

OFFICIAL ORGAN  
OF THE



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ROMANIAN SOCIETY OF LYMPHOLOGY  
GREEK SOCIETY OF LYMPHOLOGY

THE EUROPEAN JOURNAL  
OF  
**lymphology**  
and related problems

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**XXXVIII Congress  
of European Society of Lymphology**

**Berlin (Germany) - 13-15 September, 2012**

**andel's Hotel Berlin - Landsberger Allee 106**

**D-10369 Berlin - Germany**

***Clinical Sciences***

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## 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

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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.

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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.

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# XXXVIII CONGRESS

## Berlin, Germany - September 13-15, 2012

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## **38<sup>th</sup> European Congress of Lymphology**

**September 13-15, 2012**

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### **From the Wellcome Message**

Dear Colleagues,

In my capacity of President of the 38<sup>th</sup> ESL-Congress it is a great honour for me to welcome you on 14-15 September, 2012 in Berlin.

The congress will offer delegates and guests an interaction between research and clinically relevant problems. Famous representatives of our discipline from all over the world will give an overview of actual problems of clinical Lymphology.

Lymphological research has a long tradition in Germany, which is the homeland of the conservative treatment of lymphedema. Namely scientists and pioneers such as Virchow, Esmarch, Kulenkampff, Winiwarter, Bennhold and others.

The congress will also offer many opportunities for meetings and interactive discussions. It will serve as a platform for researchers, clinicians and lymphedema therapists.

Come to visit the ESL-Congress in Berlin. The metropolis welcomes you with its multi-cultural charm and many attractions: museums, theatres, music, sightseeing and tours.

**Prof. Dr. Etelka Földi**

# 38<sup>th</sup> European Congress of Lymphology

In cooperation with the society of germany speaking lymphologists  
under the auspices of the International Society of Lymphology

## Scientific program

<b>Thursday, September 13<sup>rd</sup>, 2012</b>	
<b>JOBST Symposium - Precongress</b>	
<b>10.00</b>	<b>Welcome</b>
<b>KEY NOTE LECTURES</b>	
<b>10.15-11.00</b>	<b>DIFFERENT TYPES OF WOUNDS, OVERVIEW OF A TYPICAL WOUND CLINIC</b> Dr. med. Mieke Flour, Belgium
<b>11.00-11.45</b>	<b>LYMPHEDEMA AND WOUNDS / PHLEBEDEMA AND WOUNDS</b> Prof. Dr. med. Hugo Partsch, Austria
<b>11.45-12.00</b>	<b>Coffee break</b>
<b>12.00-12.45</b>	<b>LYMPHEDEMA AND WOUNDS, A CONSERVATIVE TREATMENT APPROACH</b> Prof. Dr. med. Etelka Földi, Germany
<b>12.45-13.00</b>	<b>SUMMARY OF KEY NOTES</b> Prof. Dr. med. Christine Moffatt, United Kingdom
<b>13.00-14.00</b>	<b>Lunch</b>
<b>GLOBAL EXPERIENCES AND SOLUTIONS</b>	
<b>14.00-14.20</b>	<b>GERMANY – SIGNIFICANCE OF CDT FOR THE WOUND BED PREPARATION OF LEG ULCERA</b> Dr. med. Michael Oberlin, Germany
<b>14.20-14.40</b>	<b>ITALY – THE CEAP-L CLASSIFICATION FOR LYMPHEDEMA: THE ITALIAN EXPERIENCE</b> Prof. Dr. med. Vincenzo Gasbarro, Italy
<b>14.40-15.00</b>	<b>SPAIN – CLINICAL MANAGEMENT OF WOUNDS IN LYMPHEDEMA PATIENTS</b> Dr. med. Isabel Forner-Cordero, Spain
<b>15.00-15.20</b>	<b>ITALY – COMPRESSION GARMENTS, COMPLIANCE AND PROGNOSIS</b> Dr. med. Giovanni Moneta, Italy
<b>15.20-15.40</b>	<b>ITALY – SKIN LESIONS AND REHABILITATIVE PROGRAMS FOR LYMPHEDEMA PATIENTS</b> Dr. med. Domenico Corda, Italy
<b>15.40-16.00</b>	<b>UK – THE CHALLENGES OF MANAGING LYMPHEDEMA AND WOUND PATIENTS: AN UK EXPERIENCE</b> Prof. Dr. med. Christine Moffatt, United Kingdom
<b>16.00-16.20</b>	<b>Coffee break</b>
<b>16.20-17.20</b>	<b>Round table discussion</b>
<b>17.20-17.40</b>	<b>Summary</b>

<b>Thursday, September 13<sup>rd</sup>, 2012</b>	
<b>38<sup>th</sup> European Congress of Lymphology in Berlin</b>	
<b>13.00-14.00</b>	<b>Registration</b>
<b>FREE LECTURES</b>	
<i>Chairmen</i>	Dr. M. Földi, Dr. Dimakakos, Dr. Martin
<b>14.00-14.15</b>	<b>NEW TRENDS IN THE THERAPY OF LYMPHEDEMA AND SECONDARY INFLAMMATION REACTION IN WOUND HEALING IN TRAUMATOLOGY</b> Dr. med. Anna Loskotova, CZ
<b>14.15-14.30</b>	<b>THE MULTICOMPONENT MEDICATION LYMPHOMYOSOT ACCELERATES THE WOUND HEALING PROCESS LEADING TO IMPROVEMENT OF EXPERIMENTAL LYMPHEDEMA</b> Dr. rer. nat. Yvonne Burmeister, Germany
<b>14.30-14.45</b>	<b>THE IMPORTANCE OF INTERDISCIPLINARY COLLABORATION IN THE CONSERVATIVE TREATMENT OF LYMPHEDEMA</b> Dr. med. Evangelos Dimakakos, Greece
<b>14.45-15.00</b>	<b>THERMOGRAM RELATED WITH DERMA BACKFLOW</b> PT PhD Jean-Paul Belgrado, Belgium
<b>15.00-15.15</b>	<b>LYMPHEDEMA TREATMENT IN SLOVENIA</b> Dr. med. Tanja Planinsek Ruciga, Slovenia
<b>15.15-15.30</b>	<b>THE USE OF MLD IN LYMPHEDEMA IN INDIA</b> Dr. med. Gurusamy Manokaran, India
<b>15.30-15.45</b>	<b>NET EFFECT OF LYMPHATICOVENOUS SIDE-TO-END ANASTOMOSIS ON VOLUME REDUCTION IF PERIPHERAL LYMPHEDEMA AFTER COMPLEX DECONGESTIVE PHYSIOTHERAPY</b> Prof. Dr. med. Jiro Maegaw, Japan
<b>15.45-16.00</b>	<b>VASCULAR LIMITATIONS IN COMPRESSION THERAPY – HOW TO OVERCOME</b> Dr. med. Christian Ure, Austria
<b>16.00-16.15</b>	<b>ACUTE LYMPHANGITIS: SURGICAL APPROACH TO LYMPHATIC URGENCY</b> Dr. med. Alberto Macciò, Italy
<b>16.15-16.30</b>	<b>FIBEROPTIC LASER TREATMENT FOR LYMPHEDEMA (video presentation)</b> Prof. Dr. med. Beniamino Palmieri, Italy
<b>16.30-19.00</b>	<b>ISL Executive Committee Meeting</b>

**Friday, September 14<sup>rd</sup>, 2012**

**07.30-08.30 Registration**

**08.30-09.30 Opening Ceremony**

**SESSION I**

*Chairmen* Prof. BAUMEISTER, Prof. MICHELINI, Prof. PISSAS

**09.00-09.15 THE ANATOMY OF THE HUMAN AXILLA: CAN WE AVOID THE DEVELOPMENT OF LYMPHEDEMA AFTER AXILLARY DISSECTION?**

Prof. Dr. med. Eliska Oldrich, Czech Republic

**09.15-09.30 AWS: NATURE AND LOCALIZATION. MRI AND US IMAGING CORRELATED WITH CLINICAL ANATOMY**

Dr. med. Oliver Leduc, Belgium

**09.30-09.45 LYMPHATIC DRAINAGE OF THE HEAD AND FACE: A NEW TOPOGRAPHIC CLASSIFICATION – CLINICAL AND SURGICAL APPLICATION**

PD Dr. med. Miguel Angel Amore, Argentina

**09.45-10.00 THE INFLUENCE OF ANATOMY AND MICRO-CIRCULATION ON LYMPHSCINTIGRAPHY**

Prof. Dr. med. Pierre Bourgeois, Belgium

**10.00-10.15 THE SIGNIFICANCE OF THE DORSOLATERAL LYMPH VESSEL BUNDLE IN THE LEG UNDER PHYSIOLOGICAL AND PATHOPHYSIOLOGICAL CONDITIONS**

