

Krystyna Boroń, Marek Woźniewski
Faculty of Physiotherapy, University of Physical Education in Wrocław

The impact of physical exercises on intensity of chronic pain and functional ability of terminally ill patients

Abstract

Background. The main goal of palliative care is to alleviate pain, as well as improving the quality of life. Pain treatment should be interdisciplinary, including physical aspect-pharmacology and physical exercises, as well as psychological and spiritual.

Material and methods. The aim of the study was to establish the impact of exercising on intensity of chronic pain and functional condition at patients terminally ill. During one month, a group of 30 patients (18 women and 12 men), suffering of chronic pain, caused by cancer, circulatory and neuro-muscular diseases, participated in physical treatment, which included strengthening and stretching exercises of large group of muscles (dorsal, abdominal and lower limb), respiratory exercises and vertical position. The intensity of pain was verified by a questionnaire, including pain scales. Second method was modified Barthel's index, which evaluated patient's functional condition. Also the quantity and form of drugs were estimated.

Results. Studies are showing the reduction of pain level after exercising. The low intensity of pain before exercising are described by 3.3% of patients, the moderate — by 30.0% and intense — by 66.7% of patients. The intensity of pain after exercising, described as low was by 33.3% of patients, the moderate — by 43.3% and intense — by 34.4% of patients. The mean of points in Barthel's index initially was 14.6 for whole group, at the end of study-28.0. The mean of physical condition initially was 24.0%, after study came to 46.7% (100% = 60 points in Barthel's index). The average dose of analgesic decreased. Initially it was 130 mg, the final dose was 114 mg.

Conclusion. 1. Studies prove the significant decrease of chronic pain intensity. 2. Pain was the main factor limiting patient's daily activity. 3. Exercising caused over double increase of physical condition. 4. Doses of analgesics decreased in a significant amount of patients.

Key words: palliative care, physical exercises, chronic pain

Address for correspondence: Krystyna Boroń
Katedra Klinicznych Podstaw Fizjoterapii w Medycynie Zachowawczej i Zabiegowej, Akademia Wychowania Fizycznego
ul. Paderewskiego 15, 51-612 Wrocław
e-mail: krystynaboron@hotmail.com



Advances in Palliative Medicine 2008, 7, 15–22
Copyright © 2007 Via Medica, ISSN 1898–3863

Introduction

In accordance with World Health Organization (WHO) definition palliative care is characterized by multidisciplinary patients treatment. The main goal is the pain management, alleviating tiresome symptoms, and improvement of the quality of life in terminal state [1].

Chronic pain is a process lasting continuously min. 3 months, present despite tissues recovery, or connected with a long illness process.

The patients suffering from chronic pain experience similar mechanisms causing devaluation of the quality of life: physiological, psychological and social disturbance. Increasing fatigue, pain, depressive mood are the reason for decreasing daily activity and function.

The priority in chronic pain management at patients terminally ill is maximal pain restriction with minimal side effects and invasiveness [2]. Methods used in chronic pain management are: radiotherapy, pharmacology, psychotherapy and physiotherapy.

Merimsky and Kollender in their studies examined 12 patients who had their lower limbs amputated because of cancer changes. 75% showed positive effects in functional improvement, confirmed by Karnofsky Questionnaire (patient functional ability) [3].

The relation between musculoskeletal pain and functional decrease was studied by Miu and Chan for 5 months on 749 patients [4]. The interview included questions about commonness and intensity of pain, taking analgesics, quality of sleep and auxiliary supplies (crutches). The studies were completed with a subjective evaluation of the quality of life, Barthel Index, ADL (activity daily living) and GDS (geriatric depression scale). Pain was more common among women than men. The quality of sleep was in correlation with the pain intensity, not with pain duration. The pain duration wasn't in correlation with Barthel Index. Depression, logistic regression and subjective quality of life valuation were independently related with musculoskeletal pain. The examined group, using auxiliary supplies (crutches, a balcony), showed tendency to feel greater pain, daily activity limitation and a higher level of fatigue [4].

Fulcher, White [5], MacVicar [6] and Schwartz [7] verified patients evaluation, suffering from pain, concerning the impact of physical exercises on chronic fatigue. The most effective were exercises of large parts of muscles in rhythmic and repeated movements, for example walking 74% of patients stated a decrease of the fatigue level, with a simultaneous pain level decrease.

