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SUMMARY

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Original articles

THE EUROPEAN JOURNAL OF LYMPHOLOGY AND RELATED PROBLEMS (EJLRP)

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GUIDELINES AND HIGHLY RECOMMENDED OPERATING INSTRUCTIONS FOR DIAGNOSIS IN VASCULAR LYMPHATIC ANOMALIES AND PATHOLOGY.

LAURA MONEGHINI, EZIO FULCHERI*

With the Cooperation of:

SISAV- President - Francesco Stillo

SIAPEC- President - Prof. Anna Sapino

ESL – President - Francesco Boccardo

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The right diagnosis of vascular anomalies must be supported by standardized and validated procedures determined by evidence-based medicine and literature (1-2). Therefore specific procedures and operative instructions have been developed for histopathologic diagnosis on biopsies and specimens.

In the group of vascular anomalies there are also those of lymphatic vessels, pure or associated with those of other blood vessels, mainly veins (3-4-5).

But several lymphatic pathologies are not included in lymphatic anomalies, as the morpho-functional alterations of the lymphatic vessels (related to obesity), the degenerative lesions (related to diabetes and dysendocrinophaties), the reactive alterations in inflammatory states (post lymphangitis or post lymphadenitis), the traumatic lesions or the post-surgical alterations (post lymphadenectomy).

Lymphatic vessels pathology, as vascular anomalies, requires the application of adequate diagnostic protocols to guarantee precise and reproducible diagnosis (second opinion).The accuracy of the diagnosis is the base of a right clinical classification and subsequent follow up.

For these reasons we would like to extend the operative instruction and procedures for vascular anomalies to all vascular lymphatic pathology.(6-7)

INTRODUCTION

Histo-pathological examination of vascular anomalies and pathology represents a crucial moment in the diagnostic-therapeutic pathway in which the analysis of the sample becomes the confirmation or enrichment of information that the clinic and the instrumental examinations have already outlined and, at the same time, the starting point to trace the further therapy.

It also allows to verify the adequacy and representativeness of the sample for the genetic examination, fundamental both for prognostic purposes and for the possible pharmacological treatment. All this in order to guarantee the best quality of life of the patients.

The recommendations for an adequate histo-pathological examination for vascular abnormalities also arise as a requirement to standardize the management and anatomo-pathological reporting for this type of pathology and to complete the guidelines for the diagnostic/therapeutic management of the same, already drafted by SISAV in the 2015 (2) with a multidisciplinary approach, and in adherence to the ISSVA Classification for vascular abnormalities (8), which represents the current best international classification.

REASONS FOR A CORRECT HISTO-PATHOLOGICAL EXAMINATION BY RECOMMENDATIONS VALIDATED BY A SCIENTIFIC SOCIETY

I- Define the exact nature of the lesion (diagnostic confirmations or ex novo diagnosis) II- Evaluate the exact tissue involved III- Verify the presence of proliferative foci in the lesion IV- Identify conditions of risk and complications V- Ensure the adequacy of the process (sampling, preparation and staining) for second opinion and biomolecular investigations VI- Ensure the preservation of material for any further investigations and case studies

OPERATING INSTRUCTIONS

1-What to send with samples

a. Histo-pathological examination request (minimum requirements)

b. Preoperative iconographic documentation

c. Results of hematological analysis

d. Diagnostic imaging (CT, CT-angiography, MRI, Ultrasound, Doppler-ultrasound,…)

e. Report of previous treatments (embolization, laser, pharmacological therapy, surgery ...)

f. Suitable material for further different investigations:

a. Not fixed

i. within one hour of sampling

b. Formalin fixed

i. correlated by a sample in RNA later

ii. cryopreservation in biobanks

g. blood sample in EDTA

2-Fixation

a. In buffered formalin

b. Minimum fixative volume 1:10

c. Cooled buffered formalin for large sample

3-Sampling

a. Specimen orientation

b. Macroscopic photographic documentation

c. Possible "repere" in colored china

d. Serial sections, oriented and numbered progressively. Every sample smaller than 10 cm of major axis must be completely included.

4-Stainings

a. Hematoxylin/Eosin

b. Histochemical staining

i) Mandatory

(a) Masson'strichome

(b) Orcein

ii) Not mandatory

(1) Van Gieson

(2) Alcinan blu pH1

(3) PTAH

(4) Congo Red

(5) Azan Mallory

(6) Staining for reticuline

(7) Weigert Elastic

(8) Alkaline phosphatase or alizarin red for calcium in casessuspect of calciphylaxis

c. Immunocytochemical staining

i) Mandatory

1) CD31

2) CD34

3) Podoplanin

4) Smooth muscle actin

5) WT-1

6) Ki 67

ii) Not mandatory

1) Glut-1

2) Fli-1

3) VGFR

4)Lyve-1

5) PROX-1

6) S100protein

5-Molecular investigations

Sec. ISSVA Calssification 2018 (8)

6-Histo-pathological diagnosis must report

a. Vascular anomalies according to ISSVA Classification

b. Identification of the recognized vascular anomalie saccording to SISAVguidelines

– Extension

– Involvement of anatomical structures

– Resection margins

c. Presence of additional components associated with vascular injury

d. Inflammatory state

e. Presence of proliferative, vascular and extravascular foci (i.e. "nidus")

f. Effects of the previously performed therapy (embolization, sclerotherapy, surgery ...)

g. Intercurrent diseases

7-Biomolecular data

– Location of the mutation
  - o Genetic
  - o Somatic

– Type of mutation

– Percentageofmutated gene

8-Preservation of the material:

Despite having implemented the Guideline on "Traceability, collection, transport and storage of cells and tissues for diagnostic investigations", published in May 2015 – SIAPEC (9), it is advisable to keep the residual material after sampling for at least 3 months after the scheduled date for disposal.

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COMPLEX DECONGESTIVE THERAPY APPLICATION ON ARM WITH LYMPHEDEMA AND MONOPLEGIA

Content of paper: Determining changes after CDT in a patient with unilateral lymphedema and monoplegia.

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INTRODUCTION

Shoulder and arm impairments are common sequelae of breast cancer (BCa) treatment (Bentzen & Dische, 2000; Kwan et al., 2002; McCredie et al., 2001) and are estimated to occur in up to 90% of patients (Hack, Cohen, Katz, Robson, & Goss, 1999; McCredie et al., 2001). Arm lymphedema, brachial plexus neuropathy, and impaired shoulder mobility are the most important complications of BCa (Bentzen & Dische, 2000; Kwan et al., 2002), and these may often occur together. There is a complex interaction between these morbidities, which share common pathogenic elements (e.g., neural damage leads to restricted mobility, which can aggravate lymphedema) (Bentzen & Dische, 2000; Fathers, Thrush, Huson, & Norman, 2002; McCredie et al., 2001).

The risk of lymphedema risk from 1–30% after breast cancer surgery (Bentzen & Dische, 2000; Meric et al., 2002; Overgaard, 2000), with the risk primarily depending on the grade of lymph node dissection (Bentzen & Dische, 2000; Højris, Andersen, Overgaard, & Overgaard, 2000; Johansen, Overgaard, Blichert-Toft, & Overgaard, 2000; McCredie et al., 2001; Meric et al., 2002; Powell, Taghian, Kachnic, Coen, & Assaad, 2003). Postsurgery, lymphocyte depletion, with fatty replacement and local fibrosis or reduced lymphatic regeneration may result in lymphedema (Bentzen & Dische, 2000). Radiotherapy of the axilla also increases the incidence and severity of lymphedema (Johansen et al., 2000; Kwan et al., 2002; Meric et al., 2002; Powell et al., 2003). Both surgery- and radiation-induced fibrosis contribute to the development of lymphedema to a similar degree, as they both cause venous and lymphatic vessel obstruction (Kwan et al.,

2002). Additional risk factors for lymphedema are the use of chemotherapy or hemodynamic factors (Bentzen & Dische, 2000; Tobin, Lacey, Meyer, & Mortimer, 1993).

Lymphedema may have a negative effect on quality of life and result in major psychological and functional morbidity (Meric et al., 2002; Tobin et al., 1993). Although lymphedema cannot be eliminated in cancer patients, it can be prevented or minimized (Overgaard, 2000). Chronic lymphedema may be accompanied by skin changes (Overgaard, 2000) and predispose the individual to the development of cellulitis and shoulder stiffness (McCredie et al., 2001), which may result in limited arm mobility (Bentzen & Dische, 2000; Kwan et al., 2002; Meric et al., 2002).

Postsurgery, BCa patients may experience varying degrees of shoulder stiffness, which may be aggravated by the use of axillary radiotherapy (Højris et al., 2000). Shoulder stiffness is usually caused by fibrosis of the musculus pectoralis major and damage to vascular tissue or joints (Bentzen & Dische, 2000). Previous studies reported that the following parameters were risk factors for radiation-related impaired shoulder mobility: large doses of radiation per fraction (low α/β value), older age, concomitant systemic treatment, the co-existence of subcutaneous fibrosis, and the degree of movement impairment at the start of radiotherapy (Bentzen & Dische, 2000; Olsen, Pfeiffer, Johannsen, Schrøder, & Rose, 1993). Reported symptoms usually include reduced flexion, external rotation and abduction, and pain upon movement or rest (Bentzen & Dische, 2000; Kwan et al., 2002). In some cases, the range of movement was also decreased as a result of lymphedema or neural damage (Bentzen & Dische, 2000).

Brachial plexopathy is strongly correlated with late fibrosis and muscle atrophy within the shoulder region (Fathers et al., 2002; Johansson, Svensson, Larsson, & Denekamp, 2000). Brachial plexus neuropathy is defined as motor or sensory symptoms or physical signs, with or without accompanying pain in a nerve-root in the arm. Neurological manifestations may include paraesthesia in the fingers or hands, hypoesthesia, hypoalgesia, dysesthesia, paresis, hyporeflexia, or muscular atrophy (Bajrovic et al., 2004; Bentzen & Dische, 2000; Fathers et al., 2002; Johansson, Svensson, & Denekamp, 2000, 2002). Limb weakness in cases of brachial plexus neuropathy may be selectively distal, global with more marked distal deficits, or complete flaccid paralysis. Although magnetic resonance imaging studies show only soft tissue fibrosis, most BCa patients have abnormal neurophysiological findings. The brachial plexus damage may encompass the whole plexus or only the lower part (Fathers et al., 2002). Plexopathy is irreversible (Bajrovic et al., 2004) so it could lead to monoplegia. Its incidence depends on the patient's age and concomitant use of chemotherapy and the total dose and dose per fraction (low α/β value) of radiotherapy (Bajrovic et al., 2004; Bentzen & Dische, 2000; Johansen et al., 2000; Johansson et al., 2002; Johansson, Svensson, Larsson, et al., 2000).

After BCa radiotherapy, less frequently encountered problems include rib fractures, chronic pain, axillary vein thrombosis, and bone necrosis (Fehlauer et al., 2003; Højris et al., 2000; Johansson, Svensson, Larsson, et al., 2000; Meric et al., 2002; Pierce, 2001). These fractures are frequently multiple, spontaneous, and asymptomatic (Mesurolle et al., 2000). Chemotherapy (Sibaud et al., 2016) and radiotherapy (Andersen, Eilertsen, Myklebust, & Eriksen, 2018) may also be associated with multiple cutaneous disorders (Hinds & Thomas, 2008). According to one study, such disorders were found in 94.1% of patients (Hoffmann et al., 2018). Dermal changes can occur due to lymphedema, radiation-induced fibrosis, scar tissue, and chemotherapy. To help prevent such changes, the skin should be kept moisturized. Exposure to chemicals leads to injuries throughout thinning skin. Chemical-related skin injuries (Liao & Rossignol, 2000), can be caused by acids, bases, oxidizers, reducing agents, and alkylating agents. Chemicals splashed on the skin can cause dermal injury via oxidation reactions, reduction reactions, metabolic competition or inhibition, desiccation, and vesicant action, with resultant ischemia (JELENKO III, 1974; Tovar & Leikin, 2015). All the aforementioned factors may delay the recovery of BCa patients.