PD Dr. med. Vivien Schacht, Germany

**10.15-11.00 Coffee break**

**SESSION II**

*Chairmen* Prof. LEONG, Prof. WITTE, Prof. OKADA

**11.00-11.15 THE METABOLISM OF HYALURONIC ACID IN PERIPHERAL LYMPHEDEMA**

Prof. Dr. med. Liu Ningfei, China

**11.15-11.30 THE MITOGENIC EFFECT OF HUMAN TISSUE FLUID/LYMPH ON KERATINOCYTE PROLIFERATION**

Prof. Dr. med. Waldemar Olszewski, Polen

**11.30-11.45 CLINICAL, GENETIC AND LYMPHOSCINTIGRAPHY STUDY OF 9 FAMILIES AFFECTED BY PRIMARY LYMPHEDEMA CARRYING VEGFR3 AND FOXC2 MUTATIONS: A COMPARISON BETWEEN CLINICALLY AFFECTED AND UNAFFECTED SUBJECTS**

Prof. Dr. med. Sandro Michelini, Italy

**11.45-12.00 THE BALANCE OF PRO- AND ANTI-LYMPHANGIOGENETIC FACTORS IN DEVELOPMENT AND DISEASES**

Prof. Jörg Wilting, Germany

**12.00-12.15 IN VIVO IMAGING OF THE LYMPH VESSELS AND CHANGES OF THE LYMPH FLOW IN OBESITY**

Dr. med. Katrin Blum, Germany

**12.15-12.30 DIFFERENCE IN CALCITONIN-GENE RELATED PEPTIDE (CGRP)- BETWEEN PATIENTS WITH SECONDARY LYMPHEDEMA AND HEALTHY VOLUNTEERS**

Prof. Dr. med. Moriya Ohkuma, Japan

**12.30-13.30 Lunch**

**12.00-13.00 GDL Executive Committee Meeting**

**SESSION III**

*Chairmen* Prof. RÖBLER, Prof. WILTING, Prof. WOHLGEMUTH

**13.30-14.00 CHOLESTASIS IN AEGENAES SYNDROME: NEW DATA**

Prof. Dr. med. Øystein Aagenaes, Norwegen

**14.00-14.15 LYMPHANGIOMATOSIS/ GORHAM SYNDROME IN PEDIATRIC PATIENTS: NEW THERAPEUTIC APPROACH**

Prof. Dr. med. Joachim Rößler, Germany

**14.15-14.30 THERAPEUTIC OPTIONS IN THE TREATMENT OF LYMPHATIC MALFORMATIONS WITH AND WITHOUT LYMPHORRHEA**

Prof. Dr. med. Walter Wohlgemuth, Germany

**14.30-14.45 OVERGROWTH SYNDROMES WITH AND WITHOUT VASCULAR MALFORMATIONS**

Prof. Dr. med. Cristobal Papendieck, Argentina

**14.45-15.00 MANAGEMENT OF LYMPHEDEMA IN CHILDREN**

Dr. Ft. Alessandro Failla, Italy

**15.00-15.30 Coffee break**

**SESSION IV**

*Chairmen* Ass.Prof. JOHANSSON, Dr. FELMERER, Prof. PAPPENDIECK

**15.30-15.50 THE ROLE OF THE FASCIA IN THE TREATMENT OF LYMPHEDEMA**

PT PHD. Willem Fourie, South Africa

**15.50-16.05 PROBLEMS AND PITFALLS IN CLINICAL LYMPHOLOGY: 2 CASE REPORTS**

Dr. med. Klaus-Peter Martin, Germany

**16.05-16.20 TREATMENT OF LYMPHEDEMA OF LOWER LIMBS IN PATIENTS AFFECTED BY SEVERE PERIPHERAL ARTERIAL DISEASE**

Dr. med. Amer Hamadé, France

**16.20-16.35 LYMPHOLOGICAL COMPLICATIONS AFTER VASCULAR SURGICAL PROCEDURES**

Dr. med. Ingo Flessenkämper, Germany

**16.35-16.50 THE UNIT OF TREATMENT OF EDEMA IN FRANCE: A PECULIAR STRUCTURE AND ITS PLACE IN THE TREATMENT OF LYMPHEDEMA**

Dr. Alexandre Pissas, France

**16.50-17.05 LYMPHEDEMA ASSOCIATED WITH MORBID OBESITY: A COMPREHENSIVE THERAPEUTIC CONCEPT**

Dr. med. Tobias Bertsch, Germany

**17.05-17.20 EFFECTIVENESS OF CONSERVATIVE COMBINED TREATMENT IN LIPEDEMA PATIENTS**

Dr. med. Marco Cardone, Italy

**17.30-19.30 ESL Executive Committee Meeting**

**20.00 Gala Dinner**

**Saturday, September 15<sup>rd</sup>, 2012**

**SESSION V**

*Chairmen* Prof. CAMPISI, Prof. BRORSON, Prof. MASIA

**08.30-08.45 COMBINED SURGICAL TREATMENT FOR LYMPHEDEMA: EXPECTATIONS AND LIMITS**

Prof. Dr. med. Jaume Masia, Spain

**08.45-09.00 PITTING AND NON-PITTING LYMPHEDEMA: THE PRESENCE OF ADIPOSE TISSUE IN LYMPHEDEMA**

Prof. Dr. med. Hakan Brorson, Sweden



- 09.00-09.15 LYMPHATIC SURGERY AND MICROSURGERY TODAY**  
Prof. Dr. med. Corradino Campisi, Italy
- 09.15-09.30 PREVENTION AND TREATMENT OF LYMPHATIC MORBIDITY IN SURGICAL ONCOLOGY**  
Prof. Dr. med. Francesco Boccardo, Italy
- 09.30-09.45 INTERCONNECTED TREATMENT OPTIONS FOR LYMPHEDEMA: A BENEFIT FOR THE PATIENT!**  
Prof. Dr. med. Rüdiger Baumeister, Germany
- 09.45-10.00 THE IMPORTANCE OF ADDITIVE PLASTIC SURGERY PROCEDURES IN THE TREATMENT OF CHRONIC LYMPHEDEMA**  
Ass. Prof. Dr. med. Nestor Torio-Padron, MD, Germany
- 10.10-10.30 *Coffee break***
- SESSION VI**
- Chairmen* Dr. LEDUC, Dr. DÖLLER, Prof. OLSZEWSKI
- 10.30-10.45 CLINICAL TRIAL: LONG TERM RESULTS OF PHYSICAL THERAPIES IN LYMPHEDEMA**  
Dr. med. Isabel Forner-Cordero, Spain
- 10.45-11.00 RISK FACTORS FOR ERYSIPELAS IN LYMPHEDEMA**  
Dr. med. Walter Döller, Austria
- 11.00-11.15 LYMPHEDEMA OF THE BREAST: DIAGNOSTICS AND CONTROLLING OF THERAPEUTIC RESULTS**  
Dr. med. Michael Oberlin, Germany
- 11.15-11.30 LYMPH COLLECTOR TRANSPLANTATION FOR LYMPHEDEMA MANAGEMENT IN CANCER PATIENTS: A PROSPECTIVE STUDY**  
Cand. med. Thiha Aung, Germany
- 11.30-11.45 PRIMARY PREVENTION AFTER BREAST CANCER SURGERY: ECHO-COLOUR-DOPPLER DIAGNOSTICS VERSUS LYMPHOSCINTIGRAPHY EXAM**  
Dr. med. Marina Cestari, Italy
- 11.45-12.00 ULTRASOUND ELASTOGRAPHY AS AN OBJECTIVE DIAGNOSTIC MEASUREMENT TOOL FOR LYMPHEDEMA OF THE TREATED BREAST IN CANCER PATIENTS FOLLOWING BREAST CONSERVING SURGERY AND RADIOTHERAPY**  
Dr. med. Nele Adriaenssens, Belgium
- 12.00-12.15 PATHOLOGICAL STEPS OF CANCER-RELATED LYMPHEDEMA: HISTOLOGICAL CHANGES IN THE FOLLOWING LYMPHATIC VESSELS AFTER LYMPHADENECTOMY**  
Dr. med. Mihara Makoto, Japan
- 12.15-12.30 LYMPHATIC CLINICAL SEVERITY SCORE (LCSS) AND DISABILITY WITH LYMPHEDEMA**  
Prof. Dr. med. Sandro Michelini, Italy
- 12.30-12.45 PREREQUISITES FOR SUCCESSFUL CONSERVATIVE TREATMENT OF EXTREMITY LYMPHEDEMA**  
PT PhD Jean Paul Belgrado, Belgium
- 12.45-13.00 *End of the congress: Farewell to the participants***
- 13.00-15.00 *General Assembly ESL***
- 14.00-17.00 *Guideline session: GDL***

