Intensive physical therapy after hip fracture

A randomised clinical trial

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ABSTRACT

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Introduction: This randomised study evaluates the effect of intensive physical therapy on the duration of rehabilitation following hip fracture.

Methods: Eighty-eight patients transferred for rehabilitation after surgical treatment for hip fracture were included in the trial. Forty-four patients were randomised to physical therapy 3.6 hours (median) a week, while the 44 control patients received physical therapy 1.9 hours a week. Outcome was defined as duration of physical rehabilitation until the patient was able to (1) walk 50 metres in less than 2 minutes, (2) manage stair climbing to the first floor, (3) manage sit-to-stand transfer, (4) move in and out of bed, (5) manage bathing, dressing and lavatory visits.

Results: In the group randomised to intensive physical therapy 24 patients withdrew after 15 days while 13 patients withdrew from the control group after 22 days (median values). Early withdrawal was due to orthopaedic complications, general weakness and poor co-operation. No difference between the two groups was demonstrated in the duration of physical rehabilitation by a per protocol analysis of the patients who completed the trial.

Discussion: The considerable drop-out rate suggests that intensive physical therapy may be of limited value when attempting to reduce the duration of rehabilitation following hip fracture. An altered objective including enhanced out-patient rehabilitation may be necessary in order to reduce the length of hospital stay after hip fracture.

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INTRODUCTION

Hip fractures are responsible for the highest occupancy of hospital beds in Denmark (1) due to the high incidence and often prolonged rehabilitation. Physical training of muscle strength, range of movement (ROM), function and skills are important elements of the rehabilitation programmes used. Intensified physical therapy would be expected to accelerate rehabilitation and thus diminish the need for hospitalisation. Research within recent years supports this assumption, as a training potential has been demonstrated even in aged individuals (2-4).

The clinical effect of physical rehabilitation, however, has only been poorly elucidated, and randomised trials are lacking. Therefore, we have investigated the effect of intensified physical therapy on the duration of rehabilitation following hip fracture.

MATERIAL AND METODS

Eighty-eight consecutive women transferred for rehabilitation after surgically managed hip fracture were included. Age ranged from 61 to 89 years, median 80 years.

Inclusion criteria:
- women aged 60 to 89 years,
- fully mobilised prior to hip fracture,
- osteosynthesis or partial hip replacement due to uncomplicated hip (cervical or trochanteric) fracture,
- full weight-bearing permitted,
- no concomitant disabling disorders (locomotor system or other organs),
- transferred for rehabilitation within three weeks after surgery.

Exclusion criteria:
- patients who did not wish to participate in the trial,
- patients who fell ill during the trial with symptoms that hindered training for more than a couple of days,
- patients discharged before attaining the planned functional capacity.

Following inclusion, 44 patients were randomised to intensive training and 44 to the standard training programme.

Description of the physical therapy applied: The control group received physical therapy according to the standard principles of the department. This consisted of individual physical therapy sessions 15-30 minutes a day, Monday to Friday for a total of approximately two hours a week.

The patients in the intervention group (intensive training) were offered physical therapy six hours a week (two hours Monday, Wednesday and Friday, no formalised training the remaining four days).

The qualitative contents of the two training programmes were identical:

Bench exercises (warming up, ROM, strength, endurance, stretching, stabilising), gait, balance, coordination, stair climbing and, in some cases, hydrotherapy.

The planned functional capacity was considered to be attained when the patient was able to perform the following five items unaided:

1. walk at least 50 metres without resting in two minutes or less, using a walking stick or a quadraped, if necessary
2. climb one flight of stairs (rise of step 16 cm), with the aid of a walking-stick or the banisters, if necessary
3. manage sit-to-stand transfer
4. move in and out of bed
5. manage bathing, dressing and lavatory visits.

A blinded evaluation was performed by an external observer when the treating physiotherapist considered that the objective (all five subsets) had been reached. The external observer was a physiotherapist not involved in the project.

Efficacy parameter: Length of the training period, from the first day of physical therapy until the planned functional capacity had been achieved.

Statistics: Quantitative data are presented as median (range). Statistical significance was estimated by non-parametric statistics for unpaired data. Frequencies were calculated by the chi-square test. The Mann-Whitney test (two groups) and the Kruskal-Wallis test (more than two groups) were employed for rank data. The degree of correlation between two variables was determined by the Spearman non-parametric coefficient of correlation.

A p-value of 0.05 or less was considered significant.

Ethics: The study was performed according to the requirements of the Helsinki 2 Declaration, including informed consent and acceptance by the local Ethics Committee (Den Videnskabsetiske Komite for Københavns og Frederiksberg Kommuner, j.nr. (KF) V 92-297).

