

OFFICIAL ORGAN
OF THE



EUROPEAN GROUP OF LYMPHOLOGY
LATIN-MEDITERRANEAN CHAPTER OF ISL
SOCIETÀ ITALIANA DI LINFANGIOLOGIA
CZECH SOCIETY OF LYMPHOLOGY
ROMANIAN SOCIETY OF LYMPHOLOGY
GREEK SOCIETY OF LYMPHOLOGY

THE EUROPEAN JOURNAL OF lymphology

and related problems

VOLUME 21 • No. 59 • 2010

INDEXED IN EXCERPTA MEDICA

SUMMARY

Clinical Sciences

Original articles

- Calcitonin gene-related peptide in Lymphedema and its change after physiotherapy by Pulse Magnetic Fields, Vibration and Hyperthermia
Hasegawa H., Ohkuma M. p. 1
- Modifications of Lymph Components in Treated-Lymphoedema Patients: A Pilot Study
Albergati F.G., Michelini S. p. 3
- Therapeutic application of the Kinesio Taping Method in the management of breast cancer-related Lymphedema
Santambrogio F., Cappellino F., Cardone M., Merlino A., Michelini S. p. 6
- Immunodeficiency due to Chylous Dysplasia: Diagnostic and Therapeutic Considerations
Campisi Corradino, Campisi Corrado, Girino Margherita, Vidali Francesca, Corazza Gino Roberto, Bellini Carlo Boccardo Francesco p. 21
- Axillary web syndrome (AWS): its features and the physical treatment plan of care
Moreau O., Leduc O., Tinlot A., Clement A., Parijs T., Strappaert J., Beckers F., Pastouret F., Leduc A. p. 25

Lymphedema ISL Guidelines

- The Diagnosis and Treatment of Peripheral Lymphedema
Consensus Document of the International Society of Lymphology (Still in progress) p. 13

Calendar

EUROPEAN SOCIETY OF PHYSICAL AND REHABILITATION MEDICINE,
SIMFER, SOCIETÀ ITALIANA DI MEDICINA FISICA E RIABILITATIVA
17TH EUROPEAN CONGRESS -
23-27 MAY 2010, VENICE (ITALY)

23RD INTERNATIONAL CONGRESS OF LYMPHOLOGY -
19-23TH SEPTEMBER 2011, MALMÖ (SWEDEN)

p. 29

THE EUROPEAN JOURNAL OF LYMPHOLOGY AND RELATED PROBLEMS (EJLRP)

The EJLRP - official organ of the European Group of Lymphology (ESL), Czech Society of Lymphology, Romanian Society of Lymphology, Greek Society of Lymphology, the Latin-Mediterranean Chapter of Lymphology (LMCL), the Società Italiana di Linfangiologia (SIL) covers all fields of Lymphology and aims to present a multidisciplinary approach to diseases of the lymphatic system, with information on the analysis, control and treatments of such diseases.

Topics

The topics include:

- anatomy and anatomopathology
- physiology and physiopathology
- pharmacology
- diagnostic methods (conventional radiology, nuclear medicine, ultrasonography, computed tomography, biopsy, nuclear magnetic resonance)
- therapy (surgery, medicine, radiotherapy, physical)
- oncology (primary lymphatic system diseases, lymphonodal metastatic process)
- immunology
- post-therapeutic complications
- upper and lower limb edemas

Manuscripts publications

Submitted manuscripts will be published in the form of Editorial, Review article, Original article, Teaching article, Special article, Work in progress, Case Report, Short Communications, Letter to the Editor (in English), Abstract (in English)

They will be subdivided in Clinical and Basic Sciences.

Send manuscripts to:
the Executive Editor

Dr. S. MICHELINI

Department of Vascular Rehabilitation
S. Giovanni Battista Hospital
Via L.E. Morselli, 13 - 00148 Rome, Italy
Tel. +39 06 655961 - Fax +39 06 65596235
e-mail: sandro.michelini@fastwebnet.it

The Editor-in-Chief

Prof. Dr. F. BOCCARDO

Department of Surgery, Lymphatic Surgery and Microsurgery
S. Martino Hospital, University of Genoa
Largo R. Benzi, 8 - 16132 Genoa, Italy
Fax 0039010532778 - e-mail: Francesco.boccardo@unige.it

Associate-Editors also can receive and promote articles and start the review process.

Publications languages

Official language of the Journal is English.

Publication rate

The EJLRP is published on a quarterly basis.

Subscription rates - All members of European Group of Lymphology or of National societies (with which the ESL has a cooperation agreement and whose fee includes a subscription to the EJLRP) receive the Journal free of charge.

Subscription rate for non-members is:

- for all issues, 30 € within European Countries, 50 € elsewhere,
- for single issue, 15 € within European Countries, 18 € elsewhere.

Annual subscription rate of ESL: 80 €

Please make cheque (in euro) to order of the ESL and to be sent to the Treasurer of the ESL: Mr J.P. BELGRADO, Treasurer of the ESL, Service de Kinésithérapie, Avenue Paul Héger, 28, OF 168, 1050, Brussels, Belgium.

E-mail: belgrado@ulb.ac.be or transfer the corresponding amount on the following Bank Account of the ESL n. 210-0557380-70 N° IBAN BE60 2100 5573 8070 BIC GEBABEBB (Générale de Banque), with mention of your name and of the year(s) subscription.

Change of address - Please notify the Secretary and the Treasurer of the ESL of any change of address and telephone number at least 30 days prior to the issue date by sending both the old and new address.

Data base & Treasurer of the ESL - J.P. BELGRADO: Université Libre de Bruxelles, CP 168, Av. F.D. Roosevelt, 50, 1050 Bruxelles, Belgium. Tel. +32 2 650.24.34 - Fax: +32 2 280.13.33 - Mobile +32 475 63.34.34

Business communications - Business communications concerning advertising, subscriptions, change of address, and permission requests should be sent to the Secretary, O. LEDUC, Service de Kinésithérapie, Avenue Paul Héger, 28 CP 168, 1050 Brussels, Belgium. Tel. (32) (2) 650.24.70 - Fax: (32) (2) 650.24.73.

Advertisements are subject to editorial approval and restricted to products or services pertinent to lymphology.

Advertising rates can be obtained from the Secretary and Treasurer.

Miscellaneous - The use of general descriptive names, trade names, trademarks, etc., in the publication, even if not specifically identified, does not imply that these names are not protected by the relevant laws and regulations.

While the advice and information in this Journal is believed to be true and accurate at the date of its going to press, neither the authors, the Editors, nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

The Editors do not accept any responsibility for opinions that may be made by the authors.

Areas of distribution - Austria, Belgium, Czech Republic, Denmark, Egypt, France, Germany, Greece, Holland, Hungary, Israel, Italy, Japan, Norway, Poland, Portugal, Rumania, Russia, Spain, Sweden, UK, USA.

Past Editors-in-Chief: P. BOURGEOIS (Belgium) - C. CAMPISI (Italy) - S. MICHELINI (Italy)

Editor-in-Chief: F. BOCCARDO (Italy)

Assistant Editors: A. FAILLA (Italy) - G. MONETA (Italy)

Associate-Editors: RGH BAUMEISTER (Germany) - A. LEDUC (Belgium) - M. RIQUET (France)
H. BRORSON (Sweden) - O. ELISKA (Czech R.) - R. NUNO GRANDE (Portugal), C. CAMPISI (Italy)

Executive-Editor: S. MICHELINI (Italy)

Assistant Executive-Editors: O. LEDUC (Belgium), J.P. BELGRADO (Belgium)

National delegates and Scientific Committee:

A. BEHAR (France) - K. BENDA (Czech. Rep.) - E. FÖLDI (Germany) - M. FÖLDI (Germany) - W. OLSZEWSKI (Poland)
NUNO R. GRANDE (Portugal) - P.S. MORTIMER (Great-Britain) - A. PISSAS (France) - G. HIDDEN (France)
H. PUJOL (France) - A. PECKING (France) - R. CLUZAN (France) - E. ELISKA (Czech Rep.) - P. HIRNLE (Germany)
P. BAULIEU (France) - G. AZZALI (Italy) - G. THIBAUT (France) - A. SOUSA PEREIRA (Portugal) - I. FORNER CORDERO (Spain)

INTERNATIONAL BOARD OF TRUSTEES

MFC ANDRADE (Brazil) - J. BRUNA (Rep. of South Africa) - M. WITTE (USA) - C. PAPENDIECK (Argentina) - M. OHKUMA (Japan)

SECRETARY: O. LEDUC (Belgium)

TREASURER: J.P. BELGRADO (Belgium)

Graphics: Duògrafi snc, Rome - Printed by Arti Grafiche srl, Pomezia (Rome)

Instructions to authors

General

Submission of an original article implies: that the work described has not been published before (except in the form of an abstract or as part of a published lecture, review, or thesis); that it is not under consideration for publication elsewhere; that its publication has been approved by all coauthors, if any, as well as by the responsible authorities at the institute where the work has been carried out (including ethical committees and national licencing authorities); that, if and when the manuscript is accepted for publication, the authors agree to automatic transfer of the copyright to the publisher; and that the manuscript will not be published elsewhere in any language without the consent of the copyright holders.

Manuscripts should be submitted in triplicate (original and two copies); they should be double-spaced, with wide margins on one side of the paper only, and should be carefully prepared in the style of this journal and checked before submission. Typing errors should be corrected legibly.

All manuscripts are subject to copy editing and, if necessary, will be returned to the authors for open questions to be answered or for missing information to be supplied before being sent to the printers. When extensive corrections are necessary, authors are responsible for having manuscripts retyped.

Pages should be consecutively numbered, starting with the title page. The desired position of figures and tables should be marked in the margin.

Changes in the proofs should be kept to a minimum: a charge will be made for changes introduced after the manuscript has been set in type.

Organization of the manuscript

The speed of publication depends greatly upon following these guidelines precisely.

1. The manuscript should be divided clearly into an Introduction, Materials and Methods, Results, Discussion and Conclusion and References. The text should be concise and consistent as to spelling, abbreviations, etc...

2. The **title page** should include the title of the work, first and last name(s) of author(s), name of institution, any footnotes referring to the title (marked with an asterisk), and the address of the author to whom the proofs are to be sent.

To facilitate communication between the authors, editors and publisher, the author should furnish a **telex or fax number** on the title page of the manuscript.

3. The **abstract** should be a summary of the hypothesis or aims of the work, the basic material and methods and the conclusion of the study.

4. Immediately following the abstract, up to 7 relevant **key words** should be supplied for subject indexing.

5. **Footnotes**, other than those referring to the title heading, should be numbered consecutively.

6. The accuracy of the **References** is the responsibility of the authors.

The list of references should only include works that are cited in the text and that have been published or accepted for publication. Personal communications should be mentioned in the text only. The list should be in alphabetical order according to the first author's name. Works by two authors should be listed alphabetically according to the second author's name, then chronologically; those by three or more authors should be in chronological order. References should be styled as follows.

Biancos J.A., Eimaleh D.R., Leppo J.I.A. (1986) Effect of glucose and insulin infusion on the myocardial extraction of a radioiodinated methyl-substituted fatty acid. *Eur. J. Nucl. Med.* 12: 120-124.
Gullberg G.T., Malko J.A., Eisner R.L. (1983) Bounday determination methods for attenuation correction in single photon emission computed tomography. In: Esser PD (ed). *Emission computed tomography: current trends*. Society of Nuclear Medicine, New-York, pp. 33-53.

Meltzer YL (1971) *Hormonal and attractant pesticide technology*. Noyes data, Park Ridge, New Jersey.

Citations in the text should be given in parentheses (Child 1941; Godwin and Cohen 1969; MacWilliams et al., 1970), except when the author is mentioned, as in "and the study of Hiliman and Tasca (1977)".

7. **Tables** should be submitted on separate sheets. Numerical data given in graphs and tables must not be duplicated.

8. All **figures**, whether photographs, graphs or diagrams, should be numbered consecutively throughout and submitted on separate sheets. Plate layouts or single figures may either match the width of the column (9 cm) or be 11.8 cm in width with the legend at the side.

The maximum height for a figure or plate is 23 cm, including the legend printed at its foot. Photographs can be grouped into plates. They must be mounted on regular bond paper, not on cardboard.

All photographs and electron micrographs should be supplied as high-contrast glossy prints trimmed at right angles. Inscriptions on illustrations should allow for reduction if this is necessary; figures and letters should have a final height of 2 mm after reproduction.

Color illustrations will be accepted: however, the authors will be expected to make a contribution (approximately BF 7.500 per page) to the additional costs involved.

9. Typewritten **mathematical equations** should be clear, so that there is no opportunity for misinterpretation by the printer.

All letters contained in formulae as well as single letters in the text are automatically set in italics and therefore require no underlining. Hence, abbreviations that appear in formulae and are to be set in roman type (the type normally used for the text) should be specially marked by underlining in yellow, if possible.

It will be helpful to the printer if *Greek characters are underlined in red and script in green*. Lowercase letters should then be underlined once and capital letters twice; this applies also to Latin letters in formulae (in pencil). Boldface type (heavy type) should be marked by wavy underlining.

Subscripts and superscripts should be indicated by an inverted caret below the line, or a caret above the line, respectively: 12_{12} ; a subscript to a subscript is styled: 12_{12} .

Obscure primes and dots must be clarified for the printer. The following must be differentiated clearly: number 1 and letter l; zero 0 and letters O, o, e, c, n, u, v, primes and apostrophes. Fractional exponents should be used in stead of root signs and the solidus (/) for fractions whenever they are horizon. tal; an exp notation must be numbered sequentially in arabic numerals in parentheses on the right-hand side of the page.

10. Fifty (50) *offprints* of each paper with additional copies are available in lots of 100, (provided the order is teceived with the corrected proofs) may be supplied charged to the authors.

11. Enclose the picture of the first author of each article.

XXXVI Congress of European Society of Lymphology

Co-Chairman:

Prof. V. Smymiotis - Dr. E. Dimakakos

Athens (Greece)

May 14-15-16, 2010

edimakakos@yahoo.gr

CALCITONIN GENE-RELATED PEPTIDE IN LYMPHEDEMA AND ITS CHANGE AFTER PHYSIOTHERAPY BY PULSE MAGNETIC FIELDS, VIBRATION AND HYPERTHERMIA

H. HASEGAWA, M. OHKUMA*

Department of Nephrology, * Department of Dermatology, Sakai Hospital, Kinki University, School of Medicine, Osaka, Japan

Contact address: M. Ohkuma
Lymph@w5.dion.ne.jp

Address to whom the proof must be sent:

Prof. Moriya Ohkuma
589-1 Ohmuro, Kazo, Saitama, Japan 347-0027
Phone: 81-480-66-0273, mobile: 81-08066142703
Fax: 81-480-65-3694

ABSTRACT

Sixteen cases of secondary lymphedema patients are examined for serum calcitonin gene-related peptide (CGRP) before and immediately after as well as 1-3 days after physiotherapy by magnetic fields, vibration and hyperthermia. If the specimen are taken 1-3 days after the therapy, they are not different from those taken before the treatment. If they are taken immediately after the last treatment is finished, the values become increased after the treatment. These differences may be due to unstable CGRP which is easily broken 1-3 days after the treatment. This CGRP is released from vanilloid receptors and is thought to increase muscular contraction of the lymphatics.

It is one of the mechanisms how the physiotherapy by magnetic fields, vibration and hyperthermia works so well in treatment of lymphedema.

KEY WORDS: CGRP, lymphedema, change after physiotherapy.

INTRODUCTION

The effective conservative treatment of lymphedema is obtained by passive (twisting tourniquet or pneumatic compression) or active (intensified contraction of the lymphatic smooth muscle due to increased neurotransmitting substance released by stimulated vanilloid receptors) transport of edematous fluid to the proximal direction. Serum CGRP has been examined in order to show one of the mechanisms how the physiotherapy by magnetic fields, vibration and hyperthermia⁽¹⁾ works.

