS (100%)
Mendelsohn et al.[8], 2008	Femoral neck (70%)	Arthroplasty (50%)
	Trochanteric (25%)	
	Subtrochanteric (5%)	DHS (50%)
Portejigs et al.[4], 2008	Femoral neck*	Arthroplasty (46%)
	Trochanteric *	ORIF (54%)
Zidén et al.[14], 2008	Femoral neck (52.9%)	Not informed
	Trochanteric (37.3%)	
	Subtrochanteric (9.8%)	
Moseley et al.[12], 2009	Femoral neck (50%)	Arthroplasty (60%)
	Trochanteric (50%)	DHS (40%)
Mangione et al.[17], 2010	Femoral neck (42.3%)	Arthroplasty (30.8%)
	Trochanteric (57.7%)	ORIF (69.2%)
Bischoff-Ferrari et al.[15], 2010	Not informed	Not informed

DHS: Dynamic Hip Screw; ORIF: Open Reduction with Internal Fixation.
* Percentage of fracture types not informed.

weight training and through neuromuscular stimulation using an apparatus; the latter technique has gained prominence for the increase of strength in inhibited muscles.[10]

An important item of data indicated in another study, which also uses strength training as a form of intervention, is that in 83% of the participants, the fractured leg appeared weaker. This deficit of strength and asymmetric muscle power can complicate the transfer of weight during the stance phase of gait where only one leg is sustaining the body weight, generating a mainly lateral imbalance, where the highest rate of falls is reported.[3]

There are studies claiming that the strengthening of abductor and adductor muscles of the hip increase this laterolateral stability during walks, influencing the improvement of the patient's dynamic balance.[3]

Exercises performed with weight bearing, certainly following the weight-bearing restrictions set by the physician in charge, have shown themselves to be advantageous and have also increased dynamic balance as well as functional performance. The elderly individuals who took part in this study performed exercises in the bipodal upright position and were compared with a supine exercise group, besides a control group without intervention, for 4 months. The author justifies the gains on account of better center of mass control, possibly because the exercises while standing provided a greater challenge for the postural control system.[13]

A similar study, yet carried out in the patient's home, reported that just 3 weeks were sufficient for the elderly participants to obtain more confidence, balance, physical function and

better performance in the ADLs and IADLs, when compared with individuals submitted to conventional physical therapy in a clinic. The author justifies this finding by the fact that the home physiotherapy includes the training of day-to-day activities with the patient, both of self-care and involving trips to the bakery or to the newsstand to buy a newspaper, for example.[14] In another home physiotherapy study, the number of falls dropped by 36%, which is also due to the increase in confidence, balance and functionality.[15]

In addition, home rehabilitation has to be considered in this population, in view of the difficulty of accessibility, such as lack of transportation, inability to leave their home or fear of doing so.[16,17]

We should also take into account a factor of crucial importance that can influence our treatment: pain. This can delay recovery, and the high level of pain in the postoperative period has been associated with a longer hospitalization time, reduced adhesion to physiotherapy treatment protocols and reduced walking capacity up to three days after the procedure. In a study with Transcutaneous Electrical Nerve Stimulation (TENS), pain decreased and functionality improved significantly.[18]

Therefore, studies have demonstrated that patients with a hip fracture who have taken part in some type of physical therapy, tend to recover their physical function and quality of life faster than the control group. As seen above, there are various plausible categories and techniques of physical therapy in the treatment of a patient with this type of fracture. Rehabilitation can be done at home or in a clinic, with the use of manual techniques, strengthening, proprioception, gait or ADL training, motor stimulation apparatuses and analgesia, among others.[14]

There is a high rate of therapy abandonment by elderly patients,[19] due the intensity of the exercises that sometimes become intolerable or demotivating; the limited mobility, whether caused by physical or cognitive factors and other comorbidities also end up interfering in the treatment frequency.[17,20]

The difficult follow-up of elderly patients, cited by various articles, hinders research in this area, as it reduces the sample number, thus impairing the reliability of the study.

FINAL CONSIDERATIONS

The literature does not feature a specific and detailed physical therapy treatment for elderly patients in the postoperative period of proximal femoral fractures. There is a tendency for strengthening exercises to be the key to the functional improvement of these patients.

The evidence shows that physical therapy tends to accelerate the recovery of elderly patients, but their return to prefracture functional state is not yet guaranteed.

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