**Saturday, September 15<sup>th</sup>, 2012**

**Poster Session**

- 1. EARLY CONTRALATERAL SHOULDER-ARM MORBIDITY IN BREAST CANCER PATIENTS ENROLLED IN A RANDOMIZED TRIAL OF POST-SURGERY RADIATION THERAPY**  
Dr. med. Nele Adriaenssens, Belgium
- 2. EFFECTS OF COMBINED DECONGESTIVE PHYSIOTHERAPY WITHOUT BANDAGING IN INTENSIVE LYMPH DRAINAGE AND SUBSEQUENT MAINTENANCE**  
Ayako Tosaki, Japan
- 3. THE CURRENT TREATMENT FOR LYMPHEDEMA IN TURKEY**  
PT.PhD. Assoc.Prof. Yesim Bakar, Turkey
- 4. EVALUATION OF JOINT POSITION SENSE IN PATIENTS WITH PRIMARY LYMPHEDEMA – A CASE REPORT**  
Akin Baskent, Turkey
- 5. LYMPHATIC COLLECTOR VESSEL PUMP FUNCTION IS NOT ACUTELY INFLUENCED BY AXILLARY SURGERY FOR BREAST CANCER**  
PhD stud. Viviana Cintolesi, United Kingdom
- 6. RESEARCH OF BIOMECHANICAL AND LABORATORY ABNORMALITIES OF PATIENTS WITH LYMPHEDEMA OF LOWER EXTREMITIES**  
Dr. med. Sergey Katorkin, Russia
- 7. AUTOLOGOUS GROIN LYMPH NODE TRANSFER FOR SENTINEL LYMPH NETWORK RECONSTRUCTION AFTER NEAD-AND-NECK CANCER RESECTION AND NECK LYMPH NODE DISSECTION**  
Dr. med. Mihara Makoto, Japan
- 8. AXILLARY WEB SYNDROME COMBINED WITH LONG THORACIC NERVE INJURY AFTER AXILLARY DISSECTION: A CASE REPORT**  
Dr. med. Dolores Maldonado, Spain
- 9. MICROSURGICAL LYMPHOVENOUS ANASTOMOSES AFTER 45 YEARS – FOLLOW UP AND INDICATIONS**  
Prof. Dr. med. Waldemar Olszewski, Poland
- 10. TISSUE FLUID HYDRAULICS: NEW DATA**  
Prof. Dr. med. Waldemar Olszewski, Poland
- 11. WHERE DOES TISSUE FLUID/LYMPH ACCUMULATE DURING MANUAL AND PNEUMATIC MASSAGE AND ELASTIC GARMENT COMPRESSION IN LYMPHEDEMATOUS LOWER LIMB**  
Prof. Dr. med. Waldemar Olszewski, Poland
- 12. VEGF-C-APPLICATION AND THE REGENERATION AND RECONNECTION OF AUTOTRANSPLANTED LYMPH NODE FRAGMENTS IN RATS: THE EFFECTS OF TIME POINT, LOCATION AND DOSAGE**  
Lia Schindewolffs, Germany
- 13. FORMATION OF TISSUE FLUID CHANNELS IN LYMPHEDEMATOUS SUBCUTANEOUS TISSUE DURING INTERMITTENT PNEUMATIC COMPRESSION THERAPY**  
Dr. med. Marzanna Zaleska, Poland
- 14. PHYSIOLOGICAL PARAMETERS FOR EFFECTIVE COMPRESSION THERAPY OF SWOLLEN LOWER LIMBS – TISSUE FLUID PRESSURE AND FLOW, TONOMETRY**  
Dr. med. Marzanna Zaleska, Poland
- 15. TONOMETRY OF LIMB LYMPHEDEMATOUS TISSUES PROVIDES DATA FOR APPLYING EFFECTIVE COMPRESSION FORCE**  
Dr. med. Marzanna Zaleska, Poland
- 16. LYMPHANGIOSARCOMA, A LATE BUT RARE COMPLICATION IN LYMPHOSTASIS: THE ROLE OF PHYSIOTHERAPISTS IN EARLY RECOGNITION AND MANAGEMENT**  
C. Campisi, G. Cavallero, A. Macció, S. Accogli, F. Boccardo

Thursday, September 13<sup>rd</sup>, 2012 - H. 10,15

## JOBST Symposium - Precongress

### Key Note Lectures

#### 1. DIFFERENT TYPES OF WOUNDS, OVERVIEW OF A TYPICAL WOUND CLINIC

Dr. med. MIEKE FLOUR

*University Hospitals Leuven, Belgium*

A dedicated wound clinic will get referrals of patients suffering from different types of wounds, which for some reason are either complicated or hard to heal, and for which a second opinion, management advice, or advanced treatment is sought.

Table 1 lists a selection of wounds that are considered to have either an acute cause and evolution profile, or a chronic and retarded healing pattern. In addition, some special types of wounds deserve a specific and multidisciplinary management. These are wounds most frequently encountered in the northern countries. In other parts of the world, the list would be substantially different.

A detailed recording of history and sound clinical examination are of paramount importance when trying to define etiological factors.

For most categories of wounds, the clinical (differential) diagnosis will need confirmation by relevant diagnostic investigations in order to document the underlying cause(s) but also any co-morbidity or any detrimental factors that may retard healing or predispose the patient to possible complications, such as infection or bleeding.

In some cases, the patient's skin and subcutaneous tissues' fragility is so high that even minor trauma may result in major tissue defects or complications. Examples are skin tears in atrophic skin, contusion with hematoma in patients taking steroids and anticoagulants, or insensitive neuropathic limbs where the impact of trauma is usually underestimated.

Delayed healing may be due to repetitive trauma, which can be mechanical or chemical, infection, deficiencies in essential nutrients, or to poor tissue perfusion, to name the most prevalent causes. Local and regional edema is a frequently overlooked negatively contributing factor in wound healing.

Deep infections with abscess formation, dehiscence due to fluid accumulation, necrotic tissue or metabolically diseased fatty tissue are to be considered as some of the most prevalent underlying causes for non-healing traumatic or surgical wounds.

While venous and arterial insufficiency are the predominant etiology for chronic wounds on limbs in western countries, other vascular diseases or malfunctioning must be considered, such as syndromes predisposing to increased coagulation, or the occlusion of vessels as found in cases of vasculitis, Buerger's disease, calciphylaxis, embolization, connective tissue diseases or hypertensive vasculopathy.

In pyoderma gangrenosum, as in hydradenitis suppurativa, explosive bouts or uncontrollable recurrent flares of inflammation are considered to be an explanation for the abrupt onset and protracted course of the lesions. Other situations where the etiology remains present are blistering auto-immune diseases and genetic disorders resulting in skin defects, such as epidermolysis bullosa. For obvious reasons, ulcerated tumors may also remain unhealed. And even if treatment of the tumor may lead to a cure, the radiotherapy or chemotherapy in itself is a possible iatrogenic cause of morbidity resulting in retarded healing of wounds. On the other hand, some patients present with self-inflicted wounds, such as intricate cases of automutilation and drug abuse.

**Table 1. Different types of wounds. Overview of a typical wound clinic.**

##### **Acute causes / wounds**

Trauma: skin tear, hematoma, pressure lesions

Burn wounds

Cellulitis, infections

##### **Chronic wounds**

Vascular disorders: Venous, arterial, hypertension

Vasculitis in inflammatory conditions, connective tissue diseases

Vascular obstruction: Emboli, coagulopathy, thrombocytosis, calciphylaxis

Medication: Hydrea, statins, biological

Neuropathy and diabetic foot neuropathic ulceration

##### **Special wounds**

Blistering disease and epidermolysis bullosa

Pyoderma gangrenosum and hydradenitis suppurativa

Ulcerated tumors

Stoma complications

Radiotherapy and chemotherapy

Self-inflicted wounds

## 2. LYMPHEDEMA AND WOUNDS / PHLEBOEDEMA AND WOUNDS

Prof. Dr. med. HUGO PARTSCH  
Austria

**Pathophysiology.** Phleboedema occurring mainly on the lower extremities is a consequence of gravity which causes venous hypertension as the most important triggering factor. This venous hypertension may occur during walking (“ambulatory venous hypertension”) or be sustained like in patients with proximal obstruction or in morbid obesity. The elevated pressure in the large veins leads to capillary hypertension causing an increased fluid filtration into the tissue, reduced shear stress and endothelial cell dysfunction, lymphatic decompensation and an inflammatory reaction which ultimately causes cellular death and ulceration.