MATERIALS AND METHODS

Secondary lymphedema are evaluated for serum calcitonin gene-related peptide before (4 female, 1 male, average age: 70 YO, all lower extremity, 3 unilateral & 2 bilateral involvement), immediately (6 females, mean age: 61 YO, all lower extremity involved, 5 unilateral & 1 bilateral involvement) & 1-3 days (1 male, 4 females, mean age: 69 YO, all lower extremity, 4 unilateral, 1 bilateral) respectively after the physio-therapy by magnetic fields, vibration and hyperthermia⁽²⁾. Laboratory evaluation of CGRP is done by ELA kit, catalog. No. A05481-96 Wells, SP1-Bio, Co.

RESULTS

CGRP becomes increased if the serum is taken immediately after the physiotherapy (average: 14.2 pg/ml). However if the specimen are taken 1-3 days after the last treatment of the treatment course is finished, the data (average: 7.8 pg/ml) are not different from those (average: 7.8 pg/ml) taken before the physiotherapy (Fig.1).

DISCUSSION

Sometimes the untreated uninvolved side of the extremity becomes decreased in the volume in the unilateral or bilateral lymphedema⁽⁴⁾. This phenomenon may be explained by this increased neurotransmitter substances after the treatment which

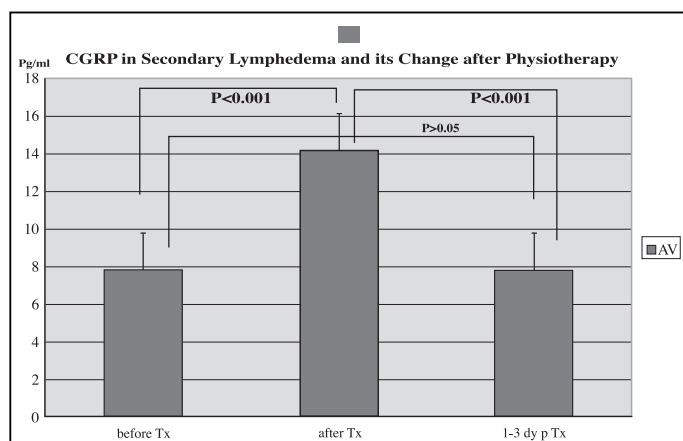


Fig. 1

intensify contraction of the smooth muscle of the lymphatics⁽¹⁾ of the whole body. One of the neurotransmitters, substance P is also increased after the physiotherapy (M. Ohkuma: 22nd International Congress of Lymphology, Sidney, 2009). This physiotherapy is effective by the various effective factors⁽³⁾. This is one of the reasons why this therapy is so effective. This physiotherapy stimulates all vanilloid receptors's subtypes TRPV1, 2, 3 & 4. On the contrary manual massage stimulates only TRPV2 and 4 (Table 1). The effect of this physiotherapy⁽²⁾ is not local but systemic. For the examination of the transmitting substances one should take specimens immediately after the aimed procedure is finished. A few patients complain of slight headache after the physiotherapy. This may be due to increased CGRP. Whether NO is produced during this physiotherapy must be investigated in future. Nitrous oxide stimulates cGMP and cGMP releases CGRP. The physiotherapy combined with administration of vanilloid receptor stimulator is now in process for evaluation.

CONCLUSION

Calcitonin gene-related peptide, one of the neurotransmitters becomes increased after physiotherapy by pulse magnetic fields, vibration and hyperthermia.

Table 1 - Vanilloid Receptors

Receptors, subtype	Stimulated by
TRPV1	temperature <43 °C, capsaicin, acid, inflammatory chemical mediators, HO-β sanshool
TRPV2	temperature >52 °C, mechanical stimuli
TRPV3	temperature >35 °C, 2-AEDB*, naphthalene
TRPV4	temperature >35 °C, mechanical stimuli
TRPV5	»
TRPV6	»
TRPM1	»
TRPM2	»
RPM8/CMR1	menthol, cold stimuli (<25 °C)
RPAI	cold stimuli (<17 °C), cinamaldehide (horse radish, garlic, cinnamon)

(*) 2-aminoethoxydiphenyl borate.

ACKNOWLEDGEMENT

This papers have been presented in the European Congress of Lymphology, Paris, 2009.

REFERENCES

1. Michael J.D., Megan M.L., Davis A.M., Durtsch D., Zawieja D.C., Muthuchamy M. and Gashev A.A.(2008): *Modulation of lymphatic muscle contractility by the neuropeptide substance P*. Amer. J. Heart Circ. Physiol., 295: 587-597.
2. Ohkuma M. (2002): *Treatment of peripheral lymphedema by concomitant application of magnetic fields, vibration and hyperthermia; A preliminary report*. Lymphology, 35: 87-90.
3. Ohkuma M. (2007): *Effects of physiotherapy by magnetic fields, vibration and hyperthermia on lymphedema - Mechanism how it works*. J. Lymphol., 41(Suppl.): 145-149.
4. Piller N.B.(2007): *New options for early stage of arm lymphedema dynamic transdermal stimulator*. Lymphol., 40(Suppl.): 493-496.

MODIFICATIONS OF LYMPH COMPONENTS IN TREATED-LYMPHOEDEMA PATIENTS: A PILOT STUDY

F.G. ALBERGATI*, S. MICHELINI**

* University of Milan, Center of Microangiopathy, Policlinico Universitario di Monza, I.R.C.A.S., Monza, Italy

** San Giovanni Battista Hospital, Rome, Italy

ABSTRACT

The AA. studied a therapeutic-compositum agent (taraxacum, calendula, arsenicum album, chelidonium, leptandra, echinacea, phytolacca, cardus marianus, condurango, hydrastis, lycopodium, sanguinaria – “Lyndiaral” – Pascoe-GmBh) that has demonstrated, in several, randomized, double-blind, placebo-controlled clinical studies, to have some activities on the lymph. The study showed a reappearance of flowmotion at 60th and of vasomotion at 90th day in the treated group respect to the control group.

KEY WORDS: lymph components modifications.

INTRODUCTION

In clinical medicine, “pure” lymphatic diseases have a lower incidence regarding both the correspondent-ones of circulatory system and the so called “mixed forms”.

Nevertheless, the first represent a very severe diagnostic and prognostic problem due to the frequently sneaky onset and the difficulty of the diagnosis, still in many cases “ex adiuvantibus” as far today.

Such type of characteristics, well known for phlebo-lymphologist specialist, give reason why “lymphatic system pathologies” are a real, true “complication” still up-yoday.

Available therapies are frequently addressed to increase, as well as possible, lymph flow.

Medical, kinetic and rehabilitative therapy as well as microsurgery represent only some of typical examples of such therapeutic approach, even it is correct to remind that they sometimes get “unsatisfactory” or “inadequate” results also when correctly used both for the specialist and for patients.

Several seem to be the reasons of this “failure”, including the (unlikely) delayed diagnosis, the still present (wrong) firm belief that “a mild leg oedema is not a problem”, together with the (partial) lack of instrumental diagnostic techniques (when compared with vascular-ones) easy to use, and other reasons well known in Medicine.

Apart of these aspects, and on the basis of evidences reported in Literature, it seems that there are not many data on the

modifications of lymph “components” during the use of clinical procedures⁽¹⁻³⁾.

It is always to be reminded that the very high inter-subject variability of lymph composition during chronic lymphatic system diseases gets extremely difficult and unreliable to evaluate possible lymph modification.

In a general “functional” view, lymphatic system can be summarized in such way:

- Tissue fluids steady-state balance;
- Protein transport;
- Immune activity.

In a general “ontogenetic” view, we today agree on the fact that lymphatic genesis undergoes many and different development processes and phases, each of these controlled by specific components of Extracellular Matrix and, among these-ones, particularly by podoplanins⁽⁴⁻⁷⁾.

The complete and final process of differentiation of lymphatic genesis goes through complicated and sequential phases starting from podoplanin receptor, also by using transcription and growing factors of Extracellular Matrix, till to the final formation of lymphatic reticula.

Processes such polarization, gemmation, growth factors, remodeling and maturation phases are expressed by VEGFR-3 (polarization), Prox1 VEGFR-3 – VEGF-C (gemmation), Syk SLP-76 (growth factors), podoplanin – Ang – 2 NrP – 2 (remodeling and maturation) are the most important phases of lymphatic reticula final formation.

In addition, it is to be reminded that lymphatic development is possible, in physio-pathologic conditions, also by the presence of common “markers” distinct from blood microvessels, both constantly controlled (for activity and action timings) by some Extracellular Matrix Metalloprotease (matrilisines?)⁽⁸⁻¹⁰⁾.

Such “unigenicity” of different growth factors in the different evolution sequence is constantly confirmed by different typologies of neoplastic neoangio-lymphangiogenesis: both processes coexists but separately develop. In fact, neoangiogenesis is prevalent inside the lesion, whereas lymphangiogenesis is present both inside and externally.

With these concepts in mind, and under a therapeutic-practical

view point, it is since many years available a therapeutic-compositum agent (taraxacum, calendula, arsenicum album, chelidonium, leptandra, echinacea, phytolacca, cardus marianus, condurango, hydrastis, lycopodium, sanguinaria – “Lyndiaral” – Pascoe-GmbH) that has demonstrated, in several, randomized, double-blind, placebo-controlled clinical studies, to have some activities on the lymph (see Literature), and in other analogues studies to improve the functional activity of capillary-tissue unit by acting, true-likely, on several components of Extracellular Matrix, in other words exactly where lymph is originated⁽¹¹⁻¹⁸⁾.

MATERIALS AND METHODS

We have so analyzed the presence of modifications (if any) of some lymph- composition parameters during therapy with this therapeutic compound (“Lyndiaral”), both i.m. and x os, in patients suffering from lower limbs phlebo-lymphoedema lasting more than 4 yrs both with or without lymphorrhea, and under a “standard” – routine therapy of phlebo-protective drugs (1000 mg/daily of micronized-purified flavonoids) together with elastic-compressive therapy (4 x 12/years). After informed consent, according to inclusion/exclusion criteria (> 35 yrs, no pregnancy, no neoplasm, et al.) we enrolled 10 patient (3 male - 66,2 yrs - 2 lymphoedema with lymphorrhea) and 7 female (59,9 yrs - 4 phlebo-lymphoedema without lymphorrhea, 2 with lymphorrhea, 1 lymphoedema with lymphorrhea). An echographic evaluation (7,5 mHz – biplanar performed by 2 different specialists), a complete microvascular evaluation (Optic Probe Video-Capillaroscopy – O.P.V.C – Doppler Laser Flowmetry – D.L.F.), an echo-guided lymph withdrawn (10-15 cc), a direct lymph withdrawn (if feasible in lymphorrhea), a blood sample withdrawn (if not performed in the past 4-6 mths) were performed. Patient were then randomized in two therapeutic groups (A / B) to receive routine + “placebo” (2 fl i.m. + 20 drops x 3/day x os x 3 mths) or routine + drug (“Lyndiaral”) as abovementioned. Patient were requested to return the Hospital after 30 - 60 - 90 days to repeat clinical assessments. At the end of the study (3 mths), all patients returned the Hospital. No patient dropped-out the study. No AE’s were reported by any patients at any time throughout the study.

RESULTS

Regarding lymphatic parameters, in B therapeutic group at the end of the study a reduction of alpha-2 proteins (from 7,3 to 6,1) were put in evidence, whereas no significant differences were highlighted in the remaining parameters (total proteins, albumins, alpha-1, beta, gamma, Na⁺, K⁺, Cl⁻, Leuko, PTT). Regarding blood parameters, no significant differences were reported when compared to baseline values in the abovementioned parameters. In A therapeutic group, regarding both lymphatic and blood parameters no significant differences were noted when compared to baseline-ones.

Regarding microcirculatory parameters, in B therapeutic group a tendency to a reduction of RBC aggregation (“sludge” and “rouleau”) was noted at 60th day, tendency confirmed and increased at 90th day at O.P.V.C. assessment, and D.L.F. showed a reappearance of flowmotion at 60th and of vasomotion at 90th day. In A therapeutic group, no significant modifications were highlighted both at O.P.V.C. and D.L.F. assessments. Randomization List opening revealed that A therapeutic group was “placebo” group, and B therapeutic group was “drug” (“Lyndiaral”) group. Constant was the tendency of lymphatic alpha-2 component reduction in B therapeutic group, together with the improvement of microcirculatory parameters starting from 60th day. No significant differences were found in blood parameters in B therapeutic group and in A therapeutic group both in blood and lymph components.

CONCLUSIONS

Further experimental and clinical data are obviously requested in order to get some conclusions, especially with long-term studies in selected patients. Nevertheless, it should seem to be speculatively correct to believe such reduction of alpha-2 lymph component in drug-treated patients (absent in placebo-ones) may be due to a constant reduction/control of pro-inflammatory/inflammatory component, with consequent, likely-true reduction also of mechanisms of cytokines-mediated feed-back reactions which increase also lymph-blood endothelial processes concurrent to flow reduction. This could allow to get, under an hydraulic view-point, a synergic result represented by a more “physiologic” lymph composition together with an increased lymph flow. Such type of synergic action could represent a real advantage in medical-therapeutic daily activity under a both “medical” and “physical” view point, with realistic advantage for specialist and patient in facing a severe, chronic disease frequently invalidating the quality of life.

REFERENCES

1. Albergati F.G.: *La Matrice Extracellulare*. Minelli Editore, Milano 2004.
2. Olszewski W.L.: *Pathophysiological Aspects of Lymphedema of Human Limbs: Lymph Protein Composition*. Lymphatic Research and Biology, June 2003, 1(3): 235-243.
3. Micheli S., Cardone M., Fiorentino A., Failla A., Moneta G., Todisco R., Todini M.: *Abstract book of 22 ISL Congress*, Sydney, September 63, 2009.
4. Baragi V.M., Fliszar C.J., Conroy M.C., Ye Q.Z., Shipley J.M., Welgus H.G.: *Contribution of the C-terminal domain of metalloproteinases to binding by tissue inhibitor of metalloproteinases. C-terminal truncated stromelysin and matrilysin exhibit equally compromised binding affinities as compared to full-length stromelysin*. J. Biol. Chem., 1994; 269: 12692-12697.

5. Brinckerhoff C.E., Matrisian L.M.: *Matrix metalloproteinase: a tail of a frog that became a prince*. Nat. Rev. Mol. Cell Biol., 2002; 3: 207-214.
6. Leontovich A.A., Zhang J., Shimokawa K., Nagase H., Sarras M.P. Jr.: *A novel hydra matrix metalloproteinase (H MMP) functions in extracellular matrix degradation, morphogenesis and the maintenance of differentiated cells in the foot process*. Development, 2000; 127: 907-920.
7. Lepage T., Gache C.: *Early expression of a collagenase-like hatching enzyme gene in the sea urchin embryo*. EMBO J., 1990; 9: 3003-3012.
8. Lepore L.S., Roelvink P.R., Granados R.R.: *Enhancin, the granulosis virus protein that facilitates nucleopolyhedrovirus (NPV) infections, is a metalloproteinase*. J. Invert. Pathol., 1996; 68: 131-140.
9. Mannello F., Tonti G., Papa S.: *Matrix metalloproteinase inhibitors as anticancer therapeutics*. Curr. Cancer Drug Targets, 2005; 5: 285-298.
10. Massova I., Kotra L.P., Fridman R., Mobashery S.: *Matrix metalloproteinases: structure, evolution, and diversification*. FASEB J., 1998; 12: 1075-1095.
11. Mayne J., Robinson J.J.: *Purification and metal ion requirement of a candidate matrix metalloproteinase: a 41 kDa gelatinase activity in the sea urchin*. Biochem. Cell Biol., 1996; 74: 211-218.
12. Mayne J., Robinson J.J.: *Calcium-Protein Interactions in the Extracellular Environment: Calcium Binding, Activation, and immunolocalization of a Collagenase (Gelatinase Activity Expressed in the Sea Urchin)*. Embryo. J. Cell. Biochem., 1998; 71: 546-558.
13. Mott J.D., Werb Z.: *Regulation of matrix biology by matrix metalloproteinases*. Curr. Opin. Cell Biol., 2004; 16: 558-564.
14. Okamoto T., Akaike T., Suga M., Tanase S., Horie H., Miyaima S., Ando M., Ichinose Y., Maeda H.: *Activation of human 74 matrix metalloproteinases by various bacterial proteinases*. J. Biol. Chem., 1997; 272: 6059-6066.
15. Overall C.M.: *Dilating the degradome: matrix metalloproteinase 2 cuts to the heart of the matter*. Biochem. J., 2004; 383: 5-7.
16. Shipley J.M., Doyle G.A., Fliszar C.J., Ye Q.Z., Johnson L.L., Shapiro S.D., Welgus H.G., Senior R.M.: *The structural basis for the elastolytic activity of the 92-kDa and 72-kDa gelatinases. Role of the fibronectin type II-like repeats*. J. Biol. Chem., 1996; 271: 4335-4341.
17. Stamenkovic I.: *Extracellular matrix remodelling: the role of matrix metalloproteinases*. J. Pathol., 2003; 200: 448-464.
18. Vu T.H., Werb Z.: *Matrix metalloproteinases: effectors of development and normal physiology*. Genes Dev., 2000; 14: 2123-2133.

