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31

Evidence-Based Usefulness of Physiotherapy Techniques in Breast Cancer Patients

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1. Introduction

Breast cancer is one of the most frequent causes of death among women, with high incidence in both developed and developing countries. When it is diagnosed at an advanced stage, including cases of metastatic lymph node invasion, the treatment becomes more aggressive and expensive (Johansson et al., 2002; Parkin & Fernandez, 2006), with the implication that the post-treatment complication rate will be greater (Kwan et al., 2002; Szuba et al., 2003; Goffman et al., 2004; King & Difalco, 2005).

The complications may be short or long-term, and the commonest of them include hemorrhage, infection, seroma, axillary web syndrome (AWS), chronic pain, paresthesia, reduction of the range of motion, muscle weakness in the shoulder homolateral to the surgery and lymphedema (Fig. 1). Of these, lymphedema is the most important morbid condition (Lee et al., 2008; Paskett, 2008; Fourie & Robb, 2009; Stanton et al., 2009).

Aggressive surgery, such as radical axillary dissection, may interrupt the main lymphatic drainage route in the arms, and this is the most important factor in edema formation (Bourgeois et al., 1998). Associated complementary radiotherapy induces fibrosis in lymphatic vessels in 20 to 30% of the cases, thus worsening the lymphatic flow (Paci et al., 1996; Bumpers et al., 2002; Carpentier, 2002; Kwan et al., 2002; Van Der Veen et al., 2004; Moseley et al., 2007).

This modification to the lymphatic flow induces alteration of the homeostatic equilibrium of absorption and transportation of interstitial fluid, which triggers lymphedema. This is a progressive condition characterized by four pathological factors: excess protein in tissues, edema, chronic inflammation and fibrosis. When the arm remains untreated, its volume progressively increases, as does the frequency of complications relating to this condition (Weissleder & Weissleder, 1988; Carpentier, 2002; Didem et al., 2005; King, 2006).

It is difficult to diagnose lymphedema, especially in its initial stages. Without a proper diagnosis, it always takes time to institute therapy. When the treatment is immediate, the improvement occurs quickly and progression of the condition is prevented (Szuba et al., 2003; Linnitt, 2007).



Fig. 1. Lymphedema following axillary dissection.

The pathogenesis of post-mastectomy lymphedema associated with axillary dissection is mainly attributed to greater numbers of dissected lymph nodes (Filippetti et al., 1994; Glass et al., 1999). The more extensive the axillary dissection is, the greater the risk of complications will be (Glass et al., 1999).

The desire to prevent lymphedema has led to intraoperative techniques that take a more conservative approach to the axillary chain, such as investigating the sentinel lymph node. Through this, selective, safe and less mutilating resection has become possible, with satisfactory results. Nevertheless, this is limited to patients without evidence of lymph node macrometastases (Clodius et al., 1981; Bourgeois et al., 1998; Bumpers et al., 2002; Goffman et al., 2004; Rietman et al., 2004; Ronka et al., 2004; Sakorafas et al., 2006).

When lymphedema becomes established, it is incurable. However, it can be avoided, treated and controlled with daily preventive measures (Linnitt, 2007). Studies have demonstrated that surgical and drug treatments are unsuccessful (Roucout & Oliveira, 1999; Didem et al., 2005). The aim of physical rehabilitation is to prevent and minimize the sequelae caused by oncological treatment or by the disease itself, and to improve patients' quality of life, in both its physical and its psychological aspects.

2. Physiotherapeutic approaches

Physiotherapeutic approaches for lymphedema can be divided into two parts: prophylactic and therapeutic approaches, with the aim of preventing sequelae and improving the patient's physical condition to face up to the treatment (Bergmann et al., 2006).

2.1 Prophylactic physiotherapeutic approaches

It should be started preoperatively or in the immediate postoperative period, with the aim of preventing sequelae and improving the patient's physical condition to face up to the treatment (Bergmann et al., 2006).

The focus of this evaluation aimed to identify risk factors for developing complications and morbid conditions relating to the axillary approach and to implementation of strategies for minimizing preexisting symptoms, with the aim of achieving better postoperative functional recovery (Paskett, 2008; Springer et al., 2010).

2.1.1 Preoperative physiotherapy

Limitations on shoulder range of motion, pain and diminished muscle strength are the main focuses of the assessment, since these may lead to morbid conditions that relate directly to axillary manipulation.

