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INVEIN TREATMENT AND TECHNIQUES - SEPTEMBER 13-15, 2007, LAS VEGAS, NV (USA)

COLLEGE OF PHLEBOLOGY - SEPTEMBER 8-9, 2007, NEW ZEALAND (AUSTRALIA)

THE EUROPEAN SOCIETY FOR VASCULAR SURGERY - XXI ANNUAL MEETING - SEPTEMBER 20-23, 2007, MADRID (SPA)

21st INTERNATIONAL CONGRESS OF LYMPHOLOGY - SEPTEMBER 26-30, 2007, SHANGHAI (CHINA)

11^o CONGRESSO NAZIONALE DEL COLLEGIO ITALIANO DI FLEBOLOGIA - OCTOBER 4-6, 2007, CAGLIARI (ITALY)

XXXV CONGRESSO NAZIONALE SIMFER - OCTOBER 10-13, 2007, SAN BENEDETTO DEL TRONTO (ITALY)

8th INTERNATIONAL VASCULAR & ENDOVASCULAR COURSE - OCTOBER 14-16, 2007, MILAN (ITALY)

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1th EAGLE CONGRESS - OCTOBER 19-20, 2007, ROME (ITALY)

LA SOCIÉTÉ EUROPÉENNE DE PHLÉBECTOMIE - XXXVII^{ème} RÉUNION - OCTOBER 27, 2007, GENÈVE (SUISSE)

21st ANNUAL CONGRESS ACP - NOVEMBER 8-11, 2007, TUCSON, ARIZONA (USA)

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MR IMAGING, PROTON MR SPECTROSCOPY AND ULTRASONOGRAPHIC FINDINGS IN CHRONIC LYMPHEDEMA

E. FUMIERE MD¹, O. LEDUC PHD², J. MONTENOT PT²,
R. DEMEURE⁴, F. WILPUTTE PT³, A. LEDUC PHD², C. DELCOUR MD¹

¹ Department of Radiology - CHU Charleroi - Université Libre de Bruxelles

² Haute Ecole PH Spaak, Brussels

³ CUB Erasme Hospital, Brussels

⁴ Siemens Belgium, Brussels

Correspondence: Dr Eric Fumière MD
CHU Charleroi, Université Libre de Bruxelles
92, Boulevard Paul Janson
6000 Charleroi (Belgium)
Tel: 0032/71920815
Fax: 0032/71920812
E-mail: eric.fumiere@belgacom.net

Dr. O. Leduc Ph.D.
Haute Ecole PH Spaak, Lympho-phlebology unit, Brussels
91, avenue Schaller
1160 Bruxelles
E-mail: oleduc@lympho.net

ABSTRACT

Purpose: Determine the usefulness of proton MR spectroscopy in investigation of lymphedema and try to precise the nature of interlobular and intralobular changes in chronic lymphedema by means of US, conventional MRI and proton MR spectroscopy.

Materials and methods: We performed bilateral US with a 13.5 MHz transducer, TSE T1 and TSE T2 images with and without fat-suppression on MRI and MR Single Voxel Spectroscopy (10*10*10 mm) in 10 patients with secondary chronic unilateral lymphedema of either upper or lower limb. In each case we determined the spectroscopy Water/Fat ratio in both the pathologic limb and the contralateral side. 3 patients underwent Chemical Shift Imaging Spectroscopy with 5*5*6 mm voxel size.

Results: All patients had intralobular hyperechogenicity and persistent intralobular fat signal on MR imaging. Water/Fat ratio of MR spectroscopy was significantly higher in cases of lymphedema (mean +/- SD = 0,49 +/- 0,34) than in contralateral extremities (mean +/- SD = 0,086 +/- 0,15) confirming either interlobular or both interlobular and intralobular water accumulation. CSI spectroscopy suggested the presence of intralobular water in case of hyperechogenic lobule.

Conclusion: MR Spectroscopy and US have a higher sensitivity than conventional MR imaging to depict intralobular and interlobular changes in lymphedema. MR spectroscopy suggests that intralobular US hyperechogenicity in lymphedema reflects an increased intralobular water.

KEY WORDS: Lymphedema - Magnetic Resonance Imaging (MRI) - Ultrasonography - Spectroscopy.

INTRODUCTION

Lymphedema is a progressive condition with abnormal accumulation of proteins and water as a result of insufficient lymphatic drainage, which leads in time to chronic inflammation and irreversible fibrosis. Two types of lymphedema are usually distinguished depending of their etiology. Primary lymphedema is due to an inherited abnormality of the lymphatic system commonly affecting the lower limbs (lymphatic aplasia, hypoplasia, or congenital malformation such as lymphangiectasis) Secondary lymphedema is much more common and results from a disruptive process in the lymphatic circulation due to an earlier aggression such as infection, inflammation, trauma, neoplasia, irradiation or surgery. In the majority of cases, the diagnosis of lymphedema can be assessed on the basis of medical history and physical examination. However, a clinical assessment solely based on the physical examination may not consistently and reliably evaluate the presence of edema/fibrosis. Association with other disease such as phlebedema (phlebolympedema), lipedema (lipolympedema), or both (lipophlebolympedema) can occur. Imaging techniques such as interstitial (indirect) lymphangiography with non-ionic contrast agents, lymphoscintigraphy, CT, MRI or US may provide useful information to confirm the diagnosis of lymphedema or to demonstrate lymphedema components in patients with lipedema or phlebedema. Changes in lymphedema include an increased of the dermis thickness, fluid retention located in the interlobular space and beside the superficial fascia: ultrasonography or MRI easily demonstrates these modifications. Moreover, in a high-resolution MRI study performed by idy-Peretti and al in 1998 (1), the mean

thickness of the fat lobule was significantly larger in the lymphedematous limb compared with that in normal legs. However, the signal of these larger lobules is similar in both the pathologic and normal limbs, which supports the hypothesis of a mechanism of fattening of the connective tissue in lymphedematous limb. On the other hand, these results of preserved fatty signal of the lobule in MRI are in contradiction with the increase of echogenicity of the fat lobule in ultrasonographic study: the subcutaneous lobule become hyperechogenic in case of lymphedema, which attests of the intralobular presence of tissues with different acoustic impedance (2). The purpose of our study was to try to demonstrate the nature of interlobular and intralobular change in chronic lymphedema using correlation between ultrasonography, MR conventional Imaging and MR proton spectroscopy.

MATERIALS AND METHODS

From 2002 to 2004, 10 patients (7 female and 3 male, age 36-77 years, mean age: 62,5 years) with clinical manifestations of unilateral limb chronic secondary lymphedema (7: upper limbs; 3: lower limbs) were examined (clinical stage 3). The disease duration ranged from 4 to 25 years (mean duration 16,2 years). The diagnosis of chronic secondary lymphedema was established on the basis of medical history, clinical findings (all patients), and additional lymphangio-scintigraphy for 3 patients. Ultrasonography was performed using a 13.5 Mhz linear transducer to detect the region that had the maximal edema infiltration and to determine the level of proton MR spectroscopy and MRI examination with cutaneous tracers. Transverse US section of the pathologic and the contralateral uninvolved limbs were taken at the same leg or arm landmark. MRI was performed with a whole-body 1.5 T scanner (symphony; Siemens Medical Systems, Erlangen, Germany). MR

images were acquired with a phased-array coil for lower limbs and with a flexible surface coil for upper limbs. For the upper limb, the protocol included sagittal STIR (slice thickness, 5mm; 7990/65 msec; FOV, 200*200mm; matrix, 217*256), axial SE T1 (slice thickness, 4mm; 500/22 msec; FOV, 150*150mm; matrix, 256*256), axial TSE T2 with and without fat sat (slice thickness, 4mm; 4010/85 msec; FOV, 150*200mm; matrix, 307*512). For the lower limb, the protocol included coronal STIR (slice thickness, 6mm; 6000/35 msec; FOV, 400*400mm; matrix, 256*256), coronal TSE T1 (slice thickness, 5mm; 800/11 msec; TSE,3; FOV, 400*400mm; matrix, 358*512) axial TSE T1 (slice thickness, 4mm; 800/11 msec; TSE, 3; FOV, 400*400mm; matrix, 358*512), axial TSE T2 with and without fat sat (slice thickness, 4mm; 4000/85 msec; TSE, 7; FOV, 262*400mm; matrix, 358*512). All patients underwent single voxel proton spectroscopy (SVS) of the pathologic and the contralateral normal limb at the same level with the following parameters: voxel size, 10*10*10mm; 1500/135msec; without water suppression. For 3 patients additional high resolution acquisition with a small surface coil specially designed for skin or finger imaging (axial SE T1: slice thickness, 3mm; FOV, 100mm; 330/22 msec; matrix, 512*512 and axial TSE T2 with and without fat sat: slice thickness, 2.5mm; FOV, 100mm; 1600/75 msec; matrix, 512*512) and Chemical Shift Imaging (CSI) proton spectroscopy (slice thickness, 5mm; FOV, 100mm; 1500/30msec; matrix, 16*16; voxel size, 5*6*6mm) were also performed. Typical spectra of both SVS and CSI spectroscopy contained two major peaks, representing water and fat (Fig. 1a-1b). The surface areas under the water and fat peaks were determined with a curve-fitting software and the relative amount of water in the subcutaneous tissue was calculated by dividing the area under the water-specific peak by the area of the fat-specific peak (W/F ratio) avoiding the relative intensity variation of individual components of the ratio, e.g. due to coil position.

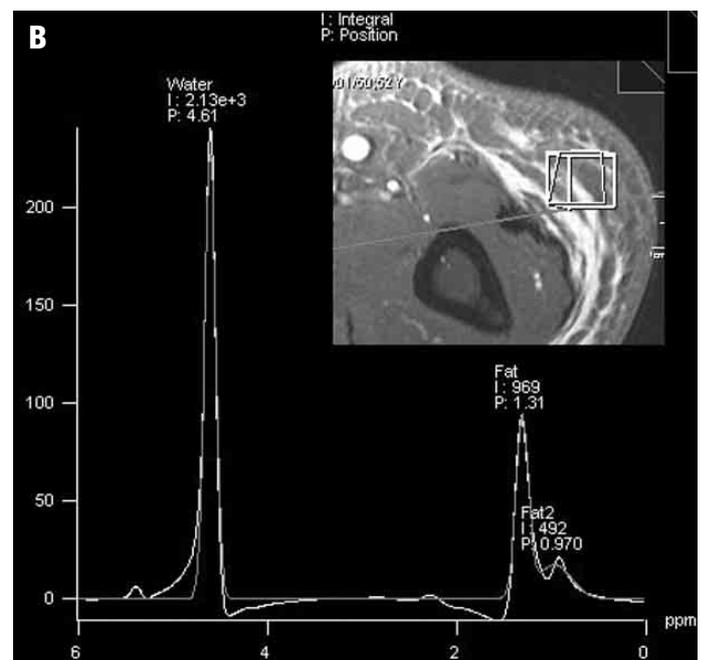
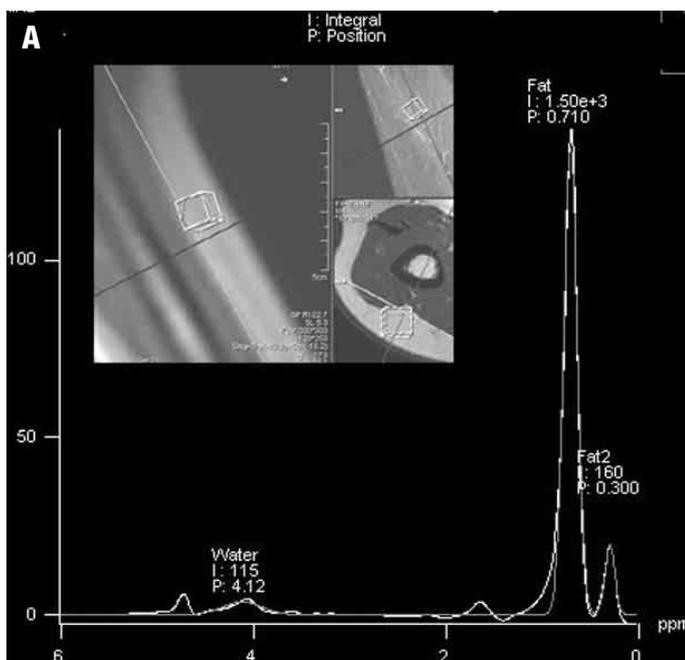


Figure 1a-1b: Single Voxel Spectroscopy (SVS) in the subcutaneous fat of a normal limb (1a) and a lymphedematous limb (1b). Localizers in 3 directions allow a correct position of the volume of 10*10*10mm: this volume include fat lobule and subcutaneous trabecular structures. The low peak of water in the normal limb is highly increased in the lymphedematous limb and the peak of fat (made of two close peaks of different types of fat) is slightly decreased in the pathologic limb.