THERAPEUTIC APPLICATION OF THE KINESIO TAPING METHOD IN THE MANAGEMENT OF BREAST CANCER - RELATED LYMPHEDEMA

SANTAMBROGIO F.¹, CAPPELLINO F.², CARDONE M.^{1,2}, MERLINO A.¹, MICHELINI S.^{1,2}

¹ Rehabilitative Centre Vaclav Vojta - Rome - Italy

² San Giovanni Battista Hospital - Rome - Italy

ABSTRACT

Breast cancer related lymphedema is the main consequence of the surgery for breast cancer, if left untreated it may evolve in a chronic, disfiguring condition that may lead to an important disability.

The conservative treatment of lymphedema has been established since 2003 in the Linee Guida Italiane di Linfangiologia, but in a recent literature review (Braz da Silva Leal NF et al., 2009) authors refer to a study in which a CDT modified (replace of multilayer bandage with kinesio taping) is compared with traditional CDT (Tsai H. et al., 2009), thus *“suggesting that KT can replace bandages during lymphedema treatment”*.

The objective of this observatory study is to determine the effect of Kinesio Taping when applied to patients with breast cancer related lymphedema as alternative to multilayer bandage, when this treatment is proposed within an outpatient therapeutic setting.

KEY WORDS: lymphedema, multilayer bandage, kinesio taping.

INTRODUCTION

Even if treatment of lymphedema can be performed at any stage of the disease, an early diagnosis and intervention should occur as soon as possible to achieve maximal results; the goals of the treatment of lymphedema are to reduce excess of fluids in the interstice of the tissue, thus maintaining limbs functionality, preventing infections and promoting a better quality of life. Literature (Linee Guida Italiane di Linfangiologia, 2003) indicate that therapy of lymphedema is divided into two methods, conservative treatment and surgical treatment. (Campisi et al., 2003).

Conservative treatment has the following resources:

PHYSICAL THERAPY. Combined Physical Therapy (CPT), Manual Lymphatic Drainage (MLD), Compression Bandage (CB), Pneumatic compression (CP), Therapeutic Exercises; Other physical therapy modalities such as laser treatment, electrical stimulation, transcutaneous electrical nerve stimulation (TENS), ultrasounds (US).

DRUG THERAPY. The medical therapy of lymphedema finds in Benzopyrones (alpha and gamma) the two most important molecules in lymphedema treatment. Surgical treatment of lymphedema. In the past, surgical technique to treat lymphedema were highly demolitive (cutlipofascetomy, total surface

lymphangectomy, etc), those technique were symptomatic and oedema reduction were only temporary. Following the advent of reconstructive Microsurgery better and long lasting results have been obtained in the treatment of primary and secondary lymphedema.

Even if conservative treatment of lymphedema has been established since 2003 in the Linee Guida Italiane di Linfangiologia, but in a recent literature review (Braz da Silva Leal NF et al., 2009) authors refer to a study in which a CDT modified (replace of multilayer bandage with Kinesio Taping) is compared with traditional CDT (Tsai H et al., 2009), thus *“suggesting that KT can replace bandages during lymphedema treatment”*.

Kinesio Tape has been invented 25 years ago by Kenzo Kase (chiropractor), with the intention to heal the body through a natural healing process, activating neurological and circulatory system. Kase et al. have purposed several benefits, depending on a correct technique application of the taping (Nosaka K., 1999; Kase et al., 1997-98). But we have limited information about KT and these came from some pilot studies and case series, that are the lower level of clinical evidence.

In accordance with the KT technique, it has been hypothesized that the effect that its application can exert depends on the amount of tension applied. The main effects that Kase attributed to Taping application are provides a positional stimulus through the skin, aligns fascial tissue, lifting the tissue above the affected area it creates more space thus reducing pain and inflammation, provides sensory stimulation and thus assist or limit motion and allows lymph drainage directing exudates toward lymph ducts.

In **LYMPHATIC CORRECTION** technique tape is cut in a fan stripe and is applied without or with a very light tension. The function of this technique is to decrease pressure by lifting the skin and opening the initial lymphatics while the tape create a sort of massaging action during active movements, in this way tape can act as a channel to direct the lymph to the nearest lymph-duct.

OBJECTIVE

The objective of this observatory study is to determine the effect of Kinesio Taping when applied to patients with breast cancer related lymphedema as alternative to multilayer bandage, when this treatment is proposed within an outpatient therapeutic setting.

MATERIALS AND METHODS

In this study two groups are compared: **19 patients** with breast cancer related lymphedema (2nd and 3rd stage) have been divided into 2 groups one of 10 patients (study group) and the other of 9 patients (control group/ historic group)

The average age of **Control group is 65.6 years**, that of **Study group is 54.4 years** ($p = 0.071$) of the **19 patients** who participated in the study over half (58%) has licensed high school, 25% have a license to junior high school, 11% have a university degree and 5% attended primary school.

There is a significant difference in schooling between the two groups ($*p = 0.026$) but actually we don't know if this difference influenced data results.

The average age of patients at **surgery was 48.3 years for patients in the study group and 54.7 years for patients in the control group**; there is no significant difference between groups for surgery as far as age at surgery is concerned.

Regarding the **type of surgery performed by 19 patients, 41% made an quadrantectomy and 32% mastectomy.**

The **control group** composed by 9 patients had a standard treatment (MLD, pneumatic compression pump, physical therapy, exercises and multilayer bandage) and the **study group** composed by 10 patients had the same standard treatment but had KT as alternative to the multilayer bandage.

Taping was done with 3 FAN strips of adhesive applied to the forearm and 3 FAN strips applied to the arm, the direction of the tape was from insertion to origin of forearm and arm. The tension of the tape was none or very light (0-15%).

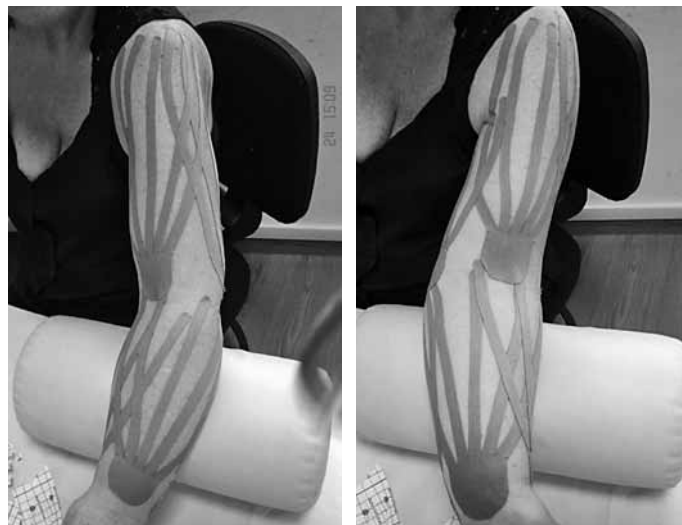
Patients in the study group was asked for consent to apply the taping in place of bandaging and taken a short training on the effects and use of taping. Patients were treated 2 h per session, 2 sessions per week, in the 8 week intervention period. Tape and multilayer bandage were applied two time at week (range 3-4 days).

Patients in **both groups** was administered the **SF36**, were detected **circumferences** of upper limbs with lymphedema and a functional evaluation was performed according to **Constant-Murrey schede**. The schede has a total score ranging from **0 to 100 where 100** is the maximum functionality of the shoulder without pain; on the basis of the schede we can have a **very bad score (<50), low (51-64), fairly good (65-79) and an excellent score (>80)**. A low score in Constant schede indicates a bad shoulder functionality. Evaluation were performed at the beginning of the treatment cycle (**T0**), after 30 days (**T1**), and after 60 days (**T2**).

DATA ANALYSIS

Regarding the **SF36**, at **T0** there are no significant differences between the two groups except for the values of **physical activity** (**AF** $*p = .006$). Therefore, patients in the study group have fewer limitations in performing activities daily life than the control group. There being no significant differences in the two groups at T0, they can be considered homogeneous.

At **T1 (30 days)**, the two groups differ both in values of physical



Pictures made at the Center Vaclav Vojta, Rome, U.O. Vascolare. KT application during treatment period.



Pictures made at the Center Vaclav Vojta, Rome, U.O. Vascolare. Multilayer bandage application during treatment period.

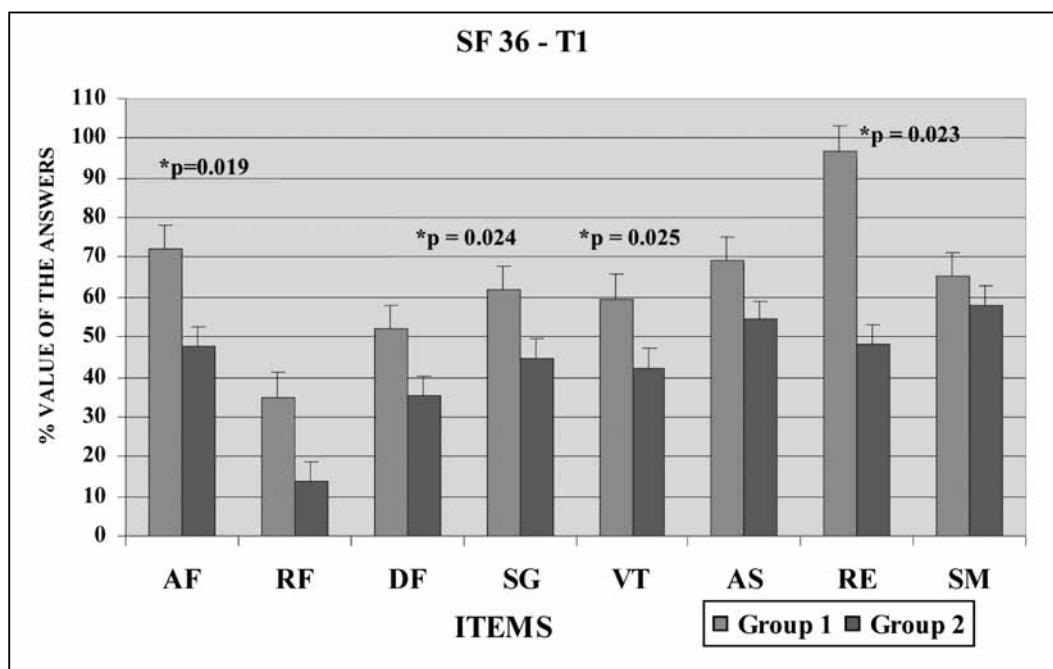
activity (**AF** $*p = 0.019$), **general health** (**SG** $p = 0.024$ for both the raw and percentage value), **vitality** (**VT** $*p = 0.025$ for both the raw and percentage value), and finally to the **role and value of emotional state** (**RE** $*p = 0.023$ for both the raw value that percentage).

The **role of values and physical health (RF)**, **social participation (AS)**, **physical pain (DF)** and **mental health (SM)** do not show a significant difference.

At **T2 (60 days)** there isn't significant difference in the value of **physical activity** (**AF** $*p = n.s.$ 0.091), and this might be due to oedema reduction even in Control Group.

There is only one difference in the raw value of the **General Health** (**SG** $*p = 0.042$) for all the other values there are no significant differences between the two groups.

So at the end of the treatment period the two groups can be considered homogeneous again.



The values shown represent mean and standard errors (vertical bar).

Regarding the question about the **change of general health (Question 2) at T0**, all the patients were evenly distributed between the **answer n. 2** (36.8% answered that “my health is a little better than an year ago”) and 3 (36.8% answered that “my health is more or less the same than a year ago”) as the contingency table shows.

However, analysis of the subgroups shows that 66.7% of patients in the control group gave the answer 2 while only 10% of patients in the study group gave the same answer and 60% of patients in the study group gave the answer 3 while 11.1% of patients in the

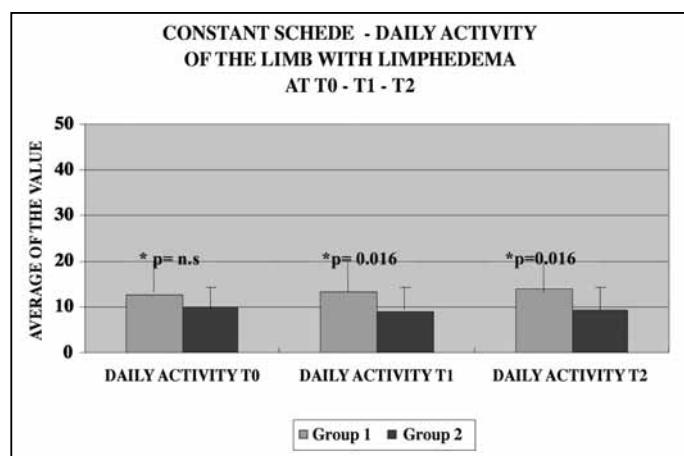
control group gave this answer. So **at T0**, patients in the control group perceive their general health as better than the previous year, while patients in the study group were perceiving the same general health status.

At **T1** values of answers to **Question 2**, shows that 42.1% of patients responded that their health status is more or less the same as a year earlier (these, 50% in the study group and 33.3% in the control group) while still a 36.8% who felt that their health is better than a year before (30% of the study group, 44.4% of the control group).

	QUESTION 2 T0 *p = 0.051			QUESTION 2 T1 *p = n.s.			QUESTION 2 T2 *p = n.s.		
	Study Group	Control Group	Tot	Study Group	Control Group	Tot	Study Group	Control Group	Tot
1. Much better now than an year ago	0 0%	1 11,1%	1 5,3%	0 0%	2 22,2%	2 10,5%			
2. A little better now than an year ago	1 10,0%	6 66,7%	7 36,8%	3 30,0%	4 44,4%	7 36,8%	4 40,0%	3 37,5%	7 38,9%
3. More or less the same than an year ago	1 10,0%	6 66,7%	7 36,8%	5 50,0%	3 33,3%	8 42,1%	5 50,0%	3 37,5%	8 44,4%
4. Somewhat worse now than an year ago	2 20,0%	1 11,1%	3 15,8%	1 10,0%	0 0%	1 5,3%	0 0%	1 12,5%	1 5,6%
5. Much worse now than an year ago	1 10,0%	0 0%	1 5,3%	1 10,0%	0 0%	1 5,3%	1 10,0%	1 12,5%	2 11,1%
Tot	10 100,0%	9 100,0%	19 100,0%	10 100,0%	9 100,0%	19 100,0%	10 100,0%	8 100,0%	18 100,0%

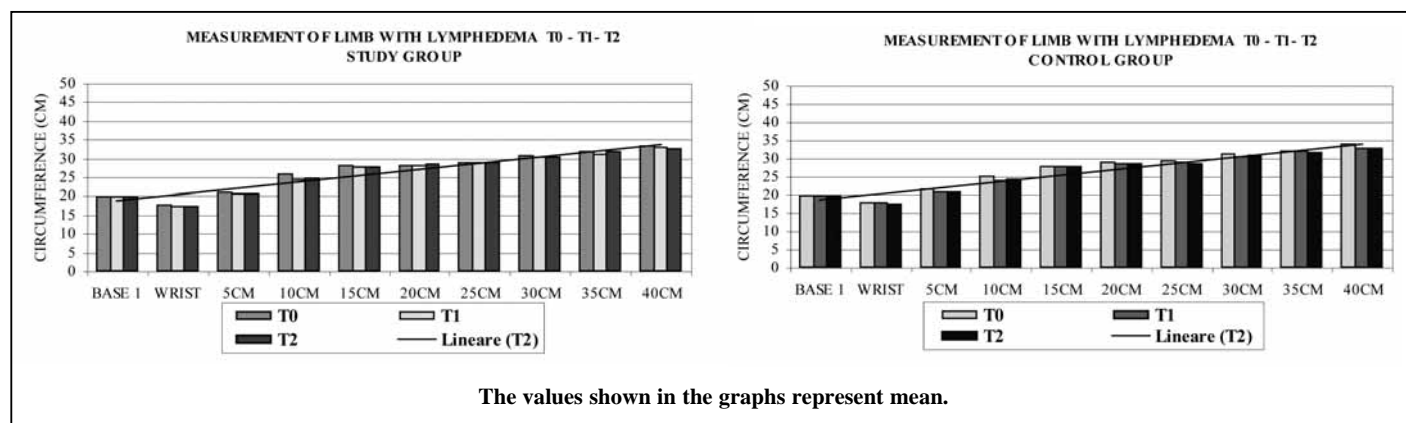
At **T1**, there is no significant difference between the two groups, and this may be due to a greater uniformity in distribution of responses by patients.