Reguła and Brzóska[8] in a questionnaire concerning the level of palliative care satisfaction on stationary ward, presented the physiotherapy evaluation — kinesitherapy and psychotherapy in pain management. 57% of patients didn't recognize it as a supportive factor in treatment, 32% evaluated it as very good, 9% as good, 2% as a sufficient impact.

The aim and hypothesis

The objective was the evaluation of physical exercises impact on chronic pain intensity and functional skills of patients on palliative ward.

The hypothesis was that physical exercises have a significant impact on the decrease of pain intensity and the increase of functional skills of patients with chronic pain.

Material and methods

Studies were carried out on a group of 30 patients treated because of chronic pain. The age range of the examined was 28–92 years old ($X = 62.9$); the average pain duration — 8 months. Chronic pain was caused by a malicious tumor of reproductive, respiratory, urinary, digestive and endocrine systems (70%); other diseases included circulatory, nervous, muscular and bone ailments (30%) (Table 1).

The patients underwent exercises once a day, for 0.5 h. The exercises included stretching and strengthening large part of muscles (lower limbs, back and

Table 1. Diseases units in the examined group

Disease unit	Sex (F/M)	Number (n)
Malicious tumor		
Breast	F	3
Skin	M	1
Cervic Uteri	F	1
Pancreas	2 F, 1 M	3
Bladder	M	1
Pharynx	F	1
Prostate	M	1
Bone	F	1
Lung	M	2
Colon	1 F, 2 M	3
Stomach	1 F, 1 M	2
Liver	M	2
Other disease units		
Parkinson's disease	M	2
Recklinghausen disease	1 F, 1 M	2
Circulatory insufficiency	F	1
Ischemic stroke	M	1
Joint arthritis	F	3

Table 2. Profile of exercises

Exercises	Mean	Min	Max
Stretching ex.	4*/2**	2/2	5/4
Strengthening ex.	6*/3**	3/1	15/5
Respiratory ex.	3*/2**	3/1	4/3
Vertical position	8***	1	30

*repetition; **rounds; ***time (minutes)

abdomen), respiratory exercises and vertical position (Table 2).

The impact of physical exercises on chronic pain intensity was evaluated in a questionnaire, filled in by the patients after the studies.

Numeric and verbal pain scales were used in the questionnaire. It include also types of taken analgesics, according to the analgesic ladder. Considering the peculiarity of the examined group (palliative care, numerous diseases, coexistent ailments), the created scale permitted a complex evaluation of pain intensity, including most significant factors. Final scale of pain intensity was divided into 3 groups: pain intensity 1–3 (low level of intensity), 4–6 (moderate), 7–10 (high).

Questionnaire “The impact of physical exercises on chronic pain intensity at patients terminally ill”

1. On a 10 points scale, how would you estimate your pain, while taking drugs (analgesics)?
 - a) 1–3
 - b) 4–6
 - c) 7–10
2. On a 10 points scale, how would you estimate your pain, without taking drugs?
 - a) 1–3
 - b) 4–6
 - c) 7–10
3. Does the pain intensify:
 - a) while resting
 - b) after an effort
 - c) at night
4. Does the pain limit your daily activity:
 - a) yes, in a significant degree
 - b) yes, in an insignificant degree
 - c) no
5. How would you describe your pain?
 - a) tearing
 - b) stabbing
 - c) squeezing
 - d) dull
6. How would you describe the intensity of pain:
 - a) constant

- b) intermittent
 - c) variable
7. In 10 points scale, how would you value your pain, without doing exercises:
 - a) 1–3
 - b) 4–6
 - c) 7–10
8. On a 10 points scale, how would you estimate your pain after exercises:
 - a) 1–3
 - b) 4–6
 - c) 7–10
9. How would you evaluate the quality of your life?
 - a) good
 - b) average
 - c) bad
10. How does your daily activity influence your quality of life?
 - a) positively, my mood is getting better
 - b) I don't see any difference
 - c) N, my mood is getting worse
11. Do you think a psychological consultation is useful?
 - a) yes
 - b) yes, but not necessary
 - c) no

Modified Barthel Index

The Barthel Index, defining patients functional ability, was filled in basing on the patients observation twice — at the beginning and at the end of the study. 60 points in Barthel Index signifies independent patient, 0 points — a total dependence.