According to a report by the American Burn Association, among chemical-related skin injuries reported in the U.S., 39.8% of injuries occurred in the home, and 6.9% of patients who suffered chemical-induced skin injuries developed wound infections (Hall, Mathieu, & Maibach, 2018). Chemical-related skin injuries may have an adverse effect on quality of life. For example, they may lead to difficulties with coping with daily life and sleep disorders (Connell, Coates, & Wood, 2013; Dahl, Wickman, & Wengström, 2012; De Sousa, 2010; Falder et al., 2009; Rimmer et al., 2010; Tagkalakis & Demiri, 2009; Wiechman, 2011; Wisely, Wilson, Duncan, & Tarrier, 2010; Yu & Dimsdale, 1999). They may also have a negative impact on perceived body image (Connell et al., 2013; Dahl et al., 2012; De Sousa, 2010; Falder et al., 2009; Rimmer et al., 2010; Tagkalakis & Demiri, 2009; Wiechman, 2011; Wisely et al., 2010; Yu & Dimsdale, 1999).

The aim of this case report was to determine changes after CDT in a patient with unilateral lymphedema and monoplegia. Additionally the a non-healed open wound was observed.

CASE

We describe the case of a 64-y-old female patient with a BCa diagnosis in 1969. The information was collected from the patient's self-report history.

The patient had undergone a left radical mastectomy. At the time of discharge from hospital, she was advised to drain with a solution for wound care. However, she was not informed about how to prepare the solution and she did not dilute the solution before applying it to the wound. As a result, she suffered a chemical burn, which resulted in an open wound on the clavicle.

To control cancer, progression chemotherapy was repeated several times. By the end of the chemotherapy and radiotherapy sessions, an open and non-healed wound begun, with persistent lymphatic leakage. In addition, the left quarter of the quadrant trunk and left arm lymphedema emerged just after surgery. To decrease the swelling, the patient's surgeon advised her to apply bandaging on her left arm. Subsequently, the patient developed clavicular osteomyelitis as a result of the chemical burn. She had 22 operations and several medical treatments for recovery for wound healing.

In 2017, the patient developed lymphedema of her left arm and presented to the physiotherapy unit for treatment. She was evaluated by a cardiovascular surgeon and the wound care unit. She rejected to apply for admission of wound care unit.

Complex decongestion therapy (CDT) is the only known management method for lymphedema. CDT has two phases, and every phase has four components. Phase 1, which is also known as reductive CDT, involves manual lymph drainage (MLD), compression (with short stretch bandages), exercise, and skin care. Phase 2, which is also known as maintenance CDT, involves manual or self-lymph drainage, compression (garments or short stretch bandages), exercise, and skin care.

The patient was prescribed CDT (phase 1) for 40–60 min daily (manual lymph drainage, skin care, multilayer bandaging, and exercise). She was advised to control her skin and report any rash due to sensation loss. In addition, the patient was shown exercises (pumping exercises for the shoulder, elbow, and wrist; aerobic exercise > 150 min/wk, and desensitization training) to perform at home and informed about strategies to control lymphedema. After 3 wk, the compression bandages replaced with a pressure adjustment band system to prevent skin injuries as a result of sensation loss.

After the CDT phase-1, she was advised to perform a home-based program, which consisted of exercises, skin care, self-drainage and the application of a pressure adjustment band system on her monoplegic left arm.

Volume of the upper limbs were evaluated with circumference measurement. Four cm interval circumference measurements were performed and reported. The total circumference measurements were calculated. The circumferences before, after, and 1 mo follow up after the CDT treatment were compared.

RESULTS

After 6 wk, the TCM were calculated for the upper limbs. The TCM of the patient's affected left arm was 108.5 cm before the treatment. Three weeks after the treatment, it was 45.6 cm. The difference of TCM was 52 cm in the upper limb six weeks after treatment. In a follow-up assessment, 1 mo after the CDT, the differences in TCM of upper limbs increased to 7.2 cm. The most noticeable decrease in lymphedema was around the elbow. The differences in the upper arm circumference measurement differences were turns negative due to atrophy (Table 1).

Table 1. Circumference Measurements

Measurement Point	Before Treatment			Mid Treatment		
	Right (cm)	Left (cm)	Difference (cm)	Right (cm)	Left (cm)	Difference (cm)
-4	19,00	21,6	-2,60	19	18,5	0,50
Wrist	20,00	23,8	-3,80	21	22	-1,00
+4	16,50	21,8	-5,30	16,5	21	-4,50
+8	18,00	33	-15,00	17,8	27	-9,20
+12	22,40	35,8	-13,40	19,8	30	-10,20
+16	24,00	37	-13,00	23	32,3	-9,30
+20	25,00	38,4	-13,40	25,3	33,3	-8,00
Elbow	25,50	38,8	-13,30	26	32,4	-6,40
+28	25,40	37,8	-12,40	26,5	31	-4,50
+32	28,60	37	-8,40	28	29,5	-1,50
+36	30,80	38,3	-7,50	31	28	3,00
+40	38,00	38,4	-0,40	33	27,5	5,50
Total	293,2	401,7	-108,5	286,9	332,5	-45,6

Measurement Point	After Treatment			1 Week After Treatment		
	Right (cm)	Left (cm)	Difference (cm)	Right (cm)	Left (cm)	Difference (cm)
-4	19	19	0	19,4	19,3	0,1
Wrist	20,5	20,5	0	20,5	22,6	-2,1
+4	16,3	19,2	-2,9	17	20,8	-3,8
+8	18	27,1	-9,1	18,4	29	-10,6
+12	20,7	30,7	-10	20,1	31,5	-11,4
+16	22,8	32	-9,2	23,6	33	-9,4
+20	24,5	34	-9,5	25,6	33,8	-8,2
Elbow	26	34,4	-8,4	26,3	33,2	-6,9
+28	25,8	34	-8,2	27,4	31,6	-4,2
+32	29,4	32,4	-3	29,3	31,9	-2,6
+36	32	30,3	1,7	32,7	30,1	2,6
+40	35	28,4	6,6	26,9	29,6	-2,7
Total	290	342	-52	287,2	346,4	-59,2

Figure 1 shows the differences in the arm circumference pre- and post-CDT treatment.

Figure 1

DISCUSSION

The present patients had several problems, including monoplegia, sensory loss, radiogenic fibrosis, muscle atrophy, and a chemical burn, which resulted in an open nonhealed wound, with persistent lymphatic leakage. The use of CDT led to a decrease in lymphedema, and this decrease continued following the application of a pressure adjustment band system. This case demonstrates that patients with a variety of severe symptoms can benefit from CDT.

The radical mastectomy acted as a trigger for lymphedema and difficulty for the success of CDT (Feigenberg, Zer, & Dintsman, 1977), today, a radical mastectomy is no longer performed because of this risk. In the present case, she had radical mastectomy before 49 years, the patient's upper limb started to swell immediately after surgery.

As reported in literature, lymphedema can also be triggered by radiotherapy in 30% cases with BCa (Bajrovic et al., 2004; Johansson, Svensson, & Denekamp, 2000; Johansson et al., 2002). Over 30 y after hypofractionated radiotherapy with possible field overlapping led to permanent damage (Bajrovic et al., 2004; Johansson, Svensson, & Denekamp, 2000; Johansson et al., 2002). One of the suggested pathomechanisms of radiation-induced neuropathy is nerve entrapment by radiation-induced fibrosis, chronic edema, or both (Bentzen & Dische, 2000; Johansson, Svensson, & Denekamp, 2000; Johansson et al., 2002). Another postulated cause is direct damage to neurones or glial cells and ischemic damage resulting from microvascular injury (Bentzen & Dische, 2000; Johansson et al., 2002; Johansson, Svensson, Larsson, et al., 2000). There are thought to be two phases of radiation-induced neuropathy: the first phase includes direct changes in electrophysiology and histochemistry, whereas the second phase involves fibrotic changes around the nerves and injury of the adjacent vessels (Bentzen & Dische, 2000; Gillette, Mahler, Powers, Gillette, & Vujaskovic, 1995). In the present case, these old radiotherapy techniques were applied, which may have increased the lymphedema. Although the medical files could not be achieved properly, the application of several cycles of chemotherapy in the present case also likely increased the severity of lymphedema (Kissin, Della Rovere, Easton, & Westbury, 1986).

In the present case, the occurrence of the chemical burn, which resulted in an open, nonhealed wound, was due to the patient receiving insufficient information about wound care. Health care staff need to ensure that patients are properly informed about wound care. The control of a patient's perception needs to be checked to overcome harmful effects of wound care at home. We did not perform wound care because the patient did not allow it, as result of losing her trust on health care stuff. Likewise, the wound site was not suitable for measurements, but the wound size decreased after treatment, and swelling from the open, nonhealed wound stopped.

Due to developments in modern radiotherapy, brachial plexus neuropathy is a relatively rare complication. In the present case, the patient had received radiotherapy 49 y earlier. At this time, the incidence of brachial plexus neuropathy was much higher than it is today (Dobbs, 2000; Fathers et al., 2002; Johansson, Svensson, & Denekamp, 2000; Johansson et al., 2002; Johansson, Svensson, Larsson, et al., 2000; Pierce, 2001) because of a high dose per fraction or use of overlapping fields (Fathers et al., 2002; Johansson et al., 2002).

In a previous series, a remarkable finding was that 30 y after treatment with hypofractionated radiotherapy, with possible field overlapping, more than 90% of female patients developed complete paralysis of the arm (Johansson et al., 2002). The estimated biologically equivalent dose in 2 Gy fractions in these patients was 85–92 Gy (Johansson, Svensson, Larsson, et al., 2000). Interestingly, the brachial plexus damage continued to progress up to 30 y after radiotherapy (Bajrovic et al., 2004; Johansson, Svensson, & Denekamp, 2000; Johansson et al., 2002). The latency period for motor and sensory impairment ranges from 1.5 to 10 y (7–14 y for complete paralysis) (Bajrovic et al., 2004; Bentzen & Dische, 2000; Fathers et al., 2002; Johansson, Svensson, & Denekamp, 2000; Johansson et al., 2002; Johansson, Svensson, Larsson, et al., 2000). The late presentation of neural damage results from the slow turnover of the tissues, that attempt cell division many years after injury. Damaged tissue is then replaced by fibrosis, leading to the formation of dense, inelastic and constricting tissue (Johansson, Svensson, & Denekamp, 2000). Female patients undergoing radiotherapy for breast cancer should be followed-

up over the course of their lives for complications of cancer and cancer treatments, as several problems tend to appear after long latency periods, and the tissue damage may be progressive (Bajrovic et al., 2004; Bentzen & Dische, 2000; Fathers et al., 2002). Such patients may develop radiation-induced fibrosis, and their skin may become more fragile. As a result, the risk of lymphedema may increase. Compression on sensory loss area must be more cautious. Our patient was treated with multilayer compression bandages for 2 wk. However, these had to be replaced with a compression garment with a band system due to the development of redness. So phase 1 continued with band system.

