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**PHYSIOTHERAPY FOLLOWING BREAST SURGERY FOR
CANCER**

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Abstract

OBJECTIVE: The aim of the study is to observe the effects of active, guided exercises on postoperative complications, shoulder range of motion (ROM) and functionality of the arm and the in women undergoing radical mastectomy or lumpectomy with axillary lymph node dissection for breast cancer. We compared patients who participated at the recovery exercise program to those who didn't attend any exercise program and patients with different associated therapies (hormone, chemo, chemo+radiotherapy). **METHODS:** The study was carried out on 140 patients with breast surgery for cancer, divided in two groups: the study group and the control group. Both groups were divided in three categories: patients with associated hormone therapy, patients with chemotherapy and patients with chemotherapy and radiotherapy. **RESULTS:** The most affected movements after surgery are: flexion and abduction. Also, the most significant changes happen for these two movements after daily participating to the physical therapy program. Postoperative complications are ameliorated and functionality tests for the arm show an improvement. **CONCLUSIONS:** A structured, patient tailored, well designed and early applied exercise program has several benefits on troublesome symptoms, functionality and range of motion of the ipsilateral arm. There are differences between the three categories of patients regarding the followed aspects, although, physiotherapy influences all of those aspects in well.

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Keywords: Physiotherapy; breast cancer; shoulder joint.



1. Introduction

Breast cancer and its treatment have common side effects such as: decreased functional capacity and range of motion (ROM), fatigue, depression, lymphedema, decreased muscle strength tightness, pain, numbness of the arm, fibrous and lymphatic cords, rigidity, decreased tolerance to activities and limitations in daily life (de Oliveira & al. 2014; Beurkens & al. 2007; Torres & al. 2010). These complaints could be due to tissue and nerve damage. Altered body alignment is frequently encountered and it is caused by redistribution of the weight on the spine, the body loses symmetry following unilateral breast resection (Puscas & al. 2013). In general, the arm-related complaints usually decrease within three months (Beurskens & al, 2007). But for many breast cancer survivors, upper-limb dysfunction may persist for many years and affect quality of life. Shoulder exercises commonly are prescribed for patients to prevent or minimize these side effects (Hu & Zhou, 2011).

The major postoperative complication of the treatment of breast cancer is the limitation of the range of motion (ROM) of the shoulder and it is accompanied by impairment and decrease of the upper limb function (Petito & al, 2012). Most affected movements after surgery are: flexion, abduction and external rotation (Hsieh & al. 2008).

Immediate postoperative complications related to surgical wound are: seroma, wound dehiscence, infection and hematoma. These complications occur in about 30 % of cases (Petito & al. 2014).

The treatment of breast cancer includes, beside of surgery, endocrine (hormone) therapy, chemotherapy and/or radiation therapy. All of these treatments have disturbing side effects. Hormone treatment may cause hot flashes, sleep disturbances, loss of bone mineral density (BMD), and muscle and joint pain. In addition to physical symptoms related to treatments, psychological symptoms such as depression and anxiety associated with the diagnosis of a serious illness may be present (Binkley & al. 2012).

Chemotherapy for breast cancer often is associated with alopecia, fatigue, neuropathy, nausea, and muscle and joint pain. Chemotherapy often leads to early onset of menopause in younger women which, in turn, may be associated with other long-term consequences such as BMD loss and weight gain (Binkley & al. 2012).

Radiation therapy can produce skin irritations and a contracture of cicatrices (Listing & al. 2009).

For a complete picture of postoperative motor deficit that requires correction and disturbing symptoms that may occur after surgery or/and anaesthesia, over which it may act by physiotherapy, perioperative evaluation is essential.

The bio-psycho-social benefits of moderate intensity and customized (Hsieh & al. 2008) exercise program for breast cancer patients are well known, including improvement of cardiorespiratory and muscular fitness and quality of life (McNeely & al. 2006; Courneya, 2003; Cheema & Gaul, 2006; Visovsky & al, 2006; Valenti & al, 2008; Garder & al, 2015). Caution is advised only when chemotherapy causes blood count change or other physical symptoms (Adkins, 2009; Courneya & al. 2002). Exercise can boost or reduce the resolution of comorbidities associated symptoms of breast cancer (Adkins, 2009).