At **T2** values of answers to **Question 2** shows that 44.4% of patients responded that their general health was unchanged from a year ago (50% in the study group, 37.5% in the control group) while the 38.9% that their health has improved from a year ago (40% in the study group, 37.5% in the control group), there is still no significant difference between the two groups. Regarding the functional assessment of **Constant-Murrey schede**, during the treatment period there have been no significant differences between Study Group and Control Group with the exception of the value of **DAILY ACTIVITY** in the arm with lymphedema. At **T0** there is no significant difference between groups but at **T1** in the Study Group there have been a significant improvement in this value (***p:0.016**) that remains stable even at **T2** (***p:0.016**).



The values shown represent mean and standard errors (vertical bar).

For all values of the **centimetre measurement** of limbs with lymphedema there are no significant differences between the two groups at **T0**, **T1** and **T2**, and this may suggest an equivalence of the effects of two treatments on lymphedema.



The values shown in the graphs represent mean.

DISCUSSION

With regard to **SF36**, results at **T1** show that in the **Study Group**, the values of **AF**, **DF** and **SM** remain unchanged throughout the treatment period, whereas for the values of **RF**, **SG**, **AS**, there is a tendency to rise. The highest values of these items show that patients in **Study Group** have fewer limitations in work and daily life activities due to their emotional state, being generally more viable, to consider better their overall health, and participate more in social activities. Unlike the **Control Group** shows to have major limitations in work and in the activities of daily life for their emotional state, and to judge their general health status worsening. Regarding the value of **DF**, even if statistical analysis at **T1** shows that there is a non significant difference between groups, **Study Group** have a higher value and this indicates that this group of patients have fewer limitations due to pain, while patients in **Control Group** are more limited in performing normal activities of daily living due to pain.

In general it seems that at **T1** patients in **Study Group** are emotionally better off than those in **Control Group** and that this improvement will result in less restriction in exercising the normal activities of daily living and participation in social activity. For **Control Group** the results indicate that during the course of treatment, all values of 8 items have fallen to lower values, and this indicates that patients in this group perceive their health as deteriorated, and therefore tend to have more difficulties in carrying out the normal activities of daily living and participate in social activities for both emotional and physical state. At the end of treatment the values of the 8 items have a tendency to rise and this suggests that even patients in this group perceive an improvement in their general health, and probably this might be due to the oedema reduction.

Analysis of values of the answers to **Question 2** at **T0** shows that patients in the Control Group perceive their general health as better than the previous year, while patients in the study group were perceiving the same general health status; data analysis shows a significant difference between groups. At **T1** results compared with previous assessment show that some of the patients in the Study Group began to perceive their general health as better than the previous year compared to the first assessment, while in

the Control Group the percentage of patients who perceived their health as better than the previous year has dropped dramatically. Statistical analysis shows that at T1 there is no significant difference between groups and this may confirm the previous analysis (SF36), namely that patients in Study Group after one month of treatment begin to perceive an improvement in their health.

Even at **T2** there is a non significant difference between Study Group and Control Group, and this is still due to a greater uniformity in distribution of responses by patients. So over time there has been a substantial shift of patients in the study group to **answer number 2**, and then to a perceived improvement in their general health over the previous year, while a significant deterioration in the perception of their general health over the previous year in the control group's patients.

Regarding the **Constant-Murrey schede**, during the treatment period there have been no significant differences between Study Group and Control Group in results of shoulder functionality evaluation with the exception of the value of DAILY ACTIVITY in the arm with lymphedema.

The significant difference shown at T1 and T2 and this may confirm the results of the SF36 questionnaire that during the treatment, patients treated with KT have an improvement in performing their work and / or activities of daily living.

The evolution over time of **centimetre reduction** in limb with lymphedema in Study Group and Control Group, the two graphs have had a similar trend and this might be due to the fact that the two treatments have equivalent effects on lymphedema, even if acting with different mechanisms.

CONCLUSIONS

This work finds its first limit being a simple comparison between two groups: a history group in which patients had already tried the bandage, and a new group that has been proposed KT as an alternative to multilayer bandage. So there wasn't a real randomization of patients who participated in the study.

In this study results show that both treatments had the same effect on lymphedema reduction and this confirm that Kinesio tape could be an alternative to multilayer bandage in the treatment of breast cancer related lymphedema (2nd and 3rd stage) when this treatment is proposed within an outpatient therapeutic setting, although the actual mechanism of action of the taping is still to be investigated. Patients who received kinesio taping had an improvement in quality of life and management of social relations compared to patients who have the bandage, and this suggest that KT is more comfortable and convenient due to its characteristics, even if in the study group there were an higher risk to have wounds and skin irritation caused by the use of tape or the removal of it from the skin.

Another limit is the little number of scientific papers in literature from which explore the real mechanism of action and effects of taping in lymphedema, so the intention of this study is to add another element to the limited information we have about

treatment with the tape. Further analysis might be done to evaluate the real mechanism of action of the kinesio taping and the cost effectiveness of materials: KT is a one-use product and its application for extended periods involve higher costs than multilayer bandage technique in which materials can be reused.



Images from the site <http://kinesiotapingitalia.it>



Pictures made at the Center “Vaclav Vojta”, Rome, O.U. Vascolare.

These pictures compare the effect of Kinesio taping in reducing hematoma and lymphoedema.

REFERENCES

- Apollone G., Mosconi P., Ware J.E. Jr: *Questionario sullo stato di salute - SF36. Manuale d'uso e guida all'interpretazione dei dati.* Guerini e Associati, 1997.
- Bertelli G., Venturini M., Forno G., Macchiavello F., Dini D.: *Conservative treatment of postmastectomy lymphedema: a controlled, randomized trial.* Ann. Oncol., 1991; 2: 575-8.
- Białoszewski D., Woźniak W., Zarek S.: *Clinical efficacy of kinesiology taping in reducing edema of the lower limbs in patients treated with the ilizarov method-preliminary report.* Ortop. Traumatol. Rehabil., 2009; Jan-Feb.11(1): 46-54.
- Braz da Silva Leal N.F., Angotti-Carrara H.H., Vieira K.F., Homsi Jorge Ferreira C.: *Physiotherapy treatments for breast cancer related lymphedema: a literature review.* Rev. Latino-Am. Enfermagem, 2009; 17 (5).
- Chen W., Hong W., Huang T., Hsu H.: *Effects of kinesio taping on the timing and ratio of vastus medialis obliquus and vastus lateralis muscle for person with patellofemoral pain (abstract).* Journal of Biomechanics, 2007; 40(S2): 318.
- Fu T.C., Wong A.M., Pei Y.C., Wu K.P., Chou S.W., Lin Y.C.: *Effect of kinesio taping on muscle strength in athletes - A pilot study.* Journal of Science and Medicine in Sport, 2008; 1(2): 198-201.
- Garcia-Muro F., Rodriguez-Fernandez A.L., Herreo-de-Lucas A.: *Treatment of myofascial pain in the shoulder with Kinesio Taping. A case report.* Manual Therapy, 2009.
- González-Iglesias J., Fernández-de-Las-Peñas C., Cleland J.A., Huijbregts P., Del Rosario Gutiérrez-Vega M.: *Short-term effects of cervical kinesio taping on pain and cervical range of motion in patients with acute whiplash injury: a randomized clinical trial.* J. Orthop. Sports Phys. Ther., 2009 Jul; 39(7): 515-21.
- Halseth T., McChesney J.W., De Beliso M., Vaughn R., Lien J.: *The effects of kinesio taping on proprioception at the ankle.* J. Sports Sci. Med., 2004; 3: 1-7.
- Han-Ju Tsai, Hsiu-Chuan Hung, Jing-Lan Yang, Chiun-Sheng Huang, Jau-Yih Tsauo: *Could Kinesio Tape replace the bandage in decongestive lymphatic therapy for breast-cancer-related lymphedema? A pilot study.* Support Care Cancer, 2009; 17: 1353-1360.
- Harris Susan R., Hugi M.R., Olivotto I.A., Levine M.: *Clinical practice guidelines for the care and treatment of breast cancer: 11.* Lymphedema CMAJ, 2001; 164(2): 191-9.
- Jae-Yong Shim, Hye-Ree Lee, Duk-Chul Lee: *The use of elastic adhesive tape to promote lymphatic flow in the rabbit hind leg.* Yonsei Medical Journal, 2003; 44: 1045-1052.
- Kase K., Wallis J., Kase T.: *Clinical therapeutic application of the kinesio taping method. 2nd edition.* Kinesio Taping Association, 2003.
- Kase K., Stockheimer K.R., Piller N.: *Kinesio taping for lymphedema and chronic swelling.* Kinesio Taping Association, 2006.
- Kase K., Hashimoto T.: *Changes in the volume of the peripheral blood flow by using Kinesio Taping.* Kinesio Taping Association, 1997-98. www.kinesiotaping.com
- Lawenda B.D., Mondry T.E., Johnstone Peter A.S.: *Lymphedema: a primer on the identification and management of a chronic condition in oncology treatment.* CA Cancer j Clin, 2009; 59: 8-24.

- Leduc O., Leduc A., Buregeois P., Belgrado J.P.: *The physical treatment of upper limb edema*. Cancer (Suppl)1998; 12 (83): 2835-2839.
- Michelini S., Failla A., Moneta G.: *Manuale teorico pratico di riabilitazione vascolare*. Edizioni P.R., 2000.
- Michelini S., Campisi C., Ricci M., Gasbarro V., Cestari M., Mattassi R., Molisso A., Zanetti L., Allegra C., Cavezzi A., Aiello A., Conte M., Palumbo M., Ghilardini R., Rocco V., Failla D.: *Linee guida italiane sul linfedema*. Eur. Med. Phys., 2007; 43(Suppl. 1 to No. 3): 1-4.
- Michelini S., Campisi C., Cavezzi A., Boccardo F., Failla A., Moneta G.: *Epidemiologia del linfedema*. Auxilia-Linfologia, 1998; 1: 22-5.
- Michelini S., Failla A., Moneta G., Cardone M., Antonucci D., Rubeghi V., Zinicola V., Michelotti L.: *Onde d'urto in riabilitazione vascolare: studio preliminare*. Linfologia Italiana, 2007; 2(3): 3-5.
- Moffatt C.J., Franks P.J., Doherty D.C., Williams A.F., Badger C., Jeffs E., Bosanquet N., Mortimer P.S.: *Lymphedema: an underestimated health problem*. Q. J. Med., 2003; 96: 731-738.
- Morrel R.M., Michele Y.H., Schild S.E., Ali Muna S., Gunderson L.L., Pockaj B.A.: *Breast cancer related lymphedema (Review)*. Mayo Clinic Proc., 2005; 80(11): 1480-1484.
- Moseley A.L., Carati C.J., Piller N.B.: *A systematic review of common conservative therapies for arm lymphedema secondary to breast cancer treatment*. Annals of Oncology, 2007; 18: 639-646.
- Nosaka K.: *The effect of Kinesio Taping on muscular micro-damage following eccentric exercises 15th Annula Kinesio Taping International Symposium, Review 1999*. 70-73 Kinesio Taping Association. www.kinesiotaping.com
- Poage E., Singer M., Armer J., Poulland M., Shellabarger M.J.: *Demystifying lymphedema: development of the lymphedema putting evidence into practice card*. Clinical Journal of Oncology Nursing, 2008; 12(6): 951-964.
- Rineheart-Ayres M.E.: *Conservative approaches to lymphedema treatment*. Cancer (Suppl) 1998; 12(83): 2828-2832.
- Słupik A., Dwornik M., Białoszewski D., Zych E.: *Effect of Kinesio Taping on bioelectrical activity of vastus medialis muscle. Preliminary report*. [Article in English, Polish] Ortop. Traumatol. Rehabil., 2007 Nov-Dec; 9(6): 644-51.
- Thelen M.T., Dauber J.A., Stoneman P.D.: *The clinical efficacy of Kinesio Tape for shoulder pain: a randomized double-blinded, clinical trial*. J. Orthop. Sports Phis. Ther., 2008; 38(7): 389-395.
- Wilburn O., Wilburn P., Rockson S.G.: *A pilot, prospective evaluation of a novel alternative for maintenance therapy of breast cancer associated lymphedema*. BMC Cancer; 6: 84.

THE DIAGNOSIS AND TREATMENT OF PERIPHERAL LYMPHEDEMA

Consensus Document of the International Society of Lymphology

(Still in progress)

*This International Society of Lymphology (ISL) Consensus Document is the current revision of the 1995 Document for the evaluation and management of peripheral lymphedema⁽¹⁾. It is based upon modifications; [A] suggested and published following the 1997 XVI International Congress of Lymphology (ICL) in Madrid, Spain⁽²⁾ which were discussed at the 1999 XVII ICL in Chennai, India⁽³⁾ and considered/confirmed at the 2000 (ISL) Executive Committee meeting in Hinterzarten, Germany⁽⁴⁾; [B] derived from integration of discussions and written comments obtained during and following the 2001 XVIII ICL in Genoa, Italy as modified at the 2003 ISL Executive Committee meeting in Cordoba, Argentina⁽⁵⁾; [C] from suggestions, comments, criticisms, and rebuttals as published in the December 2004 issue of *Lymphology*⁽⁶⁾; and [D] as suggested from discussions from both the 2005 XX ICL in Salvador, Brazil and the 2007 XXI ICL in Shanghai, China as modified at the 2008 Executive Committee Meeting in Naples, Italy⁽⁷⁾. The document attempts to amalgamate the broad spectrum of protocols advocated worldwide for the diagnosis and treatment of peripheral lymphedema into a coordinated proclamation representing a "Consensus" of the international community.*

The document is not meant to override individual clinical considerations for problematic patients nor to stifle progress. It is also not meant to be a legal formulation from which variations define medical malpractice. The Society understands that in some clinics the method of treatment derives from national standards while in others access to medical equipment and supplies is limited and therefore the suggested treatments are impractical. Adaptability and inclusiveness does come at the price that members can rightly be critical of what they see as vagueness or imprecision in

definitions, qualifiers in the choice of words (e.g. the use of may, perhaps, unclear, etc.), and mention (albeit without endorsement) of treatment options supported by limited hard data.

Most members are frustrated by the reality that NO treatment method has really undergone a satisfactory meta-analysis (let alone rigorous, randomized, stratified, long-term, controlled study).

With this understanding, the absence of definitive answers and optimally conducted clinical trials, and with emerging technologies and new approaches and discoveries on the horizon, some degree of uncertainty, ambiguity, and flexibility along with dissatisfaction with current lymphedema evaluation and management is to be expected and appropriate. We continue to struggle to keep the document concise while balancing the need for depth and details.

With these considerations in mind, we believe that this version of the Consensus presents a Consensus that embraces the entire ISL membership, rises above national standards, identifies and stimulates promising areas for future research and represents the best judgment of the ISL membership on how to approach patients with peripheral lymphedema as of 2008.

*Therefore the document has been, and should continue to be, challenged and debated in the pages of *Lymphology* (e.g., as Letters to the Editor), and ideally will remain a continued focal point for robust discussion at local, national and international conferences in lymphology and related disciplines.*

We further anticipate as experience evolves and new ideas and technologies emerge that this "living document" will undergo periodic revision and refinement as the practice and theories of medicine change and advance.