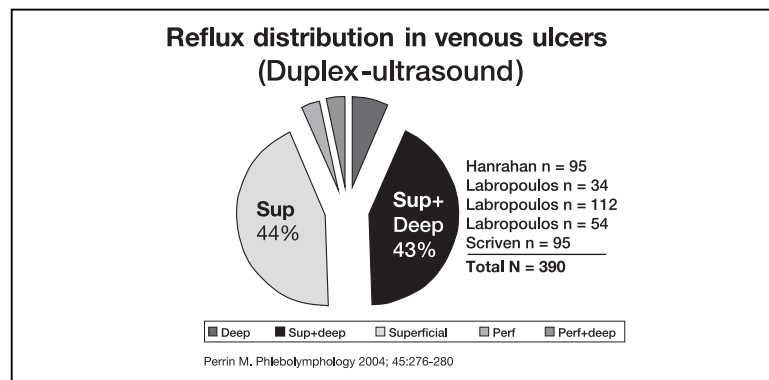
**Fig. 1.**  
*Shows a differentiation of the hemodynamic main triggers for a “venous ulcer”.*

“Venous” ulcer	
<p><b>Venous pathology proven</b></p> <ul style="list-style-type: none"> <li>• Reflux, obstruction</li> <li>• Ambulatory venous hypertension</li> <li>• EXAMPLES:                             <ul style="list-style-type: none"> <li>– Postthrombotic syndrome</li> <li>– Saphenous reflux</li> <li>– Perforator incompetence</li> </ul> </li> <li>• ~ 80%</li> </ul>	<p><b>“Hydrostatic ulcer”</b></p> <ul style="list-style-type: none"> <li>• No venous reflux or obstruction</li> <li>• “Integrated venous hypertension”</li> <li>• EXAMPLES:                             <ul style="list-style-type: none"> <li>– Obesity</li> <li>– Immobility</li> </ul> </li> <li>• ~ 20%</li> </ul>

Lymphatics are always involved in any kind of chronic edema and play a central role in the development of progressive skin changes and ulceration.

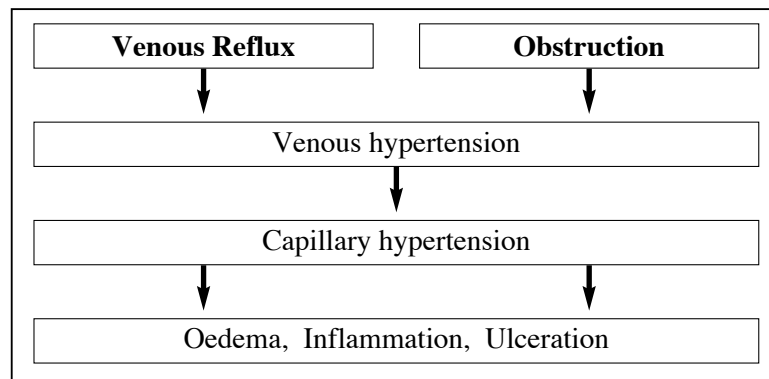
Venous reflux due to valve incompetence is the most frequent cause for venous hypertension leading to ulceration. About 80 % of venous reflux is found in the superficial venous system, accompanied by deep reflux in half of the cases (Fig. 2).

**Fig. 2.**  
*Venous reflux distribution detected by Duplex-ultrasound in patients with venous leg ulcers.*



Venous reflux can usually be followed along incompetent veins from proximal down to the ulcer region. The consequences of venous hypertension are schematically demonstrated in Fig. 3.

**Fig. 3.**  
*Schematic representation of the consequences of venous hypertension.*



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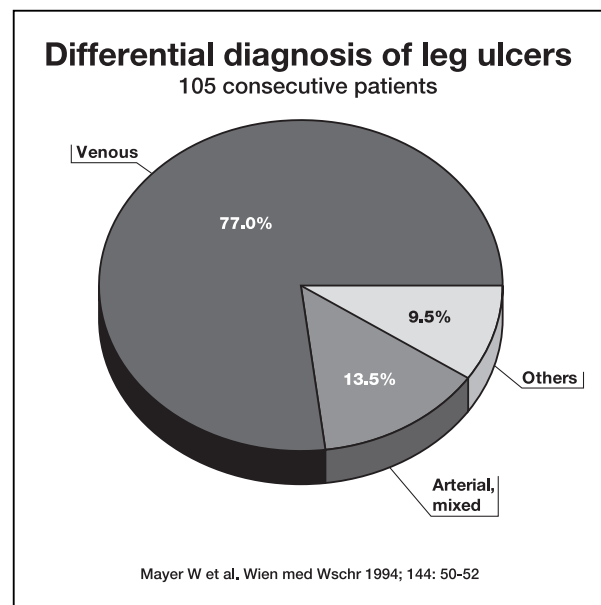
**Definition.** A venous ulcer can be defined as:

- “Full-thickness defect of skin,
- most frequently in ankle region,
- that fails to heal spontaneously
- and is sustained by chronic venous disease”.

Post-traumatic wounds in normal skin areas of the lower leg may also show delayed healing because of the compromised venous circulation acting against gravity in the upright position, but should not be classified as “venous ulcers”. In cases with an underlying arterial occlusive disease such post-traumatic ulcers have been called “arterial ulcers”.

**Differential diagnosis.** Leg ulcers should always be considered as symptoms of an underlying disease. Among a group of more than 100 consecutive out-patients presenting leg ulcers the majority (>70%) were of venous origin (Fig. 4). The second most frequent group are patients with arterial occlusive disease, either isolated or, more often, in association with venous insufficiency. The latter group has been called “mixed ulceration”. However, around 10 % of ulcers have other causes (haematological, dermatological, metabolic disorders, vasculitis, tumours, artefacts etc) which must always be kept in mind, especially when ulcers do not heal.

**Fig. 4.**  
*Main causes of leg ulcers.*



**Therapy.** Treatment strategies should always be directed against the underlying pathophysiology of the individual leg ulcer.

In leg ulcers due to venous reflux an abolition of the incompetent veins reduces the ulcer-recurrence rate and may accelerate healing. There is an increasing positive experience using ultrasound-guided foam-sclerotherapy in order to occlude superficial refluxing veins with improved ulcer healing, even in the presence of concomitant deep venous disease.

Thermal endovenous procedures or surgery may also be considered. The cornerstone of leg-ulcer treatment is compression therapy. In order to counteract gravity pressure between 60 and 80 mmHg are needed in order to compress superficial veins on the lower leg in the upright position.

Stiff, inelastic material is able to achieve pressure peaks of this magnitude during walking, leading to an intermittent blockage of venous reflux and to an increase in the amount of blood squeezed out by contraction of the calf muscle.

In the supine position the pressures of such inelastic bandages are low and well tolerated. It could be demonstrated that ambulatory venous pressure in patients with severe venous insufficiency, measured in a dorsal foot vein on a tread mill could be reduced by inelastic bandages applied with a pressure over 50 mmHg, but not by elastic stockings exerting lower pressures.

- Conclusion.**
1. Phlebedema due to venous insufficiency can be considered a precursor of the skin changes and chronic inflammatory tissue changes which may ultimately lead to open legs.
  2. Lymphatics are always involved in any kind of edema. Long-standing edema of any pathology (“chronic oedema”) is a sign of a functional decompensation of the lymphatic drainage.
  3. Additionally there is also organic damage of the lymphatics in the ulcer region.
  4. Reduction of edema by compression is a major goal in the management of leg ulcers.

### 3. LYMPHEDEMA AND WOUNDS A CONSERVATIVE APPROACH

Prof. Dr. med. ETELKA FÖLDI

*Medical Director, Földi Clinic, Specialist Clinic for Lymphology, 79856 Hinterzarten/Germany*

There are many complex interactions between chronic wounds and lymphedema.

Lymphedema is a non-infectious chronic inflammation which is associated with an increase in extracellular connective tissue fibres and alterations in the matrix. The composition of the connective tissue cells is also altered. These processes lead to a constant increase in the volume of the affected area. Tissue necroses do not occur, even in lymphedema of elephantastic proportions. If further endogenic or exogenic inflammatory processes occur in addition to the lymphedema, the combination of the various pathological factors may lead to tissue necroses which in turn may lead to chronic wounds. In other words: Pre-existing lymphedema may favour the development of chronic wounds. On the other hand, exogenic (mechanical, thermal) or endogenic damage may lead to necrosis of the skin and subcutaneous tissue, resulting in disturbances to lymph vessel functions. In both cases a chronic wound is always associated with perifocal inflammatory edema.

The precondition for wound healing is the normalisation of homeostasis in the interstitium. The lymph drainage system plays a decisive role here. As is well known, the physiological role of the lymph drainage system is lymph formation and the transport of so-called lymphatic loads:

- Transport of the lymphatic fluid load allows the lymph drainage system to regulate the fluid content of the interstitium,
- homeostasis of the connective tissue cells is regulated through transport of the cellular load,
- interstitial pressure is regulated with the protein load, and
- the transport of hyaluronic acid regulates homeostasis in the matrix.

In chronic wounds, which are always associated with inflammatory processes, the lymphatic transport of humoral inflammatory mediators has an antiphlogistic effect.

