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9TH ANNUAL MEETING OF THE EUROPEAN VENOUS FORUM - 26-28 JUNE 2008, BARCELONA (SPA)
37. JAHRESTAGUNG DER DEUTSCHEN GESELLSCHAFT FÜR ANGIOLOGIE - 23-24 SEPTEMBER 2008, MANNHEIM (GER)
LA TERAPIA DELL'ULCERA CUTANEA: UN PONTE FRA TRADIZIONE E INNOVAZIONE - 24-27 SEPTEMBER 2008, ROMA (ITA)
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SOCIETÀ ITALIANA DI FLEBOLOGIA, XII CONGRESSO NAZIONALE - 2-5 OCTOBER 2008, BRINDISI (ITA)
ACP MEETING - 22TH ANNUAL CONGRESS - 6-9 NOVEMBER 2008, MARCO ISLAND (USA)
UIP 50 - INTERNATIONAL UNION OF PHLEBOLOGY, XVITH WORLD MEETING - AUGUST 31-SEPTEMBER 4, 2009
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A PERFECT PROPHYLAXIS OF LYMPHEDEMA-RELATED ACUTE DERMATITIS

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ABSTRACT

It is well known that after lymphedema patients suffer from lymphedema-related acute dermatitis, the edema gets worse. Its complete prophylaxis is very important. The author has already demonstrated the skin surface resident bacteria are responsible⁽²⁾ and daily external application of antimicrobial lotion to the lymphedematous skin prevent the complication. Since its incidence becomes more if mycotic infection is complicated,⁽³⁾ its management has also been tried. After this complete prevention of bacterial invasion by lotion, 18 cases of lymphedema which have suffered from the attack in the past one month have been evaluated. All the patients developed no dermatitis at all.

INTRODUCTION

Lymphedema-related acute dermatitis is sometimes called dermatolymphangioadenitis, lymphangitis, erysipelas, cellulitis or septicemia. After the lymphedema patients suffer from this acute complication, edema becomes usually worse and even elephantiasis develops after multiple episodes. The complication is seen in about a half of all lymphedema patients characterized by a sudden onset of high fever with chills and reddened skin with local warmed skin. It is caused by skin surface resident bacteria such as staphylococcus epidermidis and corynebacteria and only lymphedematous skin is attacked.⁽⁵⁾ If the patients are complicated with tinea, its incidence becomes increased.⁽³⁾ A complete protection of the lymphedematous skin from this bacterial invasion and from mycotic infection is very important from its prophylactic point of view.

MATERIAL, METHOD AND RESULT

Avoidance of bacterial invasion: 18 lymphedema patients of extremity which have suffered from this lymphedema-related acute dermatitis in the past one month receive daily external application of antimicrobial lotion (1% nadifloxacin lotion) to the whole lymphedematous skin after bath and tinea, if any, is treated by antifungal lotion. During the observed duration (2-48 months)

no patient has developed any such an attack except the first case which is treated the infected mycosis and just after the beginning of the trial once suffers from the acute dermatitis (Table 1). Prophylaxis of mycotic infection: 155 cases of tinea pedis complicated in the lymphedema patients of the lower extremity and 24 cases of nail mycosis of the toes are managed by the following strategies after healing of the mycotic complications (Table 2). When the patients always stay at home in a warm room temperature, this prophylactic application of antifungal lotion must be done during the whole year including winter. No recurrence has ever been observed if the instruction is followed strictly by the patients.

DISCUSSION

Reinfection of tinea pedis is very popular which is easily shown by the fact that cultured fungus is different in the primary and the next infection. The fungus itself grows faster if an optimal temperature and humidity are given. The lymphedematous skin is moist and the adhered toe skin makes the skin surface warm and moist enough. That is why a half of all lymphedema patients show mycotic infection. If the lymphedema skin complicated by tinea, the skin surface may be injured easily and the skin surface resident bacteria can easily invade into the dermis. The first case of the Table 1 may have needed 2 weeks before the destroyed epidermis due to tinea became restored. There is a concurrence among the skin surface resident and the pathogenic bacteria. The former have advantage for the survival. That is why the causing bacteria in lymphedema-related acute dermatitis are mostly nonpathogenic skin resident bacteria. The lymphedematous extremity reveals a low tissue partial oxygen pressure which makes inflammation intensified.⁽¹⁾ Bacterial superantigen by the help of interleukin-1 of the keratinocyte stimulates monocytes making the inflammation more intense. This intensified inflammation makes edema worse. Antibiotic application for long period may cause candida complication which is not the case with the antimicrobials. Antimicrobials are characterized by: 1. inhibit the formation of bacterial cell wall; 2. disturb the function of plasma membrane; 3. inhibit the protein synthesis in the ribosomes; 4. inhibit folic acid synthesis and 5. inhibit nucleic acid synthesis. This new drug

penetrates into the lesion better and bacteria gets the resistance less easily.
The same result has been obtained by the external application of nadifloxacin cream.⁽⁴⁾ However lotion is not sticky and the skin condition is better with the lotion.

CONCLUSION

A perfect prophylaxis of lymphedema-related acute dermatitis is obtained by prophylactic strategies in relation to tinea and daily external application of antimicrobial lotion.

Table 1. Eighteen cases of lymphedema with episode of lymphedema-related acute dermatitis in the past 1 month and its trial prophylaxis by external application of 1% nadifloxacin lotion.

No.	name	sex	age	1° or 2°	extremity involved tinea	clinical course	attack after trial (after 2W) + (after 3W) –
1.	SY	F	49	2°	bilateral lower	lt. foot	6.5 Mo –
2.	RH	F	54	2°	left lower	left foot	8 Mo –
3.	TI	M	41	1°	bilateral lower	feet	14 Mo –
4.	RY	F	65	2°	right upper		7 Mo –
5.	KU	F	48	2°	right upper	right foot	3 Mo –
6.	AA	M	56	1°	left lower, scrotum	lt. foot	36 Mo –
7.	SM	M	73	2°	bilateral lower	feet	4 Mo –
8.	KY	F	73	2°	left lower	feet	3 Mo –
9.	KY	F	59	2°	right lower	feet	8 Mo –
10.	TS	F	75	2°	left lower	left foot	14 Mo –
11.	KU	F	50	2°	right lower	–	12 Mo –
12.	SI	F	67	2°	bilateral lower	feet	24 Mo –
13.	SS	F	68	2°	bilateral lower	feet	18 Mo –
14.	TM	F	68	2°	left lower	left foot	48 Mo –
15.	AN	F	68	2°	left upper	–	5 Mo –
16.	SW	F	49	1°	left lower	–	6 Mo –
17.	AM	F	61	2°	left lower	feet	12 Mo –
18.	MK	F	71	2°	right lower	right foot	2 Mo +

F: female, M: male, Mo: month, –: absent, 1°: primary lymphedema, 2°: secondary lymphedema.

Table 2. Instructions for a perfect prophylaxis for tinea

1. Confirm healing of tinea.
2. Wash foot or hand with soap during bath.
3. Wear 5 toed sox (none for hand) made of cotton or silk.
4. Apply antifungal ointment (or lotion) once in a week to the whole area of hands or feet from spring until falls (effective only in northern and subtropical countries) (if the patient always stays at warm room, even during winter, too), even though no reinfection or recurrence has ever been confirmed.
5. If tinea is suspected, microscopic examination of specimen for fungus is done for its confirmation.

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CHYLIFEROUS VESSEL PATHOLOGIES AND ASSOCIATED SYNDROMES: PRIMARY CHYLOUS ASCITES

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ABSTRACT

Chylous ascites is the accumulation of free milk-like peritoneal fluid rich in triglycerides, due to the presence of intestinal lymph in the abdominal cavity. In this paper we report our experience in management and treatment of 12 patients affected by primary chylous ascites.

We demonstrated that the use of laparoscopy to study and to treat the primary chylous ascitis, together with microsurgical methods, provides remarkable advantages, not only during the diagnostic evaluation, to study the nature and to find the place and extension of lymphochylous malformation dysplastic areas, but also to treat these disorders together with surgical, microsurgical and laser techniques.

INTRODUCTION

Chylous ascites is the accumulation of free milk-like peritoneal fluid rich in triglycerides, due to the presence of intestinal lymph in the abdominal cavity. Primary chylous disorders are most frequently caused by congenital lymphangiectasia, and, more in general, are caused by congenital lymphatic dysplasias. Secondary chylous disorders are usually caused by neoplasia, trauma, inflammations, or abdominal surgery. In general, any source of lymph vessels obstruction or leakage can potentially cause chylous effusion in the peritoneal or retroperitoneal cavities. ⁽¹⁾

In about 7.4% of oncological patients undergone to complex abdominal surgical operations, secondary chylous disorders appear. ^(2,3)

Primary chylous ascites is overall uncommon and its true

incidence is not well established, ⁽⁴⁻⁷⁾ although it can be estimated approx like one in 20,000 admissions at a large university-based hospital.

Few experiences about laparoscopic treatment of chylous ascites are reported in Literature ⁽⁸⁻¹²⁾ regarding only secondary pathologies due to surgical operations, such as oncologic urologic procedures (retroperitoneal lymphadenectomy), Nissen operation and laparoscopic presacral neurectomy treatment.

The treatment strategy in primary forms are somewhat different from secondary forms. Although most patients affected by primary disorders are successfully treated by diet composed by medium-chain triglyceride and serial paracentesis and thoracentesis, lymphatic surgical correction may be necessary in selected patients. In this paper we report our experience in management and treatment of patients affected by primary chylous ascites.

PATIENTS AND METHOD

Between September 1, 1996 and December 31, 2004, 82 patients affected by chylous ascites of various etiology were treated in our Center (Department of Surgery – Section of Lymphatic Surgery and Microsurgery, University of Genoa, S. Martino Hospital, Genoa, Italy). Seventy patients diagnosed having secondary chylous ascites caused by benign or malignant tumors, a history of trauma, or previous operations were excluded. Twelve remaining patients affected by primary chylous ascites (7 adult and 5 children), who were studied and surgically treated, are the object of the present paper.

The diagnostic investigations included abdominal sonography, computed tomography, lymphoscintigraphy, lymphography, lympho-angi-magnetic resonance, and laparoscopy. The diagnosis of chylous effusion was based by the following evaluations: milk like appearance, triglyceride level > 110 mL/dL, and presence of chylomicrons. Nonoperative management consisted of therapy based on total parenteral nutrition, proper diet characterized by low-fat MCT intake to reduce chyle production, somatostatin analogues, paracentesis to reduce the intra-abdominal pressure, thoracentesis to reduce pleural effusion when present, compression garments to reduce limb swelling if peripheral lymphedema was present. Cellulitis and/or lymphangitis when present were treated with antibiotics.

An accurate assessment of lymphatic and chylous circulation was carried out by traditional oil contrast lymphography and lymphangio-CT, then a lymphangio-MR by the suppression of fat signal (especially when there was extensive dysplastic tissular alterations), after having already done a whole body lymphoscintigraphy and an echo-Doppler study of the venous system. Lymphoscintigraphy was performed by injecting the tracer at both hands and feet, intradermically at the dorsal surface and deeply beneath the muscular fascia at the volar site, in order to study both superficial and deep lymphatic circulations.