RESULTS

In all cases, making a side to side limb comparison by means of US and MRI we found an increase in the dermal thickness [mean US dermis thickness: 2.42mm +/- 0,53 (lymphedematous limb); 1,41mm +/- 0,19 (normal limb)] (Fig. 2a-2b) and a progressive increase of the echogenicity of the subcutaneous tissue of the affected limb, which became a global hyperechogenicity with thin non-echogenic bands mimicking a honeycomb picture in areas with higher edema. The subcutaneous tissue of the normal limb and non-edematous areas of the pathologic limb presented a homogeneous hypoechogenicity with thin hyperechogenic bands. In all cases, there was a characteristic MRI appearance showing a honeycomb pattern of the subcutaneous tissue in the area of the maximal edema infiltration detected by ultrasonography.

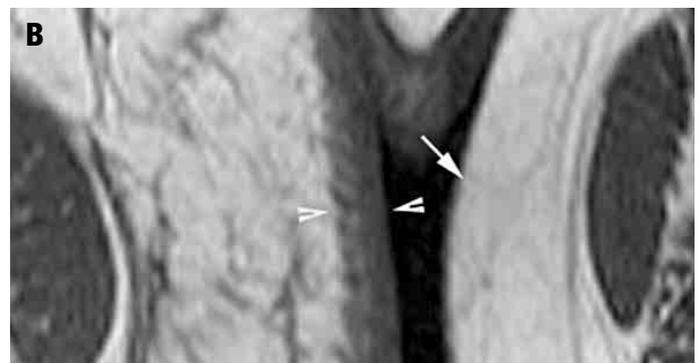
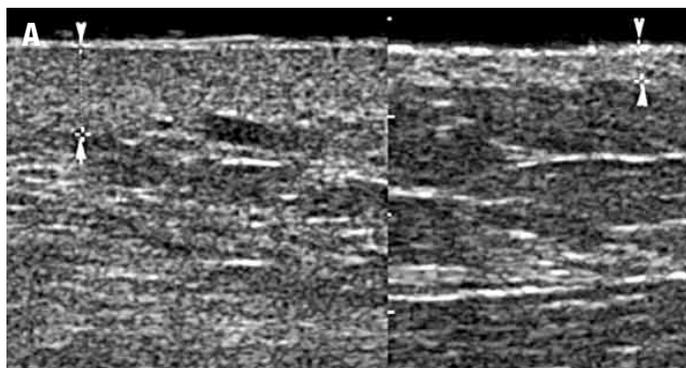


Figure 2a-2b - 2a: Ultrasonography clearly demonstrate the increase of the dermis thickness (between arrow-head) in the lymphedematous lower limb (left side) in comparison with the contralateral limb (right side). **2b:** T1 axial weighted image for the same patient shows the same modification: hyposignal enlarged cutaneous band in the left-side (between arrow-head), ill-defined thin dermis in the normal right side of the image.

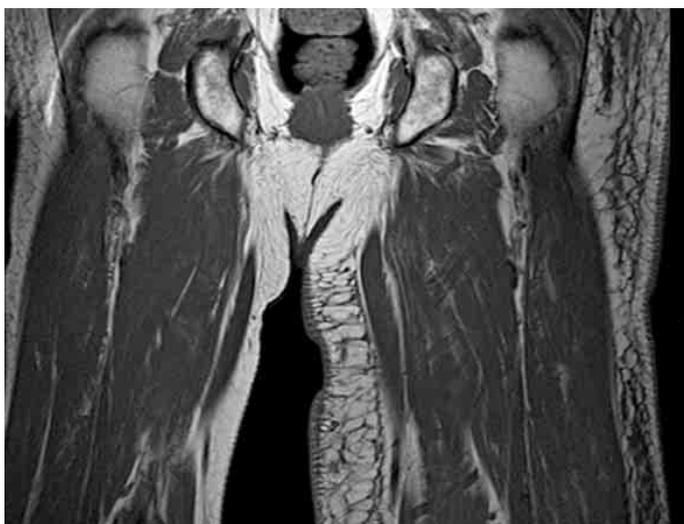


Figure 3: Coronal T1 weighted image: hyposignal enlarged trabecular subcutaneous structures giving a typical honeycomb pattern in the lymphedematous limb.

Interlobular septas were hypersignal on T2 weighted images and hyposignal T1 weighted images in all cases and the signal between these trabecular structures remained similar to fat (hypersignal on T1 weighted images, slightly hyposignal on T2 weighted images and highly hyposignal on fat-suppression image) (Fig. 4a-4b-4c).

The results of SVS spectroscopy are summarized in table 1. Water/Fat ratios of SVS spectroscopy were significantly higher ($p=0,0015$) in cases with lymphedema (mean +/- SD = 0,49 +/- 0,34) than in contralateral extremities (mean +/- SD = 0,086 +/- 0,15) (Fig. 3). The decrease of the volume of the voxel with CSI (5*6*6 mm) allows the analysis of areas with only fat signal with exclusion of the subcutaneous trabecular structures: CSI spectroscopy suggests presence of intralobular water in case of hyperechogenic lobule (fig 5a-5b).

Table 1.

Population (n = 10)	Sex	Limb.	Spectro ratio: Water/Fat Path.	Spectro ratio: Water/Fat NI.
Patient N° 1	F	upper	32,60%	0,40%
Patient N° 2	F	upper	10,70%	1,10%
Patient N° 3	F	upper	100%	50,60%
Patient N° 4	M	lower	81,20%	8,00%
Patient N° 5	F	lower	11,00%	3,60%
Patient N° 6	F	upper	58,90%	6,30%
Patient N° 7	F	upper	17,10%	5,00%
Patient N° 8	F	upper	91,40%	2,80%
Patient N° 9	F	upper	23,10%	3,20%
Patient N° 10	F	lower	63,50%	5,40%

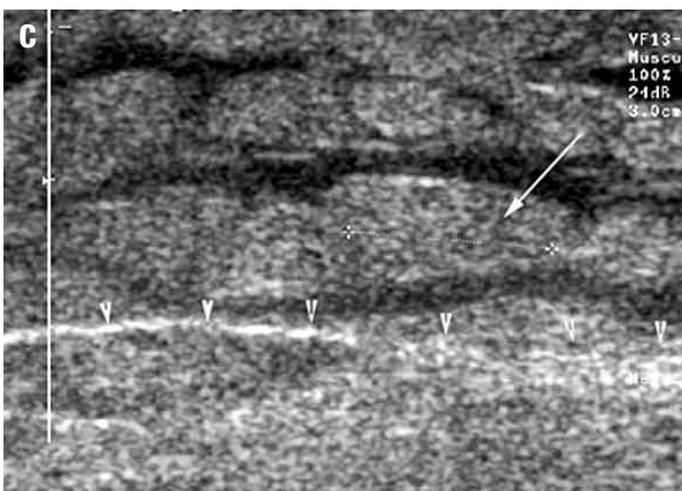
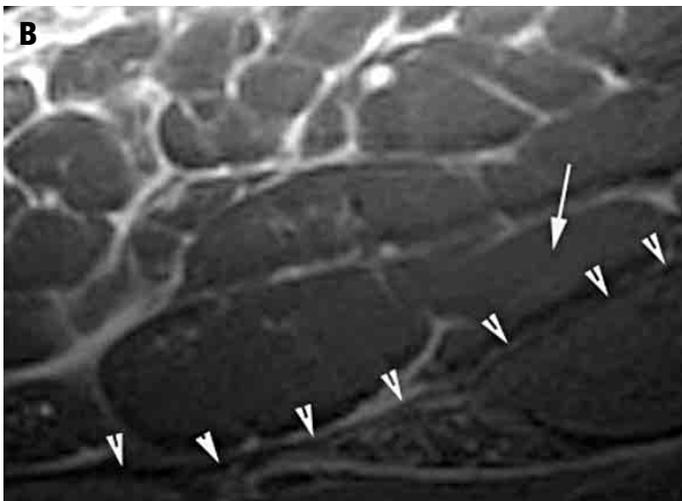
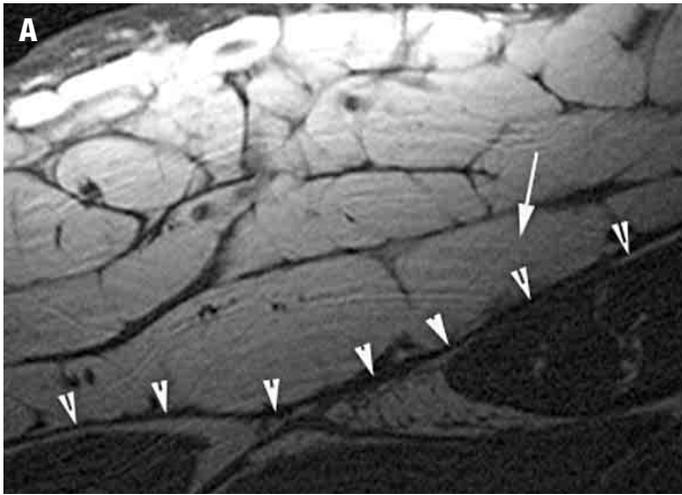


Figure 4a-4b-4c: Axial high resolution MRI in the lymphedematous limb (4a: T1; 4b: TSET2 fat sat; superficial fascial: arrow-head). Ultrasonography at the same level (4c). Enlarged subcutaneous trabecular structures hypointense on T1, hypersignal on TSET2 FS, anechogenic at US suggesting accumulation of fluid surrounding areas of persisting signal of fat [white arrow: hypersignal on T1, highly hypointense on fat-suppression sequence (4b)]. These areas with signal of fat appear hyperechoic at US suggesting chemical modification in comparison with a normal hypoechoic subcutaneous tissue (2a: right side).

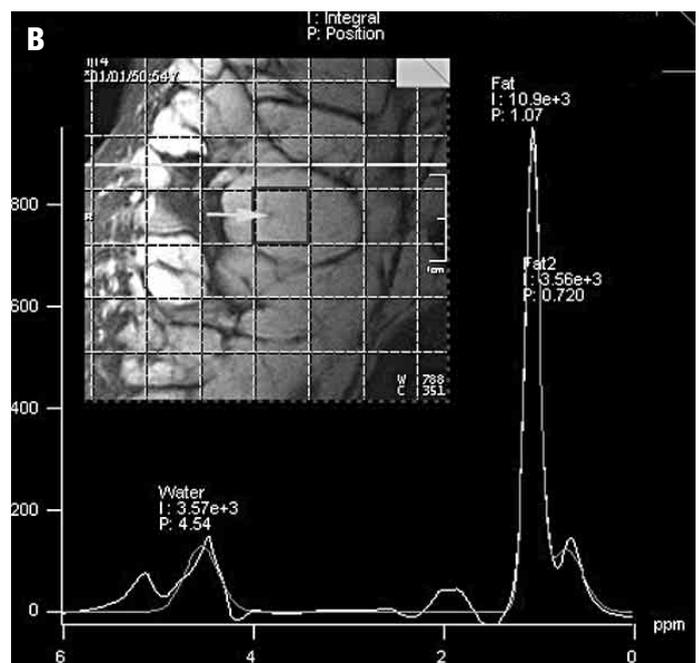
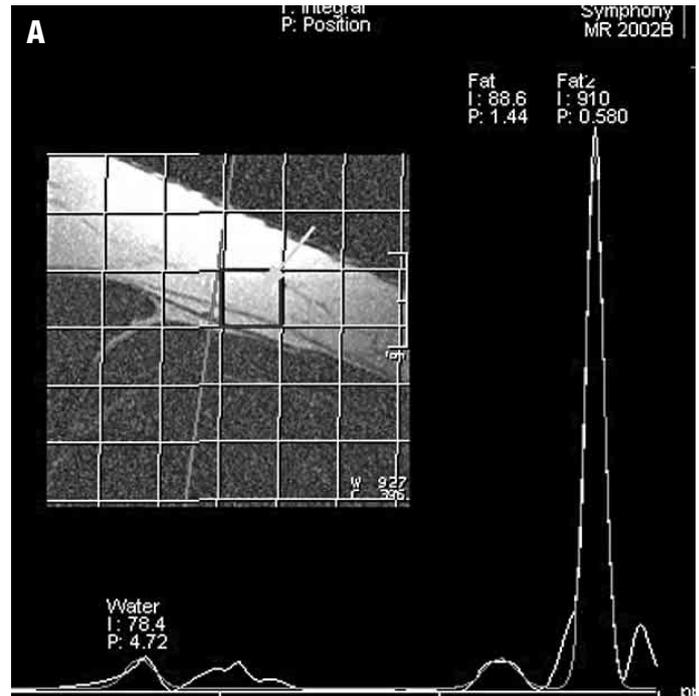


Figure 5a-5b: - 5a: CSI spectroscopy in the normal limb: selection of a voxel in the subcutaneous fat and corresponding spectrum (W/F ratio: 8%); 5b: CSI spectroscopy in the normal limb: selection of a voxel in a single zone with preservation of fat signal excluding trabecular subcutaneous structures and corresponding spectrum (W/F ratio: 25%).