This presentation will explore the possibilities of conservative therapy in reducing edema, alleviating pain and thus also neurogenic inflammation, and in the regulation of the microcirculation, which together with the normalisation of homeostasis in the interstitium is a precondition for wound healing. Therefore lymphedema in combination with chronic wounds requires a comprehensive treatment: General medical care; Complex Decongestive Physiotherapy and in individual cases additional VAC therapy in addition to wound management.

### 4. SUMMARY OF KEY NOTES

Prof. Dr. med. CHRISTINE MOFFATT

*United Kingdom*

Thursday, September 13<sup>rd</sup>, 2012 - H. 14,00

## JOBST Symposium - Precongress

### Global experiences and solutions

#### 1. GERMANY - SIGNIFICANCE OF COMPLEX DECONGESTIVE THERAPY IN WOUND BED PREPARATION FOR LEG ULCERS: PRACTICAL IMPLEMENTATION AT THE FÖLDI CLINIC

Dr. med. MICHAEL OBERLIN  
Germany

The whole patient must be taken into consideration when treating chronic wounds, rather than just the wound in the leg; i.e. the cause, and patient-centered concerns must also be addressed. Why and how do we treat chronic wound patients at the Földi Clinic?

The lymphatic system is a complex and important part of our immune-surveillance and plays a vital role in all complex wound healing processes. All three vascular systems are involved at every phase of wound healing: Hemostasis, inflammation, angiogenesis, granulation and remodeling. Peri-wound i.e. localized lymphedema in acute and chronic wounds is increasingly recognized as a major inhibiting factor in wound healing. Dye-injection studies in open wounds have demonstrated a significant reduction in lymphatic channel regeneration compared to arterial and venous angiogenesis.

One of the most important inhibiting factors in wound healing is the lack of oxygen. Skin cells are living Brady trophic and can survive ischemia for two hours. Wound treatment means inducing a systemic and/or local improvement in oxygen delivery. One of the first questions that must be addressed is the quality of the systemic oxygen situation in the wound patient. Stopping smoking is the first step in improving healing. The pulmonary situation must be examined. After spirometry tests, we check oxygen saturation and exclude sleep apnea syndrome in close cooperation with a pulmonologist.

Next we analyse the patient's cardiac situation. Echocardiography and ultrasound of the pleura and vena cava and measuring NT-pro BNP provide an overview of right and left cardiac chamber sufficiency. Blood is tested for anemia; there is a delay in wound healing if hemoglobin levels are below 10 g% and healing is often not possible if hemoglobin levels fall below 7g%. Pressure is approximately 80 mmHg or more if the dorsalis pedis pulse is present. The brachial index of the ankle is measured with small Doppler ultrasound devices.

In order for healing to occur, blood flow must have an ABI over 0.5. For patients with metabolic condition information on the vibration sense is established with a tuning fork test. Thyroid hormone levels, vitamin B12, blood sugar, HbA1c and sometimes autoantibodies are measured in order to exclude other systemic disturbing factors in wound healing.

Nutrition is analysed by measuring protein and albumin levels. Serum albumin levels below 30gr/L delay healing. Iron and zinc levels are measured and a consultation with a dietician, or the initiation of substitution therapy is initialized if necessary. In order to assess and support the management of patient-centered problems it is important to treat wound pain, if present. Unresolved pain can negatively affect wound healing and decreases quality of life. Pain activates the sympathetic branch of the autonomic nervous system and thus leads to tissue hypoxia and increased cortisol levels. Pain has also negative effects on the lymphatic system with consecutive lymphangiospasm. Systemic treatment with opiates and a careful choice of local wound pads are sometimes required at the outset of wound treatment. With questionnaires on anxiety; depression and quality of life we detect serious psychological problems which may prohibit wound healing.

An extended exudative, i.e. inflammation phase is one of the typical problems in chronic wound patients, with maceration of the skin around the wound. This is caused by necrosis and a high bacterial load, and frequently also by concomitant edema caused by venous hypertension, right heart insufficiency or lymphedema. Strong exudation with high levels of matrix-metallo-proteinases demolishes the extracellular matrix. Maceration of the wound edge leads to disturbances in microcirculation with a lack of epithelisation, and is in turn aggressive to healthy skin. Removing excess chronic wound fluid is thought to remove inhibitory factors present in the fluids. Studies have shown that fluids removed from chronic wounds suppress the proliferation of keratinocytes, fibroblasts and vascular endothelial cells in vitro. Strong and extended exudation can be treated locally with highly absorbent wound pads, negative pressure therapy and by treating concomitant edema with manual lymph drainage and compression therapy.

Manual lymph drainage improves tissue fluid absorption, i.e. lymph formation. This manual technique increases activity in the lymph collectors i.e. lymph transportation and decreases the pathologically high pressure in lymph vessels and interstitium. Complex decongestive therapy (CDT) improves diffusion and carbon dioxide evacuation. This therapy improves the venous and lymphatic transport capacity. Reducing the edema decreases local hypercapnia and leads to reduced tissue acidosis. With compression therapy a measurable reduction in elevated serum levels for VEGF and tumor necrosis factor alpha can be detected and it thus parallels the healing of venous leg ulcers.

In patients undergoing compression therapy there is a measurable improvement in the tight junctions between endothelium cells and an associated reduction in perivascular edema. Individually adapted physiotherapy programs play an active role in the prevention of relapse through improvement of the muscle and joint pumps, the reduction of restricted dorsal extension in ankle motion and improvement of the patient's general gait.

Educating patients in measures for self-treatment increases compliance with the treatment plan. Patients receive instruction in skin care and disinfection measures, chiropody and nail care is explained, some manual lymph drainage techniques and the technique of bandaging are taught in small groups. The patient is informed about the importance of ankle mobility. If a leg ulcer is not completely closed we provide contact with a Home Care Service in order to continue treatment at home.

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Debridement is often required for local wound care because denatured matrix and cell debris impair healing. We use autolytic, enzymatic and mostly mechanical debridement until an intact extra-cellular matrix is viable in the wound base. Topical antiseptic solutions are reserved for wounds in which the local bacterial load is of greater concern than the stimulation of healing.

The treatment of infection or inflammation is important in addition to debridement. Increased exudation or pain, fragile granulation tissue and strong odor are symptoms of infection. High bacterial concentrations cause increased inflammatory cytokines and proteases. This leads to a decrease in growth factor activity and impairs the healing environment.

Anti-inflammatories, protease inhibitors or topical or even systemic antimicrobials are necessary in order to achieve a low bacterial concentration and reduce inflammation. Moisture balance is a central problem in inflammation and the exudative phase of wound healing. Desiccation slows epithelial cell migration, but excessive fluid causes maceration of the wound base and margin. Frequent changing of wound pads facilitates local treatment but CDT is a wonderful method for reducing excessive fluid and maceration.

Predicting the speed of healing is possible: A 20 – 40 % reduction of wound area in 2 to 4 weeks is a reliable predictive indicator of healing. A 50 % reduction in ulcer area at 12 weeks of treatment is a good predictor of complete wound healing.

If the edge of the wound is non-advancing, is undermined or exudates strongly despite CDT, complementary methods such as negative pressure therapy are used in preparation for plastic surgery. Negative pressure therapy increases local blood flow and promotes neoangiogenesis and granulation tissue. Intermittent suction leads to wound conditioning. Close cooperation with the Plastic and Lymphological Surgery Department at the University Clinic Freiburg shortens the time to wound closure.

The combination of the holistic view together with long experience in edema treatment and a close cooperation with specialized surgery leads to good results for chronic leg ulcers.

## **2. ITALY - THE CEAP-L CLASSIFICATION FOR LYMPHEDEMA: THE ITALIAN EXPERIENCE**

Prof. Dr. med. VINCENZO GASBARRO

*Italy*

## **3. SPAIN - CLINICAL MANAGEMENT OF WOUNDS IN LYMPHEDEMA PATIENTS**

Dr. med. ISABEL FORNER-CORDERO

*Hospital Universitario y Politécnico La Fe - Rehabilitation Service - Bulevar Sur s/n - 46026 VALENCIA - SPAIN - E-mail: iforner@saludalia.com*

The main problem in Spain is the lack of awareness regarding the management of lymphedema patients, and chronic wounds; nevertheless, that awareness has improved in recent years.

As there are few specialized lymphedema units in Spain, patients with lower limb lymphedema are frequently misdiagnosed and only receive medical treatment once they are in advanced stages. They often present at the unit more than 13 years after the onset of symptoms, during which time they have visited many doctors and private clinics. Sometimes they have suffered from chronic wounds on their lower limbs for several months.

At the unit, diagnostics are performed in order to rule out malignancy, venous thrombosis and systemic diseases, and in order to assess the patient's general situation (body mass index, nutritional status, etc).

The level and type of exudate is analyzed in order to rule out infection and the appropriate antibiotics are given empirically if clinical signs of infection are present. Silver dressings are used in wounds with, or at risk of high bioburden or local infection, as recommended by International Consensus, followed by compression, the critical component of wound care in patients with lymphedema.