Exercise therapy is beneficial during adjuvant therapy, for example, it may help to reduce the frequently appearing fatigue symptoms (Mocket & al. 2001). Recent research indicates that exercise training during and after treatment may prevent and reduce cancer-related fatigue complaints (Travier & al, 2015). Resistance exercise increases bone density (Adkins, 2009). Due to this fact, it is particularly beneficial to patients under chemotherapy-induced menopause, and with an increased risk of osteoporosis. By improving body mass index and muscle mass, reduces the risk of falls and fracture (Adkins, 2009).

Structured exercise programs are helpful in regaining shoulder mobility and functional capacity in the early weeks following surgery without causing adverse side effects (Hu & Zhou, 2011).

Regular physical exercise may lead to a reduction in excessive body mass and mood improvement, lowering anxiety and depression and increasing the threshold of emotional stress. Daily aerobic exercise is associated with positive changes on body composition and quality of life of breast cancer patients. After the implementation of combined training (aerobic and resistance), further improvement of physical, emotional, social and role functioning may be observed (Hojan & al. 2013). High physical activity levels and a healthy body weight is associated with better quality of life after breast cancer (Voskuil & al. 2010; Schwartz & al. 2007; Abrahamson & al. 2006; Holmeset & al. 2005, Pierce & al. 2007).

To decrease the incidence of the reported complications, studies highlight that the performance of exercises immediately after surgery gives positive results, both in the physical and the psychological areas, since it provides conditions for the woman to return to their activities of daily living (ADLs) within a shorter period of time. The majority rehabilitation programs recommends sessions in which women undergoing surgery perform exercise in the physiotherapy or rehabilitation service of the hospital, often two to three times a week, complemented at home, with the help of manuals and/or educative videos. Few studies, however, report on exercise performed exclusively in the domicile (Petito & al. 2012; Kilgour & al. 2008; Amaral & al. 2005).

In common, all the programs present a preoperative evaluation and a gradual progression in the exercises, starting early, from the first postoperative day (Cinar & al. 2008, Kilgour & al. 2008; Springer & al, 2010; Pinto & al. 2004). Only one study recommends the initiation of the exercise program after removal of the drain (Amaral & al, 2005), and another later, after the 6th or 26th postoperative week (Lauridsen & al. 2005).

The established program will try to fulfil the patient's needs and will be systematically reviewed to be adapted for the changes that occur. It is recommended that the recovery program to contain aerobic type exercises, moderate, 3-5 days per week for 20-60 minutes (Courneya & al. 2002). Dosage of the exercise program will be customized for each patient, considering their age, activity level before diagnosis and medication therapy for associated diseases. The application of physiotherapy during the first postoperative week is important also in order to show the patients that they are allowed to use the shoulder (Lauridsen & al. 2005).

Another benefit of the exercise program is the improvement of the lymphatic system functioning (Thakur & al, 2016). The literature suggests that active exercise stimulates musculoskeletal contractions, which may be considered a major pumping mechanism for lymphatic and venous drainage (Bicego & al,

2006). Also, active exercise plays a key role in developing new pathways for lymphatics (Lane & al. 2005) and promoting lymphangiogenesis (de Oliveira & al. 2014).

No evidence exists of adverse effects on incidence of seroma formation, pain, lymphedema and delayed wound healing. Early exercise may cause more wound drainage, so patients must be informed of that drains should be kept in place longer. (Hu & Zhou, 2011).

The application of additional physiotherapy during radiotherapy or shortly after, encourage the patients to use the shoulder in full scale. The extension of the scar tissue and the muscles reduces the firm attachment of the skin to the underlying tissue and reduces the shortening of the muscles. Hence, the shoulder mobility is improved (Lauridsen & al. 2005).

Massage therapy is also part of the recovery program. Massage treatment significantly reduced some of the disturbing symptoms, especially from the breast level. The reduction in breast symptoms might be explained by reduced myofascial trigger point sensitivity, an increase in blood and lymph flow, or an influence on the autonomic nervous system. If in the massage therapy the pressure on the affected area and contraindications such as acute thrombosis, inflamed skin in the area of therapy were excluded, this treatment is considered to be safe and side effects for example hematomas are rare (Listing & al. 2009).

2. Problem statement

Treatment procedures for breast cancer has several side effects, which untreated, exacerbate.

3. Research questions

How can a structured, patient-tailored regular exercise program reduce the treatment's side effects, during the patient's hospitalization?

4. Purpose of the study

Studying the effects of an exercise program in women who performed surgery for breast cancer permits us to develop recovery program protocols.