In the presence of limitations on shoulder range of motion and/or loss of muscle strength, passive exercises, assisted active exercises, active exercises of the scapular belt and neck relaxation exercises are indicated (Lauridsen et al., 2005; Rezende et al., 2006; Springer et al., 2010). For patients with locoregional pain, transcutaneous electrical nerve stimulation (TENS) can be applied.

Improvement of respiratory capacity through the use of apparatus to incentivize the respiratory flow or volume (incentive spirometry) is also indicated for diminishing general morbid conditions, when present (Bergmann et al., 2006).

Although preventive interventions have shown good results, the numbers of patients referred for preoperative assessments and preventive care are still very small.

2.1.2 Immediate postoperative intervention

The second step of preventive intervention starts immediately after the surgical procedure, on the first day after the operation, with guidance about positioning in bed (with the operated arm above the head), functional exercises on the limb homolateral to the surgery as shown in Fig. 2, and respiratory physiotherapy if necessary.

Guidance regarding care for the limb that underwent manipulation, with prevention of trauma and lesions that might trigger inflammation and infection in the arm homolateral to the axillary dissection, avoidance of using clothes that restrict the superficial lymphatic circulation, skin hydration and provision of kinesiotherapy limited to 90° of range of shoulder movement are administered to patients who undergo radial axillary dissection and sentinel lymph node biopsy, before hospital discharge (Roucout & Oliveira, 1999; Andersen et al., 2000; Camargo & Marx, 2000; Huit, 2000; Bergmann et al., 2006).

Additional guidance regarding early lymphatic self-massage should also be provided for patients after axillary dissection (Sarri et al., 2010).

2.2 Postoperative follow-up

A new physiotherapeutic reassessment is undertaken immediately after removal of the patient's surgical stitches and suction drain, focusing on reorientation regarding preventive measures against lymphedema and assessment of the need for early physiotherapeutic intervention, before the start of radiotherapy.

Physiotherapeutic treatment concomitant to radiotherapy is very important, because it minimizes the side effects, such as subcutaneous fibrosis, limitations on shoulder range of motion, muscle weakness and pains (Lee et al., 2008).

In outpatient rehabilitation, in addition to individualized attendance, it is also undertaken in collective groups. This has the benefit of promoting interaction among the patients, with exchanges of experiences, thus making the session more agreeable and providing encouragement towards doing the exercises (Fig. 3). Patients should be advised to continue with the treatment at home.



Fig. 2. Postoperative functional exercises.

In the following, we will describe the main physiotherapeutic interventions relating to specific symptoms of complications following surgical manipulation of the axillae.



Fig. 3. Group of mastectomized patients.

3. Lymphedema

Early diagnosis and intervention, such as skincare (Kwan et al., 2002; Williams et al., 2002), kinesiotherapy and self-massage (Glass et al., 1999; Williams et al., 2002; Rietman et al., 2004), may significantly reduce the incidence of complications (Williams et al., 2002). The search for better quality of life has indicated that prevention of lymphedema is the best strategy among this group of patients. Prior knowledge of the normal lymphatic circulation and the changes that it undergoes in the presence of obstruction directs the techniques for physiotherapeutic stimulation. Several lymphatic drainage techniques are used to stimulate the lymphatic flow and treat lymphedema, such as the techniques proposed by Vodder, Leduc and Földi. Recently, we studied 22 women with breast carcinoma who underwent surgical treatment and axillary lymph node dissection. We performed early homolateral inguinal and contralateral axillary lymph node stimulation for up to 60 days after the operation, thereby simulating self-massage according to the Földi technique, and used lymphoscintigraphy to identify the immediate improvement in lymphatic flow following the stimulation (Sarri et al., 2010).

The main objective of manual lymphatic drainage is to increase lymphokinetic activity in healthy areas, before stimulating the edematous areas. There are several physiological effects, which include increased contraction of the lymphatic vessels and increased protein reabsorption, thereby reducing the microlymphatic hypertension, increasing the collateral lymphatic drainage among the lymphatic areas of the skin and improving the drainage capacity in order to direct the lymph away from the edematous area and towards lymph nodes in areas that are unaffected by lymphedema (Fritsch & Tomson, 1991; Araujo et al., 1997; Andersen et al., 2000; Huit, 2000; Williams et al., 2002; Moseley et al., 2007). As a strategy for stimulating the lymphatic circulation in cases of obstruction of the normal lymphatic flow, the collateral routes and anastomoses of the lymphatic capillaries should be taken to be the peripheral circulation. These routes deviate the lymph flow in a direction contrary to the usual flow, through the lateral cephalic lymphatic bundle and continuing over the deltoid muscle, thereby bypassing the axillary lymph node chain and draining the lymph directly to the supra and infraclavicular lymph nodes (Stanton et al., 2009; Sarri et al., 2010). Within this context, physiotherapy to treat lymphedema that has already become established and to prevent this and other comorbidities is of paramount importance for diminishing the surgical sequelae from breast cancer treatment.