In the present case, a muscle pump was not trained because of monoplegia. This can be another factor for reducing the effect of CDT. Physical exercise programs should be recommended to BCa patients to diminish the consequences of shoulder- and arm-related impairments after mastectomy (Bentzen & Dische, 2000; Johansen et al., 2000). However, some female patients with edema or neurological deficits may not be able to undertake exercise programs (Bentzen & Dische, 2000). Exercise program was continued at least passive movements.

CONCLUSION

In BCa patients with complicated lymphedema, CDT can be beneficial with careful application and follow up.

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THE APPLICATION OF COMPLEX DECONGESTIVE THERAPY IN A PATIENT WITH UPPER LIMB LYMPHEDEMA AND MONOPLEGIA

INTRODUCTION:

Cancer patients can experience a range of side effects, depending on the type of cancer and cancer treatments. Physiotherapy approaches are needed to support the recruitment. The aim of this case report was to investigate the effects of complex decongestive therapy (CDT) in a patient with breast cancer, arm lymphedema and monoplegia.

METHODS:

The patient was a 64-y-old female who was diagnosed with Breast Cancer in 1969. At the time of the first surgery, she had left radical mastectomy. Her left arm started to swell just after the surgery. As a result of misinformation about operation scar care, she suffered a chemical burn of the clavicula and developed clavicular osteomyelitis and a non-healed open wound. To support the healing of the wound, the patient underwent 22 operations and several cycles of chemotherapy, in addition to radiotherapy and reconstruction surgery. Because of the several times of radiotherapy on axillary zone, brachial plexopathy has developed. In 2017, she presented to the physiotherapy unit with lymphedema. Following an evaluation by a cardiovascular surgeon, CDT (phase 1) was prescribed for 40–60 min daily for 6 wk. Home-based exercises and a skin care program were also recommended. The circumference measurements for upper limbs were applied, and the total circumference measurement (TCM) of the upper limbs was calculated.

RESULTS:

The pretreatment TCM score was 108.5 cm, and the TCM scores 1 mo and 6 wk post-treatment were 45.6 cm and 52 cm, respectively. After therapy, the 1-mo follow-up, the difference was 59.2 cm.

CONCLUSIONS:

CDT appeared to decrease lymphedema, despite muscle dysfunction and an open wound in a patient with monoplegia and arm lymphedema. The upper limb volume was maintained 1 mo after CDT.

KEYWORDS:

Circumference measurement, sensation loss, radiation induced fibrosis, non- healed open wound

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ACCURATE PREOPERATIVE ASSESSMENT AND SURGICAL MANAGEMENT OF CYSTIC LYMPHANGIOMAS

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ABSTRACT

Cystic lymphangiomas (CL) are an uncommon type of benign tumor originating from a congenital malformation of the lymphatic vessels. They can occur in the head-neck (75% of the cases) and axillae (20%), while abdominal localization are rare (1%). They are usually asymptomatic and commonly occur in childhood. Symptoms can be associated with the onset of complications: bleeding, infections, rupture or compression on adjacent structures.

The diagnosis is based on clinical signs and imaging (ultrasound, MRI, CT scan), then confirmed by histology after surgery.

Conservative treatment, such as aspiration, radiation and sclerotherapy, has a high rate of recurrence (50%). The recommended treatment, according to surgical risk, is the complete resection.

We assessed the usefulness of lymphoscintigraphy (LS), associated to other diagnostic investigations in preoperative assessment, and of the Patent Blue dye during surgery, to reduce lymphatic complications and the relapse of the pathology.

Between 2013 and 2018, 19 patients with CL (13-82 years old, 12 females and 7 males) were treated: 8 CL of the supraclavicular region (4 left and 4 right), 3 inguinal CL (1 left and 2 right), 2 retroperitoneal, 1 in the mediastinum, 1 of the left axilla, 1 perianal CL, 1 of the right submandibular area, 1 supra-scapular (right) and 1 of the left arm. Three patients were treated with platelet gel injection for 3 times. The surgical treatment (16 cases) mainly consisted in removing the whole capsule and in preserving afferent lymphatics, identified intraoperatively using Patent Blue dye injection.

Patients were followed up for a period varying from 1 month to 5 years, clinically and by echography.

All the patients had complete healing of CL and no recurrence of the pathology.

Keywords: lymphangioma, lymphatic malformation, lymphoscintigraphy, blue patent violet, microsurgery

INTRODUCTION

Cystic lymphangiomas (CL) are an uncommon type of benign tumor originating from a congenital malformation of the lymphatic vessels. In the last classification of the International Society for the Study of Vascular Anomalies they are included in the common cystic lymphatic malformation group. The etiology is still unknown but there are no evidences of an hereditary transmission1.

They commonly occur in childhood, 90% of the cases in children less than 2 years. The great majority of the cases (about 75%) occurs in the head-neck area, followed by the axillae (20%), while abdominal localization are reasonably rare[2, 3]. They are usually asymptomatic and symptoms can be associated with the onset of complications: intra-capsular bleeding, infections, rupture or compression on adjacent structures.

Conservative treatment, such aspiration, radiation and sclerotherapy, has a high rate of recurrence (50%)[4, 5]. Surgical resection of CL is recommended but there is the risk of lymphatic complications and of recurrence of the pathology (6-7).

We assessed the usefulness of lymphoscintigraphy (LS), associated to other diagnostic investigations in preoperative assessment, and of the Patent Blue dye during surgery, to reduce complications after surgical treatment.

MATERIALS AND METHODS

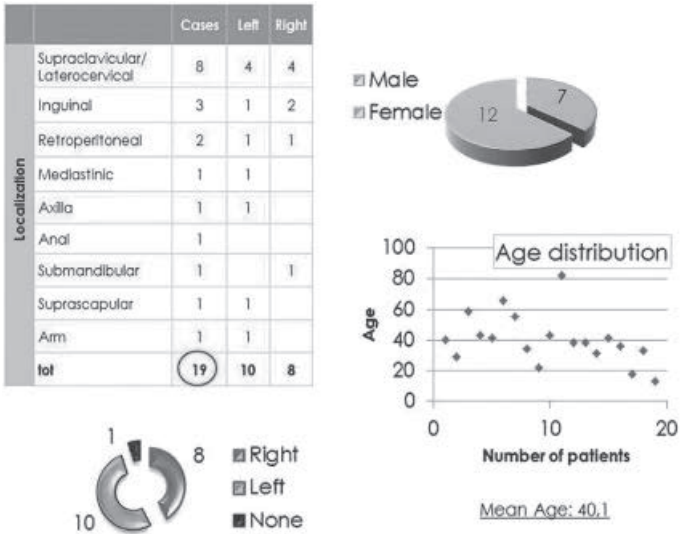
Between August 2013 and August 2018, 19 patients with cystic lymphangiomas were studied and treated by the Unit of Lymphatic Surgery, San Martino University Hospital in Genoa.

They all had been treated conservatively with aspiration and sclerotherapy several times with unsuccessful results.

The mean age of the patients was 40,1 years (range 13 to 82 years) with 12 women and 7 men: eight CL of the supraclavicular region (4 left and 4 right), 3 inguinal CL (1 left and 2 right), 2 retroperitoneal CL, 1 CL in the mediastinum, 1 CL of the left axilla, 1 perianal CL, 1 CL of the right submandibular area, 1 suprascapolar (right) CL and 1 CL of the left arm (Fig. 1).

All the patients underwent pre-operative diagnostic investigations that consisted in echography, lymphangio-MR, echo-color-Doppler scan, lymphoscintigraphy; three of them underwent lymphangio-CT due to the site of the lymphangiomas (retroperitoneum and mediastinum). Lymphoscintigraphy was performed in all the patients to study lymphatic circulation of the limbs and of the supraclavicular region, to visualize afferent lymphatic vessels and to plan the surgical approach. Demographic and clinical characteristics of the patients are reported in Fig.1. Follow up period was variable from 3 months to 5 years and it consisted mainly in clinical and echographic assessment. One patient with a CL in the mediastinum underwent CT scans, due to the difficulty in monitoring the lesion deeply located in the chest.

Fig. 1. - Demographic and clinical characteristics



Surgical technique

Blue dye was injected in all patients distally to the surgical field 10 minutes prior to surgery. It allowed to identify intraoperatively peri-cystic lymphatics and nodes colored in blue, in order to preserve them and prevent lymphatic complications (such as chylorrea, lymphorrea and peripheral lymphedema). (Fig.2).

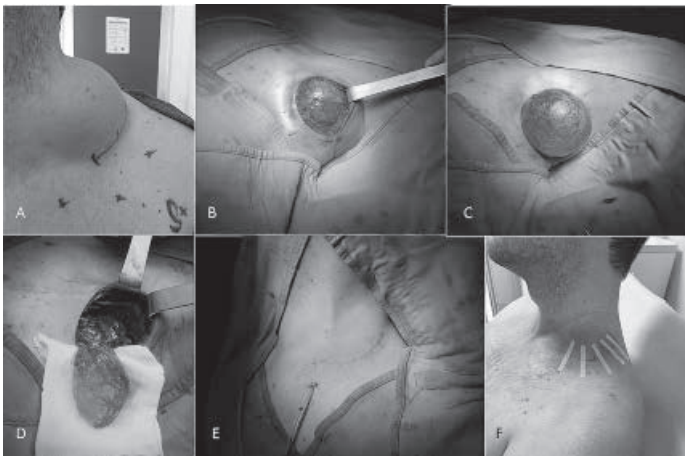


Fig. 2. - Clinical case of lymphangioma of the supraclavicular area in a young man that had already been treated with several aspirations and sclerotherapy (A-F: surgical steps, from pre-op schematic drawing to post-op)

The surgical treatment mainly consisted in removing the lymphangioma with its whole capsule with the purpose to avoid the relapse of the pathology. A suction drain was maintained for 3-4 days and removed with no further accumulation of lymph in the surgical field.

RESULTS

All the patients came to our attention had already been treated with aspiration and sclerotherapy several times with unsuccessful results. During our study, three patients were treated furthermore with conservative therapy with the use of platelet gel. We perform this conservative treatment for 3 times for each case because of the site and the size of the lesions. The first case was a big lymphangioma of the mediastinum, that dislocated the trachea and press the esophagus, causing dysphagia and discomfort to the patient. The surgical risk was too high and we decided to treat it conservatively with the injection of the platelet gel, with a remarkable reduction of the volume of the lymphangioma (70%) and disappearance of the symptoms.

The other two lymphangiomas were in the supraclavicular and in the submandibular region and were small and superficial so it was possible to treat them conservatively with a complete disappearance of the lesion.

The other 16 patients who underwent surgical procedures had a complete healing and no recurrence of the pathology.

DISCUSSION

According to the last version of the guidelines provided by the International Society for the Study of Vascular Anomalies, the diagnosis is based on clinical signs and imaging

(ultrasound, MRI, CT scan), then confirmed by histology after surgery. The MRI is the gold standard because it shows the site and the extension of the lesion and the relations with surroundings tissues, for this reason it is essential for the surgical planning (Fig.3).