The type of compression can vary according to the patients' individual characteristics; multilayer bandages are preferred for patients with big legs, two-layer silver stockings for patients with difficulties in traveling to the hospital for treatment. The ulcer is assessed twice a week and the primary dressing changed during the first weeks.

When the wound stops exuding, the ulcer is assessed once a week, until it heals completely. Manual lymphatic drainage (MLD) and intermittent pneumatic compression (IPC) can be added as adjuvant therapies depending on the patients' needs. The patient is given training in self-bandaging techniques and taught to comply with compression.

Compression medical stockings are prescribed in order to prevent a relapse of the wound. Accurate adaptation of the garment is crucial in order to safeguard the results of maintenance treatment, and patient compliance with compression is reassessed at follow-up.

#### 4. ITALY - COMPRESSION GARMENTS, COMPLIANCE AND PROGNOSIS

MONETA G., MICHELINI S., FAILLA A., CARDONE M., CAPPELLINO F., FIORENTINO A.

*San Giovanni Battista Hospital - Via L. Ercole Morselli, 8 - 00148 Rome - Italy*

Garments do not represent the end-point of rehabilitation in treatment of lymphedema of the limbs, but the procurement and improvement of the obtained results. The process that leads to the final, fitted garment, begins while still framing the clinical case and through the following and unavoidable steps:

- clinical examination,
- lymphoscintigraphy,
- doppler echography,
- evaluation of past therapeutic experiences,
- evaluation of psychological reactions and behaviour in past therapeutic experiences.

The last two steps are very important in cases of positive or negative experiences: We must absolutely maintain, create or re-create the most important therapeutic tool: Compliance.

In order to emphasize the priority of elastic compression, from bandages to the final garment, we ask patients to undersign an informed consensus on the treatment and, above all, the unconditioned acceptance of the final garment.

The final garment should be similar to the best tolerated bandage. In other words, standard rules in performing bandaging must not be forgotten.

Taking all these aspects into account, over the last 2 years we were able to reduce the rate of relapse caused by bad compliance to 21% in a sample group of 186 patients with an age range between 3 and 87 years old. All these patients were affected by lymphedema of the limbs (98 of the lower limbs, 86 of the upper limbs) except 2 who had lymphedema of the face. In conclusion, a good psychological and professional approach in the first phase of therapeutic framing and project planning for the lymphedema patient, guarantees, after discharge, the best method for preserving results, avoiding subsequent expensive and useless time loss.

#### 5. ITALY - SKIN LESIONS AND REHABILITATIVE PROGRAMS FOR LYMPHEDEMA PATIENTS

Dr. med. DOMENICO CORDA

*Italy*

The aim of this presentation is to present the treatment plan of a lymphedema patient with skin lesions, in accordance with SIMFER (Italian Society of Physical and Rehabilitation Medicine) guidelines. The Physical and Rehabilitation Medicine PRM is mainly involved with preventing, reducing, and containing disability. We are all aware that lymphedema leads to chronic disability; lymphedema and disability may evolve in a progressive way.

According to SIMFER's guidelines for patients with evolving disabilities (e.g. lymphedema patients) the **patient must be taken on in his/her total complexity, and an individual treatment plan must be or should be established.** The individual treatment plan must show:

- The team: The professional persons and their responsibilities
- The therapeutic programmes
- The planned objectives
- The necessary time for realizing the objectives.

Evaluating results is very important in monitoring the clinical outcome and in order to re-organize the therapeutic programme. Decongestion is always followed by a reduction in disability.

In order to decide whether the team and structure may fully take on care of a patient with lymphedema, the physiatrist must perform a clinical assessment of the:

- Severity of the condition,
- Presence of skin complications, such as infections, ulcers.
- Presence of comorbidities

before formulating a treatment plan.

The Rehabilitation Therapy should then be structured so as to:

- favour functional recovery; and
- avoid further development in the disease.

The primary programmes are listed below:

1. Decongestion (CDP1)
2. Stabilization (CDP2)
3. Maintenance (CDP3)

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The duration of the intensive decongestive phase, known by Italian physiatrists as the short term rehabilitation programme, and by lymphologists as CDP ONE, cannot be decided a priori, as it must be adapted to the patient's needs.

The edema stabilization phase, known by Italian physiatrists as the Medium Term Rehabilitation Programme, and which can be defined for lymphologists as CDP TWO, requires less intensive therapies, and not on a daily basis.

Planning is still individual rather than standardized.

Once stabilized, the patient is maintained through monitoring during individual three monthly assessment-therapy sessions. This is the Maintenance Phase, known by Italian physiatrists as the long term rehabilitation programme and by lymphologists as CDP THREE.

Ultimately for us the experience and competence of the rehabilitative team (the so-called lympho-team) is the most important factor.

## **6. UK - THE CHALLENGES OF MANAGING LYMPHEDEMA AND WOUND PATIENTS: AN UK EXPERIENCE**

Prof. Dr. med. CHRISTINE MOFFATT

*United Kingdom*

The management of patients with lymphedema and wounds in the UK has historically been managed by two different specialist groups. This is despite recent epidemiology undertaken in the UK that showed that 50 percent of patients with wounds also have uncontrolled chronic edema and that this is an independent risk factor for delayed healing.

Lack of specialist knowledge by the practitioners about the concurrent problems leads to a delay in diagnosis and inappropriate treatment. Within the UK there has been a move towards integrated services that bring together the expertise of both teams with good effect. Advances in our understanding of compression therapy has led to more tailored treatment of patients. There is anecdotal clinical evidence that patients are becoming more complex to manage due to factors such as increasing obesity and other comorbidities such as diabetes that make treatment more complex. This presentation will explore the pathway in the Derby Lymphedema Service and will use case studies to illustrate the challenges and ways in which joint treatment and access to a wide range of treatments on prescription has transformed care.

Thursday, September 13<sup>rd</sup>, 2012 - H. 14,00

## 38<sup>th</sup> European Congress of Lymphology

### Free lectures

#### 1. NEW TRENDS IN THE THERAPY OF LYMPHEDEMA AND SECONDARY INFLAMMATION REACTIONS IN WOUND-HEALING IN TRAUMATOLOGY

LOSKOTOVA ANNA<sup>1,2,3,4</sup>, LOSKOTOVA JITKA<sup>4,5</sup>, SUCHÁNEK IVAN<sup>1</sup>, BRYCHTA PAVEL<sup>1,2</sup>

<sup>1</sup> Clinic of burns and reconstructive surgery, University hospital Brno-Bohunice

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<sup>3</sup> 3<sup>rd</sup> Faculty of medicine, Dept. of preventive medicine, Charles University, Prague

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**Introduction.** The number of new findings on the role of lymphatic system in relation to pathogenesis, the treatment of primary and secondary lymphedema and in a relation to wound healing in traumatology (esp. burn trauma and plastic surgery), has risen dramatically in the last 20 years.

**Aim of the study.** With this study we will present our experiences in the area of burn trauma complex therapy. The influence of functional changes in the area of lymphatic system (LS) and soft tissues (ST), preferably with per oral administration of proteolytic enzymes is also included in the complex therapy. This complementary therapy reduces not only the development of edema but also a secondary inflammation reaction in the wound area, thus reducing the need of antibiotics. At the same time the study points out the significance of a syndrome of immunocomplexes (Sy IMC), which is closely related to wound healing.

WOUNDS Acute (involving burn trauma) and chronic (diabetic or other etiology) wounds always represents a “locus minoris resistentiae” in the injured area since functional pathology of the skin, ST, vascular, nervous and lymphatic system (LS) develops very quickly there. The functional pathology of ST is represented especially by muscle and ligament spasms with reflection in trigger points (TrPs). In LS it is represented by edema (event. latent edema) and nearly regular lymphostasis in the area of regional lymph nodes. Local and systematic reaction is followed by an immunological response presented by deponation of non-phagocyte immunocomplexes (IMC), particularly in “immunologically privileged sites”.

**Methods.** The above mentioned findings led us to extend the basic therapeutic standard (in the case of trauma and other wounds) of treating both the functional pathology of LS and ST with the aid of myofascial-manual lymphatic drainage (M-MLD) (we have been applying this method since 1996).

- 1) M-MLD is a new physiotherapy method influencing a functional pathology of ST (spasms, trigger at tender points), harmonizing circulation of oncotic pressure in LS and improving the transport of not only deponating but also circulating immunocomplexes (CIC). It also prevents the formation of fibrotic ganges.
- 2) Later on, we supplemented the treatment with per oral administration of PROTEOLYTIC ENZYMES. Both methods should reduce the development of edema and secondary inflammation as a consequence of trauma, incl. burn trauma.
- 3) The dynamics of cicultated IMC and CRP titres were monitored in addition to the clinical response to treatment and common LABORATORY TESTS.