DISCUSSION

The usefulness of MR spectroscopy in evaluation of lymphedematous changes was assessed in a previous study of Gniadecka (3) about water accumulation in the dermis. Such change in dermal hydration in lymphedema is well demonstrated in many studies (1,4,5,6) by the increased of the dermal thickness and a signal intensity similar to fluid on MRI, which was confirmed in our study. According to several authors, these dermal edematous thickening could be helpful in differentiating lymphedema from diseases with similar reticular subcutaneous features, e.g. in nephrotic syndrome cardiac overload patients in whom dermal edema is not found or minor (6,7). According to Gniadecka (4) the distribution of the edema in the upper or deeper layer of the dermis observed by high resolution ultrasonography can not only help specify the type of edema (lipodermatosclerosis, lymphedema, heart failure) but also evaluate the therapeutic efficacy of compression.

On the other hand, the debate about the exact nature of trabecular subcutaneous structures giving a typical honeycomb pattern on imaging techniques remains open: Dimakakos (8) suggest an intracellular fluid accumulation giving a stone-paved picture ; many authors (2,5,7,9,10) suggest that they represent dilated dermal lymphatics ; Werner (11) in a letter to the editor in reply to the article of Liu (9) expose that they are deep hydraulic chambers but no enlarged lymph vessels and provides support to his hypothesis with an anatomical study on artificial edema of a freshly amputated leg showing honey-comb pattern on MRI and mentioning anatomical studies performed by Elias in 1966 (12). The hypothesis of dilated lymph vessels may be questioned, since the majority of cases of primary lymphedema are caused by aplasia or dysplasia of the lymphatics vessels as supported by surgery and lymphoscintigraphy findings. We believe as many authors do that the honeycomb pattern represents excess interstitial fluid between areas of fat lobules, free in deep hydraulic chambers or trapped in collagen tissue and hyaluronic acid. The honeycomb pattern of the subcutaneous tissue seems to be typical of lymphedema (13), whereas in phlebedema signal abnormalities are more diffuse. Several authors (13,14) explained this difference by a component of fibrosis caused by the high protein content of edema fluid, whereas phlebedema is associated with relatively low concentrations of extracellular proteins. In chronic lymphedema, that component of fibrosis of the trabecular subcutaneous structures characterized by hyposignal in both T1 and T2 weighted sequences is observed by several authors (5,6,8), often mentioned by many authors. In our study, this particular aspect was not obvious. This might be due to a low number of patients or a low component of fibrosis in our series: Fudji in a larger MRI study of 60 patients (7) also found hyposignal on T1 and hypersignal on T2 of these trabecular structures in all patients but he didn't described the particular aspect of fibrosis characterized by hyposignal on both T1 and T2 weighted images as previously mentioned in some studies. We don't deny the presence of fibrosis in chronic lymphedema, as it was clearly demonstrated by earlier anatomical and imaging studies (15,16). However, we believe that these aspects are overestimated in some imaging studies due to chemical shift artifact or black boundaries artifact or the inclusion of a component of fibrosis due to focal fibrosis-like lesions with an appearance other than the honeycomb pattern correlated with a phlebedema component, crural ulcers or previous cellulitis (6).

Moreover, in a high-resolution MRI study of Idy-Peretti in 1998 (1), the mean thickness of the fat lobule was significantly larger in the lymphedematous limb compared with that in normal legs. The MRI signal of these larger lobules was similar in pathologic and normal limbs supporting the hypothesis of a mechanism of fattening of the connective tissue in chronic lymphedematous limb but in our study the preserved fatty signal of the lobule on MRI is in contradiction with the increase of normal echogenicity of the fat lobule on US. This hyperechogenicity of the fat lobule only means an increase of interfaces between tissues of different acoustic impedance but it doesn't demonstrate the real nature, be it fibrotic or hydric, of the modification. This increase of the echogenicity of the fat lobule is too much obvious to be due only by an effect of posterior enhancement created by hypoechogenic upper layers of the cutaneous or subcutaneous tissue such as edematous dermis or anechogenic subcutaneous trabecular structures: the upper lobules are equally affected than the lower and there seems to be in no direct relation to the thickness of the dermis. Our hypothesis is that the hyperechogenicity reflect fluid accumulation in the fat lobule. The SVS results are highly suggestive of fluid accumulation in interlobular spaces or in both interlobular and intralobular compartments confirming the interpretation of the hyposignal on T1 and hypersignal on T2 weighted images in the trabecular subcutaneous structures in MRI and the aspect of anechogenicity of these structures on US. The volume of the voxel in SVS (10*10*10 mm) is higher than the space remaining with fat signal in MRI between the subcutaneous trabecular structures and don't permit analysis of that space alone. The decrease in volume of the voxel with CSI (5*6*6 mm) allows that analysis: our first results in CSI spectroscopy (fig 5) and US aspect suggest a component of intralobular fluid accumulation but this hypothesis might be evaluated by a larger study with CSI spectroscopy. The hypothesis of fluid accumulation in intralobular space is supported by the description in MRI of a pattern of diffuse edema of subcutaneous tissues in lymphedema (5) and in phlebedema (13). In our study, the apparent preservation of the fatty signal of the lobule in conventional MR imaging may be due to low intralobular accumulation in comparison with interlobular water accumulation and by the fact that MR image are performed by a grayscale technique, which depends on the size of the voxel and on the difference with the signal of surrounding voxels. This hypothesis of a component of intralobular water accumulation doesn't mean that it is not possible to have a component of fattening of connective tissue in lymphedematous limb, especially if the hypoechogenicity of the lobule is preserved such as in lipedema. Some authors (2,17) suggest that diffuse hypoechogenicity or hyperechogenicity of subcutaneous tissues or subfascial compartments reflects water accumulation or diffuse fibrosclerosis but we must keep in mind that ultrasonography only demonstrate the architectural changes of a tissue and not chemical change. Moreover, hyperechogenicity of the subcutaneous fat is described in other pathologic conditions than lymphedema such as phlebedema, acute post traumatic edema, lipoma are sometimes hyperechogenic at US and hyperechogenicity of the subfascial compartment is found in "non fibrotic" conditions such as amyotrophy by example. That why we need to correlate different imaging techniques to assess the real nature of the modifications in lymphedema and we think that MR spectroscopy can help to increase our knowledge of chemical changes in lymphedema.

CONCLUSION

The single voxel spectroscopy confirms water content in intra/interlobular compartment in chronic lymphedema. There is discordance between MRI and US in our study for the fat lobule (preserved fat signal in MRI, change from hypoechogenicity to hyperechogenicity on US): our first results with CSI Spectroscopy suggest intralobular water accumulation but this hypothesis should be validated by a larger series. US and spectroscopy seem to be more sensitive than conventional MRI to demonstrate intralobular changes. We think that we need to correlate different imaging techniques to assess the real nature of the modifications in lymphedema and that MR spectroscopy might become a very useful tool in the future to study lymphedematous changes.

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EFFICACY OF GARMENTS IN THE LONG-TERM MANAGEMENT OF POST-MASTECTOMY LYMPHEDEMA: PRELIMINARY RESULTS FROM PROSPECTIVE COHORT STUDY

ISABEL FORNER-CORDERO*, JOSE MUÑOZ-LANGA**, LAURA ALBIACH-GASCÓ*, DOLORES MALDONADO-GARRIDO*.

* Lymphedema Unit. Hospital Universitario La Fe. Valencia (SPAIN)

** Oncology Unit. Hospital Dr. Peset. Valencia (SPAIN)

Correspondence: Dr. Isabel Forner Cordero
Lymphedema Unit
Hospital Universitario La Fe
C/ Andrés Mancebo 36, 12
46023 VALENCIA - SPAIN
Tel: +34 963862700 - extension 50925
e-mail: iforner@saludalia.com

ABSTRACT

Background: Post-mastectomy lymphedema is the most frequent type of lymphedema in our country, with an incidence from 6 to 30%. While many authors have written about lymphedema treatment in the intensive phase, few studies are performed to determine the effects of compression garments in the maintenance phase.

Objectives: To assess the efficacy of garments in maintaining the volume of the arm in post-mastectomy lymphedema patients and to assess the suitability of the garments in order to find any relation between the suitability and maintenance of the volume and patient's adherence to treatment.

Methods: 130 women with post-mastectomy lymphedema stage II, III or IV were included in this prospective, open label, controlled study. The garments prescribed are usually flat-knitted fabric, class II (20-32 mmHg) in two pieces, armsleeve and glove. The arm volume was calculated with the circumferential measurements and we defined the "Change of volume" as the percentage of change from the baseline volume at 1st, 6th and 12th months after the adaptation of the garment. The garment was assessed following a system of score to measure its suitability. Patient's demographic and clinical features were recorded in order to find prognostic factors related to change of volume using a univariate linear regression analysis. The median age of patients was 60.6 years (range 37-81) and 66.9% of them had received Complex Decongestive Therapy previously.

Results: Baseline volume was 3088 ml (95%CI: 2943-3232), and baseline oedema was 352 ml (95%CI: 293-411). The patients

were wearing the armsleeve a mean of 11.5 hours per day (CI95%: 10.9-12.2), and the glove a mean of 7.3 hours per day (CI95%: 6.3-8.3). The mean of change of volume at 1st month was -1.6% (CI95%: -2.6 to -0.7); 0.0% (CI95%: -1.4-1.4) after 6 months and 1.5% (CI95%: -0.3-3.3) after 12 months. The volume increased more in severe stages of lymphedema ($p = 0.005$). No relation was found between the change of volume and the time of compliance with the garment. High score of the garment was related to a lower increase of volume at 6th and 12th months ($p = 0.004$ and $p = 0.025$, respectively).

Conclusions: Although the garment's effect on reducing the volume is lost at 6 months, it can maintain the volume for a longer time with a little variability that is not clinically significant. This means that compression garments play an important role in maintaining arm volume at long-term management, even later than recommended. Moreover, a good suitability of garment carries a better result.

KEY WORDS: post-mastectomy lymphedema; maintenance phase; compression garment; suitability assessment; prognostic factors.

INTRODUCTION

Lymphedema, after breast cancer treatment, is the most frequent type of lymphedema in our country, being its incidence from 6 to 30%¹ depending from the sources. The management of lymphedema is based on a "two-phase" approach: Phase I or 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 endorsed by long standing experience and its major goal is to reduce volume. It consists of skin care, manual lymph drainage, range of motion exercise and multi-layered compression bandages. Phase II aims to conserve and optimize the results obtained in phase I. It consists of compression by a low-stretch elastic stocking or sleeve, skin care, and exercises. While many authors have written about treatment in the intensive phase, few studies are performed to determine the effects of different therapies in the maintenance phase. Although the use of compression garments is the most widely accepted treatment option in long-term management of lymphedema,⁴ also in of post mastectomy lymphedema, the evidence base for compression is poor.⁵ Non-compliance to compression, neither short stretch bandages nor compression arm sleeves, is a risk factor for the increase of the lymphedema after one year of maintenance therapy. Nevertheless, non-compliance to manual lymphatic drainage was not a risk factor for worsening.⁶ Properly fitted garments are essential for long-term control of lymphedema volume.⁴ The objectives of the garment could be: to help the transport of the fluids to the root of the limb, to difficult the fluid reaccumulation, to maximise muscular pump, to give support to the tissues to improve comfort, to maintain the shape and to improve the skin conditions.⁷ Garment style and compression level should be prescribed to enhance patient compliance and volume control. Standards of the different garments concerning testing methods, compression gradient and durability, are not uniform between different countries, and there is a lack of a European standard.⁸ This is another difficulty for researchers to know which kind of factors can influence the maintenance of the volume in the long-term management of lymphedema. The literature of compression garments is scarce. The Template for practice, recently published by the Lymphoedema Framework is a document with the aim of enhancing practitioners' and patients' to use compression garments.⁹ The International consensus Best Practice for the Management of Lymphoedema,¹⁰ by the Lymphoedema Framework unifies criteria for the whole management of lymphedema patients. There is a chapter of compression garments information, where many tips for prescription and checking fit are provided. In our report, data from prospective cohort of patients with post-mastectomy lymphedema are analysed to evaluate the role of the garments in maintaining the volume of the arm during the maintenance phase of lymphedema treatment.