Activity*

1. Eating
 - 0 = not able to eat by him/herself
 - 5 = needs help in precise action (e.g. cutting bread)
 - 10 = independent
2. Moving — from bed to chair and return:
 - 0 = not able to keep the balance while sitting
 - 5 = needs physical help of a third person, able to sit

- 10 = needs verbal help (encouraging)
- 15 = independent
- 3. Moving on a flat surface:
 - 0 = does not move or < 50 m, dependent on a wheelchair
 - 5 = independent of a wheelchair
 - 10 = walking with help of third person > 50 m
 - 15 = independent, may need help (crutches) > 50 m
- 4. Taking stairs:
 - 0 = dependent
 - 5 = needs physical help
 - 10 = independent
- 5. Taking on and off clothes:
 - 0 = dependent
 - 5 = needs help, in some actions independent
 - 10 = independent

In point 1–5 one possibility can be chosen, describing precisely a patient's state.

Doses and forms of the drugs taken during the month were also analyzed. The results were statistically analyzed — the mean value and the standard deviation of studies parameters were calculated.

U Mann-Whitney test was used to evaluate the difference significance between sexes concerning pain intensity, taken drugs and physical condition. The results were not statistically significant.

The relations between the pain intensity before and after taking analgesics, and between the pain intensity before and after exercises were analyzed with Wilcoxon test. The results were statistically significant, level $p = 0.000002$, $p < 0.5$.

Results

The pain intensity before taking analgesics was described by patients as low — 33% (1 M), as moderate — 39% (7 F, 5 M), as intense — 57,7% (11 F, 6 M) (Figure 1).

The pain intensity after taking analgesics was evaluated as low — 60% (10 F, 8 M), as moderate — 30% (9 F, 1 M), as intense — 10% (2 F, 1 M) (Figure 2).

An insignificant limitation of daily activity by pain was observed by 43.3% of patients (9 F, 4 M). 36.7% (4 F, 7 M) noticed a significant limitation. A lack of limitation was declared by 20% (5 F, 1 M) of patients (Figure 3).

The pain intensity before exercise was described as low by 3,3%(1 M) of patients, as moderate by 30% (7 F, 3 M), as intense by 66,7% (11 F, 9 M) (Figure 4).