In traumatology, an edema usually develops in cases of dynamic insufficiency of LS. Edema which develops in such a manner contraindicates the application of simple MLD. However, M-MLD, which uses some manual techniques of MLD and affects mainly lymphostasis in regional nodes and lymphostasis in areas of interdigital spaces, can be used. Local effects on moving with fascias and lymph close to a wound is also very important.

**Example.** Therapeutic M-MLD procedure in the area of the leg, in a case of injury, burn, scald, wound of any etiology. Best applied within 2 hours after the injury and eventually in following days, with these manual therapeutic effects:

1. TrPs in the area of adductors, both hip joints and lymphostasis in nodi inquinales in the area of the groin
2. ligament and muscle spasms of ST (after palpation examination of moving of ST) and lymph in the immediate surrounding area of the wound
3. spasms of ST, TrPs and lymphostasis in the area of interdigital spaces

Early application of proteolytic enzymes has an especially antiedematous and anti-inflammatory effect within the framework of system reaction. This is because their effect prevents higher IMC deposition in “locus minoris resistentiae” (in wound) and thus lowers the development of secondary inflammation reactions and the manifestation of edema.

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**Set of patients.** To verify the effectiveness of the above-described methods in the context of complex therapy, the treatment and laboratory tests of traumatological patients (mostly burns and scalds) monitored between 1996 and 2012 were evaluated. The patients were divided into 4 groups, according to the medical complements (each/50 patients):

Group 1. Basic standard treatment without M-MLD and proteolytic enzymes

Group 2. Basic standard treatment + M-MLD

Group 3. Basic standard treatment + proteolytic enzymes (Wobenzym/Phlogenzym)

Group 4. Basic standard treatment + M-MLD + proteolytic enzymes (Wobenzym/Phlogenzym)

The effect of M-MLD and orally administrated proteolytic enzymes was evaluated according to clinical symptomatology (mainly according to size of post-trauma swelling, speed of its decline, speed of healing and occurrence of inflammation complications) and according to the dynamics of the level of circulated IMC in serum (before, during and after treatment).

**Conclusions for practice.** The application of both M-MLD and proteolytic enzymes had an unequivocally anti-edema effect and they simultaneously played a role in lowering the risk of developing secondary inflammation. Best results were achieved in cases of early treatment while combining both methods. The dynamics of the level of circulated IMC was in accordance with clinical symptomatology.

**Discussion.** Laboratory tests of circulated IMC are unspecific; however, they gain importance in cases where the dynamics of levels are monitored during the illness. It was thus possible to indirectly verify the effectiveness of medical treatment methods, which lead to an effect on the functional pathology of the lymphatic system and secondary inflammation reactions.

**Conclusion.** Embedded in a complex approach to wound therapy in traumatology the above-mentioned combination of healing methods can be an appropriate supplement to basic surgical treatment. Application of these methods leads to accelerated healing, prevention of scar hypertrophy, lower economic costs, shorter sick-leave and prevention of medical-law disputes.

## **2. THE MULTICOMPONENT MEDICATION LYMPHOMYOSOT® ACCELERATES THE WOUND HEALING PROCESS LEADING TO IMPROVEMENT OF EXPERIMENTAL LYMPHEDEMA**

ALEX KEIM<sup>1\*</sup>, JUSTIN SLIS<sup>1\*</sup>, UZIEL MENDEZ<sup>1\*</sup>, EMILY BROWN<sup>1</sup>, YVONNE BURMEISTER<sup>3</sup>, NATALIE TSOLAKI<sup>4</sup>, OLIVER GAILING<sup>2</sup>, JEREMY GOLDMAN<sup>1</sup>

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(\*): authors contributed equal work

The surgical treatment of breast cancer is often followed by life-long and painful secondary lymphedema. It can develop several years after surgery, and is thought to occur due to an inability of damaged lymphatic vessels to adequately regenerate across the obstructive scar tissue during the wound healing process.

Treatment for lymphedema remains suboptimal and is in most cases palliative, with the aim of preventing disease progression rather than a cure. Currently there are no treatments for improving lymphatic recovery during the wound repair process following surgery.

Treatments targeted at improving the natural healing of the lymphatic-related injury may increase fluid drainage and prevent the development of secondary lymphedema.

The multicomponent medication Lymphomyosot® was found to be effective in treating edemas of thrombotic or inflammatory etiologies. In experimental models of murine lymphedema we evaluated the ability of Lymphomyosot® to reduce tissue swelling, support tissue regeneration and promote lymphangiogenesis.

It was demonstrated that Lymphomyosot® significantly reduced tissue swelling and increased the rate of surgical wound closure.

Regeneration of lymph vessels following murine axillary lymph node dissection and migration of lymph capillaries was not modulated.

The therapeutic effect of Lymphomyosot® seemed to be mediated by targeting the underlying processes of lymphatic recovery and drainage through several possible mechanisms of action including acceleration of the inflammatory and wound healing processes, modulation of inflammation and/or influencing extracellular matrix synthesis and remodeling during wound repair.

These results brought on by low dose ingredients and with minimal side effects provide the opportunity to explore the potential therapeutic effects of Lymphomyosot® as a new systemic or local medication for wound therapy or skin repair in improving the rate and quality of wound healing.

### 3. THE IMPORTANCE OF INTERDISCIPLINARY COLLABORATION IN THE CONSERVATIVE TREATMENT OF LYMPHEDEMA

Dr. med. EVANGELOS DIMAKAKOS

*Vascular Unit of Oncology Department - 3<sup>rd</sup> Internal Clinic of the University of Athens Sotiria Hospital - Aisopou 10 - 15122 Maroussi - Greece*

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The term "Lymphology" includes both the physiology and the pathology of the lymphatic system. Many disciplines are involved in the study of the lymphatic system, in order to correctly diagnose lymphatic diseases and ultimately provide the best available treatment for the patient.

Lymphedema is one of the most common lymphatic diseases, potentially causing significant problems for the patient and for the health system in general. We must also emphasize that the edema of lymphedema it is not just one symptom but a medical disease which coexists with a number of serious diseases.

The cooperation of specialized disciplines is thus required for the management of lymphedema; such as lymphologists, internists, oncologists, angiologists, phlebologists, radiologists, gynecologists, vascular and plastic surgeons and of course physiotherapists, nurses, sports instructors, dieticians etc.

Strong and close cooperation between these disciplines secures the best therapeutic effort. The correct diagnosis and appropriate treatment of lymphedema are thus ensured by the ideal cooperation of many experts.

The patient is however the most important partner in this special medical team. It is important to emphasize that a lymphological team must always remember that prevention is the best way to avoid lymphedema. The organization of teams for the treatment of lymphatic disease is an important and critical point.

The exchange of views between physicians and the other disciplines related to the treatment of lymphatic diseases will thus help the physician in charge to take the right decisions and ultimately to achieve the best results for patients.

### 4. THERMOGRAM RELATED WITH DERMA BACKFLOW

PT PhD JEAN-PAUL BELGRADO

*Belgium*

### 5. LYMPHOEDEMA TREATMENT IN SLOVENIA

TANJA PLANINSEK RUCIGAJ, VESNA TLAKER ZUNTER

*University Clinical Centre Ljubljana - Dermatovenerological Clinic - Zaloska Cesta, 2 - 1000 Ljubljana - Slovenia - E-mail: t.rucigaj@gmail.com*

**Goals.** To determine clinical characteristics of female cancer-survivors treated for secondary lymphedema, the time from cancer treatment to the development of lymphedema, and the effect of therapy on the reduction of lymphedema and occurrence of erysipelas.

**Methods.** We performed a retrospective study of women with secondary lymphedema after breast cancer (BR) and gynecologic (uterine, ovarian, vulvar) cancers (GYN) treated at our department from 2004-2010.

**Results.** The average time from cancer treatment to the development of lymphedema in our patients was 2.2 and 4.75 years in the BR and GYN groups, respectively, ranging from just after the procedure to as long as 31 years in one BR patient. The duration of lymphedema in our patients before they first received appropriate therapy was on average 4.1 and 2.65 years in the BR and GYN group, respectively, ranging up to as long as 25 years. In our series, untreated lymphedema was a strong predisposing factor for erysipelas, whereas no cases of erysipelas were noticed after the establishment of therapy. In both the BR and GYN groups, erysipelas occurred more frequently in patients who were older and had more long-standing edema. Compression therapy with short-stretch elastic bandages was shown to be an effective measure in reducing lymphedema in both groups and all measurement points. The duration of the required therapy was longer in patients with more long-standing edema and in BR patients who had experienced erysipelas in the non-treated period. Therefore, therapy of lymphedema should be initiated as soon as possible, also in order to avoid extended initial short-stretch bandage therapy.

**Conclusion.** Lymphedema may first appear several years after cancer treatment. Our findings emphasize the need for awareness of lymphedema as a possible long-term iatrogenic complication in cancer survivors in order to avoid a delay in diagnosis and therapy. Untreated lymphedema is a strong predisposing risk factor for erysipelas.