PATIENTS AND METHODS

Study Design

We conducted a prospective, open label, controlled study to assess the efficacy of garments in maintaining the volume of the arm in post-mastectomy lymphedema patients and to assess the suitability of the garments in order to find any relation between the suitability and maintenance of the volume and patient's adherence to treatment.

Schedule of Treatment

Decongestive therapy was applied when needed, in consecutive days, between 10 and 20 sessions of manual lymphatic drainage, pneumatic pressotherapy and multilayered bandages. At the end of this treatment, the garment was prescribed and adapted. The patients in the maintenance phase of lymphedema treatment with a stable volume of their arm and without a pitting oedema received a new garment at enrolment.

The garments prescribed in our Unit, are usually flat-knitted fabric, class II (20-32 mmHg), in two pieces armsleeve and glove and costume made. Measurements are taken by a trained orthopedic technician and the fitting is checked by the physician.

Garment Evaluation

The garment was assessed following a score system to measure its suitability, that was designed by consensus of the team (doctor, lymphotherapist and orthopedic technician), following the common complaints of patients and the main errors seen in the garments' fitting. Table 1 and 2 list the items checked by the system for the armsleeve and the glove, respectively.¹¹ The maximum of the score was 10 points for the armsleeve and 5 points for the glove. Higher score means better suitability.

Patient's demographic and clinical features were recorded in order to find prognostic factors related to change of volume: Age, Limb volume, Degree of Severity, Presence of fibrosis, Surgical intervention, Lymphadenectomy, Radiotherapy, Hormonal Therapy, Dominant or non dominant limb, Weight and Body Mass Index (BMI), Chronicity (in years), Reduced joint mobility and Peripheral nervous impairment.

The patients were asked about the number of hours per day that they were wearing their garment and their habits of living.

Evaluation of the change of volume

The volume was calculated with the Kuhnke formula, obtained from the circumferential measurements at hand, at wrist, and every 4 cm until the axilla:

$$\text{Volume} = \frac{C1^2 + C2^2 + Cn^2}{\pi}$$

The change of Volume was calculated as a percentage from the baseline volume at 1st, 6th and 12th months from the adaptation of the garment.

$$\text{Change of Volume} = \frac{\text{Volume at assessment} - \text{Baseline Volume}}{\text{Baseline Volume}} \times 100$$

The deterioration of the garment was recorded as none, mild or severe. Note that Public Health system only provides one garment per year and the garment that was going to be assessed was the only one that patient was wearing.

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 amplexness	<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 Foldings	<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)		

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)		

Patients Selection

Women with post-mastectomy lymphedema admitted at the Lymphedema Unit of Hospital Universitario La Fe of Valencia, between August 2004 and January 2007, that fulfilled the following inclusion criteria were recruited:

- post-mastectomy lymphedema stage II, III or IV,
- affecting only unilateral upper limb
- in maintenance phase: just after intensive treatment or continuance of maintenance therapy.

Exclusion criteria:

- Abandon of the garment
- Evidence of tumour progression
- Active lymphangitis
- Psychiatric disturbances or addictive behaviors.

Statistical Analysis

The patient database and statistical analyses were made using the SPSS version 11.5 statistical package. The results of the variables recorded in the corresponding case report form (CRF) of each patient was filtered, coded and introduced in the SPSS database (data input control). Lastly, inconsistencies were detected, along with odd values and introduction of the opportune corrections.

The *results of descriptive analysis* were presented in terms of central tendency and dispersion (mean, median, 95% confidence interval) for continuous variables, and the absolute and relative frequencies were calculated in the case of categorical variables. The comparison of categorical variables was made using contingency tables with the chi-square test (χ^2) and Fisher or Yates correction of continuity, where required. The association between categorical and continuous variables was explored by analysis of variance (ANOVA test), since it offers greater power than the t-test (Student-Fisher test) for comparing two means of independent samples.

The analysis of the relationship between continuous exposure variables and continuous response variables was based on a linear regression model (β coefficient). The analysis of the relationship between exposure variables (continuous or categorical) and binary response variable was made using a logistic regression model (Odds Ratio).

In all cases, hypothesis testing was two-tailed, with the application of a 5% level of significance ($p \leq 0.05$) and a statistical power of 80%.

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 analyzed. 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 oedema (ml) (mean, 95%CI)	352 (293-411).
After Complex Decongestive Therapy (%)	87 (66.9%)

The median age was 60.6 years (range 37-81), and most of them were suffering from stage II and stage III lymphedema (27.1% and 65.1%, respectively), with a mean of chronicity of 4.2 years from the onset of lymphedema (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 baseline oedema was 352 ml (95%CI 293-411) at the moment of prescription of the compression garment.

In 87 cases (66.9%), the patients had received Complex Decongestive Therapy previous to the prescription of the garment and the rest were stable and were following the maintenance phase.

One hundred twenty eight patients were wearing armsleeves and 100 gloves because not all the patients were suffering of hand lymphedema, despite the fact that they were not wearing glove.

Garment' suitability and Compliance

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 glove' score was 4.46 points (95%CI: 4.32-4.60) (for a maximum of 5 points).

The patients were wearing the armsleeve a mean of 11.5 hours per day (CI95%: 10.9-12.2), and the glove a mean of 7.3 hours per day (CI95%: 6.3-8.3). The 20.8 % of the patients were not independent to fit their garment.

The 8.6% of the patients abandoned the use of the armsleeve for different reasons (mainly because they did not stand the pressure),

and the 26% of the patients abandoned the use of the glove mainly because they were unable to do the homework or to work with it.

Change of volume

The volume was measured in 86 patients after 1 month, in 80 patients after 6 months and in 54 patients after 12 months. The mean of change of oedema was -64 ml (CI95%: -105 to -21) at 1st month; -16 ml (CI95%: -69-38) at 6th month; and 19 ml (CI95%: -48-85) at 12 months after garment prescription.

The mean of change of volume at 1st month was -1.6% (CI95%: -2.6 to -0.7); 0.0% (CI95%: -1.4-1.4) after 6 months and 1.5% (CI95%: -0.3-3.3) after 12 months. That means that the volume decreases at 1st month, returns to baseline values after 6 months, but increases a little after 12 months.

At 6 months, about 50% of the patients had some increase of the volume compared to baseline, but in only 5% of them this increase was clinically significant (> 10% of the baseline). At 12 months, 61% of the patients had some increase of the volume compared to baseline, but in only 8% of them this increase was clinically significant.

Prognostic Factors related to the Change of Volume

Factors related to the change of volume despite the use of the garment are list in Table 4. No relation was found between the increase of volume and the age neither the body mass index neither the chronicity of the lymphedema.

Table 4. Factors related to increase of volume despite the use of the garment

Factors	Change of Volume after 1 month	Change of Volume after 6 month	Change of Volume after 12 month
No. of patients	86	80	54
Age	β : -0.07 (95%CI -0.2-0.0) (p=0.240)	β : -0.09 (95%CI -0.3-0.1) (p=0.338)	β : -0.03 (95%CI -0.3-0.2) (p=0.754)
Body mass index	β : -0.009 (95%CI -0.2-0.1) (p=0.570)	β : 0.175 (95%CI -0.1-0.4) (p=0.201)	β : -0.070 (95%CI -0.4-0.3) (p=0.685)
Chronicity	β : -0.025 (95%CI -0.2-0.1) (p=0.742)	β : -0.041 (95%CI -0.3-0.2) (p=0.720)	β : -0.017 (95%CI -0.3-0.2) (p=0.891)
Lymphedema stage: (mean; 95%CI)	-3.4% (-5.6 to -1.1)	-4.3% (-7.3 to -1.3)	1.2% (-6.4 -8.8)
II (16 cases)	-1.2% (-2.4 -0.0)	1.1% (-0.5 -2.8)	1.3% (-0.9 -3.5)
III (63 cases)	-1.6% (-3.9 -0.7)	2.1% (-0.3 -4.4)	3.5% (-0.3 -3.3)
IV Elephantiasis (7)	(p = 0.238)	(p = 0.005)	(p = 0.787)
Time of use	β : 0.145 (95%CI -0.1 -0.4) (p=0.293)	β : -0.214 (95%CI -0.6 -0.2) (p=0.302)	β : -0.071 (95%CI -0.5 -0.4) (p=0.765)
Score of the armsleeve	β : -0.509 (95%CI -1.4 -0.4) (p=0.276)	β : -2.018 (95%CI -3.4 a -0.7) (p=0.004)	β : -2.1 (95%CI -3.9 a -0.3) (p=0.025)
Baseline Volume	β : 0.00 (95%CI -0.0 -0.0) (p=0.793)	β : 0.001 (95%CI -0.0 -0.0) (p=0.626)	β : 0.001 (95%CI -0.0 -0.0) (p=0.946)
Baseline oedema (ml)	β : 0.001 (95%CI -0.0 -0.0) (p=0.664)	β : 0.00 (95%CI -0.0 -0.0) (p=0.878)	β : 0.001 (95%CI -0.0 -0.0) (p=0.864)
Deterioration of the garment	NS	NS	NS
No	1.5 (-0.9 -3.8)	0.3 (-1.6 -2.3)	1.5 (-0.9 -4.0)
Mild	1.6 (-1.7 -4.9)	0.9 (-1.7 -3.5)	1.6 (-1.7 -4.9)
Very	1.3 (-5.8 -8.4)	-0.3 (-8.7 -8.2)	1.6 (-0.4 -3.5)
	(p = 0.991)	(p = 0.897)	(p = 0.999)

We found an association between the increase of volume after 6 months and the lymphedema stage. The volume increased more in severe stages than in mild of lymphedema ($p = 0.005$). No relation was found between the increase of volume at 1st month and the time of use of the garment. High score of the garment in our score system was related to a lower increase of volume after 6 and 12 months and this relationship was statistically significant ($p = 0.004$ and $p = 0.025$, respectively). Each point in the score means a reduction in 2% of the volume.

DISCUSSION

A recent study of Vignes et al. (2007) in 537 patients with secondary lymphedema report that the non-compliance to compression, neither short stretch bandages nor compression arm sleeves, is a risk factor for the increase of the lymphedema after one year of maintenance therapy. Nevertheless, non-compliance to manual lymphatic drainage was not a risk factor for worsening.⁶ After the first month of garment's prescription, patients have improved the volume of their lymphedematous limb and the improvement is maintained by half of the patients after 6 months. The use of accurate and suitable garment seems to be effective for maintaining the volume of the arm in post-mastectomy lymphedema after 6 and 12 months since the prescription. After 1 year wearing the same armsleeve, the volume remained stable (increase of volume < 10%) in 92% of the patients. Only 8% of the patients had a clinically significant increase of the lymphedema volume. The slight increase at this time, less than 10% of the baseline volume for most of the patients, shows the efficacy of the well designed compression garments in maintaining the volume of the arm. This means that the armsleeve plays an important role in maintaining the arm volume at long-term management, even later than recommended, and even when it seems to be deteriorated. Our results are better than those reported by Vignes et al.⁶ and this can be due to the fact that we have measured only the patients that were compliant with the garment. The better was the score of the garment, the better the results of the maintenance therapy in terms of volume. The score suitability system can be useful in the assessment of the compression garment and may predict its effect and its success in maintaining the volume of the limb. The limits of this study are the small number of patients to perform a multivariate logistic regression to identify independent predictive factors related to the results of maintenance treatment.

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LYMPHOLOGIC DIAGNOSTIC AND THERAPEUTIC IMPLICATIONS IN CHRONIC VENOUS INSUFFICIENCY

FRANCESCO BOCCARDO, COSTANTINO ERETTA, DAVIDE PERTILE, ELISA DA RIN,
CORRADO CAMPISI, CARLO BELLINI, CORRADINO CAMPISI

Department of Surgery – Unit of Lymphatic Surgery and Microsurgery
S. Martino Hospital – Univeristy of Genoa, Italy
francesco.boccardo@unige.it – campisi@unige.it

SUMMARY

Background: A certain degree of lymphatic impairment is almost always present in chronic venous insufficiency (CVI). In those cases in which lymphatic insufficiency associated with venous disorder is remarkable the clinical condition is defined phlebolympheidema.