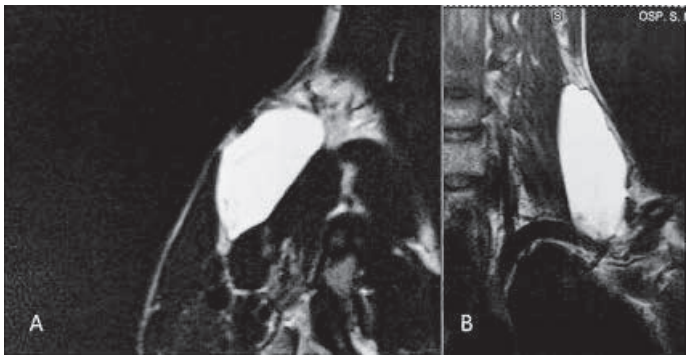


Fig. 3. MR images of a lymphangioma of the left supraclavicular region with extension to the laterocervical area and developing in between the muscles (A: latero-lateral scan; B: antero-posterior scan)

Lymphoscintigraphy is useful to assess the complete lymphatic circulation and to study if there are any main lymphatic pathways that go into the lesion and fill in the lymphangioma because in those cases instead of closing lymphatics, it is recommended to perform Multiple Lymphatic-Venous Anastomoses (MLVA)7-8 (but those cases are very rare) (Fig.4).

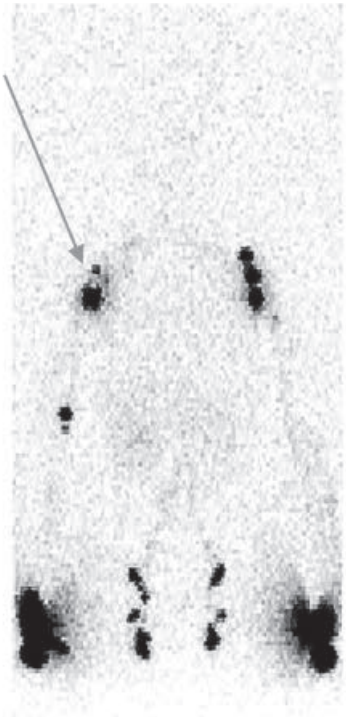


Fig. 4. Lymphoscintigraphyc images of a lymphangioma of the right supraclavicular region (the arrow indicates a slight dermal flow surrounding the cyst, that indicates a compression of the lymphatic collectors in supraclavicular region done by the lymphagioma)

According to our experience lymphoscintigraphy proved to supply important information about the functional assessment of lymphatic circulation and it can guide to an MLVA in case of lymphatic impairment.

Indications to therapy are the onset of complications (intra-cystic bleeding, infections, compression on other structures) or the increase in volume. The first choice is always conservative treatment (echo-guided sclerotherapy). According to our experience, surgical treatment is recommended if conservative approach is not successful after 3 or 4 attempts of aspiration and sclerotherapy because of the increasing risk of infections.

The injection of the Blue dye is useful to prevent lymphatic complications because it helps to avoid their disruption and their ligation. On the other hand, if the Blue dye demonstrates the lymphatic vessels enter into the lesion, they can be anastomosed to a nearby vein performing MLVA, in order to maintain a proper lymphatic circulation.

CONCLUSIONS

Cystic lymphangiomas are an uncommon type of benign tumor that are classified into the group of congenital malformation of the lymphatic vessels.

The majority of the cases occurs in the head-neck area (75%), in the axillae (20%), while abdominal localization are rare quite rare.

They are usually asymptomatic and commonly occur in childhood. Symptoms are usually associated with the onset of complications: such as intracystic bleeding, infections, rupture or compression on adjacent structures.

The conservative treatment, such as aspiration, radiation and sclerotherapy, has a high rate of recurrence so, for the cases that are not responsive to conservative treatment and according to the surgical risk, the recommended treatment is the complete surgical excision.

Surgery needs to consider lymphatic pathways in order to avoid lymphatic complications and the recurrence of the lesion and the key point is to study lymphatic circulation preoperatively with lymphoscintigraphy and peroperatively with the use of the blue dye.

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MESOTHERAPY IN THE TREATMENT OF LYMPHEDEMS. CAN IT BE INSERTED IN THE REHABILITATIVE PHYSICAL THERAPY PROTOCOLS?

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ABSTRACT

INTRODUCTION: *The therapeutic gold standard of lymphedema, based on the main guidelines, is represented by complex decongestive physiotherapy treatment according to Foldi (CDP), leaving surgery to treat resistant forms. In the treatment of lymphedema, there is currently no effective medical therapy to combine with physiotherapy to promote rapid and long-lasting resolution. Mesotherapy, due to its peculiar characteristics, favours the elimination of excess fluids, the detoxification of the organism and the improvement of the tonicity and elasticity of the skin, exploiting the anti-inflammatory, vascular and lipolytic action of drugs inoculated at the treatment site.*

AIM OF THE STUDY: *The aim of this study is to evaluate the importance of the Mesotheraphy in the treatment of lymphedema and if the procedure can be used routinely in the protocols of physical rehabilitation treatment of lymphedema.*

MATERIALS AND METHODS: *166 patients with lymphedema were treated.*

All patients were included in the CDP protocols (three phases: attack, stabilization and maintenance) of these 83 patients were also treated with mesotherapy in the attack and stabilization phases with a weekly session.

RESULTS: *The analysis of the data obtained from the comparison of the control patient group with the patients treated with mesotherapy was highlighted:*

- *Decongestion with reduction of limb volume by 60-90% in 94% of cases of treatments compared to 80% in controls;*
- *Time of decongestion with mesotherapy: 4 weeks - 3 months; (Vs 6 weeks - 4 months without Mesotherapy);*
- *Complications: lymphangitis after the first lymphatic drainage sessions (80% of 3rd grade lymphedemas) resolved with antibiotic therapy and local and systemic cortisotherapy.*

CONCLUSIONS: *The results obtained show that in "old" edemas that aren't very responsive to treatments, Mesotherapy is able to improve results and maintain them over time. The use of homotoxicological and/or bio-revitalizing medicines (glucosamine, hyaluronic acid) capable of acting on both the vascular and mesenchymal components has allowed to obtain significant results even in fibrotic edemas. In patients treated with Mesotherapy in combination with physical therapy was obtained the average reduction of edema size of 1.2 cm compared to the average reduction of 0.8 cm when the same were treated only with physical therapy, with a clinical improvement of 94% of the treatments compared to 80% of the control group. Another interesting fact is that the reduction of edema was maintained even at the control after 4 months from the last treatment. Mesotherapy was also effective in improving the feelings of tension and heaviness reported by most patients.*

Lymphedema is a pathological condition that manifests itself by district edema with a high interstitial protein concentration, degenerative changes in the connective tissues of the skin and subcutaneous tissue, recurring reduction of immune functions and consequent significant incidence of infections, which generally, but not exclusively, affect supra-fascial soft tissues.

It is a chronic pathology, therefore incurable in the sense that there is unfortunately no resolutive therapy. It's a degenerative pathology in the absence of an early, adequate and competent decongestive therapy that guarantees angio-tissue homeostasis.

Peripheral lymphedema therapy is divided into medical-physical-rehabilitative and surgical treatments[1,2,3].

The various techniques of surgical treatment of lymphedema (microsurgery, supermicrosurgery, lymph node transplantation, liposuction), used according to the various consensus documents in the early clinical stages, still require adequate short and long-term verifications today, considering that the results aren't always consistent with expectations.

The therapeutic gold standard of lymphedema, based on the main guidelines, is represented by complex decongestive physiotherapy treatment according to Foldi (CDP). This is a personalized treatment strategy, characterized by contemporary

action, synergical and/or sequential of different therapeutic procedures tending to decongestion, reduction of fibrosis, decrease of limb volume, improvement of trophic conditions and maintenance and optimization of results [1,4,5].

It must be implemented by an accredited team of competent health professionals (doctor, massotherapist/physiotherapist, nurse, podiatrist, elastocompression technician), trained, experts on the diagnosis, treatment and management of the patient with lymphedema.

The CDP is simple for the first two grades, complex for the third.

The guidelines of the various specialist companies underline the importance of reducing edema with: -press therapy; - lymphatic drainage; - adequate diet; - pharmacological therapy; - elastic stocking [1,2,3,5].

In the second and third grade, the use of the multilayer elastic bandage is decisive.

Other therapies: lasers, electrical stimulations, endermologies, aqualiphatic therapy, hyper-oxygen therapy don't have statistically significant evidence on their effectiveness.

The treatment is applied in two stages.

Phase 1 (attack therapy) managed with manual lymphatic drainage and elastic compression applied with multilayer bandages.

Phase 2 (maintenance therapy) managed with elastic compression by means of a brace (sock or bracelet) with a low degree of elasticity.

RATIONAL

In the treatment of lymphedema there isn't, currently, an effective medical therapy to combine with physiotherapy to promote rapid and long-lasting resolution.

There are numerous allopathic or homeopathic molecules and compounds on the market that have proved effective in the treatment of pathologies of the lymphocirculatory system with a draining, lymphokinetic or biorevitalizing effect of the extracellular matrix [6,7,8,9].

The mesotherapy technique, due to its relative simplicity of execution and safety, is becoming increasingly popular among doctors who take care of Lymphology and/or who practice Homotoxicology.

Mesotherapy consists of intradermal district injection of a set of drugs in small doses on a specific area of the skin, through thin needles more or less 4 mm long.

The aim of this therapy is to promote the elimination of excess fluids, detoxify the body and improve skin tone and elasticity.

The action of the injections in mesotherapy with the use of specific molecules is in fact anti-inflammatory, vascular and lipolytic [10,11,12,13].

The fields of action of mesotherapy are: local adiposity and cellulite or edemato-fibrosclerotic panniculopathy (PEFS); venous-lymphatic insufficiency; Biostimulation and skin rejuvenation of the face; Some dermatological pathologies; Motor rehabilitation in small sports traumatology and Osteo-arthro-rheumopathies.

Commonly used drugs are:

- Vasoactive and hemorheological: Buflomedil; Pentoxifylline; Sulodexide; Mesoglycan..
- Draining: Coumarin; Homeopathic (Lymphomyosot, Lymdiaral, Aesculus Hippocastani, Arnica comp.)...
- Lipolytics: L-carnitine; Phospholipids; Phosphatidylcholine; Ac. Deoxycholic ...
- Biostimulants: glucosamine, ac. Hyaluronic ...

The aim of this work is to evaluate the importance of the Mesotheraphy in the treatment of lymphedema and if the procedure can be used routinely in the protocols of physical rehabilitation treatment of lymphedema (CDP).

MATERIALS AND METHODS

In the period 2005-2017 166 patients with lymphedema were treated, of these patients since 2014, 83 were also treated with Mesotherapy.

- 14 cases of 3rd degree lymphedema of the upper limbs – women, post mastectomy, aged between 51 and 69 years and an average age of 62.3 years.
- 152 cases of lymphedema of the lower limbs – 83 men and 69 women
  - 63 cases of primary lymphedema: 34 women and 29 men, aged between 27 and 63 years and an average age of 48.8 years.
  - 89 cases of secondary lymphedema - men and women aged between 54 and 82, with an average age of 68.7 years of which:
  - 34 cases of phlebolymphatic decompensation in large obese: 19 men and 15 women.
  - 47 cases post surgical of which 7 from failure of surgical therapy.
  - 8 cases caused by episodes of relapsing lymphangitis.

The mesotherapy cocktail was composed as follows:

- 2.5 cc of Buflomedil (1/2 ampoule, equal to 25 mg)
- 1 cc of L-Carnitine (equal to 0.4 mg)

- 2 cc of homeopathic products based on Conium and Hydrastis(equal to 1 ampoule)
- 1.5 cc of Glucosamine sulphate sodium chloride (1/2 ampoule, equal to 200 mg)
- Physiological solution up to a total of 12 cc

Buflomedil was used until December 2011, because it was removed from the market. (Fig.1)

The volume measurements were made according to the disk model of Kuhnke [14].