RESULTS

An *intention-to-treat analysis* of all the patients randomised (Table 1) demonstrated that the training period was significantly shorter, while the total amount of physical therapy (hours spent training) and the intensity (hours spent training/day) were significantly increased in the intervention group compared with the control group.

Length of hospital stay (LOS) was identical in the two groups.

Thirty-seven patients discontinued prematurely, 24 in the intervention group and 13 in the control group, after 15 and 22 days (median values) respectively. Thus, the stipulated training programme was completed by 20 patients in the intervention group and 31 in the control group. The four groups did not differ significantly from one another with regard to age, fracture site (side/type), delay from fracture to operation, method of anaesthesia, surgical method or delay

Table 1. *Training intensity, length of training period and length of hospital stay (LOS) (intention-to-treat). Median (range).*

	Intervention (n=44)	Control (n=44)	p* (1-sided)
Hours spent training (total)	6.4 (1.3-21.3)	4.0 (0.3-12.5)	0.001
Training period (days)	14 (1-42)	17 (3-58)	0.02
Training intensity (hours/day)	0.5 (0.1-9.7)	0.2 (0.1-0.6)	0.000005
LOS (days)	32 (5-126)	34 (8-145)	0.4

*) Mann-Whitney.

from operation to tranfer to the rehabilitation department (Table 2).

Reasons for withdrawal (after randomisation) are presented in Table 3. The main reasons in the intervention group were fracture complications (redisplacement, screw penetration, hip dislocation) and the patients' desire to give up the study, mainly because the intensified training programme exceeded their physical and psychical capacity.

Early withdrawal in the control group was mostly due to lack of training potential caused by fracture complications (including femoral head necrosis in two patients), general debility and poor co-operation.

A *per protocol analysis* of the completers (Table 4) showed that both the total amount and the intensity of physical therapy were significantly increased in the intervention group compared with the control group. There was no significant difference between the two groups with regard to the length of the training period, though it tended to be shorter in the intervention group.

No statistically significant relationships were demonstrated between the length of the training period and age, fracture site, method of anaesthesia, surgical method or delay from fracture to operation/operation to transfer (data not shown).

LOS in the completers per protocol was significantly shorter in the intervention group.

The reduced rehabilitation potential in the patients who withdrew prematurely led to prolonged hospitalisation with median values of 53 days (drop-outs in the intervention group) and 46 days (drop-outs in the control group).

In the patients who completed the trial per protocol, the functional result of the rehabilitation process was identical in the two groups, as 90% were able to walk with one or two walking sticks at discharge. In contrast, only about 35% of the drop-outs reached this level, whereas approximately 40% were discharged with a quadraped or a rollator and approximately 25% were transferred to other hospitals due to complications.

Table 3. *Drop-outs after randomisation. Reasons and length of training period. Median (range).*

	Intervention		Control	
	n	days	n	days
Orthopaedic complications	6	8	4	26
Patient's own wish	6	20	1	14
Dementia	3	5	1	50
Depression	1	15	1	3
Dizziness	1	21	0	–
Pain	2	24	0	–
Medical condition	1	1	1	3
Malignancy	2	10	0	–
Other reasons	2	9	5	23
Total	24	15	13	22

Table 4. *Training intensity, length of training period and length of hospital stay (LOS) (per protocol). Median (range).*

	Intervention (n=20)	Control (n=31)	p* (1-sided)
Hours spent training (total)	6.2 (1.3-18.0)	4.0 (0.9-11.8)	0.01
Training period (days)	12 (3-29)	15 (5-58)	0.07
Training intensity (hours/day)	0.5 (0.3-1.0)	0.3 (0.2-0.4)	0.000005
LOS (days)	25 (9-41)	33 (8-101)	0.03

*) Mann-Whitney.

DISCUSSION

The considerable proportion of patients who were unable to complete rehabilitation as planned is somewhat surprising, especially as only patients who were fully mobilised and without concomitant disabling conditions prior to their hip fracture were included in the trial. The pre- and peroperative patient characteristics registered were similar in the completers and in the non-completers.

Early withdrawal in the intervention group was mainly due to fracture complications and dementia.

The significantly shorter training period in the intervention group when analysed according to the intention-to-treat principle can be explained by earlier drop-out in the intervention group than in the control group. In accordance with this fact, no difference was found between the two groups of patients completing the trial per protocol.