3.1 Manual lymphatic drainage

The treatment for lymphedema that has already become established is based on techniques that are well accepted and described in the worldwide literature. In Brazil, treatment also known as lymph therapy or complex physical treatment is the type most used. Complete decongestive physiotherapy (CDP) is composed of four approaches: manual lymphatic drainage (MLD), compressive bandaging, skincare and lymph myokinetic exercises (Bergmann et al., 2006; Leal et al., 2009).

Lymph therapy is carried out in two phases. The first has therapeutic aims and the second consists of maintenance. The therapeutic phase aims to mobilize the accumulated protein-rich fluid and reduce the fibrosclerotic tissue, using MLD and compressive bandaging (Foldi, 1998; Camargo & Marx, 2000; Leal et al., 2009). MLD can be carried out in regions with or without edema, depending on the aim at the time of treatment. It is done in two stages: evacuation and uptake.

The evacuation maneuvers begin with a series of gentle circular movements with the therapist's palms in contact with the patient's skin. Firstly, the contralateral axillary lymph node chain is stimulated and then the inguinal region homolateral to the surgical manipulation. After these areas have been stimulated, wavelike movements are made across the anterior region of the chest, towards areas adjacent to the axilla that underwent the operation, thus stimulating first the contralateral quadrant until reaching the ipsilateral quadrant, and then making the same movement going from the ipsilateral inguinal region to the axilla, as shown in Fig. 4. These movements can be carried out both in the anterior and in the posterior region of the trunk.

After finishing the evacuation phase, the uptake process is started. This is always performed from proximal to distal regions, with wavelike maneuvers in the upper arm region and then the forearm and hand, until reaching the fingers (Fig. 5) (Foldi et al., 1985; Camargo & Marx, 2000; Williams et al., 2002; Linnitt, 2005).

The direction of lymphatic drainage should respect the anatomy of the lymphatic system, and it is very important to take into consideration the deviation in the region of the deltoid muscle (Stanton et al., 2009; Sarri et al., 2010).

After completing the manual lymphatic drainage, the arms should be hydrated using neutral cream so that compressive bandaging can be started.

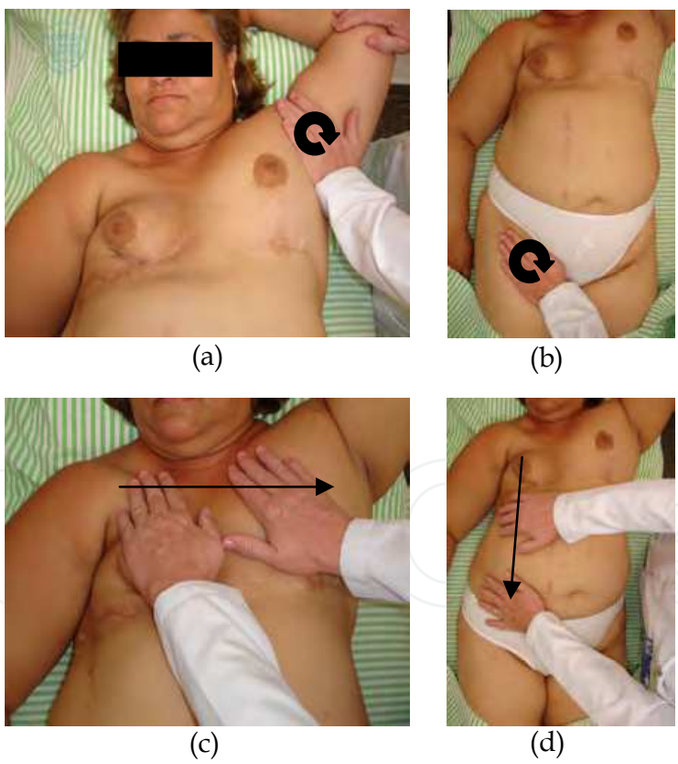


Fig. 4. Evacuation maneuvers on a patient who underwent radical right-side lymphadenectomy: a) axillary limph node chain stimulation; b) inguinal lymph node chain stimulation; c) wavelike maneuver directing the lymphatic flow towards the contralateral axillary region; d) wavelike maneuver directing the lymphatic flow towards the ipsilateral inguinal region.