According to the site of leakage, thoracentesis and/or paracentesis help to confirm the diagnosis of nature of the liquid, which will appear milky if the patient is unfasted or the dosage of triglycerides in the liquid would be very high.

Surgical treatment for chylous ascites (Laparoscopic-Microsurgical approach, only after adequate metabolic compensation) included drainage of ascites, identification and treatment of endo-abdominal chylorrhagic sites, treatment of chylous cysts, exeresis of lymphangectasia-lymphangiodysplastic tissues and sclerotherapeutic treatment, antigravitational ligatures of ectatic and incompetent collectors for treatment of chylous reflux syndrome, CO₂-Laser assisted surgical procedures, and chylo/lympho-venous shunts. Microsurgical techniques were used to carry out chylous-venous anastomoses, using lymphatics of the mesenteric area.

In the cases with chylothorax, thoracotomy with decortication and pleurodesis, thoracic duct ligation, or thoracic duct cyst resection were performed.

Follow-up evaluation was based on complete resolution of chylous effusion or ascites, reduction of protein-losing syndrome if present, and assessment of the quality of life.

RESULTS

Twelve patients, 5 men and 7 women were treated for primary chylous ascites.

Their age at the moment the study began ranged from 9 months to 12 years in (pediatric) 5 patients, and from 23 to 56 years in (adult) 7 patients (7 adult patients and 5 pediatric patients).

Presenting symptoms, laparoscopic-microsurgical treatment, and results are summarized in the Table.

More in detail, all patients underwent CT imaging studies of the chest and/or abdomen during initial evaluation. CT findings included ascites in 3 cases, pleural effusion in 2 cases, both pleural and ascitic effusion in 2, pulmonary lymphangiectasia in 1 case, intestinal wall thickening in 2 cases. Finally, CT scan was normal

in 2 patients. Lymphoscintigraphy and lymphangiography were performed, respectively, in 12 and 9 patients.

All patients affected by primary chylous ascites were initially treated with medical approach alone. They were fed by total parental nutrition for a mean of two weeks, and then progressive restore of per os nutrition by hypolipidic diet with medium chain triglycerides and followed-up till at least 6 months. In those cases (87%) where the diet is not enough to reduce symptoms, a proper total parenteral nutrition is resumed for an average period of 2 weeks, associated or not, according to the entity of chylous ascites, with the position of one or two peritoneal drainages usually by laparoscopy, which helps in delineating the extension of the pathology and the possibility to perform microsurgical lymphatic-venous shunts. Based upon the result of lymphography and on the unresponsiveness to the non-operative therapy, the surgical approach is decided.

The surgical treatment for chylous ascites or reflux included drainage of ascites in all patients, identification and treatment of endo-abdominal chylorrhagic sites in all patients by administering 60 mg of butter 4 hours before operation, treatment of chylous cysts in 3 patients, exeresis of lymphangectasia-lymphangiodysplastic tissues in all patients and sclerotherapeutic treatment in 2 patients, antigravitational ligatures of ectatic and incompetent collectors for treatment of chylous reflux syndrome in all patients, CO₂-Laser (Cut and Welding effect) in 9 patients, assisted microsurgical procedures in 7 patients, and chylo/lympho-venous shunts in 7 patients. Microsurgical techniques were used to carry out chylous-venous anastomoses, using lymphatics of the mesenteric area. Through a laparotomic approach, after having drained all the chylous ascites, the operation starts by removing all dysplastic tissues, site of chylous leakage with multiple lymphatic and chylous ligatures in non-absorbable suture material (mostly silk). Proper lymphatic and/or chylous structures are then searched to perform lympho-venous shunts, using mesenteric or iliac veins. Usually, 3 drain tubes are left inside the abdomen, and total parenteral nutrition is protracted for about 10 days. Afterwards, alimentation per os is progressively started in parallel with parenteral nutrition, always following a proper diet. Drain tubes are usually removed after 10-15 days from operation.

As concerns complications, the morbidity rate was very low and regarded above all early relapse of chylous ascites (1 case), with the necessity to put a peritoneal-jugular shunt, respiratory distress syndrome (1 case) in a patient affected also from pulmonary lymphangectasia. All patients had to follow proper dietetic regimen.

Mean follow-up was 5 years, ranging from a minimum of 1 to a maximum of 7 years. To date, 7 patients do not show symptoms, and 3 patients improved. 7 patients underwent post-operative lymphoscintigraphy confirming improved lymph flow and reduced lymph reflux. All patients but 1 are still alive.

DISCUSSION

Primary chylous ascites are overall uncommon and it is due to an inadequate lymphatic drainage from the intestine, resulting from maldevelopment of the intra-abdominal lymphatic system. The pathogenesis is poorly understood and genetic factors are claimed to be involved.

TABLE LEGEND
Summary 12 patients' clinical appearances and operative management

Presenting symptoms	
Chylous ascites	2 adult cases
Chylous ascites + inguinal lymphocele + lymphochyloedema of lower limbs	1 adult case
Chylous ascites + chylothorax	1 adult case
Chylous ascites + iliac and pelvic lymphangiomas	1 adult case
Chylous ascites + inguinal lymphangiomas	1 adult case
Chylous ascites + lymphochyloedema of breast and omolateral upper limb	1 adult case
Chylous ascites + chyluria	1 pediatric case
Chylous ascites + upper limb lymphedema + intestinal lymphangiectasia	1 pediatric case
Chylous ascites + perviety of peritoneum and vaginal duct	1 pediatric case
Chylous ascites + lymphochyloedema of lower limbs	1 pediatric case
Chylous ascites + chylopericardium	1 pediatric case
Laparoscopic – Microsurgical Treatment <i>(After adequate metabolic stabilization)</i>	
<ul style="list-style-type: none"> • Drainage of ascites • Search for and treatment of endo-abdominal sites of chyloorrhagy • Exeresis of lymphodysplastic tissues • Antigravitational ligatures of incompetent collectors • Use of CO₂-Laser (Cut & Welsing effect) in association with “Operative Microscope” • Chylo-Venous and Lympho-Venous Microsurgical shunts 	
Results	
<ul style="list-style-type: none"> • Regression of chylous ascites (follow-up > 5 years): 11/12 patients • Efficacy of traditional surgery combined with “Operative Microscope” and CO₂ - Laser for the treatment of associated diseases • Significant reduction of chylothorax after resolution of ascites and dietetic measures • Relapsing chylous ascites: 1 patient (then Peritoneum-Jugular shunt) 	

Paracentesis is the most useful diagnostic step. The chyle is usually color free, however, its appearance and composition are not constant, and depend on multiple factors such as the size of fat particles, cellular content and diet. Microscopic examination of the fluid demonstrates fat globules, and Wright's stain shows a predominance of lymphocytes, triglyceride level > 110 mL/dL, and protein level from 2.5 to 4.1 g/L. Chylomicron can be found at a high concentration if the patient has been fed normally, and the specific gravity usually ranges from 1.010 to 1.021. It has been reported a successful treatment of congenital chyloascites by a somatostatin analog.⁽¹³⁾ This first line of therapy, in conjunction with multiple needle aspiration or drainage has been successful in more than 65%-70% of patients. Prolonged use of low-fat infant formula has been associated with poor neurologic development, possibly from fatty acid deficiency, therefore, it should be limited to three to four months.

Successful surgical treatment of congenital chylous ascites can be achieved in 80% of patients by resection of the macroscopic localized anomaly, or by ligation of an identifiable lymphatic leak. The most prominent location of the lymphatic leak is at the base of the superior mesenteric vessel. If no leak can be identified, the area around the root of the mesenteric vessels should be closely inspected after mobilization of the colon, duodenum and the head

of the pancreas, and hemostasis should be performed by multiple ligation.

A peritoneovenous shunt, either the Leveen or Denver type, has been reported to be successful at least temporarily, in children in whom repeated attempts of medical or surgical approach have failed. In a large collecting series, the recurrence of chylous ascites is not unusual and can occur even after three years; the death rate from chylous ascites is estimated to be between 24% and 30%; however, no recent report exists.⁽¹⁴⁻¹⁸⁾

Our experience demonstrated that chylous ascite is close correlated with lymphatic-lymphonodal dysplasia involving visceral districts. In our experience, medical approach alone did not resolve chylous ascites. Total parenteral nutrition, proper diet with low-fat MCT intake, and somatostatin analogues were useful in the way to obtain adequate metabolic stabilization, to control disease progression, and to prepare the patient for surgical correction. We demonstrated that the use of laparoscopy to study and to treat the primary chylous ascitis, together with microsurgical methods, provides remarkable advantages, not only during the diagnostic evaluation, to study the nature and to find the place and extension of lymphochylous malformation dysplastic areas, but also to treat these disorders together with surgical, microsurgical and laser techniques.

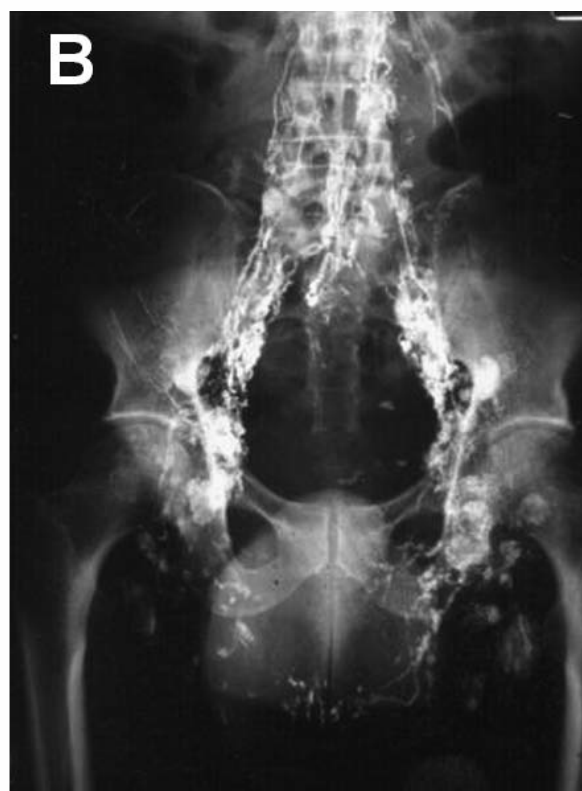
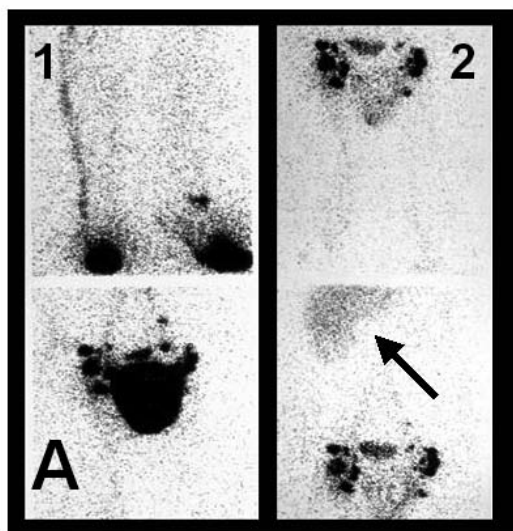


FIGURE LEGEND

Panel A. Lymphoscintigraphy in a patient affected by chylous ascites and chyloedema of genitalia. Before microsurgical treatment. It is evident lymphatic back-flow towards genitalia and lower limbs (1). After microsurgical correction consisting of lymphatic venous anastomosis at the groin bilaterally and lymphatic antigravitational ligatures at the iliac and lumbo-aortic area. Lymphoscintigraphy demonstrates the patency of micro-lymphatic venous anastomosis (early liver traces uptake) (arrow), and disappeared of previously evidenced back-flow at genitalia (2).