Conversely, hospitalisation was found to be of significantly shorter duration in the intervention group using per protocol analysis, while no significant difference was demonstrated by intention-to-treat analysis. This finding can be explained by the withdrawal of

Table 2. *Baseline characteristics of patients completing and patients withdrawn from the study. Median (range).*

	Completers		Withdrawals		
	intervention (n=20)	control (n=31)	intervention (n=24)	control (n=13)	p (2-sided)
Age	79.8 (63-89)	81.0 (61-89)	81.0 (69-88)	81.0 (62-88)	0.67*
Fracture type					
Cervical	16	18	16	9	
Trochanteric	4	13	8	4	0.44**
Fracture side					
Right	11	12	7	6	
Left	9	19	17	7	0.36**
Anaesthesia					
Universal	13	15	14	5	
Epidural	7	15	9	8	0.41**
Unknown	0	1	1	0	
Type of operation					
Screws	10	11	6	4	
Plate and screw	6	12	10	6	
Hemiprosthesis	4	8	8	3	0.75**
Duration (days)					
Fracture-operation	1.0 (0-5)	1.0 (0-5)	1.0 (0-8)	1.0 (0-3)	0.80*
Operation-transfer	8.0 (2-16)	7.0 (3-16)	6.5 (3-19)	6.0 (2-11)	0.28*

*) Kruskal-Wallis.
**) Chi-square.

a larger number of patients with prolonged hospitalisation in the intervention group than in the control group.

In spite of the fact that randomised trials have been suggested by several authors (5-7), to our knowledge, no other prospective randomised trials exist in which the effect of intensive physical therapy after hip fracture has been specifically evaluated.

In a descriptive, uncontrolled study of 70 patients in a rehabilitation ward, *Barnes* (8) was able to demonstrate a positive association between number of visits to physical therapy and achievement of pre-fracture ambulation status when physical therapy was terminated.

In contrast to these findings, the same author in a subsequent uncontrolled study (9), found number of physical therapy sessions to be negatively associated with independent ambulation in 65 patients 60 days and 1 year after surgery. The results are not comparable, however, among other things because the reasons for cessation of physical therapy in the first study are not explained.

In an uncontrolled study, *Guccione et al* (6) found improved odds of discharge directly to the home in patients who received physical therapy more than once a day immediately after surgery. The study comprised 162 patients in an orthopaedic department, mean hospital stay nine days. Only 17% were discharged directly to the home, while 78% were transferred to a rehabilitation ward. The result shows co-incidence but does not prove the existence of a causal relationship between the frequency of physical therapy and functional capacity at discharge. A more likely interpretation is that only patients with a high functional capacity, ie those in whom early discharge was feasible, were able to go through with physical therapy more than once a day.

Koval et al (7) described the outcome of prolonged intensive rehabilitation in 104 patients in comparison with a non-randomised as well as a historical control group. Intervention consisted of two hours of physical therapy daily (versus 30 minutes once-twice daily), occupational therapy one hour a day, and weekly planning conferences with the patient and family members who took part in the therapy sessions. Prolonged hospitalisation was demonstrated in the intervention group: 31.4 days versus 20.0 and 21.9 days in the respective control groups, and there was no change in functional capacity. Despite the fact that the difference could be explained by the allocation of more debiliated patients to the intervention group, the authors question the justification of such a rehabilitation programme.

In a randomised study *Swanson et al* (10) assessed the effect of early intervention in an orthopaedic department in 38 patients (including physical therapy twice a day, early operation, regional anaesthesia, early mobilisation, close multidisciplinary collaboration) versus standard management in 33 patients. Shorter hospitalisation was seen in the intervention group (21 versus 32.5 days), and also a superior functional capacity as assessed by the Barthel index. The specific impact of the intensive physical therapy yielded cannot, however, be deduced, as the intervention programme contained a number of additional items.

Comparison of the various studies is difficult, as study design and inclusion criteria differ. A quantitative evaluation of physical rehabilitation programmes requires a distinction between the cumulative amount and the intensity of the physical therapy. Variations among the qualitative contents are also of importance.

Rehabilitation outcome is usually expressed as LOS. Functional capacity, nursing requirements and mortality constitute other efficacy parameters. Although LOS – apart from patient characteristics and intervention – obviously depends on the goal set for rehabilitation outcome and on discharge criteria, these factors are seldom accounted for.

CONCLUSION

Due to a considerable drop-out rate in the intervention group, intensive training does not seem to be the way to reduce the duration of rehabilitation in the large group of resource demanding patients with hip fractures. These patients often have a multitude of non-surgical problems, demanding a multidisciplinary approach (11). Several randomised studies have, however, come to conflicting conclusions regarding the effect of multidisciplinary rehabilitation on LOS (12-14).

A significant reduction in LOS probably calls for a modified objective with more emphasize on out-patient rehabilitation.

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