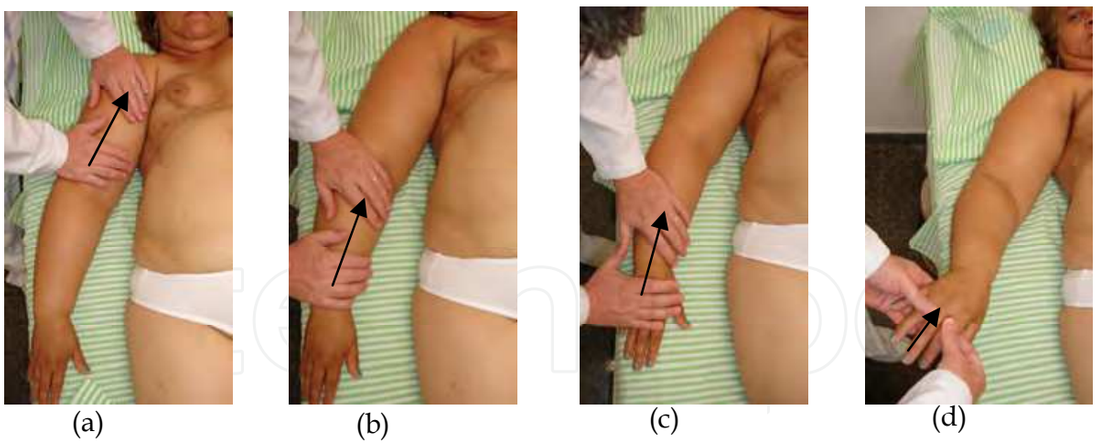


Fig. 5. Uptake maneuver on a patient who underwent radical right-side lymphadenectomy: wavelike maneuvers directing the lymphatic flow from the proximal to the distal region: a) upper-arm region; b) forearm region; c) hand region; d) finger region.

3.2 Compressive bandaging

One of the consequences of lymphedema is that the elastic fibers are destroyed. Evacuation of the lymphatic fluid by means of manual lymphatic drainage diminishes the pressure on the tissue and increases the effective ultrafiltration pressure. Elastic bandages increase the tissue pressure and counterbalance the elastic insufficiency, thereby avoiding recurrence of lymphatic fluid accumulation in the interstices (Foldi et al., 1985).

Compressive bandaging is an important technique, because it boosts the effects achieved through the preceding lymph drainage. It should always be functional, thereby enabling all day-to-day movements and guided kinesiotherapy (Fig. 6).



Fig. 6. Functional compressive bandaging, such that the patient was able to make movements.

After hydration, the skin and bone prominences should be protected using cotton gauze and foam, with the aim of filling in any anatomical spaces. The compressive bandaging is done using low-elasticity bandage rolls. It is started on the fingers and then the forearm and the upper arm. The pressure exerted by the bandaging is greater in the distal region and diminishes towards the root of the limb (Fig. 7). It is also important to respect the trophic conditions of the skin. The compressive bandaging is kept in place until the next physiotherapy session, i.e. for two days.



Fig. 7. Functional compressive bandaging: a) hydration; b) placement of cotton gauze; c) protection with cotton gauze; e) bandaging, starting with the fingers; f) bandaging on forearm; g) bandaging on upper arm.

The second phase, called the maintenance phase, has the aims of keeping the interstitial pressures in balance and optimizing the results obtained from the first phase of the treatment. It consists of using compression garments, skincare, hydration, kinesiotherapy and manual self-massage (Foldi et al., 1985; Camargo & Marx, 2000; Bergmann et al.; Leal et al., 2009; Sarri et al., 2010).