I. GENERAL CONSIDERATIONS

As a fundamental starting point, lymphedema is an external (or internal) manifestation of lymphatic system insufficiency and deranged lymph transport. It may be an isolated phenomenon or associated with a multitude of other disabling local sequelae or even life-threatening systemic syndromes. In its purest form, the central disturbance is a *low output failure* of the lymphovascular system, that is, overall lymphatic transport is reduced. This derangement arises either from congenital lymphatic dysplasia (primary lymphedema) or anatomical obliteration, such as after radical operative dissection (e.g., axillary or retroperitoneal nodal sampling), irradiation, or from repeated lymphangitis with lymphangiosclerosis (secondary lymphedema) or as a consequence of functional deficiency (e.g., lymphangiospasm, paralysis, and valvular insufficiency) (primary or secondary lymphedema).

The common denominator, nonetheless, is that lymphatic transport has fallen below the capacity needed to handle the presented load of microvascular filtrate including plasma protein and cells that normally leak from the bloodstream into the interstitium. Swelling is produced by accumulation in the extracellular space of excess water, filtered/diffused plasma proteins, extravascular blood cells and parenchymal cell products. This process culminates in proliferation of parenchymal and stromal elements with excessive deposition of ground matrix substances. *High output failure* of the lymph circulation, on the other hand, occurs when a normal or increased transport capacity of intact lymphatics is overwhelmed by an excessive burden of blood capillary filtrate. Examples include hepatic cirrhosis (ascites), nephrotic syndrome (anasarca), and deep venous insufficiency of the leg (peripheral edema).

Although the final pathway is the manifestation of tissue edema whenever lymph formation exceeds lymph absorption, the latter entities should properly be distinguished from lymphedema, which is characterized by decreased lymphatic transport. In some syndromes where high output lymphatic transport failure is longstanding, a gradual functional deterioration of the draining lymphatics may supervene and thereby reduce overall transport capacity. A reduced lymphatic circulatory capacity then develops in the face of increased blood capillary filtration.

Examples include recurring infection, thermal burns, and repeated allergic reactions. These latter conditions are associated with "safety valve insufficiency" of the lymphatic system and can be considered a mixed form of edema/lymphedema and as such are particularly troublesome to treat. Peripheral lymphedema associated with chylous and non-chylous reflux syndromes is an infrequent but complex condition that requires specific diagnostic measures and treatment methods. In the treatment of "classical" lymphedema of the limbs (that is, peripheral lymphedema), improvement in swelling can usually be achieved by non-operative therapy.

Because lymphedema is a chronic, generally incurable ailment, it generally requires, as do other chronic disorders, lifelong care and attention along with psychosocial support.

The continued need for therapy does not mean a priori that treatment is unsatisfactory, although often it is less than ideal. For example, patients with diabetes mellitus continue to need drugs (insulin) or special diet (low calorie, low sugar) in order to maintain metabolic homeostasis. Similarly, patients with chronic venous insufficiency require lifelong external compression therapy to minimize edema, lipodermatosclerosis and skin ulceration (treatments may be preventative if initiated early). The compliance and commitment of the patient is also essential to an improved outcome. For example, in a patient with diabetes, poor compliance can result in weight loss, polyuria, and even coma and, long-term, also blindness, renal failure, and stroke. With chronic venous insufficiency, poor patient cooperation may be causally associated with progressive skin ulceration, hyperpigmentation, and other trophic changes in the lower leg.

Similarly, failure to control lymphedema may lead to repeated infections (cellulitis/lymphangitis), progressive elephantine trophic changes in the skin, sometimes crippling invalidism and on rare occasions, the development of a highly lethal angiosarcoma (Stewart-Treves syndrome). The recent promulgation of a list of risk factors for secondary lymphedema has become a highlighted issue due to publications of "do's and don'ts" lists. These are largely anecdotal and without sufficient investigation. While some rely on solid physiological principles (e.g. avoiding excessive heat on an "at risk" limb or trying to avoid infections), others are less supported. It must be

noted that most published studies on incidence of secondary lymphedema report less than 50% chance of developing lymphedema and use of some of these methods for "prevention" of lymphedema may not be appropriate and likely subjects patients to therapies which are unsupported until a point in the future when evaluation and prognostication has advanced to identify more clearly specific risks and preventative measures.

II. STAGING OF LYMPHEDEMA

Whereas most ISL members generally rely on a three stage scale for classification of a lymphedematous limb, an increasing number recognize Stage 0 (or Ia) which refers to a latent or sub-clinical condition where swelling is not evident despite impaired lymph transport. It may exist months or years before overt edema occurs (Stages I-III).

Stage I represents an early accumulation of fluid relatively high in protein content (e.g., in comparison with "venous" edema) which subsides with limb elevation. Pitting may occur. An increase in proliferating cells may also be seen.

Stage II signifies that limb elevation alone rarely reduces tissue swelling and pitting is manifest. Late in Stage II, the limb may or may not pit as tissue fibrosis supervenes.

Stage III encompasses lymphostatic elephantiasis where pitting is absent and trophic skin changes such as acanthosis, fat deposits, and warty overgrowths develop. These Stages only refer to the physical condition of the extremities. A more detailed and inclusive classification needs to be formulated in accordance with improved understanding of the pathogenetic mechanisms of lymphedema (e.g., nature and degree of lymphangiodysplasia, lymph flow perturbations and nodal dysfunction as defined by anatomic features and physiologic imaging and testing) and underlying genetic disturbances, which are gradually being elucidated.

Recent publications incorporating both physical (phenotypic) findings with functional imaging (by LAS at this point) into a combined staging may be forecasting the future changes in staging. In addition, incorporation of genotypic information available in the future may further advance staging and classification of patients with peripheral (and other) lymphedema.

Within each Stage, an inadequate but functional severity assessment has been utilized based on simple volume differences assessed as minimal (<20% increase) in limb volume, moderate (20-40% increase), or severe (>40% increase). Clinicians also incorporate factors such as extensiveness, presence of erysipelas attacks, inflammation, and other complications to their own individual severity determinations.

Some healthcare workers examining disability utilize the World Health Organization's guidelines for the International Classification of Functioning, Disability, and Health (ICF). Quality of Life issues (social, emotional, physical disabilities, etc.) may also be addressed by individual clinicians and can favorably impact therapy and compliance (maintenance).

III. DIAGNOSIS

An accurate diagnosis of lymphedema is essential for appropriate therapy. In most patients, the diagnosis of lymphedema can be readily determined from the clinical history and physical examination. In other patients confounding conditions such as morbid obesity, venous insufficiency, occult trauma, and repeated infection may complicate the clinical picture. Moreover, in considering the basis of unilateral extremity lymphedema, especially in adults, an occult visceral tumor obstructing or invading more proximal lymphatics needs to be considered. For these reasons, a thorough medical evaluation is indispensable before embarking on lymphedema treatment. Co-morbid conditions such as congestive heart failure, hypertension, and cerebrovascular disease including stroke may also influence the therapeutic approach undertaken.

A. Imaging

If the diagnosis of lymphedema is unclear or in need of better definition for prognostic considerations, consultation with a clinical lymphologist or referral to a lymphologic center if accessible is recommended. The diagnostic tool of isotope lymphography (also termed lymphoscintigraphy or lymphangioscintigraphy) has proved extremely useful for depicting the specific lymphatic abnormality.

Where specialists in nuclear medicine are available, lymphangioscintigraphy (LAS) has largely

replaced conventional oil contrast lymphography for visualizing the lymphatic network.

Although LAS has not been standardized (various radiotracers and radioactivity doses, different injection volumes, intracutaneous versus subcutaneous injection site, epi- or subfascial injection, one or more injections, different protocols of passive and active physical activity, varying imaging times, static and/or dynamic techniques), the images, which can be easily repeated, offer remarkable insight into lymphatic (dys)function.

LAS provides both images of lymphatics and lymph nodes as well as semiquantitative data on radiotracer (lymph) transport, and it does not require dermal injections of blue-dye (as used for example in axillary or groin sentinel node visualization i.e., lymphadenoscintigraphy). Dye injection is occasionally complicated by an allergic skin reaction or serious anaphylaxis.

Moreover, clinical interpretation of lymphatic function after vital dye injection alone ("the blue test") is often misleading. Direct oil contrast lymphography, which is cumbersome and occasionally associated with minor and major complications, is usually reserved for complex conditions such as chylous reflux syndrome and thoracic duct injury.

Non-invasive duplex-Doppler studies and occasionally phlebography are useful for examining the deep venous system and supplement or complement the evaluation of extremity edema. Other diagnostic and investigational tools used to elucidate lymphangiodysplasia/lymphedema syndromes include magnetic resonance imaging (MRI) - including MR angiography and newer MR lymphography techniques, computed tomography (CT), ultrasonography (US), indirect (water soluble) lymphography (IL) and fluorescent microlymphangiography (FM). DEXA, or bi-photonic absorptiometry, may help classify and diagnose a lymphedematous limb but its greatest potential use may be to assess the chemical components of limb swelling (% fat, water, lean mass) before and after treatment.

IL and FM are best suited to depict initial lymphatics and accordingly have limited clinical usefulness albeit valuable in research. US has found its most practical value in depicting the dance of the living adult worms in scrotal lymphatic filariasis.

B. Genetics

Genetic testing is almost becoming practical to define a limited number of specific hereditary syndromes with discrete gene mutations such as lymphedemadistichiasis (*FOXC2*), some forms of Milroy disease (*VEGFR-3*), and hypotrichosislymphedema-telangiectasis (*SOX18*). The future holds promise that such testing combined with careful phenotypic descriptions will become routine to classify familial lymphangiodysplastic syndromes and other congenital/genetic-dysmorphogenic disorders characterized by lymphedema, lymphangiectasia, and lymphangiomatosis. In addition, there are many other clinical syndromes with lymphedema as a component and these may have genes identified in the future.

C. Biopsy

Caution should be exercised before removing enlarged regional lymph nodes in the setting of longstanding peripheral lymphedema as the histologic information is seldom helpful, and such excision may aggravate distal swelling. Fine needle aspiration with cytological examination by a skilled pathologist is a useful alternative if malignancy is suspected. Use of sentinel node biopsy in the groin or axilla in staging malignancy such as breast and melanoma, if validated for determining metastasis, may lessen the incidence of peripheral lymphedema by discouraging removal of normal lymph nodes.

IV. TREATMENT

Therapy of peripheral lymphedema is divided into conservative (non-operative) and operative methods. Applicable to both methods is an understanding that meticulous skin hygiene and care (cleansing, low pH lotions, emollients) is of utmost importance to the success of virtually all treatment approaches. Basic range of motion exercises of the extremities, especially combined with external limb compression, and limb elevation (specifically bed rest) is also helpful to virtually all patients undergoing treatment. As previously stated, even widely used methods have yet to undergo sufficient meta-analysis of multiple studies which have been rigorous, well-controlled, and with sufficient followup.

A. Non-operative Treatment

1. Physical therapy

a. **Combined physical therapy** (CPT) (also known as Complete or Complex Decongestive Therapy (CDT) or Complex Decongestive Physiotherapy (CDP) among others) is backed by longstanding experience and generally involves a two-stage treatment program that can be applied to both children and adults. The first phase consists of skin care, a specific light manual massage (manual lymph drainage), range of motion exercise and compression typically applied with multi-layered bandage-wrapping. Phase 2 (initiated promptly after Phase 1) aims to conserve and optimize the results obtained in Phase 1. It consists of compression by a low-stretch elastic stocking or sleeve, skin care, continued "remedial" exercise, and repeated light massage as needed. Prerequisites of successful combined physiotherapy are the availability of physicians (i.e., clinical lymphologists), nurses, and therapists specifically trained, educated, and experienced in this method, acceptance of health insurers to underwrite the cost of treatment, and a biomaterials industry willing to provide high quality products.

Compressive bandages, when applied incorrectly, can be harmful and/or useless. Accordingly, such multilayer wrapping should be carried out only by professionally trained personnel. Newer manufactured devices to assist in compression (i.e. pull on, velcroassisted, quilted, etc.) may relieve some patients of the bandaging burden and perhaps facilitate compliance with the full treatment program and some clinics find that patient self-care and risk reduction strategies help maintain edema reduction (although neither of these has undergone rigorous study).

CPT may also be of use for palliation as, for example, to control secondary lymphedema from tumor-blocked lymphatics. Treatment is typically performed in conjunction with chemo- or radiotherapy directed specifically at producing tumor regression. Theoretically, massage and mechanical compression could promote metastasis in this setting by mobilizing dormant tumor cells, although only diffuse carcinomatous infiltrates which have already spread to lymph collectors as tumor thrombi might be mobilized by such treatment.

Because the long-term prognosis for such an

advanced patient is already dismal, any reduction in morbid swelling is nonetheless decidedly palliative.

A prescription for low stretch elastic garments (custom made with specific measurement if needed) to maintain lymphedema reduction after CPT is essential for long-term care. Preferably, a physician should prescribe the compression garment to avoid inappropriate usage in a patient with medical contraindications such as arterial disease, painful postphlebotic syndrome or occult visceral neoplasia. Generally the highest compression level tolerated (~20-60 mm Hg) by the patient is likely to be the most beneficial. Failure of CPT is confirmed only when intensive non-operative treatment in a clinic specializing in management of peripheral lymphedema and directed by an experienced clinical lymphologist has been unsuccessful.

b. **Intermittent pneumatic compression.** Pneumomassage is usually a two-phase program. After external compression therapy is applied, preferably by a sequential gradient "pump," form-fitting low-stretch elastic stockings or sleeves are used to maintain edema reduction. Displacement of edema more proximally in the limb and genitalia and the development of a fibrosclerotic ring at the root of the extremity with exacerbated obstruction of lymph flow needs to be assiduously avoided by careful observation. Combining pneumatic compression with MLD has been reported but not sufficiently evaluated. Some published reports support the use of MLD as a monotherapy in newly established and/or mild lymphedema without fibrosis.

c. **Massage alone.** Performed as an isolated technique, classical massage or effleurage usually has limited benefit. Moreover, if performed overly vigorously, massage may damage lymphatic vessels.

d. **Wringing out.** "Tuyautage" or wringing out performed with bandages or rubber tubes is probably injurious to lymph vessels and should seldom if ever be performed.

e. **Thermal therapy.** Although combinations of heat, skin care, and external compression have been advocated by practitioners in Europe and Asia, the role and value of thermotherapy in the management of lymphedema remains unclear without further rigorous studies.

f. **Elevation.** Simple elevation (particularly by bed rest) of a lymphedematous limb often reduces swelling particularly in stage I of lymphedema. If swelling is reduced by antigravimetric means, the effect should be maintained by wearing of a low-stretch, elastic stocking/sleeve.

