

Complex Decongestive Therapy in the intensive care of lymphedema: systematic review

Terapia complexa descongestiva no tratamento intensivo do linfedema: revisão sistemática

Terapia compleja descongestiva en el tratamiento intensivo del linfedema: revisión de literatura

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ABSTRACT | Lymphedema is characterized by accumulation of proteins and fluids in the interstice, with physical and psychological changes. Among the physiotherapeutic techniques used to reduce lymphedema we have the complex decongestive therapy. The objective of this review is to identify evidence for the practice of complex decongestive therapy for intensive care of lymphedema. A search was carried out in the PubMed, EMBASE and PEDro databases. The articles chosen were randomized and cohort studies, which have been evaluated and selected independently by two reviewers who evaluated the methodological quality of the studies within the PEDro Scale. The search resulted in 414 studies, reduced to seven eligible studies for quality analysis, classified by PEDro scale as high quality and moderate effectiveness studies. The analyzed articles showed good methodological quality and their results showed the effectiveness of complex decongestive therapy in reducing the volume of lymphedema in intensive care.

Keywords | Drainage; Lymphedema; Lymphatic Diseases; Breast Neoplasms.

RESUMO | O linfedema caracteriza-se por acúmulo de proteínas e fluidos no interstício, com alterações físicas e psicológicas. Entre as técnicas fisioterapêuticas utilizadas para redução do linfedema está a terapia complexa descongestiva. O objetivo desta revisão é

identificar evidências para a prática da terapia complexa descongestiva no tratamento intensivo do linfedema. Realizou-se uma busca nas bases de dados PubMed, EMBASE e PEDro. Os artigos selecionados foram estudos randomizados e de coorte, os quais foram avaliados e selecionados de forma independente por dois revisores, que avaliaram a qualidade metodológica dos estudos com a escala PEDro. As buscas resultaram em 414 estudos, depois foram reduzidos a sete estudos elegíveis para análise de qualidade, classificados pela escala PEDro como qualidade alta e eficácia moderada. Os artigos analisados apresentaram boa qualidade metodológica, e seus resultados evidenciaram a efetividade da terapia complexa descongestiva na redução do volume do linfedema no tratamento intensivo.

Descritores | Drenagem; Linfedema; Doenças Linfáticas; Neoplasias da Mama.

RESUMEN | El linfedema es producido debido a la acumulación de proteínas y fluidos en el intersticio, causando alteraciones físicas y psicológicas. Entre las técnicas fisioterapéuticas empleadas para reducirlo se encuentra la terapia compleja descongestiva. El propósito de este estudio es identificar la práctica de la terapia compleja descongestiva en el tratamiento intensivo del linfedema. Para ello, se hizo una búsqueda en las bases de datos PubMed, EMBASE y PEDro. Los estudios

Study carried out in the graduate program in Dermato-functional Physiotherapy of Pontifícia Universidade Católica do Paraná (PUCPR) - Curitiba (PR), Brazil.

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elegidos fueron de tipo aleatorio y de cohorte, en los cuales se hizo una evaluación y elección de forma independiente por dos revisores, quienes trataron de evaluar la calidad metodología en los estudios con la escala PEDro. Se encontraron 414 estudios, después fueron reducidos a siete, elegidos para el análisis de calidad y clasificados en la escala PEDro como de alta calidad

y eficacia moderada. Los estudios evaluados presentaron alta calidad metodológica, y sus resultados mostraron la eficacia de la terapia compleja descongestiva para el tratamiento intensivo de reducir el volumen del linfedema.

Palabras clave | Drenaje; Linfedema; Enfermedades Linfáticas; Neoplasias de la Mama.

INTRODUCTION

Lymphedema is defined as an accumulation of proteins and fluids in the interstice, due to an inefficiency of the lymphatic system^{1,2}. It manifests as a chronic edema, causing discomfort, loss of function, deformity and fatigue^{3,4}. Psychological changes are also observed and negatively affect body image and self-esteem⁵.