3.3 Compression garments

The aim of using compression garments is to maintain and optimize the results obtained from the first phase of lymphedema treatment and avoid recurrences, through keeping the interstitial pressures in balance. They should be used continuously and only be removed for personal hygiene. The model of garment and the compression used depend on the patient's needs (Fig. 8). Concomitantly with using the compression garments, the patient should also comply with the guidance previously given regarding limb care, hydration and kinesiotherapy. (Foldi et al., 1985; Roucout & Oliveira, 1999; Andersen et al., 2000; Camargo & Marx, 2000; Huit, 2000; Hampton, 2003). In our institution, we use compression garments in conjunction with self-massage and kinesiotherapy in cases of initial lymphedema, with significant improvements achieved.

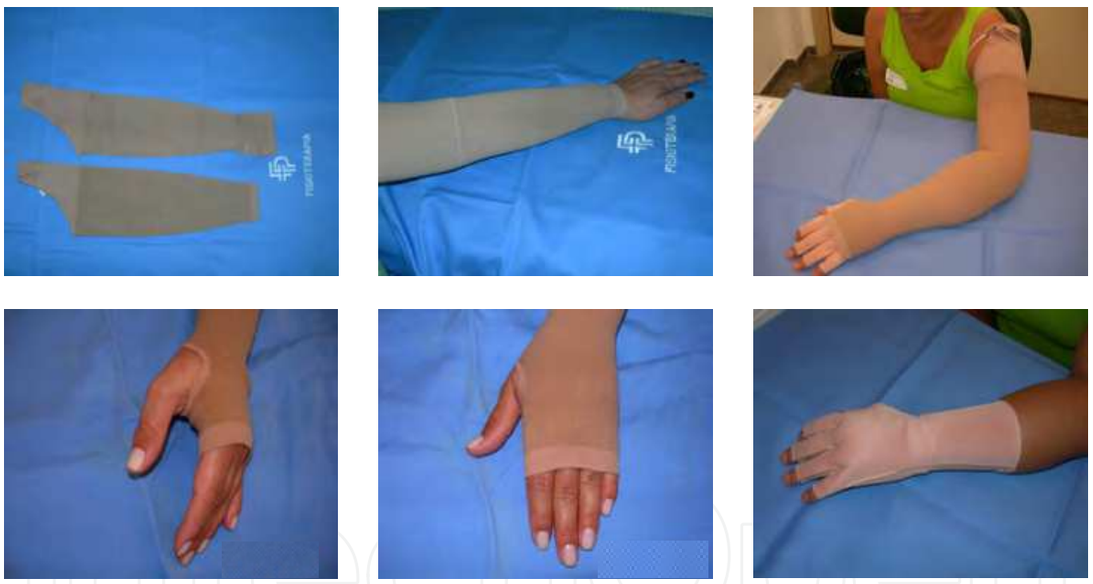


Fig. 8. Garments and gloves for elastic containment.

3.4 Lymphatic self-massage

Lymphatic self-massage, also known as simple manual lymphatic drainage, is a version of manual lymphatic drainage. The technique for this procedure is taught to the patient, who can then perform this alone, at home every day. It involves a series of gentle circular movements that begin with stimulation of the contralateral axillary lymph node chains and the inguinal chains homolateral to the surgical manipulation, followed by gentle movements starting at a place distant from the congested area and moving towards the edematous limb (Foldi et al., 1985; Camargo & Marx, 2000; Williams et al., 2002; Linnitt, 2005).

The patient should begin the self-massage with circular movements in the contralateral axillary region, with the palms in the axilla, lightly and gently moving the skin 30 times, and

then repeating this in the inguinal region homolateral to the axillary dissection. After the axillary and inguinal lymph node chains have been stimulated, hand movements are made with the aim of shifting the lymph from the operated axilla to the contralateral axilla, in the region above the surgery. The same movement is then made to shift the lymph from the manipulated axilla to the homolateral inguinal region. The movement in each region is repeated 30 times (Fig. 9).