Panel B. Lymphography in a patient affected by chylous ascites and chyloedema of genitalia. Note the extensive dysplasia of lymphatic and lymphonodal structures in periaortic and iliac-inguinal regions, with the lymphatic back-flow towards the genitalia.

Panel C. Intraoperative picture showing dilated lymphatic collectors of intestinal wall (vasa lactea).

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LYMPHATIC DAMAGE IN VENOUS SURGERY

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INTRODUCTION

Venous and lymphatic circulation can be considered as strictly correlated and it is often necessary, during the analysis of a physio-pathological process, to contextually check them as if they were a single functional unit.

They do have a common embryonic genesis: as a matter of fact, lymphatic sacs, that represent lymphatic circulation primordial structures, take origin from primordial venous formations. From an anatomical standpoint, both circulations have a supra- and sub-fascial course and are equipped with anti reflux valvular devices.

As far as functional profile is concerned, lymphatic and venous systems cooperate in maintaining correct interstitial liquids and extracellular matrix homeostasis, thus guaranteeing a centripetal transportation of organic materials and molecules originated by cellular metabolism.

AN OUTLINE OF PHYSIOPATHOLOGY

Whenever a clinically evident edema or an inflammatory-infectious manifestation affecting lower limbs is detected, it is possible to highlight a concurrent lymphatic circulation direct involvement (Fig. 1).

This latter can adequately compensate the "load" increase or, even in advance, reveal symptoms of functional insufficiency, "de facto" worsening involved subject's clinical-prognostic aspect. Getting into more details, the appearance of lymphatic edemas affecting lower limbs in the course of venous disease can be schematically due to:

- 1) low output failure, when an insufficient lymphatic drain is already present, and a parapsychological increase is therefore sufficient to create a circulatory incompetence (i.e. primary and secondary lymphatic edemas – stage 1a, or pre-existing functional deficiencies);
- 2) high output failure: while, as for instance with post-thrombophlebitic syndrome and CVI, the rise of lymphatic load can be initially offset by circulatory functional reserve, in case of further overloading or lympho-nodal lymphatic structures lesions, an oedema display can show up.



Fig. 1 - Acute diffuse lymphangitis in a patient affected from chronic venous and lymphatic insufficiency.

While first hypothesis represents a less common situation, the second condition, where lymphatic system insufficiency is subordinate to venous circulation alteration, is frequently met. In clinical practice it is pretty common to detect lymphatic edemas without any evidence of venous system alteration; with fleboedemas, on the contrary, a concurrent involvement of lymphatic system always exists and, "ab initio" already, it can show clinical symptoms of dynamic or mechanical deficiency (Lympho-Fleboedema o Flebo-Lymphoedema). Moreover, lymphatic circulation involvement in CVI is worsened by the appearance of dystrophic-ulcerative lesions and lipodermatosclerosis.

O. Eliska, with reference to the above mentioned subject, has demonstrated lymphatic involvement around venous ulcers and, through aimed biopsies, has confirmed that perilesional edemas are very frequent as well.

During phlebitis events, often pathognomonic “rubra” stria only represents a “linfangitic stria” (Fig. 2), satellite of the vein that has been affected by inflammatory/thrombotic process.

CLINICAL/DIAGNOSTIC ELEMENTS

Before a lower limbs surgical operation due to venous disease, it is necessary to immediately check presence and seriousness of the concurrent lymphatic deficiency. It has to be outlined that transitory edemas may already mean an early indication of lymphatic involvement (stage 1b).

Besides objective test that can reveal a clinically evident lymphatic deficiency, it is helpful to investigate family and remote pathological anamnesis to identify possible risk factors or specific family propensities.

As far as instrumental tests are concerned, when someone is considered at risk, it is advisable to run both a doppler ultrasonographic examination and a limb segmentary Lymphoscintigraphy (Fig. 4), being this latter considered as the “gold standard” in lymphatic circulation insufficiency care and classification by stages.



Fig. 2 - Truncular lymphangitis associated to an acute superficial thrombophlebitis.

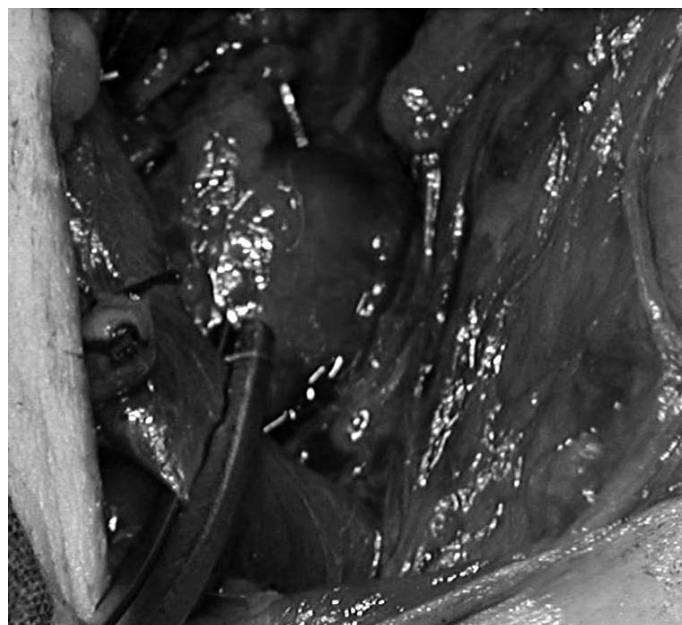


Fig. 3 - Lymphatic collectors near the great saphenous vein at the groin, pointed out by the blue dye.

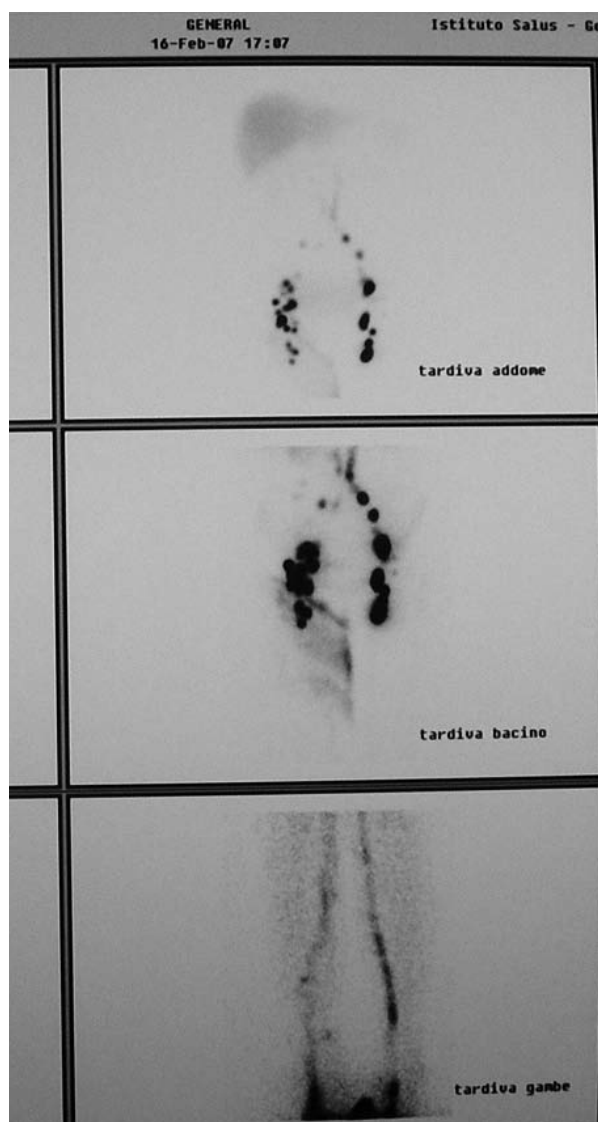


Fig. 4 - Lymphoscintigraphy in a patient affected from varicose veins at the right lower limb candidated to venous surgery. It shows a lymphatic impairment at the right side associated with venous disorder.

LYMPHATIC DAMAGE WITH VENOUS SURGERY

With reference mainly to above-mentioned anatomic-functional contiguity, it is almost impossible, even during a perfectly performed surgical operation, not to damage lymphatic structures. These ones, usually superabundant, are sometimes affected to such an extent that a vascular deficiency can show up.

The most risky area is the inguinal one, where lymphatic collector vessels join main lympho-nodal structures.

Obviously, lesions of these structures may start a lymphatic deficiency (as well known, ipoplastic lympho-nodal structures often generate primary lymphoedemas) but it is important to underline that cicatrization reactions and relevant fibrosis, that may characterize an even normal post-operation period, may create a further obstacle to normal lymphatic drain.

Inguinal “debridement” represents a standard during lymphatic microsurgery operations when lower limbs are concerned (Fig. 3). If the patient reveals a clinically evident concurrent deterioration of the lymphatic system since the beginning of the symptoms, it is recommended that surgery is planned only whenever ascending phlebitis and/or bleeding are highly probable, according to a recent Lymphology article by Prof. M. Foeldi. This article highlights as in 90% of venous surgery with concurrent lymphoedema or lipo-lymphoedema, symptomatology defined as “varicogenic” and characterized by tiredness, heaviness, cramps or itching didn’t regress at all (Fig. 4, 5, 6).



Fig. 5 - Patient affected from an evident chronic lymphatic insufficiency together with the venous dysfunction.



Fig. 6 - Patient affected from an evident chronic lymphatic insufficiency together with the venous dysfunction.

Whenever there’s a high probability of potential lymphatic deficiency (for instance having to deal with an evident drain slowing down during an aimed lymphoscintigraphic test), considerable caution in adopted technique (low traumatic operative techniques, measuring devices use during stripping, etc.) is highly recommended.

Furthermore, visual aids are helpful for a direct analysis of lympho-nodal lymphatic structures: this can be accomplished through an injection of Blue Patent Violet (BPV) vital dye in foot interdigital spaces and in the upper 1/3 of the antero-medial thigh surface, in order to avoid unintentional damage to collecting structures, not clearly distinguishable during crossectomy, saphenic stripping and ligation of incompetent collateral and perforating veins.

Lymphatic-Venous derivative microsurgical anastomoses represents by now a consolidated reality in lymphoedema therapy and in mixed conditions, when a concurrent venous insufficiency is present as well, it is possible to co-ordinate, in the same session, both surgical operations in order to get a final solution for both jeopardized vascular systems (Fig. 7).