According to the International Society of Lymphology^{6,7}, lymphedema can be classified into three degrees. Degree I is characterized by smoothness to palpation and reversibility by elevation of the limb. Degree II is characterized by the edema progression, which becomes fibrotic, irreversible and firm to palpation. Degrees I and II are often related to breast cancer¹ and have a multifactorial origin. Degree III manifests itself by cartilaginous hardening and skin hyperkeratosis, often observed in elephantiasis^{8,9}. Among the factors associated with the condition, we have radiotherapy, surgical intervention, impaired cicatrization, seroma, hematoma, skin necrosis, lack of mobility and obesity^{10,11}.

The lymphedema conservative treatment aims to reduce the edema and production of interstitial fluid, as well as stimulate the lymph's mobility⁴. Among the physiotherapeutic techniques used to reduce lymphedema we have the complex decongestive therapy (CDT)¹². The International Society of Lymphology^{6,7} supports the use of CDT, which involves a two-stage treatment program: intensive and maintenance care. Intensive treatment allows a substantial reduction in the volume of lymphedema^{3,14} and includes four components: manual lymphatic drainage, skin and nail care, compression bandaging and therapeutic exercises^{15,16}.

Considering CDT for the postoperative lymphedema treatment of breast cancer, there is a need to assess the evidence of this technique. The aim of this study was to identify evidences and systematically review the CDT

effectiveness on volume reduction in the intensive treatment of lymphedema.

METHODOLOGY

This systematic review followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) recommendations¹⁷. A descriptive study was carried out through a systematic review of the literature, by adopting as inclusion criteria cohort and randomized studies that used techniques from the complex decongestive therapy in intensive care of patients with lymphedema – published in Portuguese, English and Spanish – and without restriction for publication period. Studies that addressed the use of electro and/or thermotherapeutic resources associated with CDT and/or invasive techniques and/or use of specific drugs for lymphedema treatment were excluded, as well as review articles.

We searched articles published until July 21, 2014, in PubMed, EMBASE and PEDro databases. The descriptors used were: drainage, lymphedema, lymphatic diseases and breast cancer. The research were performed with the combination of all descriptors and with the combination of pairs, with the word AND.

The articles were evaluated and selected independently by two reviewers. Initially, the duplicates (study published in two or more databases) were removed. Based on titles and abstracts, the studies that had no connection with the subject of this review were excluded. From this pre-selection, the evaluators analyzed full texts, considering the established criteria. The reviewers also assessed independently the methodological quality of the studies selected within PEDro¹⁸ Scale, which is based on the Delphi¹⁹ list. According to the PEDro¹⁸ Scale, which goes from 1 to 10, studies with a score equal to or higher than five were considered of high quality.

Data analysis

We used a five-level evidence scoring system, which considers the number, the methodological quality and the results of studies regarding the variable of interest. Thus, strong evidence is characterized when consistent findings are detected in two or more randomized clinical trials of high quality. Moderate evidence is characterized by consistent findings in a randomized clinical trial of high quality and in one or more randomized clinical trials of poor quality, or by consistent findings of multiple randomized clinical trials of low quality. In case of limited evidence, the characterization is done when the result is found in a single randomized clinical trial or multiple randomized low-quality clinical trials. Conflicting evidence is characterized when there are inconsistent findings in multiple randomized clinical trials and absent evidence when the result is not found in any randomized clinical trial^{20,21}.

RESULTS

The initial research resulted in 414 articles. First, we excluded 23 research that appeared repeatedly in two or more databases. After the analysis of titles and abstracts, 343 articles that did not meet the predetermined criteria were excluded. In this pre-selection, the reviewers examined 48 texts completely. Considering the inclusion and exclusion criteria, only seven articles were selected for the analysis. No review addressing exclusively the intensive treatment phase with CDT was found.

According to the PEDro Scale¹⁸, the seven articles were considered high-quality studies, since they had a score higher than or equal five (Figure 1).

The analysis of the selected studies demonstrated that CDT reduces the limb's volume during intensive treatment (Tables 2, 3 and 4).

The results of the studies included in the review reveal moderate evidence for CDT use for the edema resolution during the lymphedema intensive treatment.