Introduction: In venous surgery it is very important to pay attention to lymphatic and lymph-nodal structures nearby veins, above all in case of clinical evidence or lymphoscintigraphic demonstration of lymphatic dysfunction of the limb, in order to avoid the possible appearance of post-surgical lymphedema.

Material and Methods: The clinical experience includes patients affected from varices of lower limbs, in whom venous surgery was preceded and performed by the use of preventive diagnostic (lymphoscintigraphy) and therapeutic (Blue Dye) procedures for the prevention of secondary lymphedema.

Results: As concerns venous insufficiency CEAP classification was used, and as regards lymphatic dysfunction 5 stage lymphedema classification was applied. Clinical assessment included measurement of circumferences and volumetry, instrumental evaluation consisted in ultrasonographic study and lymphoscintigraphy. Follow-up was done at 1-3-6-12 months, 1-2-3 years after treatment.

Conclusions: It is indispensable to pay attention to a possible latent lymphatic impairment in patients affected from varices that are going to be treated by surgery (saphenectomy, phlebectomy, etc.) in order to avoid damages to local lymphatic and lymph-nodal structures, which can determine the occurrence of secondary lymphedema.

KEY WORDS: Lymphatic impairment, varices, venous surgery, chronic venous insufficiency, lymphedema..

INTRODUCTION

A Phlebologist, in his daily activity, must often cope with many aspects regarding the field of Lymphology. This closed correlation between lymphatic and venous circulations is already present in embryonal development.

Lymphatic sacs, that represents the primordial structures of origin of lymphatic circulation, start from venous formations. Also from the anatomic point of view, both circulations are located above and below the muscular fascia and both have valvular devices. From the functional point of view, lymphatic system has a fundamental role in the homeostasis process, for the drainage of interstitial liquids, cellular debris, bacteria, inorganic substances, high molecular weight plasmatic proteins and immune cells.

PHYSIOPATHOLOGY

In every type of edema, lymphatic system is involved as an insufficient drainage of tissular extracellular space, which can occur through two main mechanisms:

- 1) Insufficient lymphatic drainage of interstitium (low output failure) due to congenital or acquired obstacle to lymph flow.
- 2) Overload of interstitial liquids, with normal or augmented lymphatic drainage (high output failure), as occurs for example in post-phlebitic syndrome and in chronic venous insufficiency (CVI).

Furthermore, lymphatic involvement in CVI gets worse and worse due to the appearance of dystrophic-ulcerative lesions and lipodermatosclerosis. The association of lymphostatic component with CVI leads to the appearance of edema that, according to the prevalence of one or the other pathology, is named as phlebolympheidema or lymphophlebedema.

O. Eliska¹ proved lymphatic involvement at the bottom and around leg venous ulcers, through various biopsies, thus pointing out the cause of the almost constant existence of perilesional edema. Therefore, one can well understand that a better assessment of correlations between the two systems (venous and lymphatic) can lead to a major diagnostic and therapeutic success in the clinical daily activity of Phlebologists.

CLINICAL ASPECTS

The progressive evolution of a condition of CVI towards trophic alterations, till the appearance of ulcers, associates with a significant reduction of the lymphatic drainage.

This aspect has been well demonstrated by lymphoscintigraphy, which allows to evaluate the entity of lymphatic involvement and to understand pathophysiological mechanisms of the process. Particularly, for example, lymphoscintigraphy allows to assess precisely the degree of involvement of deep lymphatic circulation in the phase of compensation of a post-phlebotic syndrome. Also microlymphographic^{2,3} study proved alterations of dermal lymphatics, as a pattern of lymphatic microangiopathy, characterized by obstructions and back flow. Laser-Doppler proved a reduced peri-lesional microcirculatory perfusion, worsened further on by edema surrounding the ulcer. All these factors are responsible of a poor healing of the same ulcer.

The association of lymphatic stasis to CVI increases the risk of episodes of dermato-lymphangio-adenitis, that determine the worsening of edema, the appearance of skin trophic alterations till ulcerations. Exudation from trophic-ulcerative lesions leads to progressive skin steeping, that associates to other alterations as hyperkeratosis, papillomatosis, lymphatic fistula, verrucosis, fibrosis, correlated to lymphatic stasis.

A progressive functional limb impotence occurs together with the increase of limb volume. Finally, there is the risk of malignant transformation of trophic-ulcerative lesions (acantocarcinoma, lymphangiosarcoma, etc.).

Therefore, association of lymphedema to CVI leads to significantly worse evolution and prognosis of clinical conditions.

THERAPY

Treatment strategy of these diseases must consider both venous and lymphatic component of the dysfunction to be able to prevent the possible evolution of mixed phlebo-lymphedematous disease. Conservative treatments must integrate with therapeutic surgical procedures.

Non-operative treatment includes: hygienic measures, limb elevation, muscular exercises, weight lost, manual and mechanical lymph drainage, bandages, proper elastic compression garments. The key of treatment is, however, the correct compression support that determines increase of interstitial pressure with limitation of capillary filtration, permits the control of edema and increases draining activity of muscular pump.

From the pharmacological point of view, benzopyrones, diuretics (not to use in pure lymphatic edema), antibiotics (also long acting) and antimicrobial (mainly for local use) can be used. Particularly, among benzopyrones, purified micronized flavonoid fraction demonstrated its efficacy in mixed venous and lymphatic edema, through the reduction of capillary permeability, increase of capillary tone, limitation of microcirculatory damage (working on the adhesion of endothelial cells) and improving lymphatic drainage.⁴

As concerns surgical therapy, particular attention has to be paid for venous surgery in the treatment of varices in phlebo-lymphedema, as it was demonstrated the possibility of worsening of clinical conditions due to damages to peri-venous lymphatics during cross-section, saphenous stripping and ligation of collateral veins and insufficient perforating veins.⁵

Diagnostic and therapeutic preventive procedures are, therefore, indispensable in these cases. Lymphoscintigraphic study of lower limbs with varices, associated to declive latent or clinically evident

edema, allows to select cases in whom lymphatic impairment is associated with venous pathology. In these situations, it is possible therefore to use preventive therapeutic measures as injection of Bleu Patent V (BPV) at interdigital spaces and at the superior 1/3 of antero-medial surface of the thigh, for the visualization of lymphatic collectors nearby veins of superficial circulation and for their preservation (Fig. 1). It is finally, possible to perform microsurgical lymphatic operations at the same time of vein surgery if the lymphatic insufficiency is remarkable⁶⁻⁷ (Fig. 2).

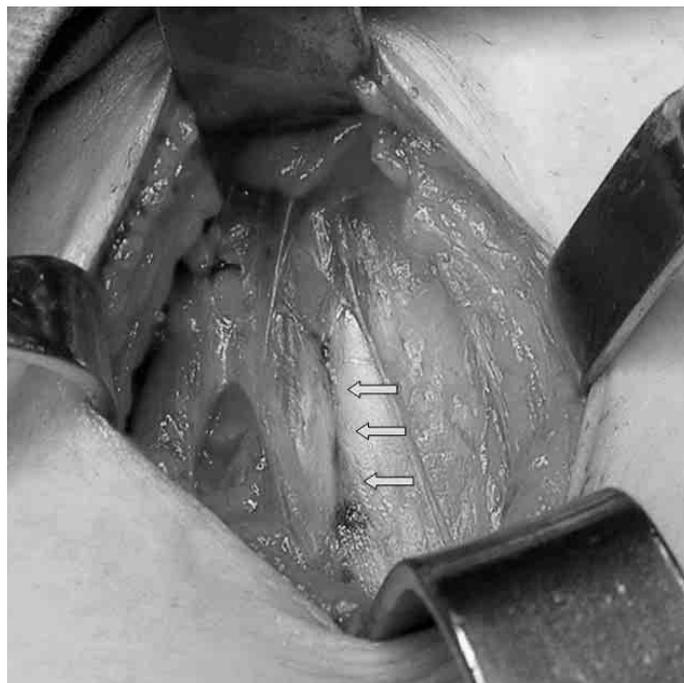


Fig. 1 - Afferent lymphatic collectors coloured in blue at the groin in a patient affected from varices with associated lymphatic insufficiency. The blue dye allows to individuate and preserve lymphatic vessels nearby great saphenous vein.

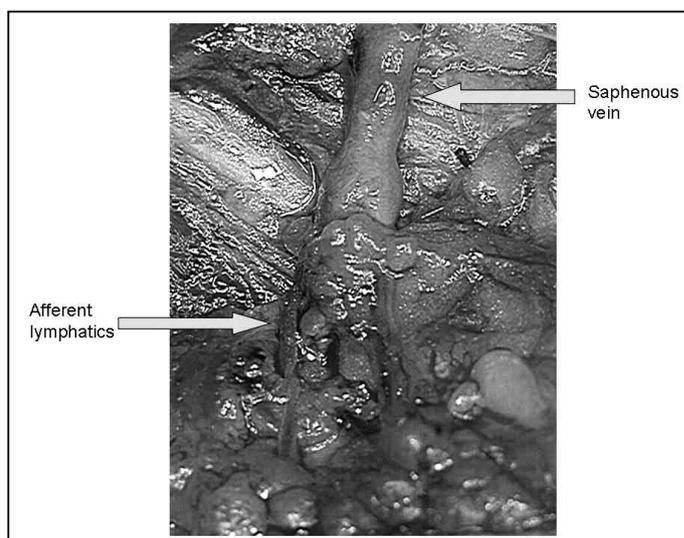


Fig. 2 - Lymphatic-venous anastomosis at the inguino-crural region performed at the same time of great saphenous vein stripping in a patient affected from phlebo-lymphedema, after proper external saphenous valvuloplasty.

CONCLUSIONS

Many studies proved the involvement of lymphatic system in cases of CVI.⁸ Evidence of international literature demonstrates that the involvement of lymphatic circulation includes patterns of low output failure and high output failure.

We must always think about a lymphatic circulatory involvement in presence of chronic edema of lower limb with signs of CVI. Diagnostic assessment of mixed pathologies must always be complete and integrated. Particularly attention must be paid to the precise indications and to the technique in venous surgery in mixed clinical patterns of lymphatic and venous insufficiency for the possible worsening of edema after surgery, till the possible use of associated lymphatic microsurgical techniques.

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CERVICAL STIMULATION IN THE VOLUMETRIC REDUCTION OF LIMBS IN THE TREATMENT OF LYMPHEDEMA

JOSÉ MARIA PEREIRA DE GODOY, MD, PhD*, SILVIA HELENA SILVA, PhT**
MARIA CRISTINA TONINATO***, MARIA DE FÁTIMA GUERREIRO GODOY, OT, PhD****

* *Livre Docente* of the Cardiology and Cardiovascular Surgery Department of the Medical School in São José do Rio Preto (FAMERP), Professor of the Graduation and post graduation courses of FAMERP and CNPq researcher

** Physiotherapist, student of post graduation the Medical School, São José do Rio Preto-SP-FAMERP.

*** Physiotherapist, student of the Latu Sensu Lymphedema rehabilitation post graduation course - FAMERP

**** Occupational therapist, professor of the Lato sensu Lymphedema rehabilitation post graduation course of Medical School, São José do Rio Preto-SP-FAMERP.

Correspondence author responsible: José Maria Pereira de Godoy
Rua Floriano Peixoto, 2950
São Jose do Rio Preto-SP-Brazil
Zipe code: 15020-010
Tel/fax: 55 17 32326362
E-mail: godoyjmp@riopreto.com.br

ABSTRACT

The aim of the current study is to report on the preliminary results evaluating the effect of stimulation of the cervical region on the reduction in size of lower limbs affected by lymphedema. Eighteen patients with grade II lymphedema were submitted to cervical stimulation for 20 minutes per day during five consecutive days. The affected limb was evaluated by water volumetry before and after the treatment period. These stimuli consisted of a total of 40 to 60 light movements per minute in the cervical region. For statistical analysis, the paired student t-test was utilized with an alpha error of 5% considered acceptable.

A statistically significant reduction in the size of all treated limbs was detected (p-value = 0.0003). The average reduction in size was 138.6grams.

The employed technique of stimulation in the cervical area reduces the size of lower limbs affected by lymphedema.