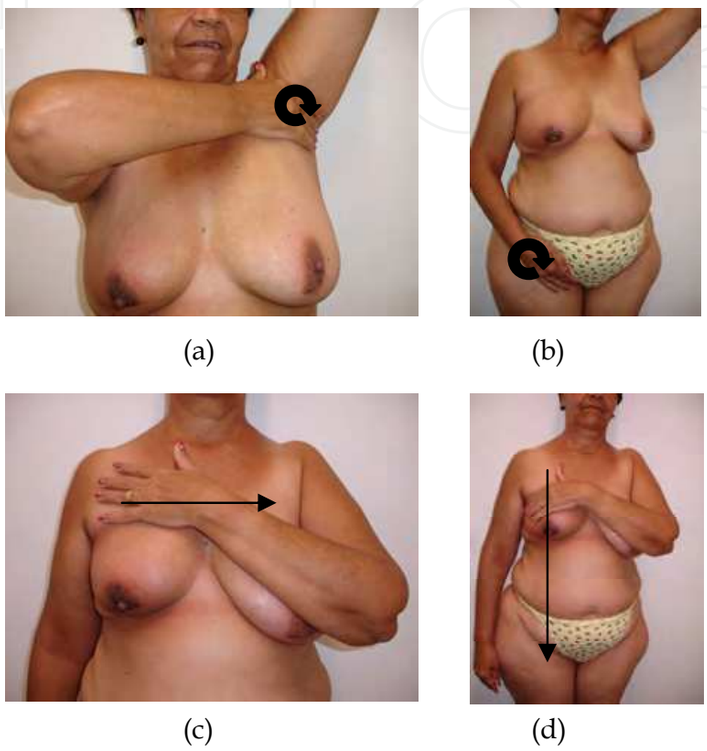


Fig. 9. Lymphatic self-massage on patient who underwent right axillary dissection:
a) axillary lymph node chain stimulation; b) inguinal lymph node chain stimulation;
c) wavelike maneuver directing the lymphatic flow towards the contralateral axillary region;
d) wavelike maneuver directing the lymphatic flow towards the ipsilateral inguinal region.

3.5 Pneumatic compression

This consists of mechanical compression with air pumps, on the edematous limb. There are basically two types of compression pumps: the segmental or sequential type and the dynamic type. Individual use of pneumatic compression has not shown satisfactory results, and high incidence of complications has been found. Several studies have combined its use with other types of treatment for lymphedema, such as the use of lymph therapy (Dini et al., 1998; Leduc et al., 1998; Camargo & Marx, 2000; Szuba et al., 2002; Leal et al., 2009).

4. Axillary web syndrome

Axillary web syndrome, also known as cording (Box et al., 2002), axillary strings (Lauridsen et al., 2005), or vascular strings (Johansson et al., 2001), is a sequela of breast cancer

treatment (Fourie & Robb, 2009). It is developed between the first and fifth week after axillary dissection, as tense and painful strings under the skin of the axilla. It may extend as far as the cubital fossa or the medial face of the upper arm (Tilley et al., 2009). It is always associated with pain and limitation of shoulder and elbow movement (Lauridsen et al., 2005). Its incidence and predisposing factors are not well defined in the worldwide literature (Moskovitz et al., 2001). It is believed that interruption of the axillar lymphatic vessels has an important role in the development of this syndrome. Lymphovenous lesions with stasis, thrombophlebitis, aseptic lymphangitis and lesions in the lymphatic ducts also seem to be involved (Johansson et al., 2001; Moskovitz et al., 2001; Lauridsen et al., 2005). The literature is deficient with regard to the approach to be taken in cases of AWS. Some papers have shown that this syndrome resolves within three months, without specific treatment (Moskovitz et al., 2001; Leidenius et al., 2003). Other studies have shown benefits from implementing active range-of-motion exercises, stretching exercises and manual manipulation techniques (Moskovitz et al., 2001; Leidenius et al., 2003; Fourie & Robb, 2009; Tilley et al., 2009).

In our service, we have used string stretching with very favorable results. The maneuver consists of stretching the string with the thumbs, while applying pressure from central to distal regions, as shown in Fig. 10. This maneuver triggers tolerable local pain that is relieved as soon as the maneuver ends, thereby enabling movements that had previously been limited (Fig. 11). We have also used active and passive kinesiotherapy on the limb and light stretching.