2. Drug therapy

a. **Diuretics.** Diuretic agents are of limited use during the initial treatment phase of CPT and should be reserved for patients with specific co-morbid conditions or complications. Long-term administration of diuretics, however, is discouraged for it is of marginal benefit in treatment of peripheral lymphedema and potentially may induce fluid and electrolyte imbalance. Diuretic drugs maybe helpful to treat effusions in body cavities (e.g., ascites, hydrothorax) and with protein-losing enteropathy. Patients with peripheral lymphedema from malignant lymphatic blockage may also derive benefit from a short course of diuretic drug treatment.

b. **Benzopyrones.** Oral benzopyrones, which have been reported to hydrolyze tissue proteins and facilitate their absorption while stimulating lymphatic collectors, are neither an alternative nor substitute for CPT. The exact role for benzopyrones (which include those termed rutosides and bioflavonoids) as an adjunct in primary and secondary lymphedema treatment including filariasis is still not definitively determined including appropriate formulations and dose regimens. Coumarin, one such benzopyrone, in higher doses has been linked to liver toxicity. Recent research has linked this with poor CYP2A6 enzymatic activity in these individuals.

c. **Antimicrobials.** Antibiotics should be administered for bona fide superimposed acute inflammation (cellulitis/lymphangitis or erysipelas). Typically, these episodes are characterized by erythema, pain, high fever and, less commonly, even septic shock. Mild skin erythema without systemic signs and symptoms does not necessarily signify bacterial infection. If repeated limb "sepsis" recurs despite optimal CPT, the administration of a prophylactic antibiotic (usually broad spectrum) is recommended. Fungal infection, a common complication of extremity lymphedema, can be treated with antimycotic drugs (e.g., flucanazole, terbinafine). In most instances, washing the skin using a mild

disinfectant followed by antibiotic-antifungal cream is helpful.

d. **Filariasis.** To eliminate microfilariae from the bloodstream in patients with lymphatic filariasis, the drugs diethylcarbamazine, Albendazole, or Ivermectin are recommended. Killing of the adult nematodes by these drugs (macrofilaricidal effect) is variable and may be associated with an inflammatory-immune response by the host with aggravation of lymphatic blockage. Short and long-term efficacy of antibiotics (e.g., penicillin or doxycyclin) separate from skin hygiene in patients with lymphatic filariasis to prevent elephantine trophic changes remains to be determined.

e. **Mesotherapy.** The injection of hyaluronidase or similar agents to loosen the extracellular matrix is of unclear benefit and may actually be harmful.

f. **Immunological therapy.** Efficacy of boosting immunity by intraarterial injection of autologous lymphocytes is unclear and needs independent, reproducible evidence.

g. **Diet.** No special diet has proved to be of therapeutic value for uncomplicated peripheral lymphedema. In an obese patient, however, reducing caloric intake combined with a supervised exercise program is of distinct value in decreasing limb bulk. Restricted fluid intake is not of demonstrated benefit for peripheral lymphedema. In chylous reflux syndromes (e.g., intestinal lymphangiectasia), a diet as low as possible or even free in long-chain triglycerides (absorbed via intestinal lacteals) and high in short and medium chain triglycerides (absorbed via the portal vein) is of benefit especially in children.

3. Psychosocial rehabilitation

Psychosocial support with a quality of life assessment-improvement program is an integral component of any lymphedema treatment.

B. **Operative Treatment Operations** designed to alleviate peripheral lymphedema by enhancing lymph return have not as yet been accepted worldwide and often require combined physiotherapy after the procedure to maintain edema reduction. In selected patients, these procedures may act as an adjunct to CPT or be undertaken when CPT has clearly been unsuccessful. In some specialized centers, operative treatment within specific guidelines may be a preferred approach.

1. **Surgical Resection.** The simplest operation is "debulking", that is, removal of excess skin and subcutaneous tissue of the lymphedematous limb. The major disadvantage is that superficial skin lymphatic collaterals are removed or further obliterated. After aggressive CPT, redundant skin folds may require excision. Debulking has been reported to be useful in treatment of advanced fibrosclerotic lymphedema (elephantiasis). Caution should be exercised in removing enlarged lymph nodes or softtissue masses (e.g., lymphangiomas) in the affected extremity as lymphedema may worsen thereafter. Omental transposition, enteromesenteric bridge operations, and the implantation of tubes or threads to promote perilymphatic spaces (substitute lymphatics) have not shown long-term value and should be avoided without further published evidence. Chylous and other reflux syndromes are special disorders which may benefit from CT-guided sclerosis, operative ligation of visceral dysplastic lymphatics, and/or lymphatic to venous diversion.

2. **Liposuction.** Liposuction has been reported to completely reduce non-pitting, non-fibrotic, extremity lymphedema due to excess fat deposition (which has not responded to nonoperative therapy) in both primary and secondary lymphedema. Just like conservative treatment, long-term management requires strict patient compliance with dedicated wearing of a low-stretch elastic compression garments. This operation and follow-up should be performed by an experienced team of surgeon, nurses and physiotherapists to obtain optimal outcomes.

3. **Microsurgical procedures.** This operative approach is designed to augment the rate of return of lymph to the blood circulation. The surgeon should be well-schooled in both microsurgery and lymphology.

a. **Reconstructive methods.** These sophisticated techniques involve the use of a lymphatic collector or an interposition vein segment to restore lymphatic continuity. Autologous lymph vessel transplantation generally has been restricted to unilateral peripheral lymphedema due to the need for one healthy leg to harvest the graft.

b. **Derivative methods.** Lymphatic-venous and lymphatic-nodal venous shunt are currently in use and these procedures are undergoing confirmation of long-term patency and

demonstration of improved lymphatic transport (i.e., objective physiologic measurements of long-term efficacy). Experience with these procedures over the last 20 years suggests that improved and more lasting benefit is forthcoming if performed early in the course of lymphedema.

4. **Treatment Assessment.** In each patient undergoing therapy, an assessment of limb volume should be made before, during and after treatment. This volume can be measured by water displacement, derived from circumferential measurements using the truncated cone formula, by perometer, or by other means. It is desirable, however, that treatment outcomes be reported in a standardized manner in order to compare and contrast the effectiveness of various treatment protocols. Additional assessments by imaging modalities such as lymphangioscintigraphy to document functional changes in lymphatic drainage and DEXA or magnetic resonance imaging to determine volume and tissue compositional changes would add scientific rigor to analysis of the different treatment approaches. Tissue alterations and fluid changes may also be examined by tonometry and bio-electrical impedance. Psychosocial indices and visual analog scales of patient perceptions are also useful.

C. **Molecular Therapy.** Despite ongoing research, molecular treatments (e.g. administration of VEGF-C by various methods) has not yet been translated to the clinic. While the addition of growth (or inhibitory) factors is attractive, the availability of these treatments in the future is uncertain at this time and should be conducted in the context of co-morbid conditions (e.g. cancer and drug regimens).

V. RESEARCH AGENDA

While recognizing and encouraging individual investigators to pursue many different avenues of investigation, some general directions can be formulated.

Ongoing epidemiologic studies on the incidence and prevalence of lymphedema regionally and worldwide will benefit from the further development and establishment of standardized, secure, intercommunicating database-registries. Assessment of lymphedema risk and steps for lymphedema prevention in different groups of at risk patients need to be determined.

Studies might include research on minimizing or preventing secondary lymphedema through altered operative/sampling techniques (e.g., sentinel node biopsy or precise anatomical knowledge of derivative pathways), vector control (as demonstrated in China) and prophylactic drugs for filariasis, identification of patients with heritable genetic defects for lymphangiodysplasia (lymphedema), and use of massage or compression where lymphatic drainage is subclinically impaired as documented by imaging techniques (e.g., LAS).

Research in molecular lymphology including lymphatic system genomics and proteomics should be encouraged. With the cellular and molecular basis of lymphedema associated syndromes better defined, an array of specific biologically-based treatments including modulators of lymphatic growth and function should become available.

Improved imaging techniques and physiological testing need to be devised to allow more precise noninvasive methods to measure lymph flow dynamics and lymphangion activity. Continuous improvement in imaging techniques as well as development of new technologies (e.g. near infrared) to visualize the superficial and deep lymphatic system.

As knowledge accrues, the current crude classification of lymphedema should be revisited and modified to include a more encompassing clinical description based on genetic, anatomic, and functional disability.

Accordingly, treatment, whether by designer drugs, gene or stem cell therapy, tissue engineering, physical methods or new operative approaches, should be directed at preventing, reversing or ameliorating the specific lymphatic defect and restoring function and quality of life.

VI. CONCLUSION

Lymphedema may be simple or complex but should not be neglected. Accurate diagnosis and effective therapy is now available, and lymphology itself is now recognized as an important speciality in which clinicians are carefully trained in the intricacies of the lymphatic system, lymph circulation, and related disorders. The emerging era of molecular lymphology should result in improved understanding, evaluation and treatment in clinical lymphology.

REFERENCES

1. International Society of Lymphology, Executive Committee. *The Diagnosis and Treatment of Peripheral Lymphedema*. Lymphology, 1995; 28: 113-117.
2. Witte M.H., Witte C.L., and Bernas M. for the Executive Committee. *ISL Consensus Document Revisited: Suggested Modifications*. Lymphology, 1998; 31: 138-140.
3. International Congress of Lymphology, Chennai, India. *General Assembly discussion. ISL Consensus Document Revisited*. September 25, 1999.
4. ISL Executive Committee Meeting, Földi Klinik, Hinterzarten, Germany. *Discussions on modification of the ISL Consensus Document*. August 30, 2000.
5. Discussions at the XVIII ICL in Genoa, Italy, September 2001 and over 50 written and verbal comments submitted to Executive Committee members. Changes discussed, modified, deleted, and confirmed at 2002 ISL Executive Committee meeting, May 2002, Cordoba, Argentina.
6. Consensus and dissent on the ISL Consensus Document on the diagnosis and treatment of peripheral lymphedema (M. Bernas and M.H. Witte); Remarks (M. Földi); Liposuction and the Consensus Document (H. Brorson); Adipose tissue in lymphedema (H. Brorson); Liposuction in the Consensus Document (S. Slavin); A search for consensus on staging and lymphedema (T.J. Ryan); and Guidelines of the Società Italiana di Linfangiologia: Excerpted sections (C. Campisi, S. Michelini, F. Boccardo). Lymphology, 2004; 37: 165-184.
7. Changes discussed, modified, deleted, and confirmed at 2008 ISL Executive Committee meeting, June 2008, Naples, Italy.

IMMUNODEFICIENCY DUE TO CHYLOUS DYSPLASIA: DIAGNOSTIC AND THERAPEUTIC CONSIDERATIONS

CAMPISI CORRADINO*, MD; CAMPISI CORRADO*, GIRINO MARGHERITA***, MD;
VIDALI FRANCESCA***, MD; CORAZZA GINO ROBERTO***, MD; BELLINI CARLO**, MD;
BOCCARDO FRANCESCO*, MD

* Department of Surgery
Unit of Lymphatic Surgery and Microsurgery
San Martino Hospital, University of Genoa, Italy

** Institute G. Gaslini – Pediatric Clinics
Genoa, Italy

*** Medical Clinics I – Foundation Policlinico S. Matteo
University of Pavia, Italy

ABSTRACT

Among primary immunodeficiencies, common variable immunodeficiency (CVID) is defined by an impaired production of immunoglobulins, characterized by low levels of plasma immunoglobulins and altered antibody response. The case reported was initially interpreted as a CVID.

A male, 20 years old, suffered from diarrhoea (2-4 times a day), weight loss (8 kilos in 5 years), and malnutrition (hypogammaglobulinemia, hypoalbuminemia, leukocytopenia with lymphocytopenia). Accurate diagnostic assessment allowed to diagnose a protein-losing enteropathy. Conventional oil contrast lymphangiography allowed to accurately assess the case and to establish a proper therapeutic approach. The operation consisted in multiple antigravitational ligatures of dilated and incompetent chylous vessels and chylous vessel-mesenteric vein microanastomoses.

Parameters concerning albumin and leukocytes normalized in 1 week after operation and remained stable with time, there were no more episodes of diarrhoea and the patient recovered weight.

An accurate diagnostic assessment and above all lymphangiography allow to diagnose properly difficult cases of immunodeficiency due to intestinal protein-loss and to plan a correct therapeutic functional approach.

KEY WORDS: Chylous Dysplasia, Protein Losing Enteropathy, Immunodeficiency, Microsurgery, Derivative chylous-venous shunts.

INTRODUCTION

Among primary immunodeficiencies, common variable immunodeficiency (CVID) is defined by an impaired production of immunoglobulins, characterized by low levels of plasma immunoglobulins and altered antibody response. The case reported was initially interpreted as a CVID. But, clear information about

the patient's medical history and accurate clinical examination allowed to reach the correct diagnosis and perform a proper treatment.

In case of chylous disorders, from the immunological point of view, it is important to avoid the leakage of immunoglobulins and lymphocytes in order to maintain immunologic competence. Lymph in the thoracic duct contains from about 2,000 to 20,000 lymphocytes per mm³, i.e., a concentration of lymphocytes 2-10 times higher than in the blood. This lymphocytosis varies according to the number of lymph nodes, temperature, digestive phase and endocrine conditions. It is, therefore, easy to understand the importance of restoring normal drainage of the intestinal lymph circulation. In the majority of cases, malnutrition is present, with significant hypoproteinemia – specially affecting the albumin fraction – and weight loss. Respiratory problems and steatorrhea are also often present in Protein Losing Enteropathy associated forms⁽¹⁻⁵⁾.

In case of chylous dysplasias, patients should not undergo operation prematurely until at least a proper diagnosis has been made as to the nature and site of the likely chyle leak. During this period, the patient should be properly metabolically compensated through an appropriate diet with protein integration and limited lipid input confined only to medium chain triglycerides (MCT). MCTs, rather than being absorbed through intestinal chyliferous lymphatic roots, use the portal venous pathway. The addition of water-soluble vitamins (ADEKs tablet) should also be considered. From the etiopathological point of view, a malformation affecting the thoracic duct, Pecquet cyst, and/or chyliferous vessels can cause a significant obstacle to lymph drainage and, in particular, to intestinal drainage. Therefore, chyliferous vessels along the walls of the small intestine and of the mesentery become significantly dilated and abnormally stretched due to chylous stasis. The disease also features lymphatic megacollectors with more or less extensive chylous lymphangiectasia, often associated with lymphangiomyomatosis⁽⁶⁻¹⁰⁾. In some cases, the chyliferous vessel at the centre of the villus breaks into the intestinal lumen, thus

causing the loss of proteins, lipids, lipoproteins, and even calcium and glucose, which lead to metabolic disorders that are typical of so called "Protein Losing Enteropathy" (PLE).

In this article, we describe a case of immunodeficiency which was due to a condition of protein losing enteropathy. The chyle reflux towards the intestinal lumen caused the loss of albumin, antibodies, lymphocytes in a manner that the patient presented a situation of serious immunodeficiency that threatened his life.

CLINICAL CASE

A male, 20 years old, suffered from diarrhoea (2-4 times a day), weight loss (8 kilos in 5 years), malnutrition (BMI 16,6), hypogammaglobulinemia, hypoalbuminemia, leukocytopenia and lymphocytopenia, associated with diarrhea.

After a first interpretation of the clinical feature as CVID, an accurate diagnostic assessment allowed to diagnose a protein-losing enteropathy.

High resolution ultrasonography demonstrated a certain quantity of intrabdominal free fluid, markedly dilated (43 mm diameter) ileal intestinal loops full of intraluminal liquid, thickened intestinal wall (4,5 mm diameter) with rich vascularisation of the wall.

The test of protein dispersion with ^{99m}Tc labelled albumin proved an intestinal protein dispersion probably at the ileal region.

Lymphoscintigraphy was not indicative of the kind and site of the chyle leakage.

Conventional oil contrast lymphangiography allowed to accurately assess the case. Lymphographic phase showed markedly dilated lymphatic pathways at the iliac-lumbar-aortic region, mainly at the right side, with dysplastic vessels and gravitational reflux. Cisterna chyli and thoracic duct were normal (Fig.1).