5. Research Methods (Material and Methods)

This study was carried out on 140 patients with breast cancer following modified radical mastectomy in the Surgery Unit of the Institute of Oncology from Cluj-Napoca between November 2010 and March 2012.

Selection criteria were: modified radical mastectomy, age between 40-65, normal BMI and ultrasound to exclude recurrence.

Exclusion criteria were: cancer recurrence, untreated/unsolved infection, untreated congestive heart failure, kidney failure, deep vein thrombosis of the arm or difficulties in understanding the physiotherapist's indications/ psychiatric disorders.

We grouped the patients, by their expressed option in two: an interventional group, consisting of 70 patients and the control group, also consisting of 70 patients.

The study group includes:

Lot I: 33 patients with endocrine therapy,

Lot II: 25 patients with chemotherapy before breast surgery,

Lot III: 12 patients who had undergone both chemo and radiation therapy before breast surgery.

The witness group includes:

Control I: 32 patients with endocrine therapy,

Control II: 25 patients with chemotherapy

Control III: 13 patients with chemo and radiation therapy.

Indicators:

The range of motion of the shoulder was measured before and every day after surgery with a *Baseline steal* goniometer. The values obtained at the flexion, extension, abduction, adduction and internal and external rotation were noted.

The patients were asked to take a global functional test, consisting in four items: hand to the cervico-dorsal region; hand to the subscapular region; a tray in the hands and a cup to the mouth.

Besides the reassessment of the mentioned indicators, we inventoried the following symptoms:

Pain (where 1 means not at all, and 5 means unbearable pain without painkillers) – by patient's response,

Tingling (1= not at all, 2 presence) - by patient's response,

Paraesthesia (1= not at all, 2= presence) - by patient's response,

Edema (1= not at all, 2= presence) - by measuring with a metric tape,

Vasomotor disturbances (1= not at all, 2= presence) – by measuring the temperature of both hands, with a thermometer, expressed in °Celsius.

Moments of evaluation: the study group was evaluated before surgery and every day after surgery, before the exercise program; the control group was evaluated before surgery and the 5-th day after surgery, at discharge.

The recovery program, consisting of exercises and massage therapy was initiated first day after surgery, after the surgeons evaluated the patients and gave their approval for starting the recovery sessions. All of the patients were evaluated by a physiotherapist before every session.

The day of the surgery, after 4-6 hours after orotracheal detubation, we started the physiotherapy program with respiratory facilitating postures. To the postures we associated thoracic percussions and vibrant massage. As physical exercises, we initialized the respiratory reeducation, for the thoraco-abdominal respiration and for the body alignment. Relaxation and isometric contraction of the muscles are used, especially for the upper body, followed by passive, passive-active and active movements.

Active stretching was introduced from day 3 after surgery. Active movements with light resistance were introduced after four days from surgery.

Every day patients attend a supervised class in the morning and a self-administrated exercise program in the evening, following the written indications received by the physiotherapist.

The exercise program was individualized to each patient. Preferences were inventoried during the first exercise session. Also the fitness level was assessed by means of a cardiopulmonary exercise test and 1-repetition maximum muscle strength tests. (Travier & al. 2015). Muscle strength training was

performed for all major muscle groups: arms, legs, shoulder, and trunk. The training started with 1×6 repetitions and gradually increased to 1×10 repetitions and the goal was to reach 2×10 repetitions by the end of the program. Also, patients perform the exercises from the *Exercise schemes in postoperative breast cancer* described by Rezende & al (2006).

Light pressure effleurage massage of the neck, head, arms and back was gave by the physiotherapist the second and the fourth day after surgery.

Every exercise was stopped at first sign of discomfort, pain, dizziness, weakness or nausea.

The control group was encouraged to move their arm, but no specific guidance was offered.

The patients were observed for five days after the surgery, during their hospitalization.

5.1 Ethical standards

We mention that the patients gave their informed consent in writing for the study and that we obtained the approval of the Medical Ethics Committee of this institution.