The volume was calculated using the formula:

$V= (C12+C22+\ldots+Cn2) /\pi$.

The percentage reduction in arm volume at each point of measurement was calculated via the formula:

$\Delta V\%=[(\text{pretreatment arm volume - post-treatment arm volume}) /\text{pretreatment arm volume}]x100$

Statistical analyses were performed with the Student t-tests. Differences were accepted as significant when $p<0.05$. All patients gave informed consent before inclusion.

THERAPEUTIC PROTOCOLS

In the last 4 years we have routinely included mesotherapy in the protocols of physical and rehabilitation therapy of lymphedemas convinced of the effectiveness and of the fundamental role in accelerating the process of clinical improvement of lymphedemas regardless of the grade of severity.

In accordance with current therapeutic guidelines, oral therapy with 100 mg of Melilotus (containing 20% coumarin equal to 20 mg), 300 mg of Rutin and 100 mg of Bromelain, one tablet /day was also prescribed for all patients continuously in all stages of treatment [15].

- CDP 1: short-term for a total of 6-9 sessions
  DECONGESTION
  - Manual lymphatic drainage: 2 to 3 weekly sessions
  - Mesotherapy: 1 weekly session for three weeks
  - Multilayer elastic bandage: personalized renewal
  - Otherwise 3rd class of compression elastic stockings (34-46 mmHg)
  - Antibiotic therapy and cortisonotherapy if there is lymphangitis
- CDP 2: in the medium-term for a total of 8 sessions
  DECONGESTION and STABILIZATION
  - Manual lymphatic drainage: weekly or biweekly sessions
  - Mesotherapy: 1 weekly session for a total of 8 sessions
  - Multilayer elastic bandage: personalized renewal
  - Otherwise 3rd class of compression elastic stockings (34-46 mmHg)
  - Antibiotic therapy and cortisonotherapy if there is lymphangitis
- CDP 3: long term for at least 6-8 months
  MAINTENANCE
  - Manual lymphatic drainage: fortnightly or monthly sessions
  - Elastic compression with 3rd class of compression elastic stockings (34-46 mmHg)
  - Educate to Self-management

RESULTS

166 cases. Of these, 83 patients have also been treated with Mesotherapy since March 2014.

Mesotherapy gave decongestive results that exceeded expectations, with rapid reduction of limb volume by 60-90% in 100% of cases, rapid scarring of trophic lesions and significant improvement in the patient's quality of life as highlighted by the VAS scale with an unexpected clinical improvement immediately after the first session, which was maintained in the following sessions.

Measurement of the limb volume reduction is the most common approach to quantify the extent of lymphedema and evaluate the therapeutic success.

After the cessation of the first cycle of attack therapy (1 month after the beginning of the therapy, T1) 7.93 %, at the second visit (2 months after the beginning of the therapy, T2) 9.02 %, and after five months from the beginning of the therapy (T3) 9.6 %.

All these volume reductions were significant as compared to the baseline mean volume ($p<0.05$).

In the control group without Mesotherapy, the mean percentage reductions in absolute volume were 3.06% (T1), 2.9% (T2), 3.6% (T3), respectively, at the corresponding follow up visits ($p<0.05$). (Tab.1, 2)

- 10 patients (6%) had no sign of improvement due to poor or non-compliance with therapeutic indications (lymphatic drainage, elastocompression, mesotherapy);
- Time of decongestion with mesotherapy: 4 weeks - 3 months; (Vs 6 weeks - 4 months without Mesotherapy);
- Complications: Lymphangitis episodes occurred in both groups with an incidence of 3% exclusively in the first decongestive attack phase. In no case of the treated patients of the two groups did lymphangitic episodes occur during the continuation of the therapy.

CONCLUSIONS

From the data obtained it can be said that mesotherapy associated with decongestive methods can be considered a valid tool to be used during CDP in lymphedemas thanks to the good results obtained, good tolerability by patients, in the absence of complications.

In "old" edemas that aren't very responsive to treatments, Mesotherapy is able to improve results and maintain them over time. We also obtained, in fact, significant results in fibrotic edemas thanks to the presence of glucosamine, a substance with an important bio-rivitalizing and anti-inflammatory capacity.

Mesotherapy has also proven effective in improving the feelings of tension and heaviness reported by most patients. (Fig.2)

If used in compliance with the most elementary sterility standards, Mesotherapy is a safe treatment, practically free of side effects: in no case have local complications (lymphangitis and/or infections at the puncture site) been recorded such as to require the discontinuation of therapy.

Improvement of patients' quality of life, with repercussions on their psychological and emotional aspects.

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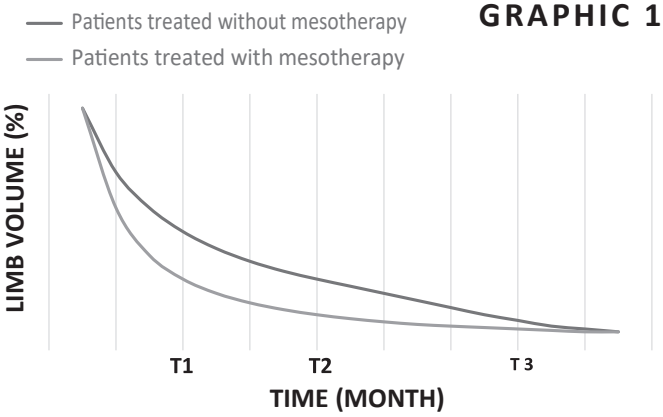
Figure 1: Mesotherapy technique.

GRAPHIC 1



Tab 1: Differences concerning the average size reduction of edema between patients treated with physical therapy and mesotherapy (orange line) and patients treated with only physical therapy (blue line).

CLINICAL CASES

- **75 year old woman**
- **In 2006 left mastectomy**
- **Chemotherapy**
- **Various unilateral pressure therapy sessions**
- **Unilateral lymphatic drainage.**
- **Repeated episodes of lymphangitis**

BEFORE	AFTER
	
WRIST 24 cm FOREARM 35 cm ARM 35 cm	WRIST 17 cm FOREARM 31 cm ARM 33 cm

CLINICAL CASES

- **46 year old woman**
- **Hysterectomy surgery**
- **increase in volume of the limb after about 20 days after surger**

BEFORE	AFTER
	
ANKLE 35 cm CALF 57 cm THIGH 74 cm	ANKLE 29 cm CALF 43 cm THIGH 65 cm

CLINICAL CASES	
• 55 year old man • swollen limb for about 30 years • E.O. : 2nd degree lymphedema, sore limb, lymphatitis	
BEFORE	**AFTER**
	
ANKLE 25 cm CALF 33 cm	ANKLE 23 cm CALF 30 cm

Tab. 2: Lymphedema mesotherapy - personal case study: some cases…

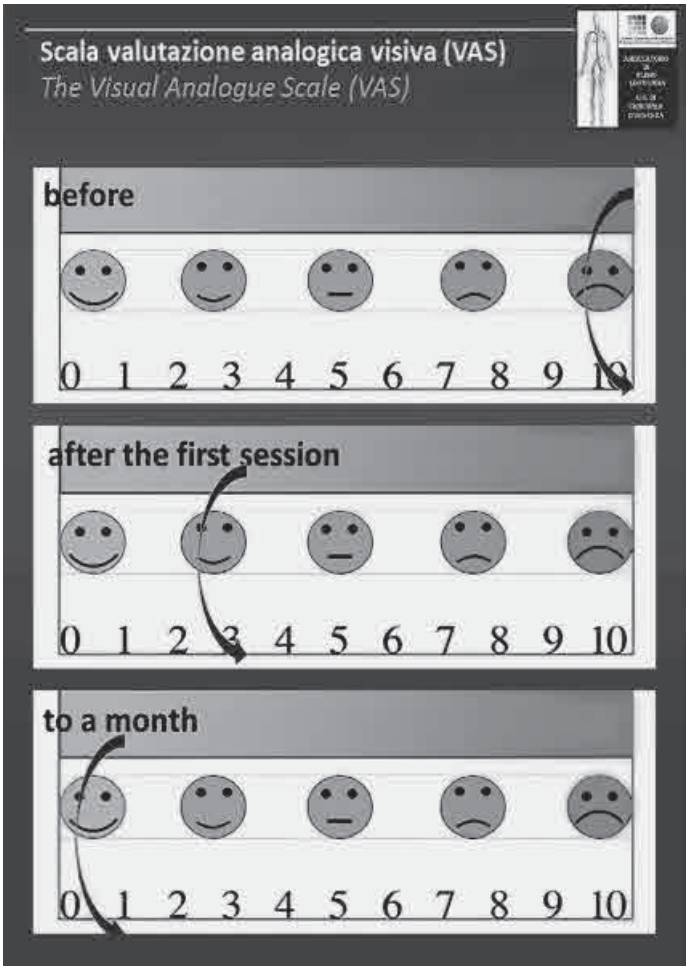


Figure 2: VAS - assessment of the patient's well-being

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OF
lymphology
and related problems
VOLUME 31 • No. 80 • 2020
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TINEA: ITS INSIDENCE RATE, RELATION TO LYMPH-EDEMA-RELATED ACUTE BACTERIAL DERMATITIS, ACCURATE DIAGNOSIS, GOOD TREATMENT AND PERFECT PROPHYLAXIS

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ABSTRACT

Objective: Tinea is mostly overlooked to diagnose and closely associated with lymphedema-related acute bacterial dermatitis.

Material and Method: 101 lymphedema patients of upper extremity and 501 lymphedema patients of lower extremity are examined for tinea by microscopic examination. Tinea is diagnosed by microscopic examination and properly treated. Its perfect prophylaxis has been tried by wearing five-toed sox(for lower extremity) and applying antimycotic lotion once in a week continuously every year.Incidence of lymphedema-related acute bacterial dermatitis is checked in the upper and lower extremity lymphedema patients separately

Table 1. Incidence of Tinea and Occurrence Rate of Lymphedema-related Acute Bacterial Dermatitis in the Upper and Lower Extremity.

Upper extremity				
		LRABD*+	LRABD*-	total
I.	Tinea+	4(36%)	7(64%)	11
II.	Tinea -	27(30%)	63(70%)	90

Lower Extremity				
		LRABD*+	LRABD*-	total
III.	Tinea+	172(56%)	134(44%)	306
IV.	Tinea -	78(40%)	117(60%)	195

III VDS IV p<0.001

*Lymphedema-related acute bacterial dermatitis

Results:Tinea including nail mycosis is correctly diagnosed by microscopic examination showing fungus in the specimen. If the external application of antifungal drug does not work well, we change the product. Or sometimes we give an oral antifungal drug. If the patient wears 5 toe-sox(for the lower extremity lymphedema), the tinea heals better. If the patients follow the regulation to prevent recurrence(Table 2), no patient has ever suffer from it, so long as the patient follows year after year continuously. Incidence of lymphedema-related acute bacterial dermatitis is calculated in tinea infected patients in the upper and lower extremity. The lower extremity lymphedema patients have more incidence for the lymphedema-related acute bacterial dermatitis. However those with upper extremity lymphedema do not have it

Table 2. Strategy to Avoid Recurrence of Tinea Pedis

1	Treat tinea perfectly.
2	Wash feet with soap during bath taking every day.
3	Wear 5 toed sox of cotton or silk made.
4	Externally apply antimicotic lotion to the whole feet after bath taking at least once in a week.
5	Continue this for years.

*Discussion:*The incidence of lymphedema-related acute bacterial dermatitis is positively related to tinea only in the lower extremity maybe because the foot is always covered by sox and shoes whereas the upper extremity is not. After culture of infected skin, the species of fungus in the second infection is different from the primary one.