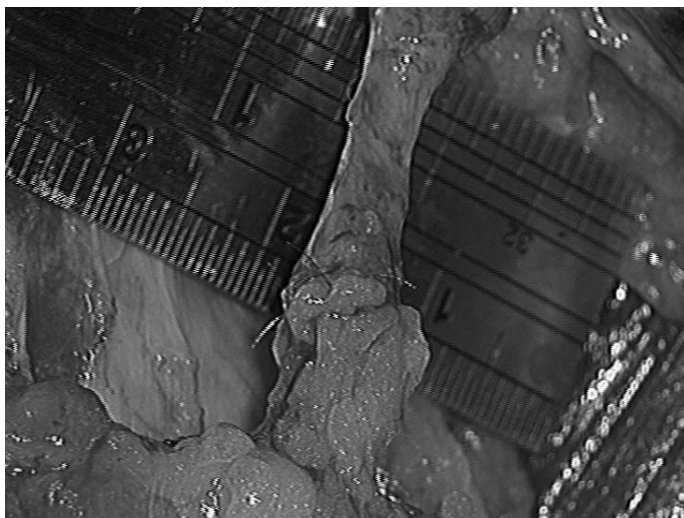


Fig. 7 - Lymphatic-venous anastomosis in a patient affected from lympho-phlebedema using a continent venous branch. Note the perfectly continent venous valve.

Whenever it's not possible to find continent and lymphatic anastomoses suitable venous vessels, it is viable to carry out a valvuloplasty. As above underlined, prevention is fundamental for correct venous and lymphatic surgical approach, but it's necessary to remember that, after surgery, a correct follow up and an eventual rehabilitation therapy, aimed at keeping under control potential worsening of clinical picture (mainly from a lymphatic standpoint) are equally important.

CONCLUSION

Several investigations have demonstrated lymphatic system involvement in an CVI context. Literature evidence demonstrates as lymphatic involvement includes low output failure and high output failure context.

A lymphatic circulatory involvement is always associated with a chronic edema of lower limbs with CVI signs.

Diagnostic framing of these mixed pathologies always has to be complete an integrated.

Special attention has to be paid to precise indications and venous surgery technique in mixed clinical situations, when both venous and lymphatic systems are involved, to avoid potential clinical state worsening – “Primum non nocere”.

Finally, diagnostic and therapeutical prevention modalities for possible sequences of lymphologic order in CVI affected limbs have to be kept into consideration, up to microsurgical technique application.

Hopefully therefore, with the purpose of a correct preventive and not intrusive surgical operation, more and more attention will be paid regarding potential lymphoangiologic sequences derived from a not careful, reckless venous surgery.

Flow Chart:

Venous Surgery Candidate Patient

- 1) **Lymphatic insufficiency manifested**
(Clinical Examination)
 - a. Limited indications
 - b. Mini-Invasivity, use of Blue Dye
 - c. Simultaneous L-V Microsurgery
- 2) **Not clinical evidence of Lymphatic Insufficiency**
(Anamnesis, Risk Factors, Lymphoscintigraphy)
 - a. Mini-Invasivity, use of Blue Dye
 - b. Selective surgery
 - c. Lymphologic Follow-up

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A NEW METHOD TO ASSESS GARMENT'S SUITABILITY IN POST-MASTECTOMY LYMPHEDEMA

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SUMMARY

Methods: We designed a score system to assess garment's suitability. 130 women with post-mastectomy lymphedema were included in this prospective cohort study to evaluate the garment with this system. The suitability score system was designed by consensus of the team (doctor, lymphotherapist and orthopaedic technician), following the common complaints of the patients and the main errors seen in the garments' fitting.

The items checked in the armsleeve were: circular or flat knit, accurate measurement, cutting at the axilla or in other regions with tourniquet effect, fixation mechanism, elbow, wrinkles, correct pressure at the wrist, redness at the elbow inside and hand swelling. For the glove the following characteristics were checked: the knitting technique (circular or flat knit), accuracy of the measurements, cutting at the wrist, length of fingers and cyanotic fingers. Each correct item was assigned 1 point in the score and the addition of points for every item gave us the final score (maximum 10 for armsleeve, 5 for glove).

Results: 128 patients were wearing armsleeves and 100 gloves. The mean of the score of the armsleeves was 8.97 (95%CI: 8.76-9.18) points (for a maximum of 10 points) and the mean of the glove's score was 4.46 (95%CI: 4.32-4.60) (for a maximum of 5 points). With the armsleeves, the most frequent errors of fit were: redness at the elbow inside (43.8%), high pressure at the wrist (13.3%), and hand swelling (13.3%). The most frequent problem with the glove was cyanosis at the fingers (37%) and incorrect fingers length (7%).

Conclusions: The suitability score system can be a clinically useful tool to check the fit and to detect errors of the garment. In our sample the score obtained was good, nevertheless some problems were observed: redness at the elbow inside and cyanotic fingers. Further research is needed to validate this method and determine the utility of this assessment system.

INTRODUCTION

Lymphedema following treatment for breast cancer is the most frequent type of lymphedema in Spain, being its incidence from 6 to 30%¹ depending from the sources. Traditionally, treatment in Europe has followed a "two-phase" approach: Phase I an intensive phase (decongestion phase) and a phase II or maintenance phase.² Combined physical therapy³ (CPT), also known as Complete or Complex Decongestive Therapy (CDT) or Complex Decongestive Physiotherapy (CDP) is backed by longstanding experience and it consists of skin care, manual lymph drainage, range of motion exercise and multi-layered bandages. Phase II aims to conserve and optimize the results obtained in phase I. Phase II consists of compression by a low-stretch elastic stocking or sleeve, skin care, and exercises.

Although the use of compression garments is the most widely accepted treatment option in long-term management of lymphedema, also in post-mastectomy lymphedema, the evidence base for compression is poor.⁴ Standards of different garments concerning testing methods, compression gradient and durability are not uniform between different countries. The quality criteria are not approved, and there is a lack of a European standard.⁵ In the different countries the availability and reimbursement by public health system of the garments are different, so the patients are wearing a wide range of products, depending on this availability rather than an accurate prescription. The garments providers fight against practitioner's and patient's ignorance and in this chaos the patients often don't wear the optimal garment that they need.

The prescription by the practitioner, the measurement by the technician and the fitting of compression hosiery need training. This sentence that seems so obvious is not what is happening in most of the centres that are treating lymphedema. Doctors, usually oncologist, prescribes a garment and the orthopaedic technician decides which one will fit best, with more or less expertise, and

anybody checks its fitting. The patients only get one garment per year reimbursed which is frequently bad fitting and the difficulty in compliance make the patient to refuse this important part of the lymphedema management.

The literature about compression garments is scarce. The recently published Template for practice, by the Lymphoedema Framework is a document that aims to enhance practitioners' and patients' use of compression hosiery.⁶ The document is wide, clear and complete with enough and accurate recommendations to prescribe and check hosiery, even in difficult cases. The International consensus Best Practice for the Management of Lymphoedema,⁷ by the Lymphoedema Framework unifies criteria for the whole management of lymphoedema patients and in the chapter of compression garments, many tips for prescription and checking fit are provided. They are a great guide to prescribe compression garments.

Following their recommendations, analysing the most frequent complaints of the patients about their garments and collecting the several fitting problems in our unit, we decided to describe all them. We designed an objective and quantifiable tool to give a quality score that if validated could be use to accept or refuse the garments that are offered to the patients.

The objective was to design an assessment system of the fitting of compression garments for post-mastectomy lymphedema.

METHODS

We designed a score system to assess garment's suitability. One hundred thirty women with post-mastectomy lymphedema were included in this prospective cohort study to evaluate the garment suitability with this system.

The suitability score system was designed by consensus of the team (doctor, lymphotherapist and orthopaedic technician), following the common complaints of the patients and the main errors seen in the garments' fitting.

The items checked in the armsleeve are listed in Table 1.

Table 1. Assessment of the armsleeve' suitability

Items	0 points	1 point
Knitting technique	<input type="checkbox"/> Circular knit	<input type="checkbox"/> Flat knit
Correct ampleness	<input type="checkbox"/> no	<input type="checkbox"/> yes
Cutting in the axilla region	<input type="checkbox"/> yes	<input type="checkbox"/> no
Cutting in other region	<input type="checkbox"/> yes	<input type="checkbox"/> no
Fixation system	<input type="checkbox"/> uncomfortable	<input type="checkbox"/> comfortable
Elbow shape	<input type="checkbox"/> no	<input type="checkbox"/> yes
Presence of folding	<input type="checkbox"/> yes	<input type="checkbox"/> no
Correct pressure at wrist	<input type="checkbox"/> no	<input type="checkbox"/> yes
Redness at elbow inside	<input type="checkbox"/> yes	<input type="checkbox"/> no
Hand swelling	<input type="checkbox"/> yes	<input type="checkbox"/> no
Total = addition of the items' punctuation (Maximum 10)		

As the recommended knit system for lymphedema is flat knit,⁷ circular knit was assigned 0 points and flat knit 1 point. The ampleness and length of the garment were seen as a correct way of measurement and were pointed as 0 when incorrect (Figure 1) and 1 point when accurate. The fixation mechanism was evaluated as comfortable for the patient and well adapted, 0 when incorrect (Figure 2) and 1 when correct.

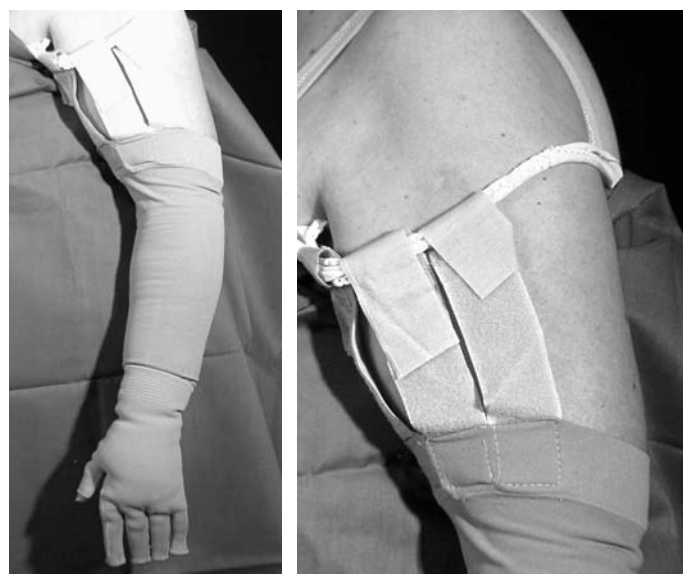


Figure 1 and 2 - Incorrect ampleness and length and incorrect fixation mechanism.

The elbow shape was considered as a quality adaptation feature so its absence was assigned 0 points and its presence 1 point (Figure 1). As folding were often seen in several armsleeves they were assigned 0 points (Figure 3) and 1 when they lack of folding. The wrist is another complicated point as the armsleeve and the glove are overlapped. Although this point has a porous zone with less pressure than the rest of the garment, sometimes it provokes an overpressure zone that can impair the lymphatic flow. When the pressure at the wrist was higher than in the forearm cutting the wrist, it was assigned 0 points (Figure 3) and 1 when the pressure was correct.