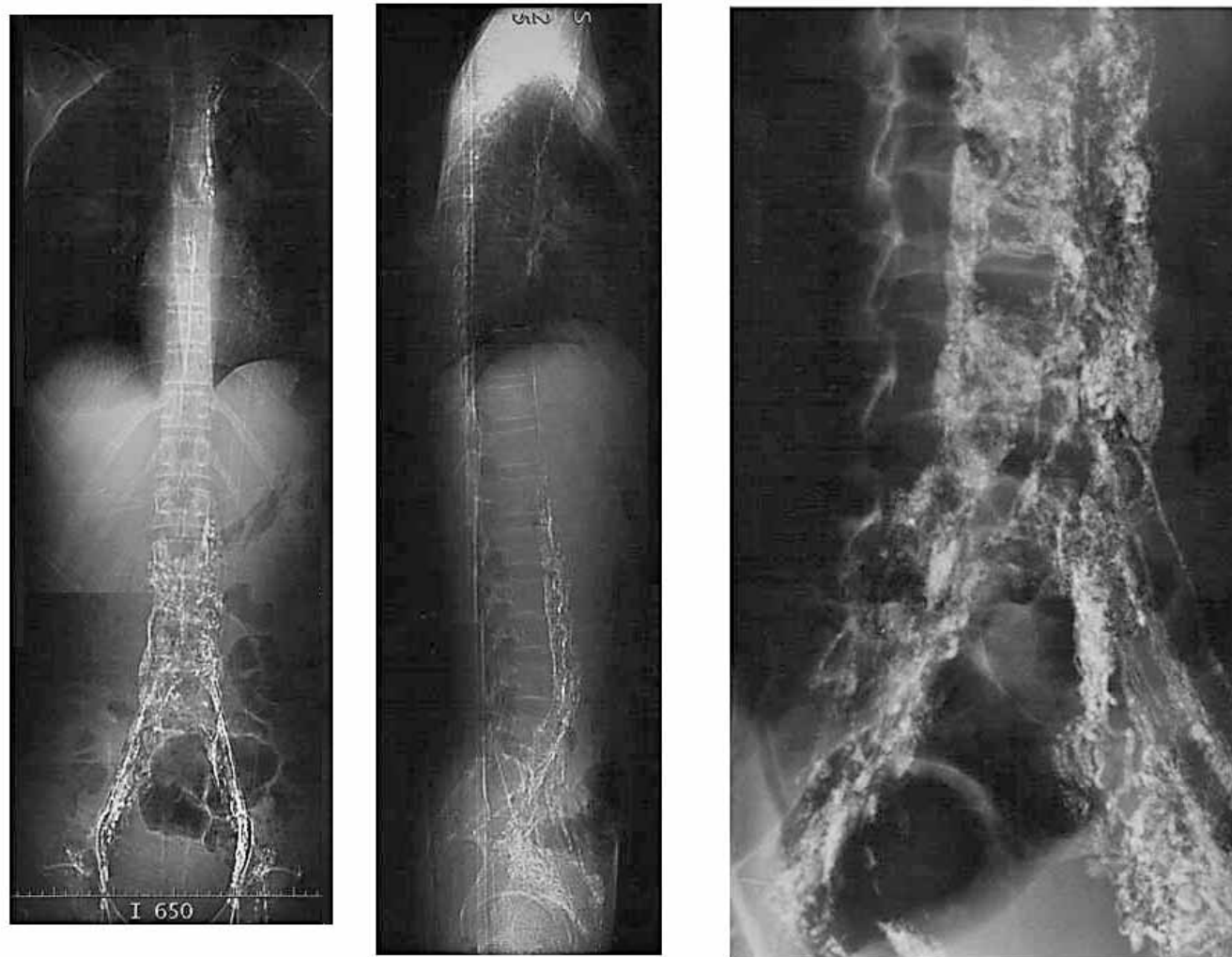


Fig. 1 - Lymphography shows dilated lymphatic pathways at the iliac-lumbar-aortic region, mainly at the right side, with dysplastic vessels and gravitational reflux.

At first, a total parenteral nutrition and protein integration were performed for about a week, but without obtaining any improvement as concerns the metabolic alterations. Hypoalbuminemia and lymphocytopenia persisted. Therefore, it was decided to operate the patient and a proper surgical approach was established. Chylous vessels were pointed out thanks to a fatty meal (60 gr. of butter eaten at 4 o'clock in the morning before operation). They appeared dilated and full of chyle. The operation consisted in multiple antigravitational ligatures of dilated and incompetent chylous vessels and chylous vessel-mesenteric vein microanastomoses (Figs. 2, 3). Chylous dysplastic vessels were ligated with non-absorbable suture material. The difficulty was not to break these vessels in order to avoid chylous ascitis. The iliac and right colic regions were the main areas where we performed these antigravitational ligatures. At the mesocolic area, near the right segment of the trasversus, we could find two dilated chylous collectors which were cut and both cut-ends anastomosed to a near mesocolic vein by an end-to-end telescopic technique, using a U-shaped stitch to pull the collectors inside the vein. Other stitches were put to fix the vessels to the venous stump.

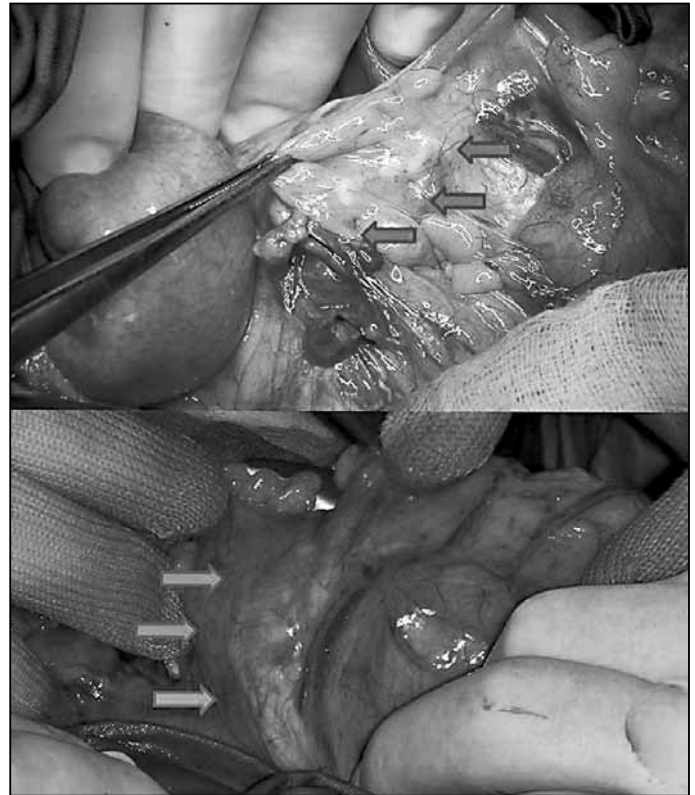


Fig. 2 - Chylous vessels are pointed out thanks to a fatty meal. They appear dilated and full of chyle..

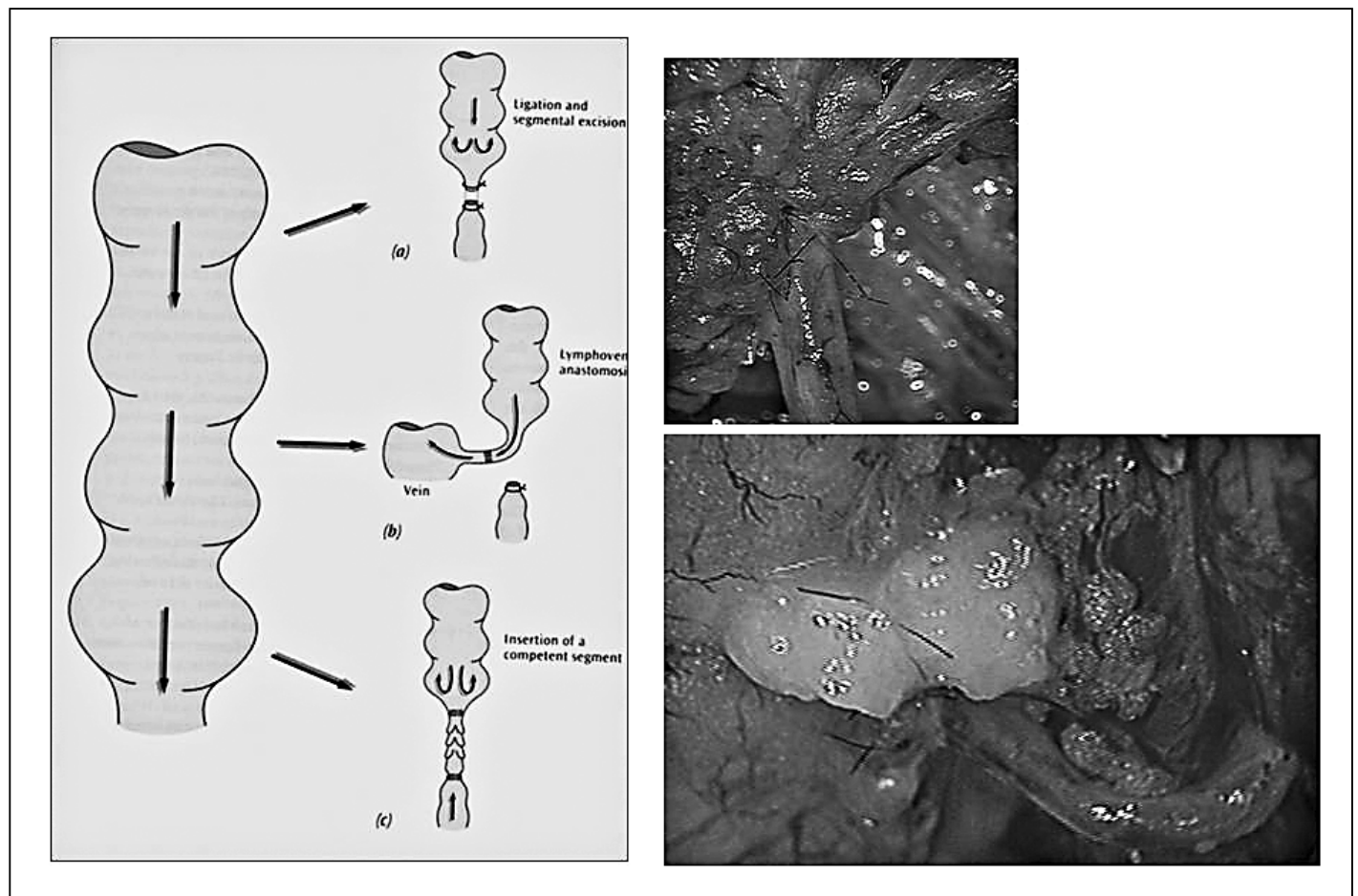


Fig. 3 - Lymphatic-mesenteric vein anastomosis.

RESULTS

In less than a week, biochemical parameters improved and reached almost normality. Post-operative course was favourable and drains could be removed after 5 days, without the appearance of chylous ascitis. After a week of total parenteral nutrition, the patient started eating, following a diet regimen with medium chain triglycerides. Presently, at over 1 year from operation, the metabolic conditions are stable, there no signs of malnutrition and the patient could conduct a normal life, gathering also in weight. Since the chylous dysplasia is very extensive, he is still following a proper diet regimen. But, before microsurgical operation this diet was not sufficient to improve his clinical conditions and to adequately integrate the loss of albumin. Thus, the association of surgical approach and diet were able to help him in reaching stable conditions of a proper metabolic situation and a normal intestinal function without diarrhea.

DISCUSSION AND CONCLUSIONS

In this case the intestinal loss of chyle with proteins and lymphocytes were higher than what it could be administered, thus the surgical approach was necessary and aimed at reducing this leak. The alternative of a right colectomy should have been considered, but this would have been a symptomatic solution not a causal one. This would have brought in this case towards the formation of other areas of gravitational reflux because the dysplasia was more extensive. Instead, performing lymphatic ligatures and deriving the chyle into the blood stream, the reduction of chylous hypertension allowed to obtain a positive and stable result.

The wide ranging extension of the chylous malformations and the complexity of their association with dysplasia of chylo-lymphatic vessels, thoracic duct, and chylous cyst explain why, especially in the newborn, sometimes these conditions affecting multiple-districts are incompatible with life. Further, upon clinical onset of the most severe cases, effective treatment may be difficult to achieve later in life, thus leading to more or less complex prognostic implications involving “*quoad valetudinem*” as well as “*quoad vitam*” issues¹¹.

In conclusion, considering the etiopathogenesis as well as the nature and complexity of chylous dysplasias, the treatment of these difficult pictures and the outcome significantly depend on the skills of the physicians/surgeons and on the available technology and equipment. For this reason, it is highly recommended that these patients be referred to the few centers that have a specific surgical experience in the treatment of this disease.

REFERENCES

1. Browse N., Burnand K.G., Mortimer P.S.: *Diseases of the lymphatics*. Arnold Ed., London, 2003.
2. Servelle M., Noguès C.: *The chyliferous vessels*. Expansion Scientifique Francaise Ed., Paris, 1981.
3. Tosatti E., Cariati E., De Mauro D., Ricco G.: *Linfonodi, cisterna di Pecquet e dinamica antigravitazionale linfatica*. Gazz. Sanit., 1964; 3: 83.
4. Casaccia M., Campisi C.: *Chyloedèmes*. Journal des Maladies Vasculaires, 1988; 13:145.
5. Witte M.H. et al.: *Lymphangiogenesis: mechanisms, significance and clinical implications*. In: “Regulation of Angiogenesis”, edited by ID Goldberg, EM Rosen EM. Basel/Switzerland, Birkhuser Verlag, 1996; 65.
6. Campisi C., Boccardo F.: *Lymphedema and microsurgery*. Microsurgery 2002; 22: 74-80.
7. Aalami O.O., Allen D.B., Organ C.H. Jr.: *Chylous ascites: a collective review*. Surgery 2000; 128: 761-78.
8. Kinmonth J.B.: *The lymphatics. Surgery, lymphography and diseases of the chyle and lymph systems*. E. Arnold Ed., London, 1982.
9. Gruwez J.: *Lymphoedema, basic mechanism, clinical problems, indications for therapy. Chylous reflux*. ISL Congress, Tucson, Arizona, 1973.
10. Press O.W., Press N.O., Kaufmann S.D.: *Evaluation and management of chylous ascites*. Annals of Internal Medicine 1982; 96: 358-64.
11. Campisi C., Boccardo F., Zilli A., Borrelli V.: *Chylous reflux pathologies: diagnosis and microsurgical treatment*. Int Angiol. 1999 Mar; 18(1): 10-3.

AXILLARY WEB SYNDROME (AWS): ITS FEATURES AND THE PHYSICAL TREATMENT PLAN OF CARE

A. MOREAU, O. LEDUC, A. TINLOT, A. CLEMENT, T. PARIJS, J. STRAPPAERT, F. BECKERS, F. PASTOURET, A. LEDUC

Haute Ecole P.H. Spaak, Unité de Lympho-Phlébologie, Brussels, Belgium

ABSTRACT

The purpose of the present study is to compare two physical treatments addressing the axillary web syndrome. 28 patients who underwent breast cancer surgery and who developed an AWS are included in this study. First, the patients filled out a questionnaire. Then, each third physical treatment, several measurements were taken of which, the length and the location of the adherence, the specific joint range of motion, and the pain level using the visual analogue scale (VAS).

We observed a striking link between the axillary surgery and the development of the AWS.

It would seem that an axillary surgery at minima would spawn less lymphatic damages than an axillary clearing; therefore, reducing yet not avoiding the complication. Our data did not allow us to identify the superiority of one treatment over the other. On the other hand, we observed a significant improvement over 13 treatments in both groups and a trend towards a resolution of the AWS in less than 2 months with physical therapy.

KEY WORDS: axillary web syndrome (AWS), physical treatment.

INTRODUCTION

In the physical therapy scope of practice, axillary surgery holds a lot of morbidity and within the potential complications AWS is one of them. This syndrome usually appears between the 2nd and 3rd week post surgery and takes the form of palpable and visible upper extremity adhesions. These adhesions not only can be painful but also restrict significantly shoulder mobility especially in the range of abduction and flexion.

OBJECTIVES

Some authors^(1,2) consider that the AWS has a spontaneous recovery in less than 3 months. However, other authors⁽³⁾ not only questioned the spontaneous recovery but they went further in

stating the significant role played by a well rounded physical treatment plan of care. To this date no consensus is available on the appropriate physical treatment of AWS. Physical therapists confronted with this syndrome support early intervention and use diverse techniques based on their own clinical experience and published articles on the subject.

The objective of the current study is to compare two types of physical treatment of AWS.

METHOD

Our population consists in 28 patients who, after undergoing breast cancer surgery, developed an AWS. First, a questionnaire was filled out by the patient and the physical therapist. Then, every third physical therapy visit, several measurements were taken such as the length and location of the adherence and the upper extremity range of motion (shoulder flexion, abduction, and external rotation, elbow extension, wrist extension). Lastly, a visual analogue scale (VAS) was used to estimate the pain level. The measurements were a mean to describe the adhesions and to objectively evaluate the efficacy of the treatment.

The questionnaire allowed us to gather:

- general patient information and the type of surgery performed;
- precise adherence information;
- the measurements performed on the adhesions.

ANALYSIS

All data were analysed with Graphpad InStat software. The statistical tests were chosen based on the population being normally distributed or skewed and being paired or not. Each test gave us a p-value which allowed us to identify if there was a significant difference: two results were possible:

- Either $p > 0.05$, there is no significant difference;
- Either $p < 0.05$, there is a significant difference.