KEY WORDS: Cervical stimulation, lymphedema, treatment, evaluation

INTRODUCTION

Manual lymph drainage was first developed by Danish biologist Emil Vodder and his wife Estrid Vodder who, from 1932 to 1936, observed a clinical improvement of edema after physical stimuli during massage sessions.¹ From this observation they described a

series of circular or spiral movements, initiating in the proximal segments of the limbs but always working in the logical direction of lymph drainage – from distal to proximal, using pressures between 30 and 40 mmHg.^{2,3} This is the basis of the proposed technique of lymph drainage which has been performed over many years. Several groups around the world utilize this technique with some additional movements, but the basic technique is the same.⁴⁻⁷ In 1999 and over the ensuing seven years, Godoy & Godoy developed a new technique of drainage that aims at complying with the physiopathologic, physiological, anatomical and hydrodynamic principles of lymph drainage.⁸⁻¹⁵ Instead of the circular movements suggested by Vodder, the lymph is drained along the logical direction of vessels, maintaining the concepts of drainage from the distal to proximal point, treating section by section starting in the proximal region of limb. Another fundamental concept is the velocity of these movements that must be slow enough to allow drainage of lymph through lymph nodes.⁸ With Godoy's technique, it is recommended that the lymph collectors should first be drained in order to facilitate the formation of new lymph and after this, to stimulate movements that cause increases of interstitial pressure in the direction of the vessels to form and drain the new lymph.⁹

However, during the evolution of the technique it was observed that cervical stimuli alone may cause a volumetric reduction of the limbs. The aim of the current study is to report the preliminary results of cervical region stimulation in reducing the size of lower limbs of patients suffering from lymphedema.

METHOD

Fifteen female and three male patients with ages between 34 and 86 years and a mean age of 57.8 years with grade II lymphedema of lower limbs in its initial phase were selected over a two-year period. Diagnosis of lymphedema was clinical and confirmed by lymphoscintigraphy. All patients were submitted to twenty-minute sessions of only stimulation daily for five consecutive days (Fig. 1). The limb was evaluated by volumetry, a technique of water displacement before and after the treatment program. These stimuli are light movements in the cervical region, with 40 to 60 stimuli per minute. For statistical analysis, the paired student t-test was utilized with an alpha error of 5% considered acceptable. In this period patients not underwent other kind of physical treatment and put on the tailored garment.



Fig. 1 - Phase of cervical manual stimulation.

RESULT

A statistically significant volumetric reduction was detected in all limbs (see Table 1) (p -value = 0.0003). The average reduction in size was 138.6 grams.

DISCUSSION

The current study demonstrates how this technique of stimulating the cervical region reduces the volume of limbs affected by lymphedema. In our opinion this is the first time that this has been reported as there are no published studies evaluating this type of approach. This stimulation is simple, but it is important that healthcare professionals who use this technique are qualified. This finding raises a series of hypotheses to explain the effect of stimulation with the suggestion by the author being a possible interference in the contractions of lymphangions via neurological stimuli. The utilization of cervical region stimulation after trauma of the face demonstrated that the response is unilateral, suggesting that humoral stimuli are not involved.

Lymphangions are located in the space between two valves and constitute a contractile unit similar to the heart with its own beats and stimuli. It is well known that stimulation in the carotid glomus region can influence heart contractions, thus, it is possible that stimulation in the cervical region may interfere in lymphangion

Table 1. Volumetric variations before and after cervical stimulus

Patient N°	Before (grams)	After (grams)	Reduction (grams)
1	2596	2492	104
2	2685	2646	39
3	2315	2265	50
4	3247	3096	151
5	3015	2811	204
6	2543	2436	107
7	2038	1997	41
8	2893	2829	64
9	3431	3383	48
10	2533	2486	47
11	2748	2624	124
12	2508	2340	168
13	3084	2769	315
14	2271	2061	210
15	2327	2194	133
16	2641	2525	116
17	3294	3281	13
18	3245	2684	561
Average	2745.2	2606.6	138.6

contractions in a similar way. The findings of this study reinforce this hypothesis; stimulation of determined regions of the body can trigger responses at a distance, in this case stimulating contractions of the lymphangions.

In a pilot study involving three patients to evaluate the amount of stimulation, it was seen that an increase from 20 to 40 minutes causes a reduction in lymph drainage even in normal limbs and so there must be an inhibitory effect. These preliminary results suggest that stimulation should not exceed 20 minutes.

Confirming this hypothesis may help to define the best use of manual lymph drainage, causing an increase in the stimulation of this procedure. The ideal method of lymph drainage is to drain existing lymph, favoring the formation of new lymph by increasing the pressure in the interstitium and stimulating contractions of the lymphangions.

CONCLUSION

In conclusion the technique employed using stimulation of cervical region reduces the volume of lower limbs affected by lymphedema. The technique demonstrates a therapeutical efficacy independent from other treatments. It's very important the specific ability of the physiotherapist.

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E.S.L. News

Starting from the 21 January 2007 the European Group of Lymphology became European Society of Lymphology, according to the official registration by the *Court* of Brussels.

E.S.L. Website

Starting from the 10 June 2007 the E.S.L. Website is: **www.lymphology.eu**

E.S.L. General Assembly

Most important decisions

- 1) To improve the Relationship with other scientific Societies.
- 2) Approval of E.S.L. annual balance.
- 3) Adjustment of the Enrolement fees: starting from 2008, 100 euro yearly.
- 4) Next Congresses:
 - 2008 Naples (*President*: Prof. Bracale)
 - 2009 Paris (*Presidents*: Prof. J.P. Brun – Prof. Riquet)
 - 2010 Valencia/Belfast
 - 2011 Belfast/Valencia
- 5) E.S.L. Website: they will publish on the website all the articles of the European Journal of Lymphology except the last four issues.
- 6) It's institute the Pierre Bourgeois lymphological Award (1000 euro) to the best and most interesting original scientific presentation (oral or poster) of each E.S.L. annual Congress.
- 7) News members: Virginie Soulier Sotto, Lodovico Michelotti, Sergio Calabrese, Martha Földi, Oliver Kretz

E.S.L. Executive Committee

<i>President:</i>	S. Michelini (I)		
<i>Vice-President:</i>	G. Thibaut (F)		
	R.G.H. Baumeister (D)		
<i>Secretary:</i>	O. Leduc (B)		
<i>Treasurer:</i>	J.P. Belgrado (B)		
<i>Members:</i>	P. Bourgeois (B)	F. Boccardo (I)	J.P. Brun (F)
	C. Campisi (I)	O. Eliška (CZ)	E. Földi (D)
	N.R. Grande (Port)	G. Hidden (F)	A. Leduc (B)
	C. Papendieck (Arg)	A. Pissas (F)	M. Riquet (F)

THE RULES OF THE EUROPEAN SOCIETY OF LYMPHOLOGY (ESL)

1. THE RULES OF THE ESL

These rules are designed to extend the Bye-laws of the EANM and set out codes of practice. National Societies of Lymphology, or in the absence of such a society the recognised section of lymphology or in the absence of both aforementioned bodies, the national body for specialisation in lymphology that has ordinary members of the EANM, of neighbouring countries with special affinities to Europe may apply to the Executive Committee of the EANM for full delegate status. The decision must be endorsed by the Delegates' Assembly.

2. OBJECTIVES OF THE ESL

- 2.1. The ESL should act as an advisory body of experts and to lead European activities concerning regulatory affairs (education and training, instrumentation, quality control and assurance,...).
- 2.2. The ESL should promote the development of Lymphology in Europe in all its aspects so that its performance is generally up to the state of the art. The European School of Lymphology is an ESL body dedicated to education in Lymphology. Coordination with the Lymphology section of the other specialities interested partly in Lymphology is encouraged.
- 2.3. The ESL may set up Task Groups and Committees to meet objectives defined by the Executive Committee with the help of the Task Group Co-ordinator.
- 2.4. The ESL must protect and promote its intellectual property.
- 2.5. The European Journal of Lymphology and Related Problems is the official organ of the ESL.
- 2.6. The ESL confers the Caplan and Papamiltiades Prizes for the best scientific presentation during the annual congress and/or the best original paper published during the academic year.

3. MEMBERSHIP FEES

- 3.1. An annual membership fee is to be paid by Ordinary members, and a lesser fee by Junior, Technologists and Associate members, the amounts to be proposed initially by the Executive Committee. The national Societies also pay an annual fee. Any change in

membership fee proposed by the Executive Committee must receive a simple majority at both the Delegates' and Members' Assemblies. This fee shall be paid to the ESL not later than the end of November of the preceeding year. Delaying payment causes immediate suspension of the delivery of the EJLRP.

- 3.2. Any member failing to pay his or her fee during 3 years in spite of two warnings shall lose his or her membership. The reminders, for which a record of posting will be made, shall stipulate a time limit of payment of within not more than eight weeks. Corporate members shall pay such a fee as appears appropriate to their interest in encouraging the ESL and their economic circumstances as agreed by the Executive Committee.
- 3.3. Special financial arrangements may be accepted for some countries with difficulties in transferring funds.

4. DELEGATES

- 4.1. If a state is not represented in the Delegates' Assembly for two consecutive years, the President shall contact the National Society or recognised section of Lymphology or the national body for specialisation in Lymphology in question and mention that the Delegates are expected to be present at the third consecutive meeting. Failure to attend then will lead to the demotion of such Delegates to non-voting observers at the next Delegates' meeting that they attend, returning to full voting Delegate status at the next Annual Delegates' Assembly after that when they attend.
- 4.2. If a National Society or recognised section of Lymphology or the national body for specialisation in Lymphology does not pay the appropriate contribution to the ESL, approved by the Delegates' Assembly, the President shall write to the appropriate body as above and state that failure to pay the appropriate approved contribution to the ESL within two months of receipt of the President's letter will demote their state to non-voting observer status only. Failure to pay within two months of a further written warning from the President will lead to the exclusion of the state from holding the ESL Congress. The delegates of the appropriate body representing the state may appeal to the Court of Arbitration. Restitution of the full funds due to the ESL

will allow the Delegates of the appropriate body representing the state to return to the Delegates' Assembly, initially as non-voting observers and after a further year as full voting Delegates in the Delegates' Assembly.

- 4.3. If a national delegate is not retired after the appropriate duration of office as set out in Bye-law 6.3., he or she will subsequently have non-voting observer status only.
- 4.4. The ESL Congress cannot be held in a state which has a non-voting or no Delegate to the Delegates' Assembly.
- 4.5. Special financial arrangements will be necessary in some countries with difficulties in transferring funds.
- 4.6. The Executive Committee may accept Delegates from other countries.

Written applications are submitted to the Executive Committee who will decide upon these in consultation with the Advisory Council.

5. THE EXECUTIVE COMMITTEE

- 5.1. The Executive Committee should promote Lymphology and undertake the appropriate public relations.
- 5.2. The Executive Committee should support the Congress President in organising the European Lymphology Congress and take note of the Report of the Past Congress President.
- 5.3. The Executive Committee should ensure that the sponsorship of national and Task Group meetings is not seen to compete unduly with the sponsorship of the ESL Congress.
- 5.4. The Executive Committee should maintain a good liaison with Industry in the field of Lymphology which may be achieved through an Industry Committee.
- 5.5. The Secretary and the Treasurer of the Executive Committee should not leave the Executive Committee at the same time and one or other may be granted an extra year in office to prevent this happening.
- 5.6. The ESL President is appointed as Honorary Editor of the EJLRP during his/her time of Office.
- 5.7. Members of the Executive Committee should belong to different countries.
- 5.8. Officers of the Executive Committee may resign from office before their term is completed on giving three months' notice in writing to the ESL President or ESL Secretary.
- 5.9. The Executive Committee can co-opt observers to participate in its meetings.

6. TASK GROUPS AND COMMITTEES OF THE ESL

6.1. Task Groups and Committees can be formed - to help meet the objectives of the ESL - and terminated when necessary by the Executive Committee.

Task groups are open to members willing to perform a specific task in a given period of time defined by the Executive Committee (maximum three years).

Committees are composed of a small group of members chosen by their Chair and the Task Group Co-ordinator with the approval of the Executive Committee. Committees are in charge of long term issues.

Members of Task Groups and Committees should represent several European countries.

Chairs of Task Groups and Committees are appointed by the Executive Committee who may seek the advice of the Delegates Assembly. They report on their activities twice a year to the Task Group Co-ordinator who informs the Executive Committee, Advisory Council, Delegates and Members Assemblies.

Task Groups and Committees must propose a yearly budget to the Task Group Co-ordinator who presents it to the Executive Committee for approval. The Treasurer should assist with advice in this matter.

A work in progress and financial report must be submitted annually for approval.

If Task Groups and Committees wish to run sessions in the ESL Congress, this must first be agreed with the Congress President, who approves the scientific programme of the sessions.

6.2. The Constitution Committee

This Committee will be set up by the Executive Committee when changes in bye-laws and rules are considered.

The chair and members of the Constitution Committee are nominated by the Executive Committee to whom they must report in writing within six months.

The Secretary of the ESL should liaise the Executive Committee with the Constitution Committee without being a formal member.

