

The Efficacy of Kinesiotherapy in Secondary Fall Prevention among seniors for Optimisation of their Health Quality

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Abstract

With the increase of life expectancy, fall risks also increase, particularly among people of older ages, which lead to the need for preventing and managing such risks, and promoting quality of life for these individuals. This paper studies the effect of a specially designed kinesiotherapeutic intervention protocol in secondary fall prevention for optimisation of quality of life among seniors who have undergone intramedullary nailing surgery (g-nail) following a trans-trochanteric hip fracture. This is a quantitative randomised control trial including sixty (n=60) seniors aged 65-74 who had undergone intramedullary nailing surgery (g-nail) due to a fall during the previous year. Participants were divided into two groups: the experimental group (n=35), which followed a combined treatment programme of static and dynamic exercises, balance and flexibility, and the control group (n=25) that did not follow any treatment plan. The total duration of the therapeutic plan was twelve weeks, with three weekly sessions not exceeding sixty minutes each. The therapeutic plan was evaluated using the SF-36 health survey, with follow-up reviews six months and one year after the implementation of the therapeutic plan to the experimental group. The results of the study revealed that the experimental group presented a statistically significant improvement, as confirmed by the SF-36 health survey ($p < .001$) and they maintained results at the 6- and 12-month intervals. The combination therapeutic protocol, lasting a total of twelve weeks, improved quality of life among seniors who had undergone intramedullary nailing surgery (g-nail) following a trans-trochanteric hip fracture.

Keywords: Aged, Accidental Falls, Exercise Therapy, Quality of Life

1. Introduction

Senior population has significantly increased in recent years, and the world demographic aging affects not only developing, but also developed countries. By 2050, the world population over 60 years of age is expected to reach 2 billion individuals, who are bound to be more sensitive and vulnerable than normal, regardless of any health conditions (1). According to the WHO, by 2020, there will be over 1,000,000,000 seniors and by 2050 they will represent 1/3 of the world population (2).

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A senior's quality of life directly correlated with safeguarding sound functionality and independence (3). One of the most important problems facing seniors is falling due to loss of balance. Fall consequences have a decisive impact on human health as well as a country's economic budget (4). In total, over 30% of seniors above the age of 65 experience a fall. This rate increases to 40% among seniors above the age of 80 (5).

The therapeutic community has at its disposal a wide range of fall prevention approaches related to primary prevention and optimisation of quality of life among seniors. However, secondary prevention, i.e. all therapeutic actions focusing on reducing the frequency and severity of complications after the initial fall (6), requires a clinical exercise therapy plan that will aim at improving joint mobility, optimising quality of life and reducing the risk of a new fall. This is why this paper was undertaken, so as to support hypotheses regarding for the need for secondary prevention after intramedullary nailing surgery (g-nail) in senior populations.

2. Material and Methods

This study included 60 seniors aged 65-74 (elderly individuals, according to the WHO), who had undergone intramedullary nailing surgery (g-nail) following a trans-trochanteric hip fracture. The eligibility criteria were: 1) Subjects had to have undergone seniors intramedullary nailing surgery (g-nail) in the previous year at the General Hospital of the Prefecture of Kilkis; 2) The fall leading to the fracture should have been due to a musculoskeletal condition (knee or hip osteoarthritis), but not to any other causes (e.g. neurological diseases); 3) At least 3 months should have elapsed since the surgery; 4) Subject should have a functional status ≥ 4 METs.

Subjects were randomly allocated into two groups: Group A was the experimental group (n=35), which followed a combined treatment programme of static and dynamic exercises, balance and flexibility. Group B was the control group (n=25), which did not follow any treatment plan. 4 measurements were performed: one before the therapeutic intervention, one at the end of the intervention and two review measurements at 6- and 12-month intervals so as to ascertain the duration of the programme's effect. The total duration of the therapeutic plan was 12 weeks, with each session not exceeding 1 hour.

The therapeutic plan consisted of a 5-minute warm-up, during which the subjects walked on the spot while supporting themselves on a chair before each session started. They reached 70% of their Maximum Heart Rate, they actively stretched their lower extremities for 10 minutes, they performed resistance exercises for the hip abductor, extensors and flexors, for knee flexors and extensors, as well as ankle dorsiflexor and plantarflexors (3 sets of 12-15 repetitions for each muscle group), extensions of the hamstrings, rectus femoris, gluteus maximus, iliopsoas, gastrocnemius, soleus and abdominal-dorsal muscles (10-30 sec / 3 times for each muscle group), balance exercises with weight shifts, initially in the seated and gradually in the standing position (first supporting themselves on a chair or a large medicine ball) (for 5 minutes), walking while clapping every 5 steps or looking left and right every 5 steps or lifting the lower extremity higher every 5 steps (for 5 minutes), exercises on a mattress to practice getting out of bed (rolling, side sitting, weight shifting on all fours) (for 10 minutes) and a 5-minute cool-down period with respiratory exercises, rhythmical movement of the upper and lower extremities, and relaxed walking.