We asked the patient to remove her garment and we checked the marks left on the skin. When the garment provoked cutting in the armpit (Figures 4 and 5) or in other region (Figure 3) was pointed 0 points in these items.

The redness at the elbow inside (Figure 6) was a sign of skin harm and receives 0 points and its absence 1 point.

Hand swelling provoked by the armsleeve was considered as a negative effect and was assigned 0 points (Figures 3, 7 and 8). In the glove we checked: knitting technique, accuracy of the measurements, cutting at the wrist, length of fingers (Figure 2) and incidence of cyanotic fingers (Figure 9). Each correct item was assigned 1 point in the score.



Fig. 3 - Foldings, high pressure at the wrist and hand swelling.



Figure 9 - Cyanotic fingers.



Figure 4 and 5 - Cutting in the armpit.



Figure 6 - Redness at the elbow inside.



Figures 7 and 8 - Hand swelling provoked by the armsleeve.

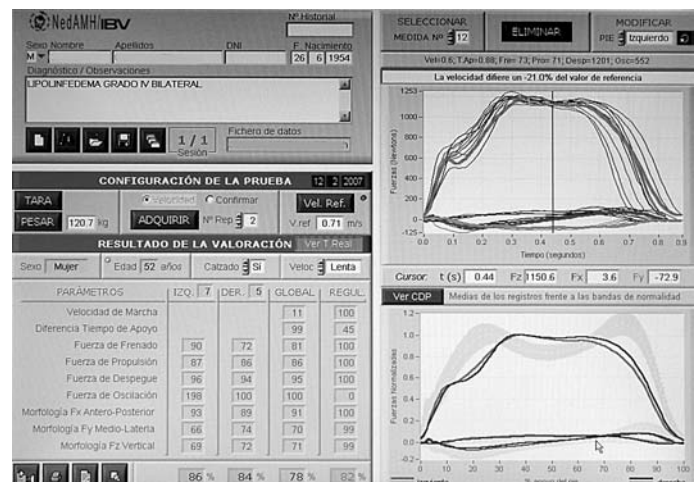


Figure 10.

The addition of points for every item gave us the final score that was from 0 to 10 for armsleeves and from 0 to 5 for gloves.

Table 2. Assessment of the glove' suitability

Items	0 points	1 point
Knitting technique	<input type="checkbox"/> Circular knit	<input type="checkbox"/> Flat knit
Correct amplexness	<input type="checkbox"/> no	<input type="checkbox"/> yes
Cutting in the wrist	<input type="checkbox"/> yes	<input type="checkbox"/> no
Correct lenght of the fingers	<input type="checkbox"/> no	<input type="checkbox"/> yes
Fingers' cyanosis	<input type="checkbox"/> yes	<input type="checkbox"/> no
Total = addition of the items' punctuation (Maximum 5)		

RESULTS

One hundred thirty patients with post-mastectomy lymphedema and compression garments prescribed for the maintenance phase were included in the study and the fitting of their garment was prospectively analysed. The patients and clinical characteristics are described in Table 3.

Table 3. Sample characteristics

No. of patients	130
Age (mean; 95%CI)	60.6 (59.0-62.2)
Upper limb:	
• Right	64 (49.2%)
• Left	66 (50.8 %)
Dominant	67 (51.9 %)
Chronicity (years) (mean; 95%CI)	4.2 (3.1-5.3)
BMI (mean; 95%CI)	29.6 (28.6-30.5)
Type of surgery (%):	
• Modified radical mastectomy	54%
• Quadrantectomy	18.3%
• Lumpectomy	27.8%
Axillary lymphadenectomy	98.5%
Type of adjuvant therapy (%):	
• Chemotherapy	73.4%
• Radiotherapy	84.5%
• Hormone therapy	71.7%
Lymphedema stage:	
• II	35 (27.1%)
• III	84 (65.1%)
• IV (elephantiasis)	10 (7.8%)
Fibrosis:	
• No	76 (59.4%)
• Local	33 (25.8%)
• Extended	19 (14.8%)
Upper Limb volume (ml) (mean, 95%CI)	3088 (2943- 3232)
Baseline edema (ml) (mean, 95%CI)	352 (293- 411).
After Complex Decongestive Therapy (%)	87 (66.9%)

The mean age was 60.6 years, and most of them were suffering from a stage II and a stage III lymphedema (27.1% and 65.1%, respectively), for a mean of 4.2 years from the onset (95%CI: 3.1-5.3). The mean of the affected upper limb volume was 3088 ml (95%CI 2943- 3232) and the mean of absolute oedema at baseline was 352 ml (95%CI 293- 411) at the moment of prescription of the compression garment. In 87 cases (66.9%), the prescription of the garment was done just after Complex Decongestive Therapy and in the rest of the patients in the maintenance phase.

One hundred twenty eight patients were wearing armsleeves and 100 gloves.

The mean of the score of the armsleeves in our suitability assessment system was 8.97 points (95%CI: 8.76-9.18) (for a maximum of 10 points) and the mean of the gloves' score was 4.46 points (95%CI: 4.32-4.60) (for a maximum of 5 points). With the armsleeves, the most frequent errors of fit were: redness at the elbow inside (43.8%), too high pressure at the wrist (13.3%), and hand swelling (13.3%). The most frequent problem with the glove was cyanosis at the fingers (37%) and incorrect finger length (7%).

Table 4. Armsleeve' suitability in the sample

No. patients	128
Knitting technique	
• Circular knit	1 (0.8%)
• Flat knit	127 (99.2%)
Correct ampleness	
• No	1 (0.8%)
• Yes	127 (99.2%)
Cutting in the armpit	
• Yes	9 (7.0%)
• No	119 (93.0%)
Cutting in other region	
• Yes	10 (7.8%)
• No	118 (92.2%)
Fixation system	
• Uncomfortable	9 (7.0%)
• Comfortable	119 (93.0%)
Elbow shape	
• No	2 (1.6%)
• Yes	126 (98.4%)
Presence of folding	
• Yes	10 (7.8%)
• No	118 (92.2%)
Correct pressure at wrist	
• No	17 (13.3%)
• Yes	111 (86.7%)
Redness at elbow inside	
• Yes	56 (43.8%)
• No	72 (56.3%)
Hand swelling	
• Yes	17 (13.3%)
• No	111 (86.7%)
Total score (mean, 95%CI):	8.97 (8.76-9.18)

Table 5. Glove' suitability in the sample

No. patients	100
Knitting technique	
• Circular knit	2 (2%)
• Flat knit	98 (98%)
Correct ampleness	
• No	2 (2%)
• Yes	98 (98%)
Cutting in the wrist	
• Yes	6 (6%)
• No	94 (94%)
Correct lenght of the fingers	
• No	7 (7%)
• Yes	93 (93%)
Fingers' cyanosis	
• Yes	37 (37%)
• No	63 (63%)
Total score (mean, 95%CI):	4.46 (4.32-4.60)

CONCLUSIONS

The suitability score system can be a clinical useful tool to check the fit and detect errors of the garments. In our sample the score obtained was good, nevertheless some problems were observed. Redness at the elbow inside and cyanotic fingers were the most frequent findings. Further research is needed to validate this method and determine the utility of this assessment system.

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SHOCKWAVE THERAPY IN VASCULAR DISEASE REHABILITATION: PRELIMINARY STUDY

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ABSTRACT

The anti-inflammatory and neo-angiogenetic effect of shockwave therapy has proven to be effective even in vascular disease treatment. This preliminary study involved 82 vascular D.H. patients. The results of the study demonstrated a substantial therapeutic effect on the reduction of volume and consistency of limbs involved and of a quicker reparative process. This demonstrates that this technique is an effective treatment tool that should to be included in the rehabilitation project of vascular disorders.

KEY WORDS: shockwave therapy, vascular rehabilitation.

INTRODUCTION

The shockwaves are generated pneumatically and are transmitted through programming the various functions of the treatment device that can be radial or focal, on human tissue and can penetrate upto 3,5 centimeters. The effects on the tissue consists of incrementing the metabolic cellular regeneration, anti-inflammatory, vasodilator, and neo-angiogenetic, also increasing the capacity of transportation of interstitial fluid (1,2,3,4). For these reasons this technique was adopted in treating vascular diseases, mutating it's primary application in the treatment of bone, muscle or joint diseases with phlogistic components, especially in cases where difficulty in fluid transportation prevails (lymphedema, post-phlogistic syndrome, diabetic foot) (5,6). The first preliminary results appear encouraging consequently stimulating the research team to continue the study.

MATERIAL AND METHODS

82 patients were studied (32 males and 50 females between the ages of 11 to 78) all D.H. vascular rehabilitation patients (62 with primary and secondary lymphedema of the limbs, 15 with s.post-flebitica and 5 with diabetic foot). The patients were submitted to clinical examination (inclusive of the measurement of the limbs with comparison study, and ColorDoppler ultrasounds of the limbs completed with a high definition ultrasound study of soft tissue involved).

Criteria of exclusion:

- Alteration of haematic coagulation
- The use of medication that alters haematic coagulation
- Pregnancy or presumed
- Focal area of the pulmonary tissue
- Active neoplasias (the use of this technique was proscribed for initial stage of secondary lymphedema – before five years of the clinical observation – and in all the forms in which it wasn't certain the absence of any type of tumour present- uncertain markers, dubious clinical status)
- Active phlogistic tissue complications.



Fig. 1a - Treatment of the hand in post-mastectomy large arm.



Fig. 1b - Treatment of large arm.



Fig. 1c - Shockwaves of the shoulder in large arm.



**Fig. 2a -
Diabetic foot
before
the treatment.**



**Fig. 3a -
Large arm
before
the treatment.**



Fig. 2b - Shockwaves on the diabetic foot.



**Fig. 3b -
Large arm
after
the treatment.**



**Fig. 2c -
Diabetic foot
after
the treatment.**



Fig. 4 - Treatment of post-phlebotic ulcer.

The study consisted of five sessions of shockwave therapy at variable pressure from 1 to 2,5 atmospheres, with variable number of shocks from 1000 to 4000/ session depending on the vastness of the zone to be treated, on a weekly bases, variable penetration from 0,5 to 3 centimeters, depending on the affected tissue. The system used (the shockwave equipment swiss dolorclast master or classic ems) represents an important innovation in the application of shockwave therapy that doesn't need the aid of other medical tools such as Rx or high resolution ultrasounds. It wasn't necessary in any case to use local anaesthesia.

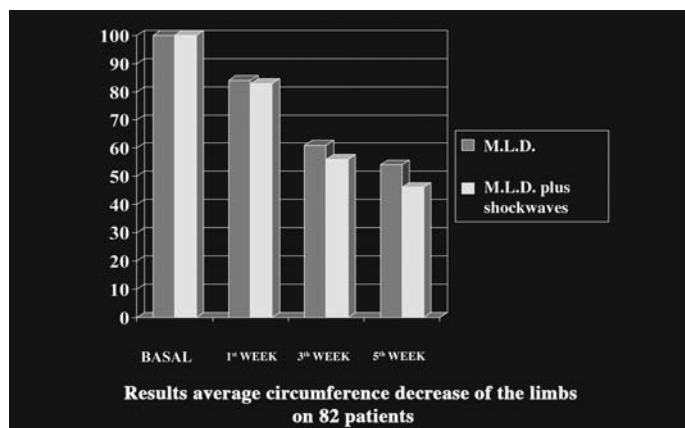


Fig. 5.