*Conclusio*n:Tinea must be diagnosed only by microscopic examination of skin surface specimen. Because incidence of lymphedema-related acute bacterial dermatitis is high in tinea infected lower extremity, we should carefully treat tinea pedis and unguum following prophylactic strategy.

Key Words:An accurate diagnosis and treatment & prophylaxis of tinea are important in lymphedema patients.

INTRODUCTION

Lymphedema-related acute bacterial dermatitis is different from acute cellulitis and from erysipelas(1). After this complication the lymphedema gets worse(2). This time the author has tried to see if the lymphedema-related acute bacterial dermatitis is more often seen if the patent suffers from tinea. If it is so, the management of tinea in lymphedema is very important. It is well known that tinea recurs every summer. We must prevent this recurrence of tinea. That is why a strategy to avoid this recurrence has been tried.

MATERIAL AND METHOD

One hundred and one upper extremity and 501 lower extremity lym- phedemas are used. Diagnosis of tinea is only done

correctly by mi-croscopic examination of scraped skin surface specimen. For nail tinea cut off edge of the nail plait end is examined in the same way.

They are treated by externally applying antimycotic lotion, cream and ointment.Tinea unguum is treated by 10% efinaconazole solution. In case they do not work, the patients are treated by oral antimycotic drugs. Incidence of lymphedema-related acute bacterial dermatitis is calculated in tinea infected or non infected patients with upper or lower extremity lymphedema patients (Table 1). A perfect prophylactic procedure is performed as the Table 2 shows.

RESULTS

They are correctly diagnosed by microscopic examination of the skin specimen, treated completely by external application of antimycotic or oral drugs.The incidence of lymphedema-related acute bacterial dermatitis is seen more often in tinea-infected lower extremity lymphedema patients(Table 1). After strategy of perfect prophylactic procedure no patients have ever complain of reinfection (Table 2).

DISCUSSION

No general lymphologists other than dermatologists check foot in daily clinic. This is an important error in clinical lymphology. The fungi of these patients could be transmitted to the others when they are examined for water volumemetry to check the volume change of the lymphedmatous lower extremity. It is known that the nailplate is not directly attacked by fungus in the usual patients but it is always via skin mycosis except special patients such as collagen disease.

So the skin mycosis of foot is very important for prophylaxis of worsening of lymphedema of the lower extremity. The tinea of the upper extremity is less frequent because hands are washed more frequently and are not covered by gloves in daily life.

Whereas the feet are covered by sox and microtraumatized by shoes in case of walking. It is well known that after lymphedema-related acute bacterial dermatitis the lymphedema becomes clinically worse and finally repeated attacks may cause elephantiasis. Epidermal barrier of the lymphedematous skin is decreased because the epidermis and corneal layer are swollen because of edema and easily erodiert and macerated. Then epidermal resident bacteria easily invade into the dermis causing lymphedema-related acute bacterial dermatitis(2).

The recurrence of tinea is caused by reinfection because the kind of cultured fungus species is different from the original one. After the patients follow the prophylactic strategy(Table 2) very strictly for years, no reinfection is known.

CONCLUSION

To diagnose tinea correctly by microscopic examination of the infected skin is necessary. Tinea pedis is often seen in the feet and causes lymphedema-related acute bacterial dermatitis. If the patients follow a new prophylactic strategy, tinea peids never recurs.

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VENOUS THORACIC OUTLET SYNDROME AFTER BREAST SURGERY

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ABSTRACT

Venous thoracic outlet syndrome is a unilateral, rarely bilateral, form of thoracic outlet syndrome (approximately 4%), due to an extrinsic compression of the subclavian vein which can be divided into thrombotic and no thrombotic clinical entities.

In this study, the author underlines the usefulness of Echo-Colour-Doppler diagnostic to evidence an intermittent subclavian vein compression, without intraluminal thrombus, in patients who had undergone breast surgery, with axillary lymphadenectomy, who refer homolateral venous claudication while performing work activities that can be resolved by resting the limb.

In this study, the subclavian venous obstacle discharge was due to impaired posture and/or predisposing morphotype (weak muscular support of the shoulder girdle), completely resolved through specific physical therapy, in order to take pressure off the vein in the thoracic outlet, with complete disappearance of symptoms and consequent improvement in the performance of work activities and quality of life.

Furthermore, the resolution of not thrombotic venous thoracic outlet, through physical therapy, avoids the possibility of deep vein thrombosis onset due to the intermittent narrowing of the subclavian vein.

Keywords: breast surgery, venous thoracic outlet syndrome, colour duplex ultrasound

INTRODUTION

Thoracic outlet is composed of 3 compartments: costoclavicular and interscalene triangles and retro-pectoralis minor space where neurovascular compression is possible.

In this study the author decided to focus the attention on eventual subclavian vein compression in the thoracic outlet after breast surgery, following the evaluation of a patient (38 years, housewife, normal weight, no sport, no central venous catheter) who had undergone breast surgery, with axillary lymphadenectomy followed by radiotherapy, sent to the author's study centre for lymphoedema onset.

In the anamnesis, the patient reported homolateral dominant arm heaviness and fatigue after using it, in abduction, resolving with resting position.

The patient was not affected with lymphoedema but with homolateral axillary-subclavian vein thrombosis highlighted through Echo-Colour-Doppler examination.

Angio-MRI requested resulted negative for bone, muscle or soft tissue abnormalities as well as a research of congenital thrombophilic factors.

Furthermore, a physiatrist evaluation highlighted poor posture (drooping of homolateral shoulder).

The aim of this in progress study is to determine the incidence of subclavian vein compression in thoracic outlet in patients who had undergone breast surgery.

MATERIAL AND METHODS

The study was carried out on 110 patients who had undergone (1-2 years) breast surgery (quadrantectomy-axillary lymphadenectomy) followed by radiotherapy, without homolateral central venous catheter.

Patients have been divided into 3 groups based upon I.S.L. staging (subclinical stage, stage I and II) and their upper limbs have been examined through Echo-Colour-Doppler (Sonoscape device - 7.5 MHz linear high-frequency probe) at rest, to exclude venous disease, and during the dynamic test to research eventual venous compression in thoracic outlet. The correct dynamic test is performed in seated position, with an experienced physical therapist who passively helps patient to perform the manoeuvre, while the angiologist displays the vascular structures through bilateral abduction manoeuvre by transducer, beneath the clavicle, with longitudinal view of subclavian vein and Doppler angle selected at 60°.

In cases of venous thoracic outlet compression at the beginning the flow speed increases, then the flow speed decreases or disappears with upper-stream venous diameter increased and the appearance of spontaneous eco-contrast.

Patients positive for venous thoracic outlet compression underwent physiatrist assessment to evaluate their posture.

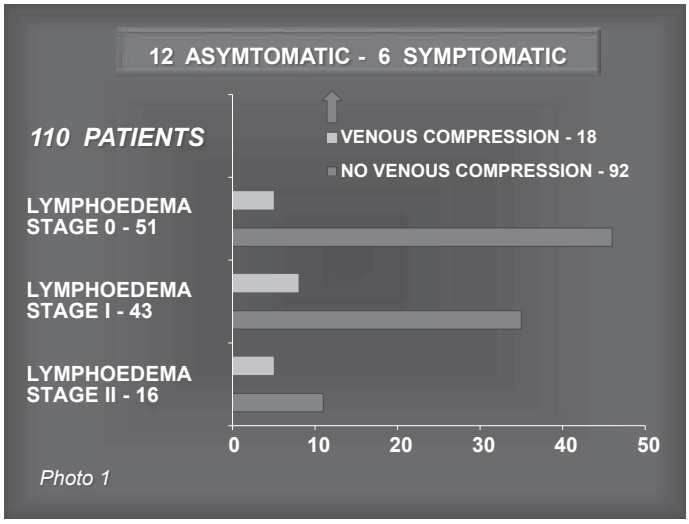

Photo 1

RESULTS

This study, carried out on 110 patients, has highlighted 92 patients negative and 18 positive (12 asymptomatic and 6 symptomatic) for venous thoracic outlet compression. Photo 1

The symptomatic patients referred venosus claudication within minutes after using, in abduction, and resolving on resting:

- Subclinical stage: 2 patients (35 years, housewife, normal weight, no sport - 47 years, teacher, normal weight, no sport) reported homolateral arm (in the first dominant and in the second no dominant) heaviness, fatigue and swelling in abduction;
- Stage I: 3 patients (38 years, housewife, normal weight, no sport - 48 years, sales assistant, normal weight, no sport
- 50 years, factory worker, overweight, no sport) reported homolateral arm (in the first and second dominant and in the third no dominant) heaviness, fatigue, hand cyanosis in abduction.

Stage II: 1 patient (33 years, housewife, normal weight, no sport) reported homolateral dominant arm heaviness and fatigue in abduction.

Patients positive for venous thoracic outlet compression, underwent physiatrist assessment that highlighted poor posture (anteriorized posture and/or drooping shoulder and/or weak muscular support of the shoulder girdle).

After opening of rehabilitative project, the physiatrist required a personalised physical therapy programme (postural rehabilitation, respiratory gymnastics, cervical pompage, stretching and strengthening exercises, decontracting manoeuvres of bilateral medium trapezius and homolateral pectoral muscle, scapula muscles detachment in lateral decubitus and strengthening of the shoulder girdle muscle) as well as a personalised home exercise programme and educational postural programme.

Through the physical therapy programme, subclavian vein compression was resolved with the disappearance of symptoms in symptomatic patients (6 out of 12 patients).

A follow-up (2 checks: 1 every 3 months) was requested and it consisted on physiatrist evaluation to verify the posture as well as angiologist examination through Echo-Colour-Doppler to confirm the absence of subclavian vein compression.

CONCLUSION

In this study, the subclavian vein compression in the thoracic outlet, due to poor posture and/or predisposing morphotype, has been diagnosed in 18 out of 110 patients, and completely resolved through personalised physical programme, personalised home exercise programme and educational postural programme. The latter is important because the patient must develop the awareness of correct posture, also if initially a new posture attitude is frequently uncomfortable and a constant encouragement by family and physical therapist is fundamental.

Furthermore, the resolution of venous thoracic outlet compression is essential to avoid the deep vein thrombosis onset due to the intermittent narrowing of the subclavian vein.

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CO.DE.PHY.L. PROCEDURE IN THE TREATMENT OF LYMPHEDEMA

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ABSTRACT

Lymphedema is a chronic condition characterized by the abnormal accumulation of interstitial fluid due to the insufficiency of the lymphatic system. Although it is a common disabling disease that causes significant morbidity for affected patients, treatment for this condition remains limited and largely ineffective. The therapeutic gold standard of lymphedema, based on the main guidelines, is represented by complex decongestive physiotherapy treatment according to Foldi (CDP). In the Phlebo-lymphology clinic attached to the U.O.C. of Emergency Surgery at the University Hospital of Palermo, CDP is practiced for patients with lymphedema tending to obtain adequate decongestion, reduction of fibrosis, limb volume, improvement of trophic conditions and maintenance and optimization of results.