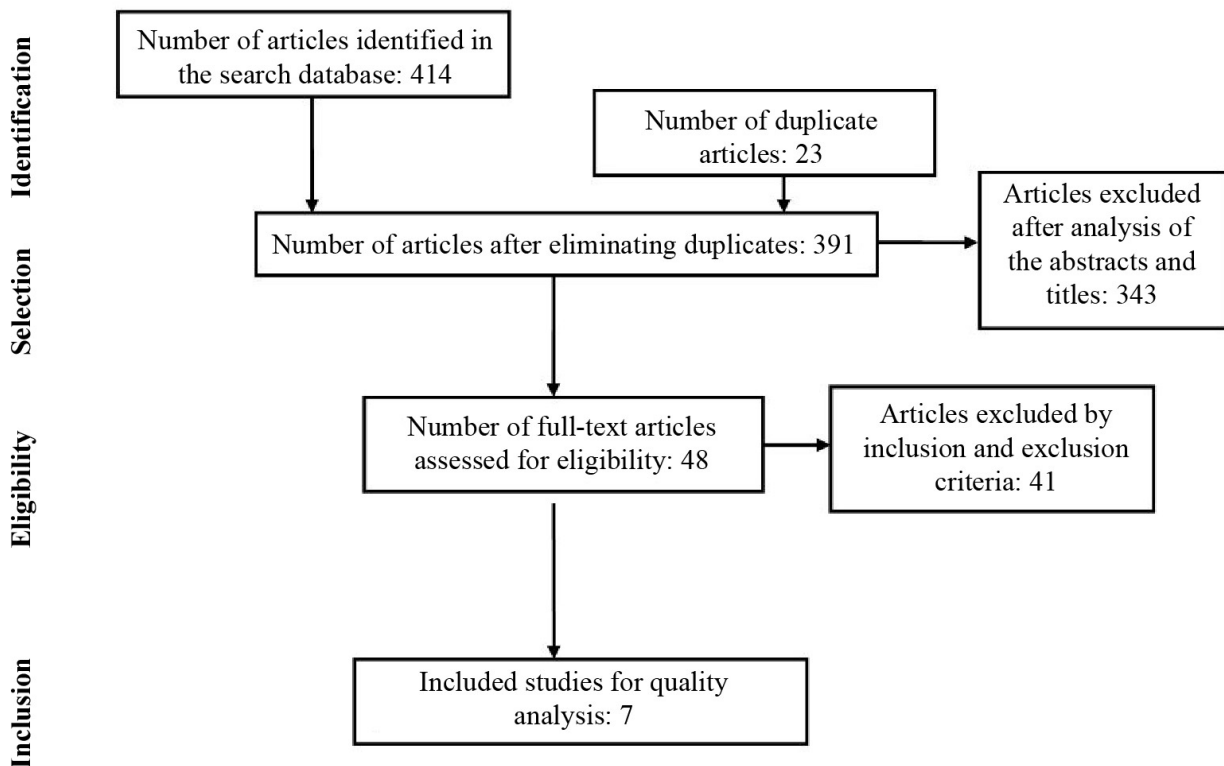


Figure 1. Article selection flowchart

Table 1. Synthesis of the selected articles

Studies	Pekyavas et al. ²²	Dayes et al. ²³	King at al. ²⁴	Gurdal et al. ¹	Vignes et al. ²⁵	Vignes et al. ²⁶	Vignes et al. ²⁷
PEDro Scale	9	8	7	7	5	5	5
Study design	Randomized	Randomized	Randomized	Randomized and controlled prospective	Prospective cohort	Prospective cohort	Cohort
Variables evaluated	Pain, limitations of daily life activities, discomfort, heaviness sensation, tension, stiffness, paresthesia, quality of life and limb volume.	Quality of life, limb function and limb volume.	Pain, heaviness sensation, tension, functional compromise and limb volume	Quality of life and limb volume.	Limb volume	Limb volume	Limb volume
Interventions	- G1 CDT + bandaging - G2 CDT + kinesiotaping + bandaging - G3: CDT + kinesiotaping without bandaging	- Experimental Group: CDT - Control group: Elastic compression clothes.	All patients underwent CDT. G1: compression sleeves G2: compression bandages	- CDT - IPC + SLD	All patients were submitted to CDT and moderate exercises	All patients underwent CDT.	All patients were treated with CDT.
Treatment duration	10 sessions (2 weeks)	20 sessions (4 weeks)	10 sessions (2 weeks)	6 weeks	5 days a week	5 days a week, with 11 days of intensive treatment	2 weeks
Assessment tools	- VAS - SF-36 - Limb circumference	- Limb circumference - SF-36 - DASH	- Volumetry - Limb circumference - VAS - DASH	- Limb circumference - ASES - EO-RTC-QLQ-C30	- Limb circumference	Lymphedema volume with the truncated cone formula	Lymphedema volume with the truncated cone formula
Conclusion	KinesioTaping associated with CDT can stimulate long-term edema reduction.	Compared to the control group, it did not demonstrate significant results for the lymphedema treatment with CDT.	Compression bandages result in a better effect on volume reduction, but the application of compression garments may result in fewer symptoms and improve the function.	Treatment modalities reviewed with skin care and exercises are effective and tolerable in the lymphedema treatment.	The use of elastic gloves and bandaging at night are the main components of the maintenance therapy for lymphedema after CDT.	Bandages and elastic sleeves are important for maintenance therapy after intense decongestive physiotherapy.	The lymphedema volume was significantly reduced after CDT. The duration of the lymphedema and body mass index were the predictors of absolute volume reduction after CDT.