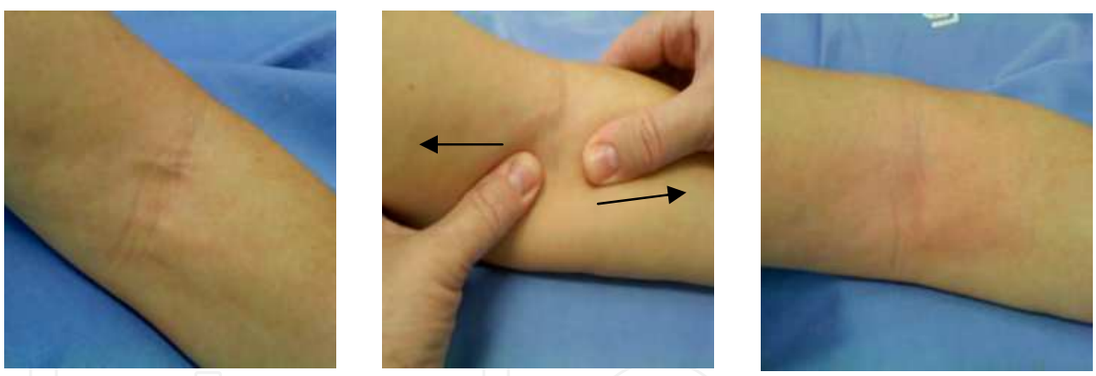


Fig. 10. Axillary Web Syndrome maneuver: a) string in anterior region of elbow; b) axillary web syndrome maneuver; c) anterior region of forearm after maneuver, without string.



(a) (b) (c) (d)

Fig. 11. Axillary Web Syndrome: a) axillary region before the maneuver; b) axillary region after the maneuver; c) anterior region of the elbow before the maneuver; d) anterior region of the elbow after the maneuver.

5. Limitation of shoulder movement

Restriction of shoulder movement, which is one of the complications following axillary lymph node dissection, may occur because of tissue and nerve lesions, with prevalence of 7-36%. This musculoskeletal disorder of the shoulder results in considerable joint debility and pain. The symptoms generally diminish within three months, but they may become chronic, thus interfering with these patients' quality of life (Kärki et al., 2001; Beurskens et al., 2007). Early physiotherapeutic treatment is effective for this disorder and promotes faster functional recovery (Kärki et al., 2001; Lauridsen et al., 2005; Beurskens et al., 2007). The treatment should be progressive, taking care in manipulating the limb so as to avoid tissue or muscle injuries. Passive exercises, assisted active exercises, active exercises of the scapular belt, neck relaxation and postural guidance should be undertaken.

6. Painful post-mastectomy syndrome

Chronic pain secondary to surgical treatment for breast cancer is of neuropathic origin or results from muscle and ligament injuries. Intercostal brachial neuralgia has been correlated most frequently in axillary treatments, in which the nerve may become injured because of its proximity (Poleshuck et al., 2006; Labreze et al., 2007; Couceiro et al., 2009). Such pain may be continuous or intermittent, with varying intensity, and it can be located in the anterior wall of the chest, the axilla or the medial face of the upper arm (Vecht et al., 1989; Caffo et al., 2003; Burckhardt & Jones, 2005). The physiotherapeutic treatment consists of specific analgesia techniques, such as transcutaneous electrical nerve stimulation (TENS), cryotherapy and kinesiotherapy. It can also be implemented in association with the use of analgesic medications.

7. Conclusion

In conclusion, physiotherapeutic interventions on patients who have undergone axillary lymph node manipulation can be implemented at any postoperative stage. However, it is increasingly certain that early intervention significantly minimizes the emergence of lymphedema.

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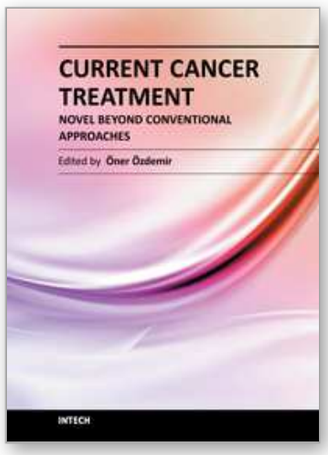
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Currently there have been many armamentaria to be used in cancer treatment. This indeed indicates that the final treatment has not yet been found. It seems this will take a long period of time to achieve. Thus, cancer treatment in general still seems to need new and more effective approaches. The book "Current Cancer Treatment - Novel Beyond Conventional Approaches", consisting of 33 chapters, will help get us physicians as well as patients enlightened with new research and developments in this area. This book is a valuable contribution to this area mentioning various modalities in cancer treatment such as some rare classic treatment approaches: treatment of metastatic liver disease of colorectal origin, radiation treatment of skull and spine chordoma, changing the face of adjuvant therapy for early breast cancer; new therapeutic approaches of old techniques: laser-driven radiation therapy, laser photo-chemotherapy, new approaches targeting androgen receptor and many more emerging techniques.

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