RESULTS

The physical treatment is described in table 1:

Table 1 - Main features of the treatment under evaluation

Treatment groups	Treatment	Treatment reactivity as perceived by the therapists	Treatment reactivity as perceived by the patients (means of the differences between VAS linked to the adherence and VAS linked to the treatment)
Treatment 1	<ul style="list-style-type: none"> – Manual lymphatic drainage (MLD) – Light adherence stretch 	Pain free range	+1.18 (0-4.5) during treatment time
Treatment 2	<ul style="list-style-type: none"> – Soft tissue work – Adherence stretch – Upper extremity mobilisation 	Pain free as well as within painful range	+0,52 (0-2,4) during treatment time

Treatment 1 consisted in the association of manual lymphatic drainage (MLD) with stretching and mobilisation of the adherence without mobilising the upper extremity. Further, the patient's arm never was positioned beyond the pain free abduction range tolerated. The MLD techniques used during the treatment were the ones suggested and performed according to the Leduc's method. The stretching techniques were performed along the adherence axis either between the thumb and index or between both thumbs. The mobilisation consisted of transverse finger pressures perpendicular to the adherence axis.

Treatment 2 consisted of first petrissage type of massage which was applied at the adherence site, the axilla, the arm, the elbow, and the forearm. In this type of plan of care, the key element is the massage which comes first before any adherence stretching or

mobilisation of the upper extremity. Upper extremity passive mobilisations were set to force shoulder flexion (at times also shoulder abduction). This way, the adherence can also be stretched by combining wrist extension with shoulder flexion. The adherence was also treated by means of the therapist hands in such a way to create a long axis stretching towards both ends. The both treatments could essentially be distinguished by either the use or non use of 2 techniques:

- The MLD solely used in the treatment group 1;
- Passive mobilisations of the upper extremity (set to force shoulder flexion), solely used in the treatment group 2.

We observed the features of our sample and the AWS using 28 patients over a period ranging from 2007 to 2009.

Table 2 - Evolution of the features of the treatment group 1

δ = standard deviation

Parameters (means in %)	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5	p-value
Range in shoulder flexion	100	109,402 (δ = 16,3)	116,247 (δ = 20,5)	118,466 (δ = 25,6)	120,267 (δ = 28,1)	0,0014 Very significant
Range in shoulder abduction	100	109,610 (δ = 18,2)	132,936 (δ = 45,7)	143,838 (δ = 64,7)	155,647 (δ = 92,2)	0,0002 Extremely significant
VAS of adherence	100	85,674 (δ = 15,24)	51,487 (δ = 36,8)	37,925 (δ = 44,4)	28,571 (δ = 48,7)	0,0007 Extremely significant
VAS of treatment	100	76,760 (δ = 38,3)	41,894 (δ = 38,9)	19,222 (δ = 36,3)	14,285 (δ = 37,7)	0,0002 Extremely significant

Table 3 - Evolution of the features of the treatment group 2

Parameters (means in %)	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5	p-value
Range in shoulder flexion	100	112,016 ($\delta = 11,6$)	125,312 ($\delta = 18$)	128,622 ($\delta = 17$)	132,665 ($\delta = 20,6$)	0,0030 Very significant
Range in shoulder abduction	100	117,797 ($\delta = 24,5$)	120,949 ($\delta = 27,3$)	126,060 ($\delta = 27,9$)	146,060 ($\delta = 27,5$)	0,0042 Very significant
VAS of adherence	100	95,267 ($\delta = 51,3$)	83,350 ($\delta = 63,4$)	44,344 ($\delta = 45,9$)	32,309 ($\delta = 43,2$)	0,0007 Significant
VAS of treatment	100	81,347 ($\delta = 17,8$)	56,372 ($\delta = 25,8$)	38,467 ($\delta = 41,2$)	28,856 ($\delta = 39,5$)	0,0101 Significant

Table 4 - Comparison of both groups, of each parameter, of each measurement

Parameters (means in %)	Group 1	Group 2	p-value
Flexion range, M2	109,402 ($\delta = 16,3$)	112,016 ($\delta = 11,6$)	0,7442<0,05
Flexion range, M3	116,247 ($\delta = 20,5$)	125,312 ($\delta = 18$)	0,2908<0,05
Flexion range, M4	118,466 ($\delta = 25,6$)	128,622 ($\delta = 17$)	0,2229<0,05
Flexion range, M5	120,267 ($\delta = 28,1$)	132,665 ($\delta = 20,6$)	0,2229<0,05
Abduction range, M2	109,610 ($\delta = 18,2$)	117,797 ($\delta = 24,5$)	0,5205<0,05
Abduction range, M3	132,936 ($\delta = 45,7$)	120,949 ($\delta = 27,3$)	0,6148<0,05
Abduction range, M4	143,838 ($\delta = 64,7$)	126,060 ($\delta = 27,9$)	0,5806<0,05
Abduction range, M5	155,647 ($\delta = 92,2$)	146,060 ($\delta = 27,5$)	0,8283<0,05
AVS of adherence, M2	85,674 ($\delta = 15,4$)	95,267 ($\delta = 51,3$)	0,6458<0,05
AVS of adherence, M3	51,487 ($\delta = 36,8$)	83,350 ($\delta = 63,4$)	0,2950<0,05
AVS of adherence, M4	37,925 ($\delta = 44,4$)	44,344 ($\delta = 45,9$)	0,8128<0,05
AVS of adherence, M5	28,571 ($\delta = 48,7$)	32,309 ($\delta = 43,2$)	0,8939<0,05
AVS of treatment, M2	76,760 ($\delta = 38,3$)	81,347 ($\delta = 17,8$)	0,8104<0,05
AVS of treatment, M2	41,894 ($\delta = 38,9$)	56,372 ($\delta = 25,8$)	0,4874<0,05
AVS of treatment, M2	19,222 ($\delta = 36,3$)	38,467 ($\delta = 41,2$)	0,4118<0,05
AVS of treatment, M2	14,285 ($\delta = 37,7$)	28,856 ($\delta = 39,5$)	0,5325<0,05

DISCUSSION

Our population consists of 28 patients who present an AWS following breast cancer surgery.

Over a 2 year follow up, we observed that none of our patients received a surgery limited to the breast. Indeed, all the surgeries performed also involved the axillary region. These observations are supported by Moskovitz's study (2001). Indeed, Moskovitz's study, conducted over a 16 year period, found 44 cases of AWS over 750 breast cancer surgeries. None of the AWS was observed after a surgery limited to the breast. Therefore, the AWS seems to be related to axillary surgery.

Regarding axillary surgery, we saw in our study that 82.14% of the subjects (23 patients) had an axillary clearing whereas only 17.85% had sentinel node removal (5 patients).

These values are close to Leidenius observations (2003). Indeed, based on a sample of 85 female patients who had breast cancer surgery Leidenius observed that:

- 20% of AWS in the patients who underwent the sentinel node surgical technique (10 patients over 49)
- 72% of AWS in the patients who underwent the axillary clearing (26 patients over 36)

Without preventing the occurrence of AWS, it would seem that a more restricted axillary surgery, spawning less lymphatic damages, reduces the incidence of the syndrome. An average delay of 15.26 (± 10.4) days for the occurrence of the AWS is observed in our study. This delay is in total agreement with Moskovitz's study (2001), in which was found a peak of occurrence between the 2nd and 3rd week post-surgery. Regarding our study, for both groups, the evolution of the physical treatment plan of care data varied from significant to extremely significant. This level of significance is observed over the first five measurements, which corresponds to 13 physical treatments. Therefore, based on these results we can conclude that both treatments are efficient within 13 treatments. The post-test didn't reach the level of significance for the observed differences between each measurement time or over 3 physical treatments. Based on the level of significance, the efficacy of the treatments was reached solely after 13 treatments. This is in agreement with Brandao⁽⁴⁾ who reported a significant evolution after 10 physical treatments. Regarding the between group comparison, for each variables and at each time of measurement the results never reached the level of significance. Therefore, we can conclude that none of the treatments is superior over the other. Since there was a significant clinical improvement after 10 treatments (whether be it a classical approach or combined to MLD), physical treatment should be implemented in case of AWS. Knowing that we observed a significant improvement for both of our groups after 13 treatments, ideally, we should now make the attempt to show that physical treatment allows a faster recovery from this syndrome. In fact, we observed respectively a delay to

recovery of 44.44 (± 14.16) days for group 1 and of 46.63 (± 11.52) days for group 2. The delays correspond to about one month and a half. Therefore, our data show a trend towards a recovery in less than 2 months when AWS is addressed by physical treatment.

CONCLUSION

Based on these results, physical treatment seems to play a positive role in the recovery from AWS. Therefore, despite a potential spontaneous recovery in less than 3 months physical therapy should be considered in the plan of care of AWS.

BIBLIOGRAPHY

1. Moskovitz A.H., Anderson B.O., Yeung R.S., Brd D.R., Lawton T.J., Moe R.E.: *Axillary web syndrome after axillary dissection*. The American Journal of Surgery, 2001; 181: 434-439.
2. Leidenius M., Leppanen E., Krogerus L., Von Smitten K.: *Motion restriction and axillary web syndrome after sentinel node biopsy and axillary clearance in breast cancer*. The American Journal of Surgery, 2003; 185: 127-130.
3. Kepics, Jane M.: *Physical therapy treatment of axillary web syndrome*. Rehabilitation Oncology, 2004.
4. Brandao R., Jordao S., Duarte N., Pascoalinho J., Jordao J., Rosario Vieira M., Colarinho P., Quaresma P., Calado D.: *Manual lymphatic drainage with and without nonsteroidal anti-inflammatory drugs associated to the conventional treatment of physical therapy in the lymphatic vessel "overload"*. Re(habilitar), 2006; 3: 87-108.

17th EUROPEAN CONGRESS
EUROPEAN SOCIETY OF PHYSICAL and REHABILITATION MEDICINE

VENICE ITALY
23/27 MAY 2010

SIMFER
SOCIETÀ ITALIANA DI MEDICINA
FISICA E RIABILITATIVA
The Italian Society of Physical and
Rehabilitative Medicine

ESPRM

Tuesday, May 25

	COURSES Room	Laguna Room	Perla Room	Mosaici A Room	Mosaici B Room	Room 1	Room 2	POSTER SESSION D
09.00-09.30 a.m.								
09.30-10.00								
10.00-10.30	COURSE: The PHYSIATRIST and URO- GYNECOLOGICAL REHABILITATION (P. Di Benedetto)	Evidence based assessment and rehabilitation of patients with chronic pain (L.J. Carroll, S. McDonough, B. Gerdle)	ESPRM-ESIL JOINT SESSION ON REHABILITATIVE APPROACH TO PHLEBOLYMPHAEDEMA (Michelini, Ricci, Leduc, Foddi, Campisi, Boccardo, Pissas, Rubay, Priour, Adriaens, Cardone, Falla, Moneta, Fiorentino, Cappellino, Cordero, Corda, Belgrade)	Joint Session ESPRM/SIGASCOT Physiatrist and Orthopaedics (M. De Marchi, G. Melegati, S. Della Villa, F. Pontegaglia)	Advancing in Rehabilitation Research: Perspectives and methodology for research in PRM (J. De Lisa, A. Liberati, M. Taricco; A. Tennant, G. Stucki, G. Grimby, A. Cieza, M. Zampolini, L. Tesio, F. La Porta, J.L. Thonnard, S. Negri, F. Franchignoni)	ACADEMIE Européenne de Médecine de réadaptation - Meeting for the Académie Members only (J.P. Didier, G. Lankhorst)	National Societies Meetings	
10.30-11.00								
11.00-11.30								
11.30-12.00		Joint Session PAIN Symposium AOSPRM (J. Li, S. Royvagan, A. Wong, R. Casale)	PRM Diagnostics (T. Paternostro Sluga, S. Sterzi)	SPA and Thermal Treatments in PRM (C. Guenbrunner, T. Bender, M. De Fabritius, P. Cantale)		ITALIAN RELATIONSHIPS BETWEEN PRM DOCTORS AND OTHER PHYSICIANS (D. Fietzer)	Meetings for Promotion of International Research	
12.00-12.30								
12.30-01.00 p.m.								
01.00-01.30								
01.30-02.00								
02.00-02.30								
02.30-03.00								
03.00-03.30								
03.30-04.00								
04.00-04.30								
04.30-05.00								
05.00-05.30								
05.30-06.00								
06.00-06.30								
06.30-07.00								

23rd International Congress of Lymphology

September 19-23 2011

Malmö, Sweden

23rd International Congress of Lymphology



Welcome to Sweden and the 23rd International Congress of Lymphology!

Dear Colleagues and Lymphologists!

The Department of Plastic and Reconstructive Surgery at Malmö University Hospital, Sweden, is honoured to organize the 23rd International Congress of Lymphology in cooperation with the Faculty of Medicine at Lund University, and the Swedish Lymphology Association. Problems related to the lymphatic system are central issues for us, and one of our main focuses is the development of surgical techniques related to lymphology.

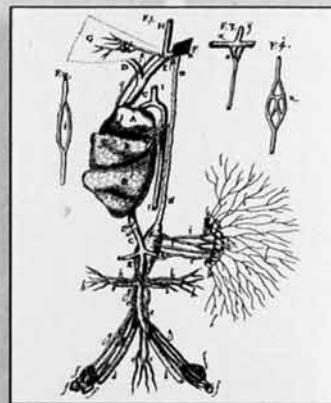
Olof Rudbeck (1630-1702), a Swedish scientist, published his first treatise *De Circulatione Sanguinis* in 1652, at the age of 22 years only, and he actually became the first one to describe the delineation and function of the lymphatic system in *Nova Exercitatio Anatomica*, which he published one year later. With this historical perspective in mind, we are enthusiastic about hosting the 23rd International Congress of Lymphology in Sweden. We are also proud of being entrusted with the task of arranging the prestigious congress in the city of Malmö. In fact, Malmö connects on to another pioneering scientific work in the field of lymphology performed by Thomas Bartholin (1616-1680), who was active in the nearby capital of Denmark, Copenhagen.

In 2011, from September 19 to 23, the most renowned scientists from all over the world will gather in Malmö to present and debate their front line knowledge and experiences in the various fields of lymphology. This will assure for an interdisciplinary and all-round illumination of the lymphatic system, its pathophysiology, and the state-of-the-art of different treatment regimes. Moreover, at the end of the summer but before fall, September is an excellent time of the year to visit Sweden.

We look forward to seeing you all in Malmö on this very special occasion. Please contact us for any additional information or suggestions that can make your stay even more pleasant in our dynamic and beautiful city.

On behalf of the Organizing Committee,

Håkan Brorson, MD, PhD
Congress President



Turning Torso, a 190 m tall
building for residents.
Photo: Pierre Mens

www.lymphology2011.com

23rd International Congress of Lymphology

Program outline

Monday September 19

Registration opens

Tuesday September 20

Welcome reception

Wednesday September 21

Optional social evening,
Tivoli Gardens in Copenhagen

Thursday September 22

Congress dinner

Friday September 23

Congress ends at noon



*Tivoli Amusement Park
in Copenhagen.
Photo: Tivoli*



Life in the Viking village



*Malmö Opera House
Photo: Charlotte Strömwall*

Topics will include:

- Anatomy of lymphatic system
- Physiology of lymphatic system (lymphatic endothelial cells, lymphatics and lymph nodes)
- Physiopathology of lymph stasis and related disorders (infection, fibrosis, adipose tissue)
- Prevention
- New frontiers in lymphatic research (genetics, lymphangiogenesis, lymphatic dysplasias)
- Lymphatic imaging
- Cancer and lymphedema (oncolymphology & sentinel node)
- Filariasis and lymphedema
- Clinic on lymphedema (diagnosis, staging, classification)
- Treatment (surgery, complex decongestive therapy, rehabilitation, alternative therapy, new approaches)
- Phlebolympatology

www.lymphology2011.com

Compression stockings straight to the right solution

VARISAN^{Top}
Fashion

VARISAN^{Top}
Lui & Lei

VARISAN^{Top}

VARISAN^{Top}

VARISAN^{Top} guanto

VARISAN^{Top} soft

VARISAN^{Top} A.T.E

VARISAN^{Top} bracciale

VIVA^{Top}

VARISPORT^{Top}