Data were collected through the use of the SF-36 health survey, weighted for the Greek population. The SF-36 health survey is one of the most widely used psychometric instruments and is used in several countries for self-assessment of quality of life and for comparing health levels of various population groups, whether healthy or sick, belonging to different categories or among various therapeutic methods applied to one patient category. It consists of 36 questions which were collected, processed and finally selected by the researchers of the Medical Outcomes Study (MOS) out of a total of 149 questions, following the evaluation of various measuring tools in use over the past 20 years for the assessment of quality of life (7).

For the SF-36 mental health scale, the repeated measures ANOVA 2x4 was used for two factors, of which only one was repeated, the dependent variable being the SF-36 mental health scale, the independent variable being the 'group' (Experimental and Control), and the repeated factor being the 'measurement' factor (initial - final - 6 months later, 12 months later). The two-factor analysis of variance showed that there is a statistically significant interaction between the 'group' and 'measurement' factors, $F(3,58) = 135.843$, $p < .001$.

A statistically significant main effect was revealed in the 'measurement' factor, $F(3.58)=15.109$, $p<.001$. No statistically significant effect was found for the 'group' factor. Scheffé's multiple comparisons test was used to investigate which differences regarding the groups referred to above were statistically significant. Results indicated that the experimental group presented a statistically significant difference following the completion of the therapeutic plan ($p<.001$), 6 months later ($p<.01$) and 12 months later ($p<.001$) as compared to the control group. Furthermore, the statistically significant differences persisted during the time period between the final measurements and twelve months later.

3. Results

Results showed that the members of the experimental group presented statistically significant improvement of seniors' health quality and that this improvement seems to be maintained 12 months after the completion of the therapeutic plan.

4. Discussion

The statistically significant change of the overall result in the SF-36 questionnaire following the implementation of the therapeutic plan is a strong indication of the extent to which exercise therapy contributes towards preventing falls, not only while the plan is being implemented, but even twelve months after its completion. The value reported for the quality of life of a typical population in a previous survey undertaken in our country with 193 senior participants without serious health problems is higher (SF-36 = 74.07) (8), while the present study recorded SF-36 = 62.58. A possible explanation for the difference between these two values is the fact that the group examined belongs to a population category of subjects with accumulated problems, both motor and psychological, which often lead to disability (9), (10). There is also a difference in comparison to the general population recorded in numerous other papers that confirm the particularity of patients who had suffered prior falls as opposed to those free from any systemic disease (11), (12), (13).

Fear of falling is considered to be a problem among seniors, regardless of whether they have fallen or not. Such a fear is a significant factor increasing the frequency of falls among seniors whether they are stationary or moving (14). The study by Tsongas *et al.* (2008) confirms among women with osteoarthritis, where their scores in similar questionnaires did not exceed 30 points (15).

The paper by Randell *et al.* (2000) compared 32 seniors with hip fractures to 29 individuals of the same age and gender without fractures. Their general health condition was recorded, as well as any concomitant problems for the members of both groups who were invited to answer the SF-36 questionnaire. Results showed, at the first measurement, those who had suffered a hip fracture had statistically significant lower scores in relation to their quality of life before the fracture, as compared to the control group in all health aspects, except for physical pain and their activity level. The hip fracture group showed a statistically significant reduction in functionality (51%), activity level (24%) and sociability (26%) at the second measurement. The control group showed no statistically significant differences at the second measurements as compared to their first, with the exception of the aspect of their general health (11% reduction). Analysis and comparison of the two groups indicated that the hip fracture group members experienced a statistically significant higher reduction in their quality of life both physically and mentally (16). This study clearly shows that clinical exercise has a statistically significant effect on both the mental and the physical SF-36 scale, and this positive effect of the plan is maintained one year later.

In order to better interpret the results of this study, it should be noted that account was not taken of the kind of possible lesion that might have been caused by prior falls or the gender of the participants. This is confirmed by the study by Adachi *et al.* (2001), which reported that the greatest SF-36 score reduction was recorded for hip fractures among men and hip and pelvic fractures among women, out of a total sample of 4,816 participants (17).

The study by Johnell et al. (2002) included 206 male and female participants, who answered the SF-36 questionnaire within two weeks following a fall and the ensuing fracture (wrist, hip, vertebrae, shoulder). The patients were re-evaluated at six-, nine- and twelve-month intervals. Surprisingly, it seemed that individuals who had suffered a spinal fracture scored slightly lower than individuals who had suffered a hip fracture. Participants of both groups recovered part of their lost quality of life six months later, but this was followed by gradual exacerbation. On the contrary, individuals who had suffered a wrist or shoulder fracture reported a reduction in their quality of life one month after the fracture, but then returned to the quality of life they enjoyed prior to the fracture; this leads to the conclusion that a hip fracture results in lower quality of life (18). Although this study indicates significant improvements in physical health following the exercise therapy plan, it has not taken account of the type of lesions suffered by the participants following their fall(s).