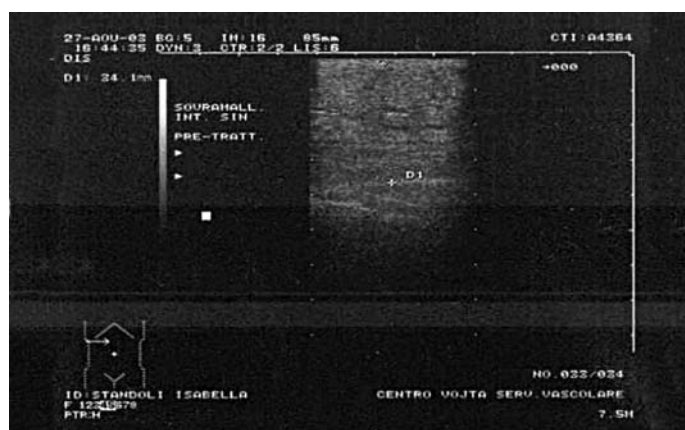


Fig. 6a - High resolution echography before treatment.



Fig. 6b - High resolution echography after treatment.

RESULTS

The patients had a follow-up evaluation 2 weeks after and one month after terminating treatment. The follow-up consisted of confronting the basal and final measurement of the limbs involved, the consistency of the tissue, the trophism variations of the 4 domains of the I.C.F (between basal values and the final ones). The first follow-up after 15 days of terminating treatment, we observed the following:

- The average reduction of the limbs circumference was 32% in patients with primary and secondary lymphedema (fig. 5);
- The average reduction of the limbs circumference was 28% in patients with S.post- phlebitis;
- Reduction of the consistency of the limbs (clinical evidence and modification of the echographic frame on the study of the suprafascial compartement) (fig. 6 a,b);
- Significant reduction of the symptomatology parestesia e disestesia (pain-scale);
- Rapid ulceration healing.

The average tolerability threshold of the treatment was high. What was referred in some cases was a slight discomfort, pain, but usually only during the first application (possibility psychological component).

Side Effects observed, temporary and well tolerated by the patients:

- Irritation
- Petechial
- Haematomas
- Edemas
- Pain

The side effects described above disappear usually after 24 to 36 hours after termination of the treatment. Only in one case we had to suspend therapy because of intolerance to treatment.

CONCLUSION

The preliminary study described above demonstrates the validity of shockwave therapy in treating vascular disorders, not only for reducing oedematous limbs but also to improve trophism and areas infested by fibrosis tissue with inevitable functional repercussions. The technique is easy to apply and can be carried out by either a physician or physiotherapist.

The advantages of this treatment tool can be summed-up as follows:

- Reduced time consumption for treatment;
- Constant optic control;
- Absence of exposure to radiographic radiation;
- Easy application (direct feedback)
- Reduced maintenance;
- Reduced size of equipment;
- Total transportability of the apparatus (possibility to use in different settings and also bedside of patient);

- HRZ variable
- Generation of direct shockwaves

The advantages documented for the patient:

- Immediate pain reduction;
- No necessity of local anaesthesia;
- High resolution of the disorder;
- Treatment not invasive;

The economic advantages:

- Reduction in cost due to reduced time consumption eliminating other less efficient methods of treatment;
- Minimal maintenance, practically irrelevant;

The authors are eager to continue the study involving a larger group of patients in a more articulated manner, in synergy with other medical facilities interested in experimenting the effectiveness of this method of treatment especially valuating the long term affects (annual follow-up).

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LYMPHOSCINTIGRAPHY BY INTRADERMAL INJECTION IN MORE SEVERE LYMPHEDEMAS: TECHNICAL ASPECTS AND INTERPRETATION OF PATHOLOGICAL PATTERNS

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ABSTRACT

Aim: We propose a technical improvement of the intradermal lymphoscintigraphy and an interpretation of the pathological patterns in patients with limbs lymphoedema.

Material and methods: 63 patients (50 f, 13 m), were enrolled. Two doses of 99mTc-nanocoll, 37-50 MBq (x2) were injected 1-2 mm under the skin surface at the first interdigital area on the top of the feet. The needle was introduced at an angle about 1-2 mm under skin's surface. Dynamic and static scans were acquired until appearance of the first proximal (axilla or groin) lymph node, using a gamma camera with a low energy general purpose collimator.

Results: In normal controls, scan shows the lymph drainage pathways and the regional lymph node within 5-10 minutes. Four scintigraphic patterns were identified: 1) a delayed lymph drainage 2) a lymph pathway diversion with spontaneous collaterals 3) dermal backflow, 4) a lymph drainage failure.

Conclusions: Intradermal lymphoscintigraphy is time-saving. Superficial intradermal injections provide better visualization of lymph pathways, also in advanced lymphoedema. Patients with delayed drainage or diversion of lymph path gave best results after pressotherapy, vascular rehabilitation and manual lymph drainage. In absence of suitable collaterals, the patients should be treated with a microsurgical approach. The dermal backflow is an inversion of the lymph flow from deep lymph way toward the superficial lymphatic networks. This is an index of serious alteration of the gradient of pressure of the lymphatic system.

KEY WORDS: Intradermal - Superficial Injection - Lymphoedema - Lymphoscintigraphy - Tc99m Nanocolloid - Scintigraphic Patterns.

INTRODUCTION

Clinical assessment of lymphedema is extremely variable (1), but the only clinical evaluation is often insufficient for staging the disease (2-4).

When diagnosis is not clear and needs further confirmation, lymphoscintigraphy is used as first choice exam (5).

Lymphoscintigraphic evaluation of lymphatic system, by injecting radiocolloids, has been used for over 25 years (6).

Traditional technique consists in a series of scintigraphic patterns obtained after subcutaneous injection of radiocolloids at the first interdigital space, under the foot plant (7).

Subcutaneous injection was preferred instead of intradermal one since radiotracer used in the past, Au198-labelled colloid, had a pH over 8-8.2 and intradermal administration was very painful.

Subcutaneous injection of radiocolloids is characterized by a slow clearance of the tracer and in case of severe lymphedema require to protract the exam till 3-6 hours from injection (8).

Lymphoscintigraphic pattern in lymphedema consists in an impaired distribution of the tracer with slow or absent lymphatic drainage (9).

Quantitative parameters such as time of appearance of the tracer at the first lymphnodal station, lymphnodal percent uptake, percent calf activity and lymphatic reserve index can be helpful for the qualitative analysis of scintigraphic image (10).

Frequently, after subcutaneous injection there is an absent lymphatic drainage, that is explained by some Authors as a decreased activity of phagocytes of reticulo-endothelial system or a slower trapping of injected colloids (11,12).

In more severe lymphedema, images and anatomic detail of lymphatic pathway obtained by traditional technique are very poor (13-17).

In these last few years lymphoscintigraphic investigations have aroused remarkable interest thanks to the development of radioguided surgery of sentinel lymph node in cutaneous melanomas (18,19).

Pharmacological research allowed to find radiotracers with neutral pH such as technetium 99m-labelled albumin or colloid (*Nanocoll*, *GEHealthcare*) with molecules of proper size for lymphatic drainage.

Presently both subcutaneous and intradermal injection are commonly used in the study of superficial lymphatics of extremities, but there are still different opinions about the choice of the injection technique (20).

Intradermal injection of nanocolloids is associated with a more rapid lymphatic drainage and a better visualization of superficial lymphatic pathways (19-21).

A wide variety of lymphatic drainage dysfunctions can be pointed out and the quality of images has not only a functional but also a morphological utility (almost similar to images supplied by traditional oil contrast lymphography, in some cases), also in case of more severe lymphedemas (22-28).

In our study, we suggest some technical details and propose an interpretation of pathological patterns in the management of severe lymphedemas.

MATERIALS AND METHODS

Between January 2000 and December 2006 we studied 63 patients (50 females and 13 males) affected from advanced stage lymphedema of limbs.

The examination does not require particular preparations, expect taking off tight and elastic clothes before starting the investigation. Two doses of technetium 99m-labelled albumin or colloid (*Nanocoll*, *GEHealthcare*) 37-50 Mbq (x 2), 0.3 ml of volume, are injected intradermally, at the same time into the first interdigital space at the dorsum of the foot.

The needle is introduced tangentially to the skin for 1-2 mm.

Dynamic and static images are taken immediately after injection (pre-set time 10 min., matrix 128x128, collimator LEGP).

Images are taken till the appearance of the first proximal lymphnode (at the axilla or the groin).

In normal cases the Arrival Time (AT) of the tracer to the first lymph node is less than 10 minutes.

RESULTS

Four pathological patterns were identified:

1. delayed lymphatic drainage, without alterations of the pathways, was observed in 8 patients with lymphedema at stage I-II (AT = 10-30 minutes);
2. deviation and/or obstruction of main lymphatic pathways with spontaneous formation of collateral ways were found in 38 patients with lymphedema at stage II-III (AT < 30 min.). In 3 cases, there was a shunt towards the deep compartment, with abnormal uptake by popliteal lymphnodes;
3. absence of part of the main lymphatic pathway and back flow towards the superficial lymphatic network (dermal backflow) was observed in 15 patients with lymphedema at stage III (AT = 30-60 minutes);

4. Absent lymphatic drainage with slow distal diffusion of the tracer towards the fingers was found in 2 cases with congenital lymphedema at advanced stage III (AT null).

DISCUSSION

In the 80s studies by means of the electronic scanning microscope showed the presence of a complex lymphatic capillary network into the papillar and reticular derma, that form superficial and deep plexus.

Lymphatic capillaries are without valves and vary a lot in form and size (from 1 micron to 1 mm.) and anastomoses are numerous.

Lymphatic plexus form a superficial and deep layer progressively growing in size.

Epidermis and subcutaneous tissue have no lymphatic capillaries (30-33).

Intradermal injection gives better results compared with the subcutaneous one (25) probably because lymphatic capillary network supplies a wide absorbent surface for radiotracers and transport them towards main lymphatic vessels more rapidly.

We suggest to inject little doses in small volumes, using gamma camera with high sensitivity collimators or LEGP.

Tracer transport depends also on the size of the particles that must not exceed 500 micron (34,35).

Nanocoll available in Europe is composed by albumin particles with diameter less than 100 micron, optimal for studying lymphatics.

Injection technique is a crucial point to obtain an accurate lymphatic mapping.

We suggest to introduce the needle intradermally, tangential to the skin, for 1-2 mm., into the first interdigital space at the dorsum of the foot, so as to inject the tracer directly into the derma which thickness is about 1-1.5 mm., averagely.

This technique allows to obtain an excellent visualization of lymphatic pathways with a low background, a low blood interference and an absent liver and bladder uptake.

After intradermal injection nanocolloid albumin is filtrated by lymphatic capillaries and transported towards main lymphatic pathways into the epifascial compartment.