5.2 Statistical analysis

Statistical analysis was performed using Statistica 8.0 for Windows (Stat-Soft, Inc., USA). Box-and-whisker plots, t-test and non-parametric tests (Wilcoxon matched pairs test, sign test, 2x2 table evaluation) were used to examine the strength of association between results. The experimental data were evaluated using one-way analysis of variance (ANOVA), with $p < 0.05$ as threshold for statistical significance. The statistical results confirm the hypothesis that the differences between the results are either not significant ($p > 0.05$), significant ($0.001 < p < 0.05$) or highly significant ($p < 0.001$). The mean value was used for the plots and the box and whiskers are the standard error of the mean and standard deviation, respectively.

6. Findings (Results)

The most affected movements after surgery are: abduction and flexion. The most commonly reported symptoms include: pain, swelling, paraesthesia and vasomotor disturbances.

a). Abduction

After statistical analysis, a statistically significant difference is observable between the patients who had hormone therapy from the interventional and control group. This indicates a positive influence of exercise program on the recovery of the shoulder's range of motion.

A highly statistical significance is observed between patients with chemotherapy between the interventional and the control group. Physical therapy determines the recovery of abduction and improves the side effects of chemotherapy.

There is a highly statistical significance between the group with chemo and radiotherapy and interventional control group with the same treatment.

It can't be observed a statistically significant difference in the fifth postoperative day (at discharge) between interventional groups; the percentage recovery of the abduction is very similar between patients with hormone therapy, chemotherapy and radio-chemotherapy (Fig. 1).

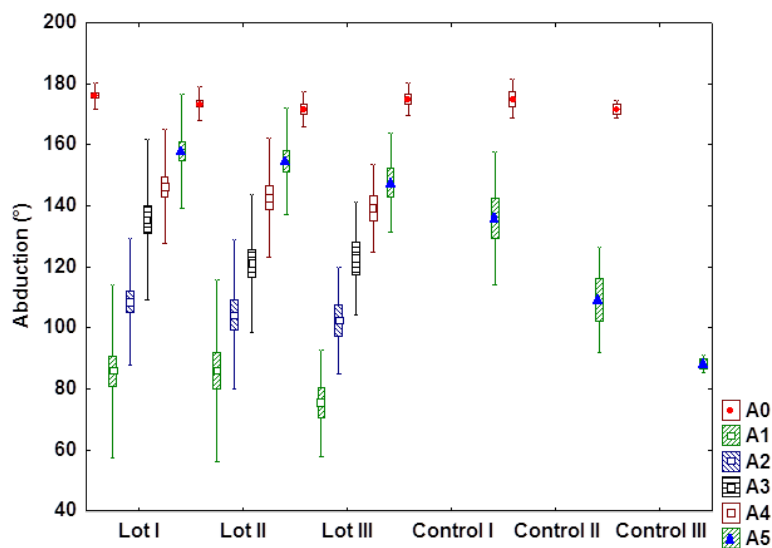


Fig.1. Abduction

b). Flexion

There is a statistically highly significant difference between interventional and control groups in patients with hormone therapy and chemotherapy, and a highly significant difference between patients with radiation and chemotherapy from the interventional and control group, meaning that patients who have undergone rehabilitation program presents a much wider range of motion relative to patients who have not been directed to exercise.

There is a highly significant statistical difference in patients from the interventional groups, between those who have only hormone therapy and those with radiation-chemotherapy. This is explained by adverse effects of radiation and chemotherapy, which restrict the range of motion and affects negatively the recovery rate (Fig. 2).

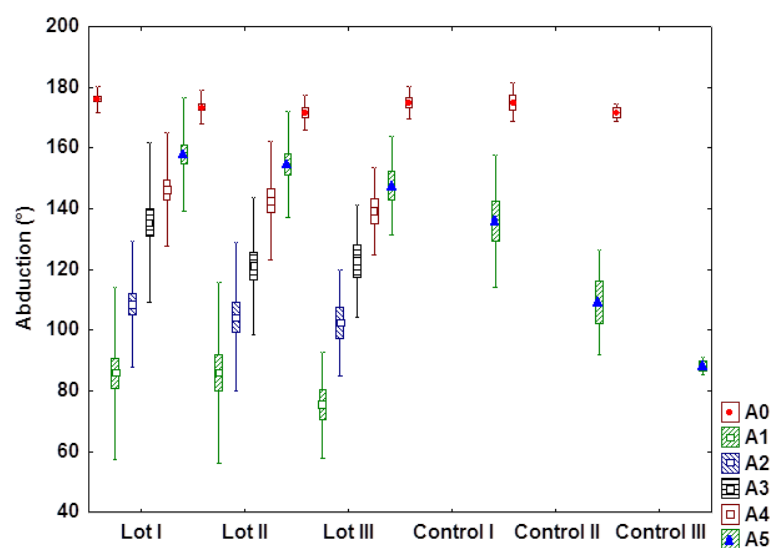


Fig.2. Flexion

c). Extension

The extension is less affected movement after surgery. However, it can be observed a statistically significant difference between interventional and control groups. There are also differences between groups by treatment. Recovery is linear and positive. (Fig 3).