The Constitution Committee of the ESL has the following functions and responsibilities:

- To report on the working of the Bye-laws and Rules of the ESL.
- To consider proposed amendments to the Bye-laws and Rules as necessary, subject to Bye-law 12.
- To undertake the careful wording and evaluate the effects of the proposed amendments taking particular note that they do not conflict with the Bye-laws or other Rules of the ESL.

6.3. The Industry Committee

The Industry Committee is made up of individuals who are Corporate Members or who represent a Corporate Member. The Industry Committee chooses from its members an Industry Commission of four members to represent their views concerning the Congress venue and industrial exhibition to the ESL Congress President.

The Industry Commission must have at least one member from an equipment manufacturer and one member from a radiopharmaceutical manufacturer. A representative for the Industry Commission, chosen by them, may attend the Executive Committee at the request of the Executive Committee. He or she will report on the activities of the Industry Commission and Industry Committee but will have no voting power in the Executive Committee. The Industry Commission representing the Industry Committee has the following functions and responsibilities:

- To support the Congress President in co-ordinating the industrial exhibition at the ESL Congress.
- To promote the development of more efficient, cost effective and safe equipment and pharmaceuticals for Lymphology.

7. CHANGES IN RULES

Proposals to change the Rules can be made by the Executive Committee or by individual members. In the latter case, they must be lodged with the EANM President in writing not later than twelve weeks before the Members' Assembly and must be supported by at least 100 Ordinary members. Such proposed changes in the Rules must not conflict with the Bye-laws and must be submitted for advice to a Constitution Committee and be on the Agenda for discussion by both the Delegates' and Members' Assemblies where the changes must receive a two-thirds majority of those present in both Assemblies.

8. THE ESL CONGRESS - A CODE OF PRACTICE

There should be equal opportunity for each European country to hold the ESL Congress. The congress sites and venues proposed by candidates for office as designate Congress President must be approved by the Executive Committee prior to the election at the Members' Assembly. The candidates must sign the Congress President guidelines.

The ESL Congress will be held on an annual or regular basis to meet the objectives of the ESL. The meetings of all Committees and Assemblies of the ESL will take place at or around the time of the Annual Congress. The duties and responsibilities of the Congress President are set out in the following:

8.1. Congress Finances

The Congress President has the responsibility for the budget.

The congress fees have to be approved by the Executive Committee of the ESL. Fees for the members of the ESL must be less than those for non-members.

The financial status in relation with the budget must be regularly approved by the Executive Committee.

The Congress remains a non-profit organisation.

There should be an agreement between the ESL Executive Committee, the Congress President and the local national society so that a loan is made available to the Congress President, if needed. This sum should be held in a special Congress account.

Prior to establishing the balance of the congress, the ESL and the National Society should be compensated for their efforts in organizing and supporting the congress.

8.2. Opening and Closing of the ESL Congress

The Congress President will formally open and close the Congress and open the Exhibition. The President of the ESL should give an address to the participants at the opening and/or closing ceremonies. The President of the local national society should participate in these ceremonies, which should be relatively short.

8.3. The ESL Congress Programme

Attempts should be made to introduce continuity in the programme organisation in terms of pre-Congress teaching courses, sessions, seminars or round tables task group organized sessions, and in other ways.

8.4. The Congress President

He or she is responsible for the general organisation and themes of the Scientific Programme, taking into account the recommendations of the Congress Scientific Committee.

8.5. The Congress Scientific Committee

The Chair of the Congress Scientific Committee is proposed by the Congress President to the Executive Committee. He/she must come from another country than the President and cannot be a member of the Executive Committee.

The Congress Scientific Committee is composed of ordinary members of the ESL from different countries and members of the local supporting national society, so that all of the disciplines in Lymphology are covered.

The Chairman will always be one of these individuals.

The Congress Scientific Committee has the following functions and responsibilities:

- To ensure proper scientific and anonymous scoring of all works submitted for presentation to the Scientific Programme.
- To select abstracts for either oral or poster presentation
- To propose the scientific programme to the Congress President

8.6. Scientific Presentations

All abstracts accepted for the Scientific Programme (papers and posters) should be published. The Executive Committee should decide where these abstracts should be published and whether and where any other scientific material from the Congress should be published. This publication should be made available to Congress participants. An effort to avoid duplication of published material should be made. The working language is English.

The Congress President should determine before the meeting of the Scientific Committee the absolute number of oral presentations and posters that can be accepted, given the nature of the Congress Centre, the rooms, publication requirements and the time available.

8.7. Invited Speakers

It is the right of the Congress President to choose the invited speakers. The Congress President should consider suggestions from the Congress Scientific Committee. The overriding consideration should be the individual scientific standing of the nominee and the appropriateness of his contribution to the theme of the meeting. Emphasis should be placed on the selection of European scientists and

doctors. Only if the contribution is thought outstanding or unique, should overseas guests be invited to proffer scientific work.

The Congress will, however, remain an open forum for international scientific discussion, where colleagues from all over the world are encouraged to submit their work to the Congress Scientific Committee. It is preferable not to have parallel sessions at the time of the invited speaker presentations.

8.8. Session Chairs

There should be a minimum of two Chairs per session. It is the right of the Congress President to appoint these taking note of recommendations by the Chairman of the Congress Scientific Committee. It is essential that the Chairs are properly briefed in writing as to their role. This is particularly true for the Chairs of the poster discussion sessions.

8.9. Posters

Posters should be displayed throughout the time of the Congress. The posters may be categorized into two groups. A smaller group for discussion, chosen from the higher marked abstracts and a larger group for display only. Discussion of posters should be part of the Scientific Programme.

8.10. Industrial Exhibition

The ESL Congress usually has a large industrial exhibition. This exhibition follows guidelines laid down in the memorandum of agreement between the Executive Committee of the ESL and the Industrial Committee and made known to all candidates for Congress Presidency.

BYLAWS OF THE EUROPEAN SOCIETY OF LYMPHOLOGY

1. NAME, SEAT AND SCOPE OF ACTIVITIES

- 1.1. The name is the "European Society of Lymphology" abbreviated to ESL. The Registered Office of the Association shall be situated at Brussels in Belgium. It extends its activities throughout Europe.
- 1.2. The ESL is founded by members of the European Lymphology Group Groupement Européen de Lymphologie.

2. OBJECTIVES

The Society is a voluntary non-profit making organisation of persons associated for the purposes set out in the following:

- 2.1. To advance science and education in Lymphology, for the benefit of public health and humanity.
- 2.2. To promote and co-ordinate throughout Europe the discussion and exchange of ideas and results on problems associated with the diagnosis, treatment, research and prevention of lymphatic diseases.
- 2.3. To provide a suitable medium for the dissemination and discussion of the latest results in the field of Lymphology, and related subjects.
- 2.4. To convene a regular European Society Lymphology Congress to help to meet the objectives of the ESL.
- 2.5. To represent with one voice all European Lymphology activities in the field of science, education and the promotion of good and safe practice by providing information, reasoned comment and argument vis-à-vis European Authorities, the World Health Organisation and other appropriate organisations.
- 2.6. To promote appropriate professional training in Lymphology.

3. RAISING OF FUNDS

The financial year of the ESL is the calendar year.

The funds of the ESL may be raised by individual membership fees, and by contributions from National Societies of Lymphology or in the absence of such a

Society by the recognised section of Lymphology or in the absence of both aforementioned bodies by the national body for specialisation in Lymphology that has ordinary members of the ESL, and by other means that the Executive Committee shall decide. Gifts may be incorporated into the funds of the Society.

4. VOTING

Voting will be by the absolute majority of valid votes of members present who have voting rights. If necessary a second ballot will be used to elect from the two candidates with the greatest number of votes in the first ballot. Subsequent voting will be by a simple majority. This voting procedure applies in all cases except as indicated in Bylaws 5.12, 5.15, 6.2.12, 6.3.4, 6.6, 8, 12 and 13.

5. MEMBERS

- 5.1. In conformity with the aims of the ESL and the universal nature of scientific research, membership is irrespective of any one country, language area, ethnic group or sex.
- 5.2. The members of the ESL are: Ordinary members, Junior members, Technologist members, Associate members, Emeritus members, Honorary members, Corresponding members. Companies may have the status of Corporate members.
- 5.3. Any physician or other scientist or person committed to the objectives of the ESL with a completed university or equivalent education will be able to become an Ordinary member of the ESL provided that he or she is engaged in Lymphology or related fields.
- 5.4. Junior membership can be obtained upon request by any physician or other scientist during his/her formal training in Lymphology or related fields. It is restricted to the period of training with a maximum duration of 5 years.
- 5.5. Any healthcare professional who is qualified in his/her country and works as a Lymphologist can become a member of the ESL.

- 5.6. Associate membership of the ESL is open to any other person working in the field of Lymphology or related fields.
- 5.7. Emeritus membership is available upon request by Ordinary members upon retirement. They keep all benefits of ordinary members except for the EJLRP which can be delivered upon request to the Executive Committee at ordinary member's rate.
- 5.8. Honorary membership is reserved for persons of outstanding scientific distinction who have provided great service to the ESL.
- 5.9. Corresponding membership is reserved for persons of outstanding distinction practicing outside Europe.
- 5.10. Corporate membership can be offered to individuals, societies, associations or companies interested in promoting the aims of the ESL.
- 5.11. Admission to Ordinary, Junior, Technologist, Associate and Corporate membership of the ESL requires that a proposal in writing on such forms as the Executive Committee shall from time to time prescribe be lodged with the President or with the Secretary of the ESL and shall be endorsed personally by two Ordinary members of the ESL. Decisions concerning acceptance of members shall normally be made by the Executive Committee. The Member's Assembly must be informed about the admission of new members.
- 5.12. Honorary members and Corresponding members are elected at the Members' Assembly on a proposal from the Executive Committee. Such elections shall require approval by two-thirds of the members present.
- 5.13. Rights of Members: All members have the right to vote at the Members' Assembly, to be informed of and participate in the activities of the ESL. Only Ordinary Members for more than 3 years have the right to bear an office of the Executive Committee or the Court of Arbitration of the ESL.
- 5.14. Obligation of Members: All members shall promote the objectives of the ESL set out in Byelaw 2. All members shall pay the appropriate approved membership fees of the ESL.
- 5.15. Termination of Membership: Termination may be voluntary by giving written notification three months in advance of the next calendar year to the Secretary of the ESL. Termination will be obligatory if a member

has remained three years in arrears with his or her membership fees despite two warnings in writing from the Secretary.

Termination will be at the discretion of the Executive Committee by an unanimous decision if a member is considered to have brought the ESL into disrepute. A member may appeal to the Court of Arbitration.

6. THE ORGANS OF THE ESL

6.1. The organs of the ESL are:

1. The Assembly of Members,
2. The Assembly of Delegates,
3. The Advisory Council,
4. The Executive Committee,
5. The Auditors,
6. The Court of Arbitration,
7. Committees and Task Groups may be set up as and when required.

6.2. The Members' Assembly

The Members' Assembly is made up of Ordinary, Junior, Technologist, and Associate members and a representative of each Corporate membership. Members may only attend provided they produce evidence that they have fully paid their membership fees by the time of the Members' Assembly. Honorary, Corresponding and Emeritus members may attend. The Members' Assembly takes place once per year subsequent to the Delegates' Assembly and normally during the regular meeting of the ESL, the time of written notice of the agenda being at least six weeks. Items can be added to the agenda and discussed under "other items" if approved by the Assembly. Voting on those items can only take place at the time of the next regular meeting.

If there is no meeting of the ESL during the year, the Member's Assembly must still meet once per year, as the Annual General Meeting of the ESL, by being called by the ESL President, giving three months' written notice of the Agenda.

The Members' Assembly has the following functions and responsibilities:

1. To receive the Annual Report of all members of the Executive Committee.
2. To exonerate the Executive Committee.
3. To discuss the general policy put forward by the Executive Committee.
4. To discuss and approve the individual membership fees of the ESL.
5. To present individual views to the Executive Committee.

6. To elect to the Executive Committee two members: The ESL Congress President Elect and the Treasurer, from all nominations received and circulated by the Secretary and in the knowledge of the preferred nomination of the Delegates' Assembly for Congress President Elect.
7. To be informed of the admission of members.
8. To vote on changes in the Bylaws.
9. To elect Honorary and Corresponding members.
10. To elect one member to the Court of Arbitration.
11. To implement the dissolution of the Association.
12. An extraordinary Members' Assembly may be called either by the Executive Committee or if at least 100 ordinary members propose this in writing to the President. After a decision to hold an extraordinary Members' Assembly has been taken, the time of notification of the Agenda shall be normally at least nine weeks. An extraordinary Members' meeting must have ten per cent of Members present from more than 3 different countries as defined in 6.3.1.