The study by Boonen *et al.* (2004) reports that one must seriously take into account that the self-assessment of quality of life using questionnaires such as SF-36 have an inherent risk of not being answered properly, and this affect research results (19). More specifically, the authors report that numerous participants who repeatedly filled out the SF-36 questionnaire reported significant effects on their mental and physical health despite their noteworthy recovery.

References

- Bozzetti F. Nutritional issues in the care of the elderly patient. *Crit Rev Oncol Hematol.* 2003;48(2):113-21.
- World Health Organization National Institute on Aging National Institutes of Health U.S. Department of Health and Human Services October 2011.
- Oliver D, Daly F, Martin FC, McMurdo ME. Risk factors and risk assessment tools for falls in hospital in-patients: a systematic review. *Age Ageing.* 2004;33(2):122-30.
- Sattin RW, Lambert Huber DA, DeVito CA, Rodriguez JG, Ros A, Bacchelli S, Stevens JA et al. The incidence of fall injury events among the elderly in a defined population *Am J Epidemiol.* 1990;131(6):1028-37.
- Tinetti ME. Performance-Oriented Assessment of Mobility Problems in Elderly Patients. *J Am Geriatr Soc.* 1986;34(2):119-26.
- Unsworth J. Falls in older people: the role of assessment in prevention and care *Br J Community Nurs.* 2003; 8(6):256-62.
- Pappa E, Kontodimopoulos N, Niakas D. Validating and norming of the greek SF-36 health survey. *Qual Life Res.* 2005;14(5):1433-8.
- Kyriazi Ch, Michalopoulou M, Zisi V, Theodorakis I, Kioumourtzoglou E. Physical activity and quality of life in Greek older adults. Gender effects. A EU workshop focusing on "The State Art of Assessment of Physical Activity in Elderly People "25th – 26th September 2006, Oslo.
- Dominick KL, Ahern FM, Gold CH, Heller DA. Health-related quality of life and health service use among older adults with osteoarthritis. *Arthritis Rheum.* 2004 15;51(3):326-31.
- Peat G, McCarney R, Croft P. Knee pain and osteoarthritis in older adults: a review of community burden and current use of primary health care. *Ann Rheum Dis.* 2001;60(2):91-7.
- Franzén H, Johnsson R, Nilsson LT. Impaired quality of life 10 to 20 years after primary hip arthroplasty. *J Arthroplasty.* 1997;12(1):21-4.
- Jones CA, Voaklander DC, Johnston DW, Suarez-Almazor ME. Health related quality of life outcomes after total hip and knee arthroplasties in a community based population. *J Rheumatol.* 2000;27(7):1745-52.
- Jones CA, Voaklander DC, Suarez-Alma ME. Determinants of function after total knee arthroplasty *Phys Ther.* 2003;83(8):696-706.
- Iakovidis, P., Angelousis, N., Porfyriadou, A., Gourgoulis, V., Malliou, P. / Apotelesmatikotita tis Therapeftikis Askisis stin Isorropia, stin Kinitikotita ke sto Esthima Fovougia Ptsi sta Atoma tis Tritis Ilikias[Efficacy of exercise therapy concerning balance, mobility and fear of falling among seniors]. *Periodiki ekdosi tis Athlitiatrikis Eterias Ellados* 2008 [Periodical publication by the Sports Medicine Association of Greece, 2008]. Volume 3, Issue 1.

- Tsonga Theano, Maria Michalopoulou, Paraskevi Malliou, Georgias Godolias. *Piotita Zois ke Fysiki Drastiriotita meta apo Arthroplastiki Gonatos se Ginekes Tritis Ilikias [Quality of life and Physical Activity after Total Knee Arthroplasty in Elderly Women]*, *Anazitisis stin Fisiki Agog ike ton Athlitisimo*[Inquiries in Sport & Physical Education], 2008, 37-46.
- Randell AG, Nguyen TV, Bhalerao N, Silverman SL, Sambrook PN, Eisman JA. Deterioration in quality of life following hip fracture: a prospective study. *Osteoporos Int.* 2000;11(5):460-6.
- Adachi JD, Loannidis G, Berger C, Joseph L, Papaioannou A, Pickard L, Papadimitropoulos EA et al. The influence of osteoporotic fractures on health-related quality of life in community-dwelling men and women across Canada. *Osteoporos Int.* 2001;12(11):903-8.
- Johnell O, Kanis JA, DeLaet C. Sequential changes in quality of life after osteoporotic fractures. *Osteoporos Int.* 2002;13(1), 70-75.
- Boonen S, Autier P, Barette M, Vanderschueren D, Lips P, Haentjens P. Functional outcome and quality of life following hip fracture in elderly women: a prospective controlled study. *Osteoporos Int.* 2004;15(2):87-94.