MATERIALS AND METHODS: *We enrolled 56 patients (31 men and 25 women), aged between 41 and 68 years, with 3rd Clinical stage lymphedema of the lower limbs, in particular with primary lymphedema in 21 cases, post-surgical lymphedema in 26 cases and 9 cases post lymphangitis. In 7 patients the lymphedema had worsened after lymphatic surgery failure. Specifically, 4 cases of venous lymphatic anastomosis, 2 cases of autologous lymph node transplantation and 1 of super microsurgery, twice a week with a zinc oxide and coumarin multilayer bandage applied immediately after 55 minutes of Co.De.Phy.L. Treatment.*

RESULTS: *The Co.De.Phy.L. Treatment is an original idea of the Phlebo-Lymphology Clinic, acronym of Combined Decongestive Physic Lymphatic Treatment, using the combined and simultaneous action of different methods, such as 1MHz Ultrasound (US), 500 kHz Resistive Radio Frequency (RF) and 760nm Soft Laser (SL), in patients with 3rd grade of lymphedema it has allowed to obtain an amazing result in terms of significant reduction of limb volume, immediate attenuation until resolution of inflammation and disappearance of algic symptoms in 100% of treated patients.*

DISCUSSIONS AND CONCLUSIONS: *Today the Co.De. Phy.L. Treatment has been routinely included in our lymphedema treatment protocols, with rapid reduction of limb volume, scarring of trophic lesions and significant improvement in the patient's quality of life.*

By acting on the interstitial matrix, it demonstrates its high decongestive and anti-inflammatory drainage and lymphatic stimulus activity.

By promoting the reabsorption of edema and exudate, improving venous circulation, it can perfectly integrate with other physiotherapeutic principals of CDP, such as safe regenerating, rebalancing and cellular and tissue recovery therapy in flebo-lymphatic pathology.

Lymphedema is a pathological condition that manifests itself by district edema with a high interstitial protein concentration, degenerative changes in the connective tissues of the skin and subcutaneous tissue, recurring reduction of immune functions and consequent significant incidence of infections, which generally, but not exclusively, affect supra-fascial soft tissues [1-5].

For WHO (World Health Organization) it is a chronic, progressive and disabling pathology, that occurs in the body due to a lymphatic transport deficit.

Lymphedema is classified into primary or congenital, and secondary or acquired [5-7].

Primary lymphedema is usually the consequence of an agenesis or a congenital hypoplasia of the lymphatic vessels or lymph node stations.

Secondary lymphedema occurs throughout life, is not congenital, but it's the consequence of an impoverishment of the loco-district lymphatic tissue due to surgery, infections or injuries.

This is a serious personal and social disease, more recurring than it actually seems. The data obtainable from the international literature, corresponding to the official data of the World Health Organization, report an incidence of lymphedema in the world equal to 300 million cases (about one person in every 20).

Almost half of the lymphedemas are of primary origin.

Another 70 million are of parasitic origin (the most frequent forms are represented by the infestation of Filaria Bancrofti), particularly present in tropical and subtropical areas (India, Brazil, South Africa).

50 million are post-surgical and especially secondary to the treatment of breast cancer in women and prostate cancer in men.

The other 30 million are essentially caused by functional problems

of overloading the lymphatic circulation (particularly, in outcomes of deep phlebothrombosis of the lower limb, liver failure, nephrotic syndrome, arteriovenous fistulas).
There are also 10 million cases of posttraumatic and non-use transient lymphedema especially in the elderly.
In western countries, the main causes are genetic, surgical or related to the venous system and in Italy 40,000 new cases are estimated every year. Up to 10% of the population is a victim of lymphedema, a disease also known as elephantiasis, which affects more in the South (12%) and in the Center (11%), than in the North (7%).[1,8,9]
Lymphedema causes abnormal thickening of the skin and underlying connective tissue, especially of the legs and male genitalia. It is one of the most common causes of disability in the world [9, 10, 11, 12].
The incidence of lymphangitis, clinically more or less manifest, as a complication of lymphatic stasis, was very high (practically in almost all cases), to such an extent as to require protracted antibiotic treatment, both for therapeutic and prophylactic purposes.
Lymphedema, more frequent in the female sex, at the III-IV decade of life [13], reduces the functionality of the affected limb; it can be associated with pain, recurrent infections and skin changes; it can make social and relationship life very difficult, impacting on the quality of life; it can rarely develop into a malignant disease, lymphangiosarcoma.
Considering the high incidence of secondary lymphedema, it's appropriate to underline the importance of the possibilities of prevention of lymphostatic pathology, both in terms of early diagnosis and timely treatment.
It's a chronic pathology, therefore degenerative and there isn't resolutive therapy. If action is taken with an early diagnosis and an adequate treatment with a decongestive therapy that guarantees the angio-tissue homeostasis, valid results stable in the long term and a good quality of life can be obtained. This task belongs to the dedicated multidisciplinary and highly specialized centers that must take care of the patient not only for treatment, but also to monitor the degeneration of the disease which, in advanced forms, deserves particular attention as it is highly disabling.
The therapeutic gold standard of lymphedema, based on the main guidelines, is represented by complex decongestive physiotherapy treatment according to Foldi (CDP), that is, a personalized treatment strategy, characterized by contemporary action, synergical and/or sequential of different therapeutic procedures tending to decongestion, reduction of fibrosis, decrease of limb volume, improvement of trophic conditions and maintenance and optimization of results. The chances of success of decongestive therapy increase if the stage of disease is early. Instead surgery is reserved for cases where the disease cannot be managed with CDP, but the results are not always as exciting as they are often presented [1-2-13-15-16-17-18].
In the Phlebo-lymphology clinic attached to the U.O.C. of Emergency Surgery at the University Hospital of Palermo lymphedema can be cured thanks to the use of some revolutionary methods such as the zinc oxide and coumarin multilayer bandage, mononuclear cell implantation for the treatment of ischemic trophic lesions, and last but not least, but only for a chronological fact, the decongestive treatment of lymphedema: Co.De.Phy.L. Treatment.
Acronym of Combined Decongestive Physic Lymphatic Treatment.
The Co.De.Phy.L. Treatment is an original idea of the Phlebo-Lymphology Clinic that arises from the experience made on a case of phlebo-lymphatic edema caused by post-thrombotic syndrome gained by subjecting the patient to some decongestive sessions using a device capable of sequentially exploiting the effects of the Lipolaser, RF and Ultrasound. The amazing result in terms of significant reduction of limb volume, immediate attenuation until resolution of inflammation and disappearance of algic symptoms has led us to want to try the effects on a pathology certainly more "tough" such as elephantiasis from lymphedema of the lower limbs.
The Co.De.Phy.L. Treatment uses the combined and simultaneous action of different methods, such as 1MHz Ultrasound (US), 500 kHz Resistive Radio Frequency (RF) and 760nm Soft Laser (SL). The methodical represents a safe stimulus of the interstitial matrix with the production of collagen fibers and a perifibrillar protein network.
Ultrasound has a cavitation effect in the underlying tissues, promoting the improvement of skin microcirculation and hydration of the tissues [14].
Radiofrequency promotes arterial inflow and phlebolymphatic drainage by stimulating the production of Collagen Elastin and Hyaluronic Acid thus allowing a rebalancing of the treated areas with an increase in on-site metabolism [14].
The Soft Laser simulate angiogenesis and the production of ATP, gives to the patient a pleasant sensation of warmth contributing to the natural drainage of body fluids in water retention and has an analgesic effect causing serotonin and endorphins to be released [14].

MATERIALS AND METHODS

The aim of this work is to evaluate the importance of the combined and contemporary action of Ultrasound 1MHz (US), Resistive radio frequency 500 kHz (RF) and Soft Laser 760nm (SL), 800 (Co.De.Phy.L. Teatment) in the treatment of lymphedema and whether the procedure can be used routinely in the protocols of physical rehabilitation treatment of lymphedema (CDP)
We enrolled 56 patients (31 men and 25women), aged between 41 and 68 years, with 3rd Clinical stage lymphedema of the lower limbs, in particular with primary lymphedema in 21 cases, post-surgical lymphedema in 26 cases and 9 cases post lymphangitis. In 7 patients the lymphedema had worsened after lymphatic surgery failure. Specifically, 4 cases of venous lymphatic

anastomosis, 2 cases of autologous lymph node transplantation and 1 of super microsurgery.
We have excluded patients with secondary lymphedema to oncological surgery for less than 10 years from the treatment, considering the possible biostimulating effect of the radio frequency.
All patients underwent metric evaluation of the circumferences above-below the knee, calf, ankle and on the back of the foot, and an instrumental evaluation with arterial and venous doppler ultrasound of the lower limbs, longitudinal ultrasound measurement of the medial portion of the knee, the calf, the internal and back foot malleolus, before and after the Co.De. Phy.L. Treatment. Diagnostic examinations were performed including high-resolution ultrasound of soft tissues in all patients (both at the beginning and at the end of treatment).
We have submitted our patient to biweekly of Co.De.Phy.L. Treatment sessions of 55 minutes each for one month, then weekly for another two months. The results were maintained with a single session every 15-30 days.
After each treatment session, each patient was subjected to a zinc-oxide and coumarin multilayer bandage.
In accordance with current therapeutic guidelines[19], oral therapy with 100 mg of Melilotus (containing 20% coumarin equal to 20 mg), 300 mg of Rutin and 100 mg of Bromelain, one tablet /day was also prescribed for all patients.
Patients were assessed at baseline (T0), after one months (T1), and after two months of treatment (T2), after five months (T3) for the following parameters: pitting, measurement of circumferences of the limbs, measurement of ultrasound thicknesses of the superficial tissues in the affected limbs, VAS and assessment of the patient's well-being through the SF12 questionnaire.
The volume measurements were made according to the disk model of Kuhnke[20]. The volume was calculated using the formula:
$V= (C_1^2+C_2^2+...+C_n^2)/\pi$.
The percentage reduction in arm volume at each point of measurement was calculated via the formula:
$\Delta V\%=[(pretreatment\ arm\ volume - post\text{-}treatment\ arm\ volume)/ pretreatment\ arm\ volume] \times 100$
Statistical analyses were performed with the Student t-tests. Differences were accepted as significant when $p<0.05$. All patients gave informed consent before inclusion.

RESULTS

Used on patients with elephantiasis from lymphedema of the lower limbs, Co.De.Phy.L. Teatment gave decongestive results that exceeded expectations, with rapid reduction of limb volume by 60-90% in 100% of cases, rapid scarring of trophic lesions and significant improvement in the patient's quality of life as highlighted by the VAS scale with an unexpected clinical improvement immediately after the first session, which was maintained in the following sessions.(Fig.1) Such data WAS confirmed by the completion of the SF12 questionnaire, which showed a progressive improvement in the quality of life. (Fig.2,3,4)
Measurement of the limb volume reduction is the most common approach to quantify the extent of lymphedema and evaluate the therapeutic success. After the cessation of the first cycle of attack therapy (1 month after the start of the therapy, T1) 24.5%, at the second visit (2 months after the start of the therapy, T2) 18.5%, and after five months after the start of the therapy (T3) 15.3%. All these volume reductions were significant as compared to the baseline mean volume ($p<0.05$). (Tab.1)
The decongestion time was variable, from 2 to 8 weeks.
At T0 patients presented with either weakly expressed (25.3%) or more fully expressed (74.7%) pitting. At T2, average disappearance of pitting was observed in 81% of cases, in 13.3% of cases was weakly expressed while 2.7% of cases still expressed full pitting.
During the decongestive treatment period, any skin wartiness was surgically removed.
At the ultrasound check after the treatment we found a clear reduction of the lymphatic gaps detected at the beginning of the treatment in the various segments explored. (Fig.5) There was a total absence of complications, patient tolerability of the treatment was excellent and the result obtained was maintained with the use of 3rd class of compression elastic stockings and with a fortnightly or monthly decongestive maintenance session.