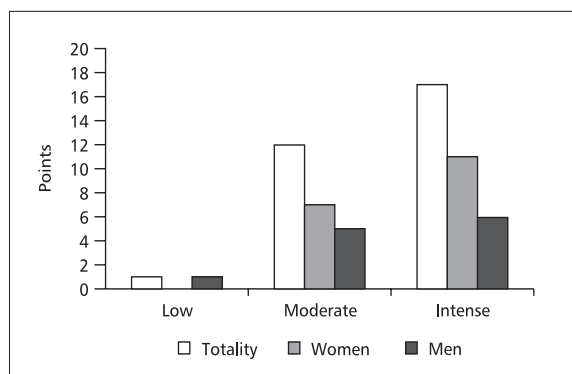


Figure 1. Intensity of pain before taking analgesic

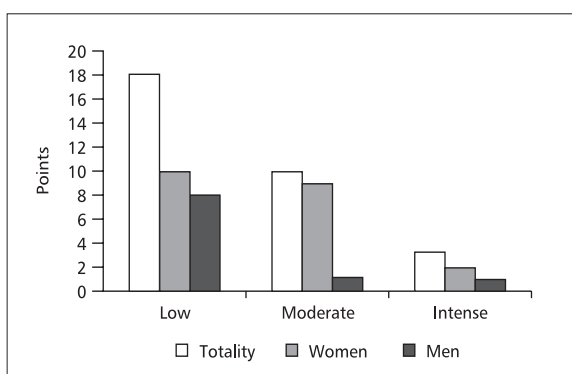


Figure 2. Intensity of pain after taking analgesic

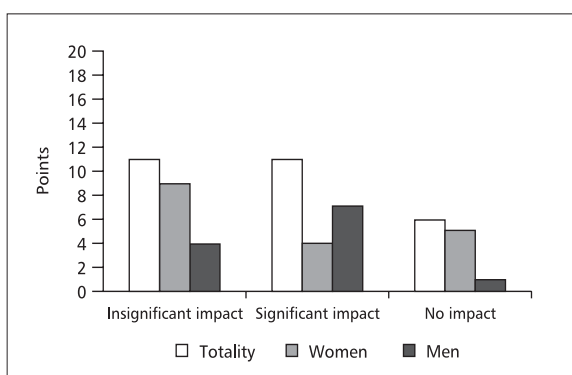


Figure 3. Impact of pain on limitation of daily activity

The pain intensity after exercises, was described as low by 33,3% (5 F, 5 M) of patients, as moderate by 43,3% (9 F, 4 M), as intense by 34,4% (6 F, 4 M) (Figure 5).

The minimal number of points in Barthel Index for both sexes (Table 3), at the beginning of the study was 0, the maximum for women was 30, 25 for men. The minimal number of points in Barthel Index for both sexes at the end of the study was 0.

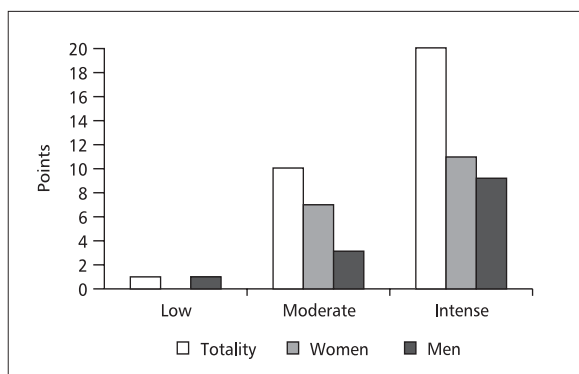


Figure 4. Intensity of pain before exercising

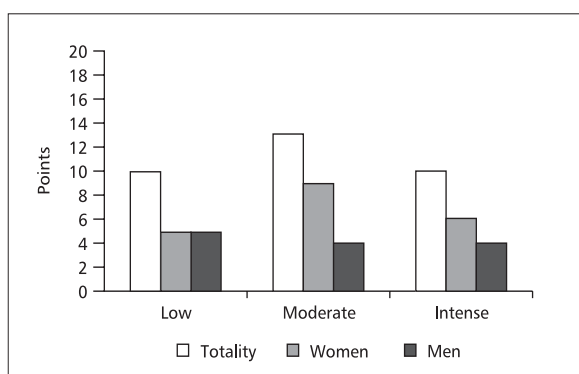


Figure 5. Intensity of pain after exercising

The maximum for women was 50, for men 60. The average number of points in Barthel Index at the beginning of study for the whole group was 14.6, for women 13.9, for men 15.8. Mean number of points at the end of the study was 28 for the whole group 27.5 for women, 28.8 for men.

Table 3. Average of points scored in Barthel’s questionnaire before and after rehabilitation

Before	Women		Men		Total	
	Before	After	Before	After	Before	After
13.9	13.9	27.5	15.8	28.8	14.6	28.0

Table 4. Participation of various parts of Barthel’s Index in the examined group before and after rehabilitation

Barthel Index	Women		Men	
	Before	After	Before	After
1	30.0%	26.2%	31.6%	26.1%
2	28.0%	27.7%	34.2%	33.3%
3	24.0%	22.2%	15.8%	17.4%
4	8.0%	10.1%	7.9%	8.7%
5	12.0%	15.5%	10.5%	14.5%

*1–5 activities of modified Barther’s Index; **percentage of various activities in Barther’s Index before and after rehabilitation

The average level of functional ability (Table 4) at the beginning of the study was 24%, after 1 month of rehabilitation — 46.7% (60 points in Barthel Index = 100%).

The lowest drug dose before the examination was 20 mg, the maximal — 400 mg for women, 350 mg for men. The lowest drug dose after the examination was 20 mg for women, 25 mg for men. The maximal — for women 200 mg, for men 100 mg.

Mean daily analgesic dose before the study, was 130 mg in total, 150.7 mg for women, 99.0 mg for men. After the study it was 114.7 mg in total, 77.7 mg, for women 171.0 mg for men.