d). Internal rotation

There is a difference between interventional and control group with hormone therapy, but there are no differences between groups in patients with chemo and radiation+chemotherapy. It can be observed differences between patients with different treatments. Most patients with hormone therapy recover entirely the internal rotation while patients with radiation and chemotherapy patients recover the least. (Fig 4).

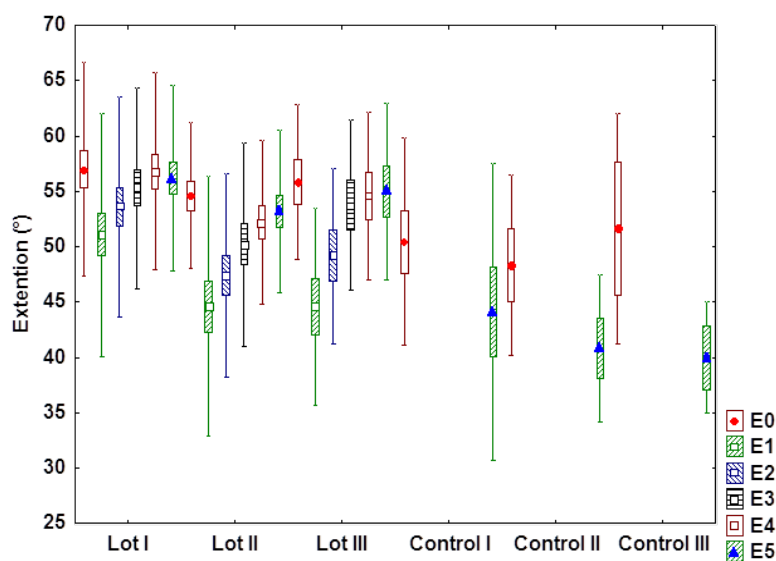


Fig. 3. Extension

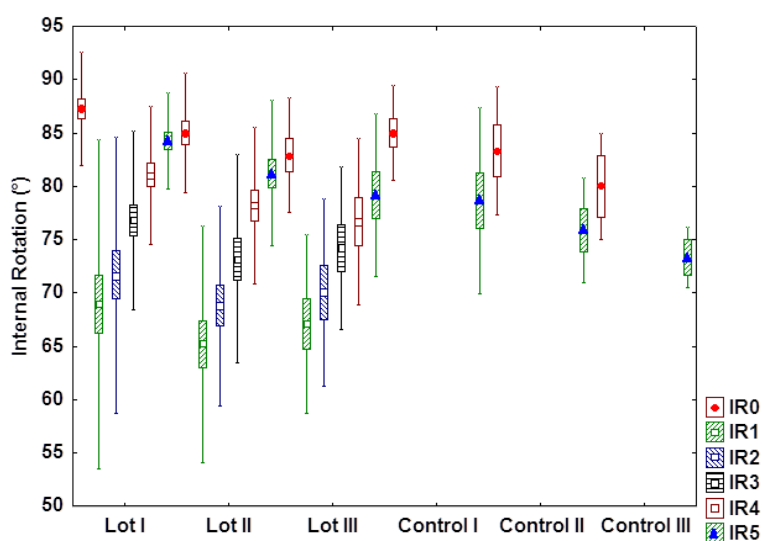


Fig. 4. Internal rotation

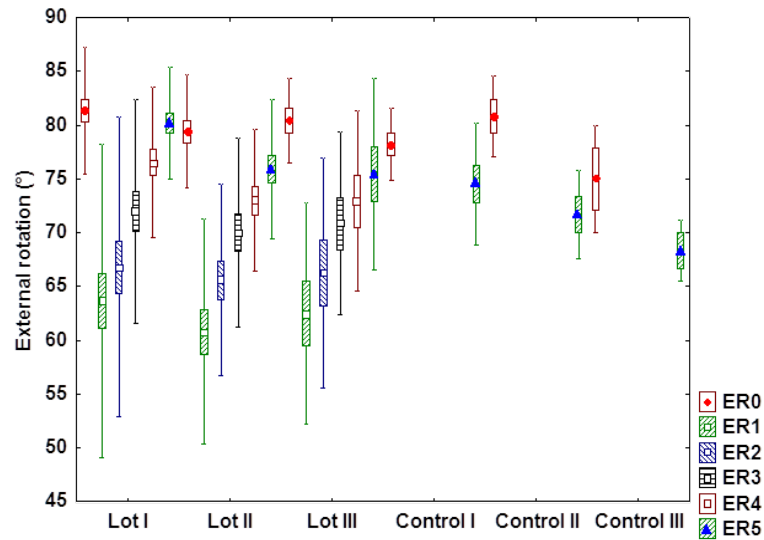


Fig.5. External rotation

e). Pain index

Regarding pain, patients presents an exponential recovery. On the first day almost all patients are affected, but on the fifth day the pain is much improved and is no longer reported, particularly in patients who undergo hormone therapy only. (Fig. 6)

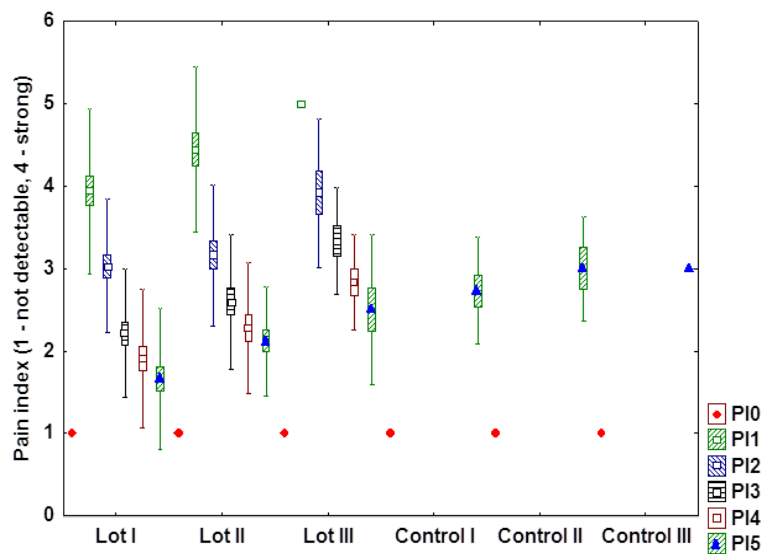


Fig. 6. Pain index

f). Edema

Among patients with chemotherapy, in the first postoperative day, is observed most cases of swelling in the arm from the operated side. On the fifth day, the patients in the interventional group with hormone therapy and chemotherapy presents a complete recovery, while in patients with radiation and chemotherapy, edema persists. It is assumed that radiation therapy is one that predispose to lymphedema.

g). Paresthesia and vaso-motor disorders

There is a highly- highly statistical significance between the interventional and control group. Physical therapy significantly improves symptoms. Exercise and massage have a significant beneficial effect on these symptoms. As regards the vaso-motor disorders in the first postoperative day, the group with hormone therapy is less affected than the group with chemotherapy and the group with radiation and chemotherapy. The recovery is exponential.

h). "The hand on the nap"

All patients have problems in the first day after surgery at this functional test. Recovery presents a positive trend, linear, with differences between interventional and control groups. There is no difference between patients depending on the followed treatment.

i). Hand to subscapular region

In the first postoperative day there are major differences between patients based on the followed treatments. Patients with radiation and chemotherapy patients are most affected, but at discharge, the results are comparable. Statistically significant differences between the intervention and the control groups can be observed.

7. Conclusions

The most affected movements after surgery are: abduction and flexion. The most commonly reported symptoms include: pain, swelling, paraesthesia and vasomotor disturbances.

Regarding the recovery of the abduction, there is a great difference between the patients in the interventional and the control groups and very small difference between interventional groups. On the fifth day after surgery, there isn't any significant difference between patients depending on the followed treatment.

There are differences in paraesthesia and vasomotor disturbances between interventional and the control groups. Recovery is exponential; physical therapy has a positive influence on improving these symptoms.

Regarding functional test "hand on the nape", all patients were experiencing problems on the first day after surgery at this functional test. Recovery has a positive trend, linear, with differences between interventional and control groups. There is no difference between patients depending on the followed treatment.

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