CDT: Complex Decongestive Therapy; SF-36: Short Form-36; DASH: disabilities of the arm, shoulder and hand; VAS: Visual Analogue Scale; IPC: Intermittent pneumatic compression; SLD: simple lymphatic drainage; ASES: American shoulder and elbow surgeons; EORTC-QLQ-C30: quality of life questionnaire

Table 2. Pre- and post-CDT lymphedema volume analysis in cohort studies

Study	n	Initial volume (mL)	Final volume (mL)	p-value
Vignes et al. ²⁵	682	936	335	<0,0001
Vignes et al. ²⁶	537	1054	647	<0,0001
Vignes et al. ²⁷	357	1067	663	<0,001

Table 3. Pre- and post-CDT lymphedema volume analysis in randomized studies

Studies	n	CDT Group		Control Group	
		Initial volume (mL)	Final volume (mL)	Initial volume (mL)	Final volume (mL)
Dayes et al. ²³	103	3,422	3,094	3,266	3,043
King at al. ²⁴	21	2,335	-5	2,45	-70
Gurdal et al. ¹	30	3533	3004	3581	3142

Table 4. Pre- and post-CDT lymphedema volume analysis in randomized studies

Study	n	Compression bandage		Compression bandage +KT		KT	
		BL	BT-AT (p)	LB	BT-AT (p)	LB	BT-AT (p)
Pekyavas et al. ²²	45	921,15	313,90 (0,023)	1303,67	373,29 (0,008)	983,72	358,21 (0,008)

KT: KinesioTaping*; BL: Baseline; BT-AT: Difference between before and after treatment

DISCUSSION

The selected studies included randomized clinical trials and cohort studies. Randomized clinical trials were described as gold standard in the assessment of therapeutic and preventive health issues²⁸. For cohort studies, the researcher catalogs individuals, follow them for a certain period and may obtain a wide range of outcomes.

In the quality analysis of studies by PEDro Scale¹⁸, most of the selected studies showed flaws for the reviewers' blinding and the allocation of individuals was not preserved. These procedures are important to avoid influence on the treatment and to produce more consistent results²⁸.

All analyzed studies^{1,22-27} showed that intensive treatment with CDT favors volume reduction of the upper limb lymphedema. Pekyavas et al.²² investigated, through a randomized study, the effects of the association of CDT with neuromuscular elastic adhesive bandaging (KinesioTaping®) in patients with lymphedema. Forty-five patients were recruited, randomly divided into three groups that underwent CDT. In the first group, compression bandage was applied. In the second group, compression bandaging and neuromuscular adhesive elastic bandaging were applied. In the third group, only neuromuscular elastic adhesive bandaging was applied. There was lymphedema reduction in three groups ($p < 0.05$), with improvement of pain, discomfort, heaviness sensation and paresthesia. There was an improvement in the quality of life and functional independence.