If, conversely, deep injections are performed, lymphoscintigraphic times are longer, quality of images is worse, whilst blood rate, background, liver and bladder activities increase.

Deep injection allows, on the other hand, to evaluate subfascial lymphatic drainage, even if not in such a clear way, that is the lymphatic system that drains deep structures such as muscles, bones and blood vessels.

Deep compartment of lower limbs includes popliteal lymph nodes. Interstitial pressure in the skin is slightly negative, whilst that one in lymphatic capillaries is positive. This suggests that lymphatic transport in lymphatic capillaries occurs at the beginning against a slight pressure gradient (20)

A recent theory proposes the presence of an aspirative force generated by muscle contractions and arterial pulsations. According to Pascal law as increase of pressure applied to a fluid inside a closed system transmit equally in all directions and towards all walls of the case.

Lymphatic flow is therefore probably the result of different pressure gradients, combined with gravity force and efficiency of valves of lymphatic vessels.

In patients with early lymphedema we observed a normal morphology of main lymphatic pathways that go along the great saphenous vein (Fig. 1), with a good AT (pattern 1).

In 38 patients with moderate lymphedema we noticed a deviation of the lymphatic way towards the little saphenous vein (Fig. 2) and/or obstruction of the main lymphatic pathway with the presence of spontaneous shunts (pattern 2).

The deviation of the lymphatic flow towards the lymphatic network that exists around the little saphena seems to be linked to a progressive obstruction or increase of the pressure gradient in the distal part of the main lymphatic pathway.

In 3 cases we observed a slowed lymphatic drainage with a shunt towards the subfascial compartment, with abnormal uptake of popliteal lymphnodes.

In our experience the group of patients with pattern 2 obtains good results after physical treatment, manual lymph-drainage and rehabilitative exercises (36).

Patients with primary or secondary obstruction of the main lymphatic way, without well evident vicarious ways, can be successfully treated by microsurgical operations (37) (Fig. 3).

In lymphedema secondary to lymphadenectomy we observed deviation of lymphatic flow towards more distant lymphnodes (Fig. 4).

In 15 patients with severe lymphedema we noticed an absence of a part of deep lymphatic way with visualization of a wide superficial lymphatic network.

Lymphoscintigraphic pattern is characterized by a dense net of superficial lymphatics that starting from the obstruction site of the deep way make a sort of drawing of a segment of the profile of the edematous limb (Fig. 5).

Probably in presence of a severe obstruction of the main lymphatic way, pressure gradient increases over the threshold value, causing the insufficiency of lymphatic valves with the lymph back flow towards the superficial lymphatic network.

This pattern called by other Authors "Dermal Back Flow" (38,39) is an evident sign of marked alteration of the lymphatic system (pattern 3).

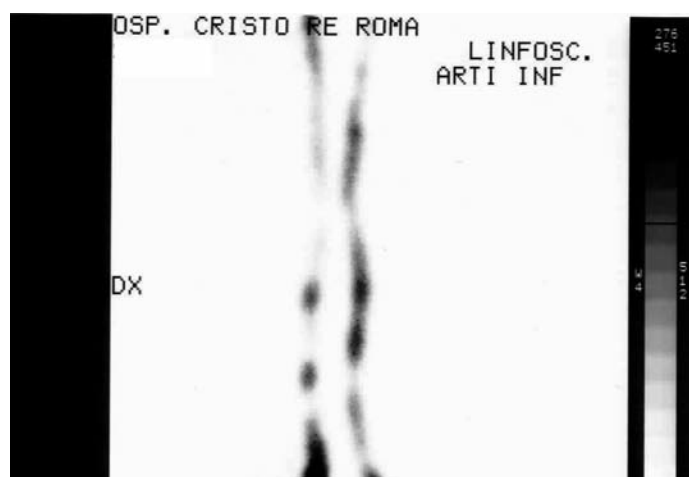


Fig. 1: Normal visualization of lymphatic way, with slow drainage (Pattern 1)

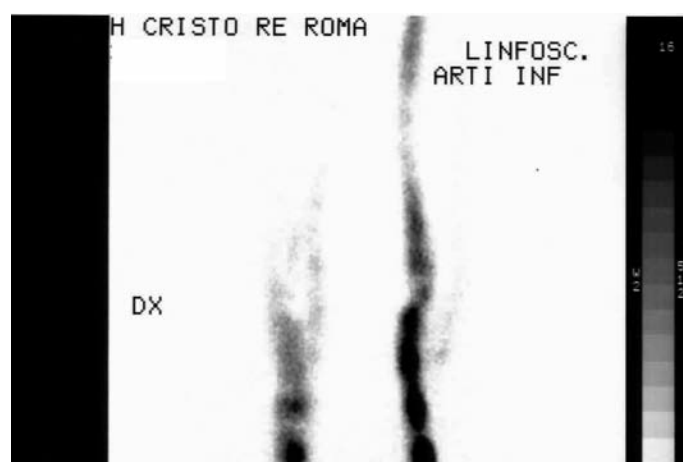


Fig. 3: Obstruction of right main lymphatic way, without proper collateral pathways (Pattern 2)

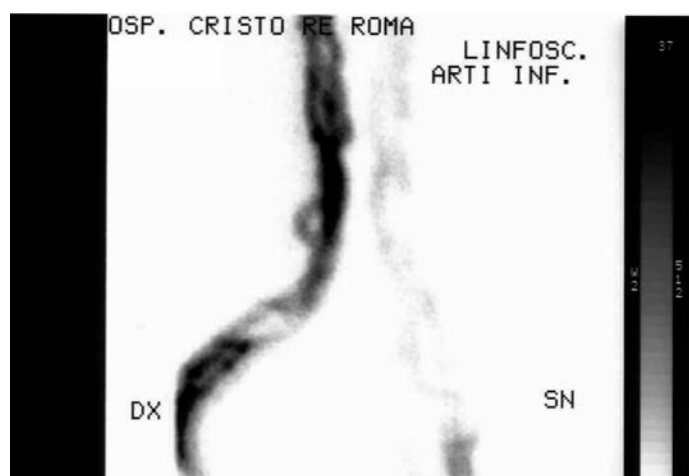


Fig. 2: Shunt of lymphatic way towards small saphenous vein (Pattern 2)



Fig. 4: Deviation of main lymphatic way towards more distant lymphnodes at the groin, in patient with lymphedema secondary to lymphadenectomy for prostatic carcinoma (Pattern 2)



Fig. 5: Blockage of main lymphatic way and lymph back flow towards superficial pathways at the right lower limb (Pattern 3)

In our experience, patients with pattern 3 did not have significant clinical and lymphoscintigraphic improvement in controls performed at medium and long term after physical treatments. In 2 patients affected from congenital lymphedema at very advanced stage we found the absence of lymphatic drainage and a slow progression of the tracer distally towards the fingers (pattern 4).

CONCLUSIONS

Lymphoscintigraphy performed by intradermal injection is easily and rapidly feasible and supplies a better definition of superficial lymphatic drainage. Tracer transport is closely linked both to the size of particles and injection technique. We suggest intradermal injection into the first interdigital space at the dorsum of the foot. The qualitative interpretation of lymphoscintigraphic patterns seems to supply a more accurate staging of the disease and can address to the proper clinical management, also in patients with severe lymphedema.

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LYMPHEDEMA AND COMPLIANCE

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ABSTRACT

The aim of this study is to find the most suitable way to evaluate and increase compliance in patients with lymphedema.

For this reason was conducted a study with data bases using the following key words: lymphedema, compliance, combined physical therapy, physical therapy, chronic disease.

Although in literature the words compliance and adherence are generally considered two synonymous, these terms have not the same meaning.

Adherence is a multidimensional phenomenon determined by the interplay of five sets of factors, termed also “dimensions”, of which patient-related factors are just one determinant. The common belief that patients are solely responsible for taking their treatment is misleading and most often reflects a misunderstanding of how other factors affect people’s behaviour and capacity to adhere to their treatment.

Adherence is a primary determinant of the effectiveness of treatment because poor adherence attenuates optimum clinical benefit. Good adherence improves the effectiveness of interventions aimed at promoting healthy lifestyles.

INTRODUCTION

Consensus Document of the International Society of Lymphology [1] [2] considers Combined Physical Therapy the most effectiveness approach to care lymphedema. This methodology composed by skin care, manual lymph drainage, multi-layered bandage-wrapping and range of motion exercise allow to obtain the best outcome.

To maintain lymphedema reduction after CPT is essential a prescription of elastic garments personalize to patient clinical stage.

But this therapy is however inadequate if not supported by patient compliance, especially in the maintenance of reduced swelling. Only the patient is the protagonist in the struggle against lymphedema.

The best team of health professional care will not obtain any outcome if the patient does not undertake to fight the disease by his/herself.

Patient’s compliance is essential for:

- risk factors’ valuation,
- skin care,
- prevention of infection (dermato-lymphangio-adenitis),
- maintenance of the reducing swelling,
- adequate self routine to the illness,
- fight against the chronicity of the illness.

The aim of this study is to find the most suitable way to evaluate and increase compliance in patients with lymphedema

METHODS

It was conducted a search with data base (PUBMED/MEDLINE and PEDro) using the following key words: lymphedema, compliance, combined physical therapy.

It was found:

- A lot of studies about Quality of Life in women with lymphedema after breast cancer treatment,
- A few studies about patient with lymphedema caused by filaria bancroft infection,
- No studies about patient affected by primary lymphedema.

It was not found any publication about method of assessing compliance as outcome.

As a result it was ned a new search using addicted key words in order to consider lymphedema as a chronic illness.

These were: compliance, physical therapy, chronic disease.

Even if patient affected by COPD, low back pain and rheumatoid disease have very different problems from patient with lymphedema, the chronicity of the illness joins patient’s reaction to his/her treatment’s plan.

So health care practitioners could have the same strategy to care patients with chronic illness.

First of all, I will consider publications about QoL to find factors that influence positively or negatively patients’ compliance.

I will not consider studies about parasitic infection because I do not have any experiences about.

Passik, Mc Donald (1998) [3]: It is extremely important to offer information and prevention to people previously. Women who have few social support, pain, lymphedema in the dominant hand, and/or a passive and avoidant coping style report the highest levels of disability.

Rinehart-Ayres (1998) [4]: Steps to prevent lymphedema should begin immediately after surgery. Women must be educated about possible complications after breast surgery. This should be a team effort, with physicians, nurses, physical and occupational therapists, all participating in the same process.

Saskia (1998) [5]: If Secondary lymphedema is not known or considered, the majority of women undergoing axillary lymph node dissection will not receive an adequate education in pre- or postoperative prevention. As a result of this ignorance, once the lymphedema develops, these patients receive no or harmful treatment.

Runowicz (1998) [6]: Formal education about lymphedema is not a part of the training of most medical and allied health professionals. Educational strategies for patients and providers need to be developed and implemented.

Kocart (2000) [7]: focuses on risk factors in the development of arm lymphedema in breast cancer. Patient with advanced disease at diagnosis, older age, greater BMI (obesity) and longer follow-up seem to be higher risk for developing lymphedema. Hypertension and infection are important co morbidities and may be initiating factors, but more likely they aggravate existing lymphedema. To stop the chronicity of lymphedema it is essential patient compliance.