DISCUSSION AND CONCLUSIONS

Lymphedema and in particular its most serious manifestation, elephantiasis of the lower limbs, represents a serious personal and social disease, more frequent than it actually seems. It can make social and relationship life very difficult, impacting significantly on the quality of life.
It's a chronic pathology, therefore degenerative and to date there is no resolutive therapy. If an intervention is carried out with an early diagnosis and adequate treatment with a decongestive therapy that guarantees angio-tissue homeostasis, valid results can be obtained, stable in the long term, and a good quality of life. It's essential that the patient can count on dedicated multidisciplinary and highly specialized centers able to take care of the problem not only for treatment but also to monitor the degeneration of the disease which, in advanced forms, deserves particular attention as it is highly disabling, such as to make all normal daily activities complicated.
The Co.De.Phy.L. Treatment is an original idea of the Phlebo-Lymphology Clinic attached to the Complex Operative Unit of Emergency Surgery at the University Hospital of Palermo that arises from the experience done in some case of phlebo-lymphatic edema caused by post-thrombotic syndrome made by subjecting the patient to some decongestive sessions using a device capable of sequentially exploiting the effects of the Lipolaser, RF and Ultrasound.
The amazing and long-lasting result of decongestion obtained on the first cases of 3rd grade lymphedema of the lower limbs since the

first sessions with considerable clinical improvement, has led us to use the device routinely in the most serious cases of elephantiasis that have come to our observation.
Today the Co.De.Phy.L. Treatment has been routinely included in our lymphedema treatment protocols, with rapid reduction of limb volume, scarring of trophic lesions and significant improvement in the patient's quality of life.
By acting on the interstitial matrix, it demonstrates its high decongestive and anti-inflammatory drainage and lymphatic stimulus activity.
By promoting the reabsorption of edema and exudate, improving venous circulation, it can perfectly integrate with other physiotherapeutic principals, such as safe regenerating, rebalancing and cellular and tissue recovery therapy in flebo-lymphatic pathology.

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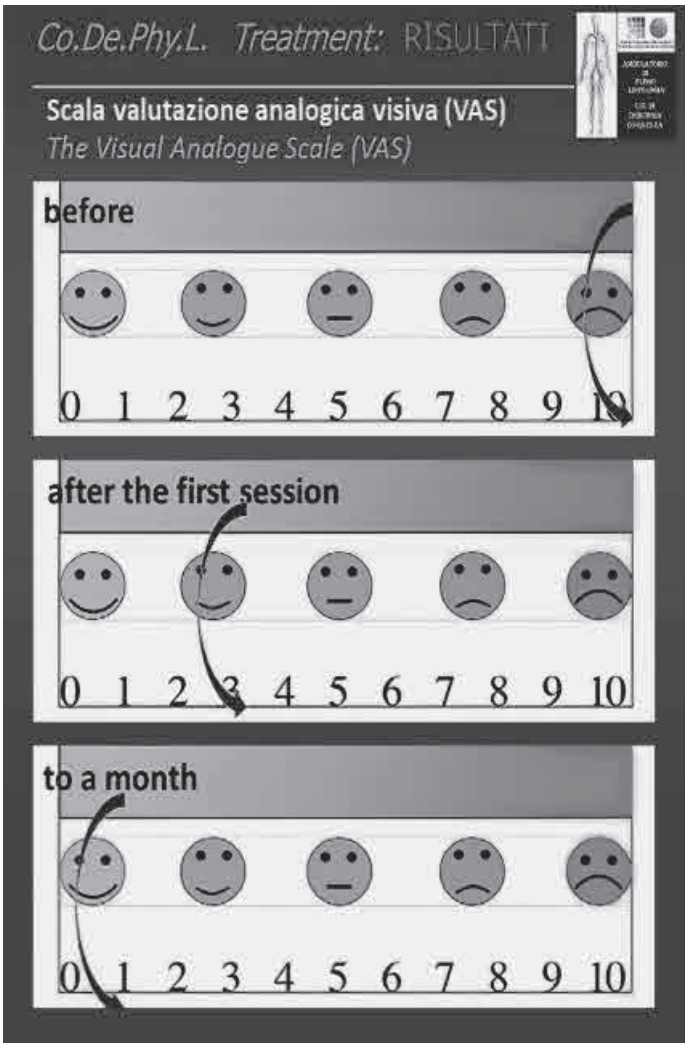
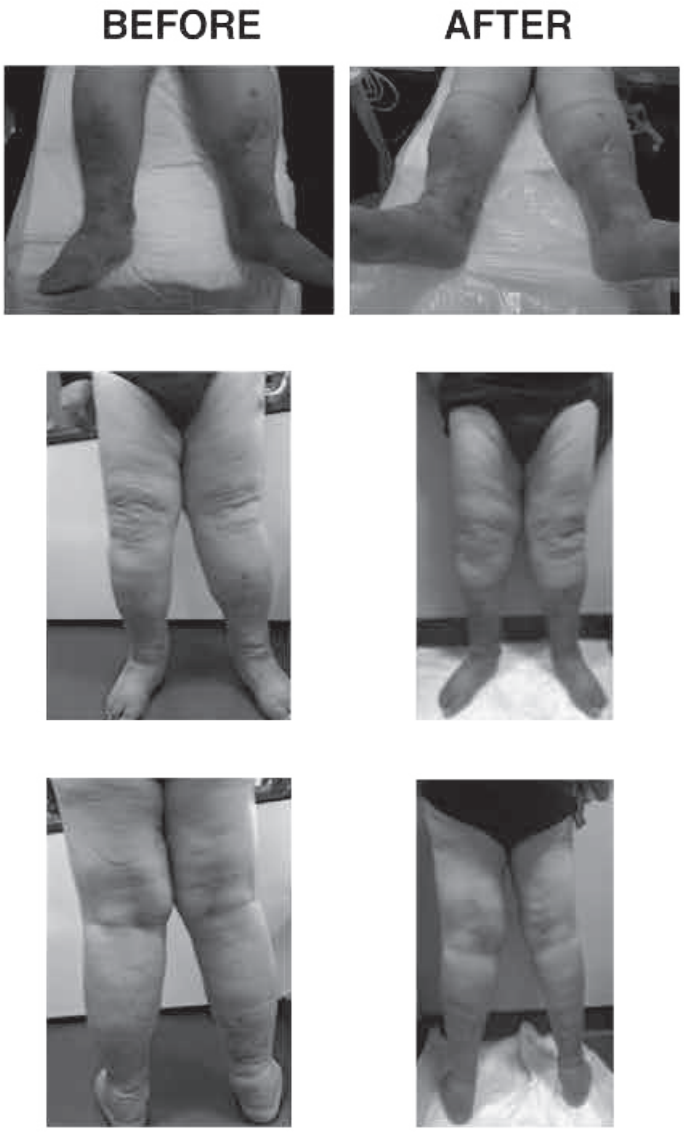


Figure 1: VAS - assessment of the patient's well-being

CASE 1: N.P. - 44 year-old woman, primary lymphedema for 20 years, elephantiasis for lower limbs for 10 years, various pressotherapy and lymph drainage sessions, repeated episodes of lymphangitis.

BEFORE	AFTER
BELOW KNEE: DX 64 cm / SN 64 cm	BELOW KNEE: DX 57 cm / SN 55 cm
CALF: DX 56 cm / SN 54 cm	CALF: DX 48 cm / SN 50 cm
ANKLE: DX 38 cm / SN 39 cm	ANKLE: DX 37cm / SN 36 cm

Figure 2: Clinical case



CASE 2: N.M. 75 year-old man, radical prostatectomy, increase in limb volume after about 30 days from surgery, various pressotherapy and lymph drainage sessions

BEFORE	AFTER
BELOW KNEE: DX 52 cm / SN 54 cm	BELOW KNEE: DX 48 cm / SN 51 cm
CALF: DX 53 cm / SN 57 cm	CALF: DX 39 cm / SN 44 cm
ANKLE: DX 35 cm / SN 33 cm	ANKLE: DX 30 cm / SN 30 cm

Figure 3: Clinical case

CASE 3: P.M.R. 54 year-old woman, primary lymphedema for 40 years, elephantiasis for lower limbs for 20 years, various pressotherapy and lymph drainage sessions, repeated episodes of lymphangitis.

BEFORE	AFTER
BELOW KNEE: DX 55 cm / SN 65 cm	BELOW KNEE: DX 43 cm / SN 46 cm
CALF: DX 51 cm / SN 64 cm	CALF: DX 41 cm / SN 42 cm
ANKLE: DX 41 cm / SN 48 cm	ANKLE: DX 34 cm / SN 35 cm

Figure 4: Clinical case

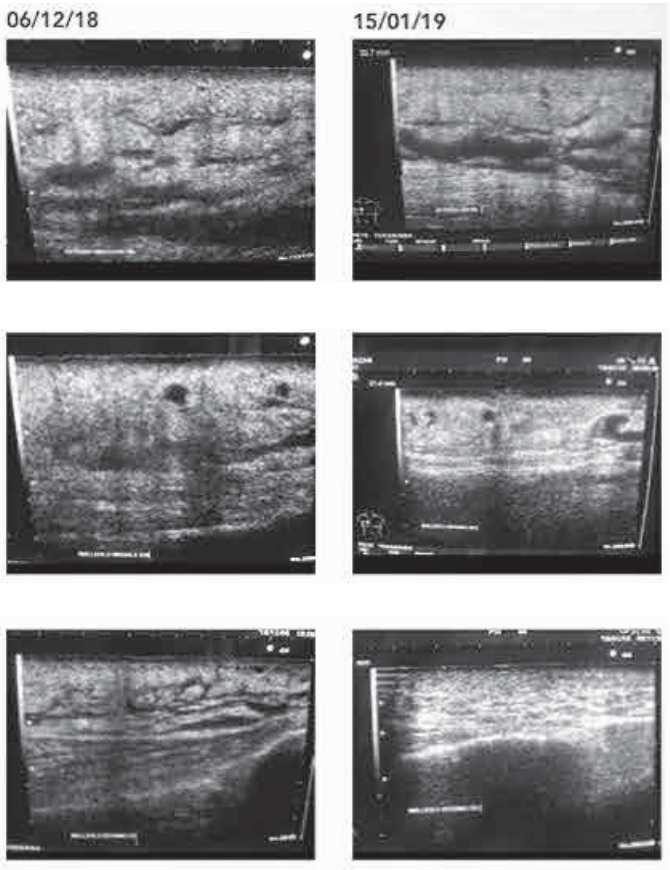
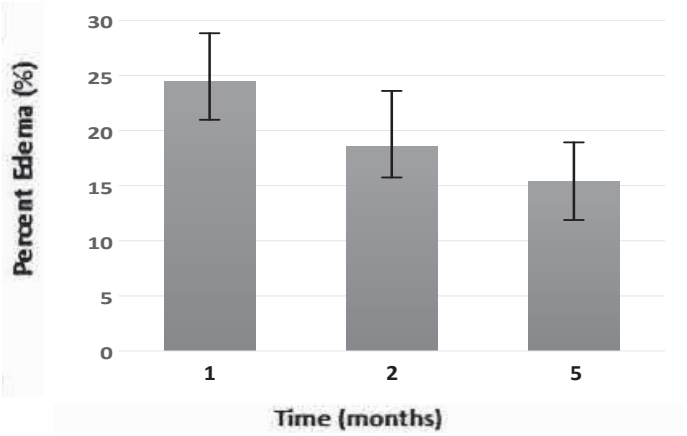


Figure 5: Ultrasound rating thicknesses of the superficial tissues in the affected limbs



Tab.1: Change in percent of edema

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