A decrease of analgesic doses after 1 month of rehabilitation, was observed in 63% of patients (15 F, 4 M). The increase of analgesic doses was noticed in 30% of patients (2 F, 7 M). 7% (1 F, 1 M) of patients did not modify the doses (Table 5).

Discussion

Pain is a limiting factor of functional ability, which increases fatigue syndrome and has a negative impact on the quality of life.

Mock and others [9], examined 46 patients with a high level of weakness, during a complex rehabilitation including physical exercises (walking, stretching, respiratory exercises), a modification of sleep patterns and stress coping strategy (psychotherapy). Results after the rehabilitation indicated a higher functional factor than in control group.

The impact of regular exercises on mortality and decrease of functional skills were studied by Japanese researchers Oida and Kitabake [10]. 155 elderly people were examined. Patients participated in

Table 5. Forms and frequency of using analgesic before and after rehabilitation

Drug form	Total		Women (n)		Men (n)	
	Before	After	Before	After	Before	After
Muscle injection	30%	20%	5	3	4	3
Intravenous injection	23.3%	40%	5	7	2	6
Tablets	23.3%	23.3%	5	6	2	1
Plasters	23.4%	16.7%	3	2	4	2

a 5-year rehabilitation program, including kinesi-therapy — walking, stretching and exercises with resistance. Stretching included 5 elements — shoulder girdle, abdomen, pelvis, front part of the thigh and whole body relaxation. Except the stretching part, also strengthening of the lower limbs muscles (with a flexion movement in the hip joint in sitting position and extension of the knee joint) took place. Researchers concentrated on the walking manner, where one of the verification methods was the length and number of taken steps. Results showed that in the examined group, the mortality factor during 5 years was 14.3%, while decrease of functional ability factor was 5.4%. Simultaneously, in the control group, these values were 17.2% and 13.8% respectively in men. In women group — 3% and 8.1% respectively while in control group 13.3% and 23.3%. The result confirmed studies in which double increase of the functional ability factor was proved among examined patients.

Many researchers were proving the significance of the physical effort in the functional ability decrease and other ailments prevention. The rehabilitation impact on the elderly independence was verified by Green and Young [11]. The examined group included 141 patients, requiring rehabilitation and suffering from chronic pain. Barthel Index and Nottingham Questionnaire were used as evaluation of daily activity, during 6 months.

The aim of kinesi-therapy was an improvement of the quality and range of movements in daily activity. The results showed 27% increase of functional ability level in Barthel Index and 23% in the Nottingham Questionnaire.

Kim, Fall and Wang [12] studied a group of 301 patients in terminal state, undergoing a basic, palliative rehabilitation program — neuromuscular re-education, stretching and strengthening elements. An increase of Barthel Index was observed in 84% of patients.

O'Toole and Golden [13] evaluated 70 patients with cancer, chronic pain, participating in a 3 months rehabilitation. The functional independence was measured by Karnofsky scale. 14% of the examined were functionally independent at the beginning of

study, 84% in the final evaluation. 28 out of 37 patients showed strengthening or improvement of function. 30% of the examined initially showed independence in hygiene maintenance, 14% in moving and 38% in maintenance of the correct bladder action. The final evaluation showed a growth of independence in hygiene maintenance at 50%, 80% in moving, 91% in maintenance of correct bladder action. All examined indicated pain as the main factor deteriorating their functional skills. Majority of patients in the palliative ward, also claimed pain as a symptom, limiting their daily activity.

Other factors which may deteriorate functional skills despite rehabilitation are: anaemia, malnutrition, disturbance of metabolism or using analgesics.

The function ability level was conditioned not only by the present state but also by skills before falling ill, hospitalization and coexistent ailments.

The psychological factor is one of the most important among the ones taken into consideration in pain intensity evaluation.

Herr and Mobily [14] proved that patients suffering from chronic pain showed higher level of depression, which may increase pain and the functional skills decrease. Pain intensity caused sleep disturbance and decrease of the quality of sleep. This factor increased fatigue and pain intensity.