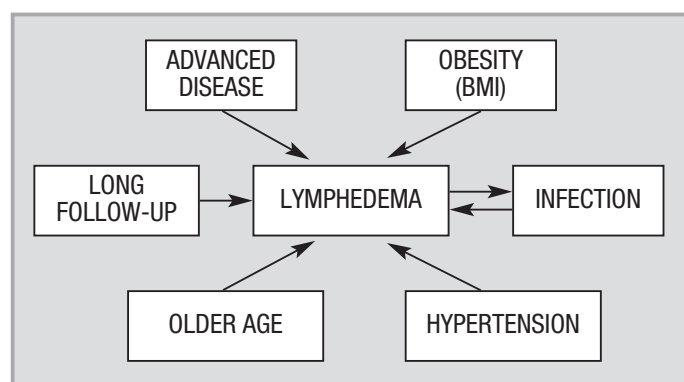


Table 1 - Kocart (2000) [7]: Factors related to the development of lymphedema.

Engel (2003) [8]: made a prospective cohort study with EORTIC QLQ-C30 and additional questions. This study has the advantage of large patient numbers and many variables. Communication problem, co-morbid illness, lymphedema and older age have a strong and consistent association with poorer quality of life. The actors tell that their study is the first to demonstrate the strength relationship between arm dysfunction, doctor-patient communication and breast cancer patients' quality of live.

Not only these are the two most important problems in breast cancer care, but also they can be solved, fortunately. Communication skills training for doctors may improve patient quality of life. Research has shown that certain skills such as active listening, open questioning, showing empathy, summarizing information and checking patient understanding, can be learnt.

Mc Callin's review (2005) [9]: considers combined physical therapy in all its components. If patients are educated about prevention strategies, lymphedema occurs only in 10% of patients, while the incidence rises to 30% in patients who have no education at all. Patients' compliance have a significant impact on maintaining reductions in swelling after "attack phase" as non-compliant patients lose more of their initial gains. Skin care plays a fundamental part in the treatment of secondary lymphedema: meticulous skin care reduces the risk of infection and injury, and protects skin during daily activities. Education of patients in susceptible population appears to have a positive effect on reducing the incidence of lymphedema.

In literature comparison of outcome across different studies is hampered by the fact that a variety of health status questionnaires have been used to assess quality of life.

Wilson (2005) [10]: assesses the convergent and discriminative properties of SF-36 and FLIC (Functional Living Index-Cancer). Although both the SF-36 and the FLIC appear to be useful for measuring physical functioning in patients with breast cancer, the condition specific FLIC may be more sensitive to psychological factors influencing the health and well-being of people with breast cancer and secondary lymphedema than the generic SF-36.

Wilson finds that Women with secondary lymphedema averaged 1 standard deviation below the norms for the US population with regard to physical well-being. This classification is similar to people diagnosed with chronic lung disease, arthritis, diabetes or symptomatic human immunodeficiency virus. This discovery support the aim of my study: consider lymphedema as chronic illness and analyze studies about chronic disease and compliance.

Basset (2003) [11]: notes that it is common practice in literature for the words compliance and adherence to be used interchangeably, but they haven't the same mean. COMPLIANCE regards as abiding obediently by the practitioner's prescribed treatment protocol. ADHERENCE is considered to imply active voluntary involvement of the patients in the planning and implementation of the treatment

"the extent to which the patients undertake the clinic-based and the home-based prescribed components of their physiotherapy programme"
(Meichenbaum & Turk 1987)

The degree to which patients adhere to the treatment requirements is considered to be responsible in some part of the success of physiotherapy programmes. Patients diaries and self-report questionnaires are the most commonly reported methods of measuring adherence.

The main limitation of retrospective self-reports is the possibility of inaccurate recall and a bias toward an over-estimation of doing the home-based activities.

World Health Organization (2003) [12] wrote an interesting report:

Adherence to long-term therapies. Evidence for action.

The consequences of poor adherence to long-term therapies are poor health outcomes and increased health care costs. Poor adherence to long-term therapies severely compromises the effectiveness of treatment making this a critical issue in population health both from the perspective of quality of life and of health economics.

Interventions aimed at improving adherence would provide a significant positive return on investment through primary prevention (of risk factors) and secondary prevention of adverse health outcomes.

Adherence is a multidimensional phenomenon determined by the interplay of five sets of factors, of which patient-related factors are just one determinant.

The common belief that patients are the only responsible for taking their treatment is misleading and most often reflects a misunderstanding of how other factors affect people's behaviour and capacity to adhere to their treatment.

THE FIVE DIMENSION OF ADHERENCE

- **Social-economic factors** (poor socioeconomic status, low level of education, unstable living conditions, long distance from treatment centre...).
- **Health system-HCT-factors** (poorly developed health services, inadequate or non-existent reimbursement by health insurance plans, overworked health care providers, lack of knowledge and training for health care providers on managing chronic diseases, short consultations, weak capacity of the system to educate patients and provide follow-up, lack of knowledge on adherence and of effective interventions for improving it).
- **Condition-related factors** (severity of symptoms, level of disability progression, severity of the disease and the availability of effective treatments. Their impact depends on how they influence patients' risk perception, the importance of following treatment, and the priority placed on adherence).
- **Therapy-related factors** (complexity of the medical regimen, previous treatment failures frequent changes in treatment, the immediacy of beneficial effects...).
- **Patient-related factors** represent the resources, knowledge, attitudes, beliefs, perceptions and expectations of the patient. Patients' knowledge and beliefs about their illness, motivation to manage it, confidence (self-efficacy) in their ability to engage in illness-management behaviours, and expectations regarding the outcome of treatment and the consequences of poor adherence, interact in ways not yet fully understood to influence adherence behaviour.

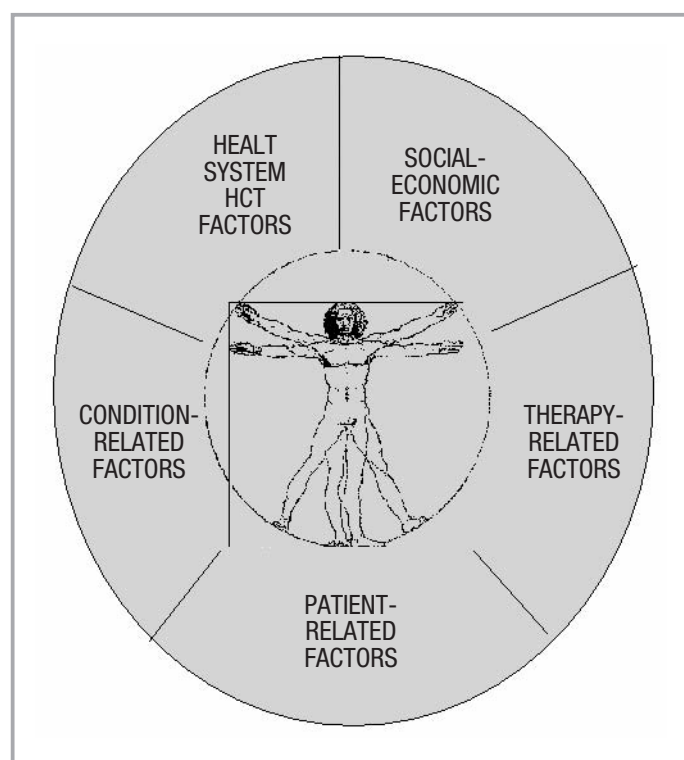


Table 2 - WHO: The five dimension of adherence.

The best treatment can be rendered ineffective by poor adherence. Optimal outcomes in population health require both efficacious treatments than adherence to those treatments.

Some treatments involve one behaviour, while others carry multiple behavioural requirements, the nature and meaning of adherence change according to the specific treatment demands of a particular protocol. Patients differ in their ability to meet those demands, and the resources available and the environmental contexts outlined earlier also differ.

Perhaps adherence might be better understood as reflecting the process of efforts, occurring over the course of an illness, to meet the treatment-related behavioural demands imposed by that illness. This behavioural conceptualization allows us to define adherence more explicitly according to the type of behaviour, an acceptable frequency, consistency, intensity and/or accuracy.

Variables related to how health care providers interact and communicate with their patients are key determinants of adherence and patient health outcomes.

Behavioural science offers useful theories, models and strategies that support best-practice approaches to delivering treatment. The effectiveness of adherence interventions based on behavioural principles has been demonstrated in many therapeutic areas **Information-Motivation-Behavioural skills model (IMB model)** borrowed elements from earlier work to construct a conceptually based, generalizable, and simple model to guide thinking about complex health behaviours.

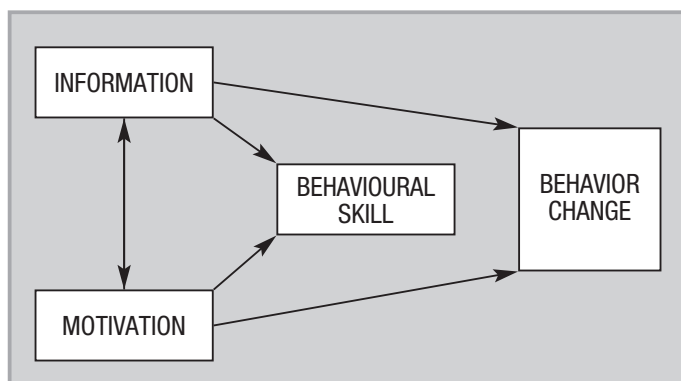


Table 3 - Information-Motivation-Behavioural Skill Model.
[da WHO]

INFORMATION is the basic knowledge about a medical condition that might include how the disease develops, its expected course and effective strategies for its management.

MOTIVATION encompasses personal attitudes towards the adherence behaviour, perceived social support for such behaviour, and the patients' subjective norm or perception of how others with this medical condition might behave.

BEHAVIOURAL SKILLS include ensuring that the patient has the specific behavioural tools or strategies necessary to perform the adherence behaviour.

Note that information, motivation and behavioural skills must directly pertain to the desired behavioural outcome; they have to be specific.

The IMB model demonstrates that information is a prerequisite for changing behaviour, but in itself is insufficient to achieve this change.

Information and motivation, through behavioural skills, work strongly to affect behaviours.

When the behavioural skills are familiar or uncomplicated, information and motivation can have direct effects on behaviours. In the IMB model, the presence of both information and motivation increase the probability of adherence.

RESULTS

Adherence is a multidimensional issue where different health care actors' efforts meet.

Good adherence requires a continuous and dynamic process. Adherence is the most important changeable factor that can compromise the outcomes of the cure.

Compliance to educational and informative supports in women with breast cancer is fundamental to prevent risk factors to upper limb just after surgery treatment.

Patient compliance to her own treatment program, when lymphedema is already developed, allow to control the illness and its chronicity. In both cases adherence improves the quality of life and quality of life better adherence.

Knowledge of basic behavioural principles and of models of behavioural change is relevant to adherence to treatment for all chronic medical conditions and lymphedema is one of these.

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