6.3. The Delegates' Assembly

6.3.1. The Delegates' Assembly shall consist of two ordinary members of each country recognized by the Council of Europe.

Nomination of these members to the Delegates' Assembly is effected by the national Society-ies interested in Lymphology, or in the absence of such a society, by the recognised section of Lymphology, or in the absence of both aforementioned bodies, by the national body for specialisation in Lymphology that has members appointed as members of the society.

Duration of office is two years, renewable for one further two-year period only. The delegate cannot be re-elected during the next consecutive year period. Only Ordinary members of the Association are eligible as Members of the Delegates' Assembly. An Ordinary member holding an office in the ESL cannot continue to be a National Delegate.

6.3.2. The Ordinary Delegates' Assembly shall take place at least once a year earlier than the Members' Assembly and normally during the regular meeting of the ESL, the time of written notice of the Agenda being at least six weeks. If there is no meeting of the ESL during the year, the Delegates' Assembly will be called by the ESL President, giving three month written notice of the Agenda to National Societies.

6.3.3. National Delegates represent the views of their national society or equivalent as in 6.3.1. Each country has a single vote, which is cast jointly by the national delegates. Voting by proxy is not permitted.

6.3.4. An extraordinary Delegates' Assembly may be called either by the Executive Committee or if one-third of the Delegates' Assembly wish so. After the decision to hold an extraordinary Delegates' Assembly has been taken, the time of notification of the Agenda shall be normally at least nine weeks. An extraordinary Delegates' Assembly must have fifty per cent of Delegates who have voting rights present.

6.3.5. The Delegates' Assembly has the following functions and responsibilities:

- To receive the Annual Report of the ESL Executive Committee,
- To discuss the general policy put forward by the Executive Committee,
- To discuss and approve the contribution to funds due to the ESL from the National Societies,
- To discuss congress venues (countries and cities) related to the nominations for Congress President Elect and to give to the Members' Assembly their preferred nomination for Congress President Elect.
- To bring forward the views of the national Societies to the Executive Committee of the ESL,
- To propose to the election by the General Assembly of Members the Executive Committee, the ESL President Elect, Secretary and the Task Group Co-ordinator,
- To elect the one Delegate representative to the Court of Arbitration,
- To elect two Auditors.

6.4. The Advisory Council of the ESL

This is composed of the chairs of Task Groups and Committees and two delegates of the Industry. Co-opted members are the Editor-in-Chief of the EJLRP and the Dean of the European School of Nuclear Medicine.

It meets together with the members of the Executive Committee, at the time of the regular meeting of the ESL, and at such time as the ESL President requests, the time of written notification of the Agenda is normally at least six weeks. The ESL President chairs the meeting of the Advisory Council.

The Advisory Council is the scientific council of the ESL in matters of policy and long-term planning. It makes proposals on the aims and composition of Task Groups and Committees. Together with the Task Group Co-ordinator, it ensures the co-ordination and follow-up of activities of Task Groups and Committees and makes their conclusions available for the strategic planning of the ESL.

It may propose Honorary and Corresponding members to the Members' Assembly.

It may propose a historian to be appointed by the Executive Committee

6.5. The Executive Committee

The Executive Committee shall be composed of the following members:

1. The President of the ESL,
2. The Vice-President(s) of the ESL,
3. The President Elect of the ESL,
4. The Congress President of the ESL,
5. The Congress President Elect,
6. The Secretary of the ESL,
7. The Treasurer of the ESL,
8. The Task Group Co-ordinator.

6.5.1. The ESL President has the following functions and responsibilities:

- To act as the official representative of the ESL.
- To sign with the Secretary or Treasurer appropriate documents for the ESL.
- To chair the Executive Committee and Advisory Council and to be responsible for the short and long term planning of the ESL.
- To chair the Delegates' and Members' Assemblies. In case of early retirement or physical incapacity of the ESL President, the ESL President Elect or the Vice-President takes Office immediately until the end of his/her own mandate.

6.5.2. The ESL President Elect and the Vice-President have the following functions and responsibilities:

To appreciate and become cognisant with the overall lines of policy and directions of the ESL as a whole, to help in period of transition between officers of the Executive Committee and to assist the President in officially representing the ESL

6.5.3. The Congress President of the ESL has the following functions and responsibilities:

- To act as Chairman of the Organising Committee of the ESL Congress according to the Congress President Guidelines approved by the Executive Committee
- To select the Organising Committee together with the local National Society.
- To select the members of the Congress Scientific Committee and to propose the Chair.
- To establish the Congress budget according to the Congress President Guidelines in written agreement with the ESL Treasurer, to present to the Executive Committee a final detailed financial report and to be responsible for the financial arrangements in conjunction with the local national lymphological Society.

- To be responsible for the general organisation, the themes of the scientific and social programmes, taking into account the recommendations of the Congress Scientific Committee.
- To liaise with government, city, university, medical, scientific and industry's organisations in connection with the ESL Congress.
- To choose the ESL Congress venue, taking note of the advice of the Industry Committee and the local National Society.

6.5.4 The Secretary of the ESL has the following functions and responsibilities:

- To deal with the correspondence relating to the ESL at the request of the ESL President and Congress President as appropriate.
- To notify the Executive Committee, Advisory Council, Delegates and Members of the meetings with normally at least six weeks' notice.
- To send out the Agenda and Minutes of all Assemblies in good time.
- To record all resolutions passed by the Executive Committee, Advisory Council, Delegates' Assembly and Members' Assembly and to document the short and long term plans of the ESL in the Minutes of those meetings. The Minutes shall be signed by the ESL President and Secretary.
- To be responsible for the Membership List.
- To circulate the nomination papers in good time.
- To be responsible for the ESL web site and its content.

6.5.5. The Treasurer of the ESL has the following functions and responsibilities:

- To carry out the financial dispositions decided by the Executive Committee, and to keep accurate records thereof by the keeping of proper books of account with respect to the following:
 - All sums of money received and expended by the ESL,
 - All sales and purchases by the ESL,
 - All assets and liabilities of the ESL.
- To report to the Executive Committee, the Advisory Council, Member's Assembly and Delegates' Assembly on the financial state of the ESL, through a written account of income and expenditure for the preceding twelve months together with a balance sheet made up at the same date, once yearly, and to propose the budget for the next year to the Executive Committee.
- To submit these accounts to the Auditors.

6.5.6. The Congress President Elect of the ESL has the following functions and responsibilities:

- To participate and assist in the activities of the Executive Committee.

- To prepare for the following ESL Congress for which he or she is responsible in accordance with the Congress President guidelines.

6.5.7. The Task Group Co-ordinator of the ESL has the following functions and responsibilities:

- To be responsible for co-ordinating the activities of the Task Groups and Committees.
- To require and receive written reports of Task Group and Committee activities from their Chairman.
- To present the budget and accounts of each Task Group and Committee to the Executive Committee.
- To receive proposals for new Task Groups and Committees.

6.6. Functions of the Executive Committee

The Executive Committee will be chaired by the ESL President.

It should meet at least once per year. The ESL President is responsible for calling a meeting and the Secretary is responsible for notifying members of the Executive Committee of the date normally at least six weeks before a meeting is to take place, the agenda being presented two weeks in advance.

Decisions will be taken by simple majority vote. The ESL President will cast the deciding vote in case of deadlock.

The Executive Committee will be responsible for:

- Establishing the broad policy guide-lines and forward planning for the Association.
- Proposing membership fees and the level of contributions from National Societies and administering the funds of the ESL
- Convening the Advisory Council and the Member's and Delegates' Assemblies and reporting its activities to them.
- Carrying out the decisions of the Delegates' and Members' Assembly.
- Deciding on, electing Chairmen for, approving members of and dissolving Task Groups and Committees as appropriate.
- Approving the Chair of the Congress Scientific Committee on the proposal of the ESL Congress President.
- Undertaking responsibility for liabilities, credits or loans and responsibility for property, goods or services as appropriate for the ESL

7. THE AUDITORS

The accounts of the ESL shall be audited by two Ordinary members appointed by the Delegates' Assembly and by an externally registered auditor.

8. THE COURT OF ARBITRATION

The Court of Arbitration may be called by the President of the ESL on the advice of the Executive Committee to resolve all disputes arising within the ESL that cannot be solved by the organs or officers of the ESL. It shall be composed of three Ordinary members:

- One chosen by the Members' Assembly,
- one chosen by the Delegates' Assembly and
- these two members shall choose a third acceptable to both, who shall act as Chair.

If no agreement is reached as to the choice of Chair, the choice of one of the alternative proposals shall be determined by lot. The Court of Arbitration shall then decide in matters of dispute as conscientiously as it can without being bound by fixed rules, but, if necessary, by majority vote.

9. COMMITTEES AND TASK GROUPS

The purpose of Committees and Task Groups is to implement the ESL activity. Their function is governed by the ESL rules.

10. NOMINATION AND ELECTION PROCEDURES

10.1. Announcement of elections

The Secretary must circulate all members at least 4 months before the Delegates' and Members' Assemblies of the ESL with information about positions open for elections. All nominations for positions in the Executive Committee and for the three Ordinary members of the Advisory Committee must be sent in writing to the Secretary of the ESL, stating the name and affiliation of the person proposed, the office, the name and affiliation of the proposer and two seconders, who must all be from different nations represented in the Delegates' Assembly and that the consent has been obtained of the person who is proposed to undertake the position if elected. These nominations must be received by the Secretary at least two months before the meeting of the Executive Committee at which such nominations for election are due, which will normally be at or about the time of the annual or regular meeting of the ESL.

Nominations may be made by any paid up member, delegate or the Executive Committee.

The Secretary of the ESL must circulate all members and delegates at least one month before the Members' and Delegates' Assemblies of the ESL with the details of the nominations for officers of the Executive Committee and Ordinary members of the Advisory Committee, proposers and seconders, etc. as set out in this Bye-law.

No nominations will be accepted from the floor of the Delegates' Assembly or the Members' Assembly, except if exceptionally, no nominations have been received for an office or position.

10.2. Nominations to the Executive Committee

These are undertaken according to the procedure set out above. Ordinary members nominated for the Executive Committee must be practicing Lymphology in Europe.

- ESL President Elect, ESL Secretary and ESL Task Group Co-ordinator:

These officers are elected by the Delegates' Assembly.

The ESL President Elect is appointed on a one-year non-renewable term, taking office as EANM President one year later for a three years non renewable term.

The ESL Secretary is appointed for a two-year term, renewable twice.

The Task-Group Co-ordinator is appointed for a two year term, renewable once.

- ESL Congress President, the ESL Congress Presidents Elect and the Treasurer:

These officers are elected by the Members' Assembly.

The Congress President is appointed for a one year term only.

Designated Congress Presidents Elect are chosen and elected by the Members Assembly at least two years before their term as Congress President begins, becoming Congress President Elect one year before their term as Congress President starts. In exceptional circumstances, an earlier activation of the election procedure of Congress President Elect can be initiated by the Executive Committee.

These elections should continue even if the Executive Committee decides not to hold an ESL Congress one year.

The Treasurer is appointed for a two-year term, renewable twice.

All terms for renewal are subject to re-election.

11. INDEMNITY SUPPRESSED?

The Members of the Executive Committee and other Officers of the Association for the time being shall be indemnified out of the funds of the Society against all costs, charges, losses, damage and expenses which they shall respectively incur or be put to on account of any act, deed, matter or thing which shall be executed, done or permitted by them respectively in good faith in or about the execution of their respective offices.

12. CHANGES IN BY-LAWS

Proposals to change the Bylaws can be made by the Executive Committee or by individual members. In the latter case, they must be lodged with the ESL President in writing not later than twelve weeks before the Annual Meeting of the Members' Assembly and must be supported by at least 100 Ordinary members. Such proposed changes must be submitted for advice to a Constitution Committee and be on the Agenda for discussion by both the Delegates' and Members' Assemblies where the changes must receive a two-thirds majority of those present in both Assemblies.

13. DISSOLUTION OF THE ESL

The voluntary dissolution of the ESL may be approved if proposed as a resolution in writing to the Executive Committee by at least one half of the delegates, and then is only valid if it is agreed by three-quarters of all Ordinary members present.

In the event of dissolution of the Society, or should the purpose of its existence no longer exist, a properly qualified lawyer should be appointed as liquidator and any asset remaining, after settlement of all financial commitments of the Society and including any fees due to the Liquidator, shall then be given to such Societies or organisations with similar objectives as the ESL at the sole discretion of the Executive Committee.