Sex (gender) also determined pain perception. Women group stated higher commonness of depression, than in men group. Depression increased pain perception, which decreased activity level, as well as the quality of life, which wasn't confirmed by analysis of gender (sex) variety, including the impact of physical exercises on pain intensity and analgesics. Results were not statistically significant [15].

Patients personality also may shape pain behavior and influence the nociception. Often only thought about effort, not a real action, improved the functional ability and decreased the pain intensity. Patients environment, as well as himself, can influence their attitude. Family convictions, the manner of transmitting information concerning the health state by medical staff, patients character and false imagination about sickness, are shaping the

pain sensibility, they may also cause effort avoiding and decrease of functional ability [16].

Basic analgesics are pharmacological means. The decrease of drug dose may indicate decrease of sensibility to taken drugs [17] the growth of doses may be caused by increase of somatic ailments, temporary taken drugs, in some cases on patients wish [5]. A constant dose of a drug may indicate strengthening of the pain level, also decrease of Barthel Index [4]. Satisfying analgesia and good drug tolerance are most important for the patient. During studies not only doses, but also forms of taking drugs changed. It may be caused by the lack of tolerance to particular drug form, for example longlasting taken pills cause side effects- damage of stomach membrane or inflammation of ulcer disease [1].

Also psychological factors may have an impact on the used drug form. For some patients injection may be traumatic way of taking a drug; whereas for other the more invasive method, the better effects of treatment. Changing drugs form may be an effect of subjective needs of the patient, as well as an objective indications. Expectation are not always related with the treatment process, and the health state of a terminally ill person can worsen but it is specific for the palliative care.

Conclusions

1. Pain was a significant factor limiting patients activity.
2. Significant pain intensity decrease was showed in the examined group.
3. Physical exercises caused double increase of functional skills.
4. In a significant amount of the examined, analgesic doses decreased.

Reference

1. Thomas E., Weiss S. Nonpharmacological interventions with chronic cancer pain in adults. *Cancer Control* 2000; 7: 157–164.
2. Small N., Green J., Young J. Effects of locality based community hospital care on independence in older people needing rehabilitation: randomised control trial. *Bio-Medical Journal* 2005; 10: 69–98.
3. Merimsky O., Kollender Y, Inbar M. Palliative major amputation and quality of life in cancer patients. *Acta Oncologica* 1997; 60: 55–59.
4. Miu. Chan. Pain and disability in group of Chinese elderly out-patient in Hong Kong. *Medicine Journal of Hong Kong* 2004; 10: 160–165.
5. Fulcher K., White P. Randomised control trial of graded exercise in patients with chronic fatigue syndrom. *Bio-Medic Journal* 1997; 311: 17–52.
6. Kujawska J., Kotlińska T., Dager A. Zwalczanie bólów nowotworowych. *MZOS, Warszawa* 1994: 48–51.
7. Rowbotham J. Ból przewlekły. *Vademecum lekarza praktyka. Via Medica, Gdańsk* 2003.
8. Powell P., Bentall R., Edwards R. Randomised control trial of patient education to encourage graded exercise on chronic fatigue syndrom. *BioMedical Journal* 2001; 322: 1–5.
9. Miniszewska B., Jabłońska B. Strategie radzenia sobie z chorobą nowotworową a jakość życia. *Psychoonkologia* 2002; 6: 95–102.
10. McCahill L. Palliative surgery for cancer pain. *West Journal Medicine* 2002; 176: 107–110.
11. Segal R., Evans W., Johnson D. Oncology Rehabilitation program at the Ottawa Regional Cancer Centre. *Canadian Medical Association Journal* 1999; 161: 1–8.
12. Hilgier M., Rykowski J. *Ból* 2001; 7: 24.
13. Golden A., O'Toole D. Evaluating cancer patients for rehabilitation potential. *Western Journal of Medicine* 155: 384–387.
14. Herr K., Mobily P. Chronic pain and depression. *Psychosocial Nursery Mental Health Service* 1992; 32: 7–12.
15. Dobrogowski J., Wordliczek J. *Medycyna bólu, PZWL, Warszawa* 2004.
16. Dobrogowski J., Wordliczek J. *Ból przewlekły, Wydawnictwo MCKP UJ, Kraków* 2002.
17. Domżał T. *Ból. Wiedza Powszechna, Warszawa* 1983.