Dayes et al.²³ analyzed CDT for lymphedema treatment in 103 women with breast cancer. A randomized clinical study was carried out with compression therapy for the control group and CDT for the experimental group. The upper limb circumferences were measured by blind review. After six weeks of intensive treatment, significant results for the quality of life analysis and limb motor function were not found. The CDT patient group showed reduction of 29.0% (250 mL) in the lymphedema volume, while the control-group patients showed a 22.6% (143 mL) reduction. Although the study of Dayes et al.²³ did not have results statistically significant in the comparison between groups, it stands out for its design. The treatments were standardized in all the centers, and therapists had experience with the technique. In

addition, the measurements were performed by blind review, with standardized procedures.

King et al.²⁴ compared the effects of compression clothes and compression bandaging in the CDT early stage. They evaluated the limb volume, symptoms and functional damage. Ten patients were randomized for group 1 (they wore gloves and compression sleeves) and 11 for group 2 (they wore compression bandaging). The evaluations were performed before the treatment, on the fifth and tenth day and three months after the treatment, by blind examination. There was a reduction of the limb volume in both groups, however, without reaching the significance level. The study of King et al.²⁴ had as strong points randomization, presence of inclusion and exclusion criteria, eligibility of the sample and blind review. However, the sample was small, which may explain the lack of significant differences between groups.

Gurdal et al.¹ conducted a randomized controlled prospective study to compare CDT and intermittent pneumatic compression (IPC) efficacy, associated with simple lymphatic drainage (SLD). The arm volume and quality of life of patients with lymphedema related to breast cancer treatment was assessed. Each group had 15 patients. Treatment protocols were applied for six weeks. Although the group treated with CDT presented a 529 mL reduction (14.9%), there was no significant difference in comparison with the other group that presented a reduction of 439 mL (12.2%). In this study, measurements and interventions were conducted by the same physical therapist. Moreover, the sample was relatively small.

Other studies that had follow-up and larger samples were also selected for this review²⁵⁻²⁷. Vignes et al.²⁵⁻²⁷ carried out three cohort studies with patients from a Department of Lymphology and conducted to CDT. The treatment was carried out by physical therapists specialized in lymphology.

In their first study, Vignes et al.²⁷ analyzed the predictive factors of lymphedema response to CDT. 357 women with lymphedema were recruited between 2001 and 2004, and underwent CDT five times a week. The average CDT duration was 11.8 ± 3.3 days. The upper limb volume was assessed before and after CDT, by the same researcher, and significantly reduced ($p < 0.001$), from 1067 ± 622 mL to 663 ± 366 mL.

In the second study, Vignes et al.²⁶ evaluated the role of CDT different components after an intensive treatment of the upper limb lymphedema. All eligible women were recruited and conducted from 2001 to

2004, totalizing 537 women. The measurements were evaluated by a single evaluator at the time of inclusion, at the end of treatment and in 6 and 12 months, in follow-up visits. Significant reductions were observed in the lymphedema volume ($p < 0.001$) – from 1054 ± 633 mL to 647 ± 351 mL after CDT.

In the third study, Vignes et al.²⁵ recruited 867 patients from 2001 to 2008 and submitted them to CDT. The first intensive stage was performed with the aim of reducing 40–60% of the lymphedema volume. At the end of this stage, the authors observed a reduction from 936 mL to 335 mL in the limb volume.

Although some of the studies in this review have not presented statistically significant results, there was a reduction in the affected limb volume after CDT in all studies. The lymphedema treatment is extremely important. Besides promoting clearance of lymphatic network, it improves emotional issues and, unlike surgical procedures, presents no serious adverse effects.

CONCLUSION

The articles analyzed in this study presented good methodological quality. The results revealed the evidence and effectiveness of CDT in protocols of intensive treatment for lymphedema reduction.

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