## 6. MLD AND BANDAGING IN INDIAN LYMPHEDEMA PATIENTS

Dr. G. MANOKARAN<sup>1</sup>, Ms. J. ABIRAMI<sup>2</sup>, Ms. S. SYAMALA<sup>2</sup>

<sup>1</sup> Senior Consultant, Plastic Surgeon Apollo Hospitals, Chennai, India

<sup>2</sup> Physiotherapist Billroth Hospital, R. A. Puram, Chennai, India

Lymphedema is a global chronic problem and in each country the cause and the number of affected patients varies. In India we have two thirds of the world's population of lymphedema patients and we have millions of patients with lymphatic filariasis. Most of the patients are very poor and cannot afford private treatment; there is no set or uniform protocol in our country.

Though we have been advocating surgery for a long time, patients are not able to meticulously follow post-operative instructions, and the rate of recurrence is high and their reluctance to have further surgery is clear. As we do not have any schools for training lymphedema therapists, since 2006 a few volunteers from different countries and from different schools have trained a few of our therapists in MLD and bandaging and or CDT. From 2006 onwards we have tried various combinations, such as CDT alone, periodically, CDT and surgery, CDT, surgery and post-operative CDT.

In this presentation the various outcomes and recommendations to our patients will be discussed, and demonstrated with slides and power point presentation. Your input is most welcome and most valuable.

## 7. NET EFFECT OF LYMPHATICOVENOUS SIDE-TO-END ANASTOMOSIS ON VOLUME REDUCTION OF PERIPHERAL LYMPHEDEMA AFTER COMPLEX DECONGESTIVE PHYSIOTHERAPY

JIRO MAEGAWA, HIROTO TOMOEDA, KOUICH HIROTOMI, KAZUNORI YASUMURA, YUUICHIRO YABUKI, KOUKICHI HASHIMOTO and AYAKO TOSAKI

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**Objective.** The results of reported lymphaticovenous anastomoses include some effects of complex decongestive physiotherapy (CDP). We consider that volume reduction effected by CDP and surgery should be evaluated separately. This study aimed to determine the net effect of lymphaticovenous side-to-end anastomosis (LVSEA) in patients with lower limb lymphedema treated by preoperative CDP.

**Design.** Retrospective observational study.

**Materials.** 37 LVSEAs in 31 patients.

**Methods.** Volumes of the thigh and leg with edema were compared between the time of initial examination, and before (application of CDP) and after LVSEA. The patients were divided into two groups based on the number of anastomoses and lymphoscintigraphic findings.

**Results.** Preoperative CDP resulted in a reduction of 593 mL (both leg and thigh;  $p < 0.001$ ). After CDP, LVSEA (1-8 anastomoses; average of 5) reduced the volume by 109 mL (52 mL for the thigh ( $p = 0.01$ ) and 57 mL for the leg ( $p = 0.002$ )). There was no significant difference in volume reduction on lymphoscintigraphy. Volume was significantly reduced (by 55 mL in the thigh,  $p = 0.049$ ; 96 mL in the leg,  $p = 0.006$ ) in the group that underwent 6-8, but not 1-5 LVSEAs.

**Conclusions.** The net effect of LVSEA on volume reduction was confirmed, but was not particularly large. The need for CDP decreased in some patients postoperatively, and these patients should be considered for evaluation.

## 8. VASCULAR LIMITATIONS IN COMPRESSION THERAPY, AND HOW TO OVERCOME THEM

CHRISTIAN URE, MD

Centre of Lymphology, State Hospital Wolfsberg, Austria

2 case reports of patients admitted for in-patient treatment with severe contraindications for CDT (Complete Decongestive Therapy).

Case 1: Secondary lymphedema of the leg and coincident PAOD (peripheral arterial occlusive disease)

Case 2: Lymphedema of the head after malignoma treatment with concomitant highgrade compression of the internal jugular vein with consecutive upper venous congestion.

**Case 1** describes a patient admitted for complete decongestive in-patient treatment of secondary lymphedema of the right leg posttraumatic and after prostate cancer.

Clinical examination revealed typical intermittent claudication symptoms and in colour duplex imaging and MR angiography a long arterial occlusion of the right external iliac artery was detected, with a peripheral artery occlusion pressure of only 60 mmHg. After successful lysis and PTA/stenting of the external iliac artery and common femoral artery, the planned decongestive therapy was carried out successfully and the patient was discharged with a custom-made compression garment.

**Case 2** describes a patient with secondary malignant head-neck lymphedema after neck dissection and radiation therapy of a metastatic squamous carcinoma, moderately differentiated (cancer of unknown primary). During the palliative rehabilitation inpatient-treatment a significant venous stasis with massive edema in the head and neck area was observed, resistant to therapy. On suspicion of an upper venous occlusive disease CT-imaging detected a severe compression of the left internal jugular vein and an occlusion of the right internal jugular vein. Endovascular recanalization by means of stenting the left jugular vein led to a rapid regression of the vast eyelid edema, and then CDT was carried out successfully.

**Key words.** Vascular limitations in CDT (Complete Decongestive Therapy), intermittent claudication symptoms, peripheral artery occlusion pressure, lysis and PTA/stenting, secondary malignant head-neck lymphedema, palliative rehabilitation, upper venous occlusive disease.

### **9. ACUTE LYMPHANGITIS: SURGICAL APPROACH TO LYMPHATIC URGENCY**

ALBERTO MACCIÓ<sup>1\*</sup>, GIOVANNA CAVALLERO, FRANCESCO BOCCARDO<sup>\*\*</sup>, CORRADO CAMPISI, CORRADINO CAMPISI<sup>\*\*</sup>

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This year a very important Health Care Project was founded in Piedmont, a large region in Northern Italy. The aim of this project is to promote networking in the management of lymphological disorders and our first step was to review the proper diagnosis and treatment of lymphatic diseases in emergency and urgent medical areas.

We thus discussed the clinical approach to acute lymphangitis as broadly as possible.

We held multidisciplinary discussions on the epidemiological, clinical and microbiological aspects of the most important lymphatic diseases found in surgical departments and emergency care in order to properly recognize the signs and symptoms of local and general diseases, treat them appropriately and reduce serious complications such as septicemia

Our past personal experience encompasses over 3000 patients, which were admitted to the Emergency Room, and evaluated by lymphologically trained physicians: About 1.1% of these patients were diagnosed with acute lymphangitis and lymphangioadenitis.

After over 10 years of clinical experience we can claim to have successfully treated over 500 patients with acute lymphatic diseases.

We would thus like to propose a surgical clinical protocol for the correct approach to these particular diseases, starting with the correct diagnosis in the emergency room up to appropriate post-acute rehabilitation.

### **10. FIBEROPTIC LASER TREATMENT FOR LYMPHEDEMA**

Prof. Dr. med. BENIAMINO PALMIERI

*Italy*

**(Video presentation)**

Friday, September 14<sup>rd</sup>, 2012 - H. 09,00

## 38<sup>th</sup> European Congress of Lymphology

### Session I - Anatomy and Clinic

#### 1. THE ANATOMY OF THE HUMAN AXILLA. CAN THE DEVELOPMENT OF LYMPHEDEMA BE AVOIDED?

ELISKA O., PAVLISTA D.

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Oncogynecologic Center, Department of Obstetrics and Gynecology - First faculty of Medicine - Prague - Czech Rep.*

The development of lymphedema after axillary dissection is reported in the literature between 20 to 40 %. During surgery surgeons perform the biopsy of the sentinel node. If the biopsy is positive for metastases they dissect the other nodes and the risk of the development of lymphedema increases. If the sentinel node is negative no axillary clearing is performed, in most cases. Nevertheless the biopsy of even one node can in some patients be responsible for the development of lymphedema, whereas in other patients lymphedema does not occur. The question is: are lymph nodes in the axilla used in common by the lymphatics from the upper extremity and the lymphatics passing from the breast, or are they separated? We thus evaluated: 1) our direct oil lymphographies of the upper extremity and axilla in normal patients and patients after axillary dissection for cancer of the breast and 2) a second observation was performed on cadavers without history of cancer of the breast after cutaneous and subcutaneous injection of patent blue and Berlin Blau simultaneously into the breast and upper extremity in 24 bodies.

**Results.** On lymphography snaps and in cadavers we found that the lymphatics of the upper extremity predominantly enter the lateral lymph node in the axilla and the lymphatics of the breast mostly enter the located medial lymph node of the axilla. From these findings we could say that the lymphatics of both territories are separated, but this is not true. Between both groups of nodes there are numerous anastomoses and sometime both nodes are fused together; it depends on the level of union. The development of lymphedema in some cases is therefore unpredictable.

#### 2. AWS: NATURE AND LOCALIZATION. MRI AND US IMAGING CORRELATED WITH CLINICAL ANATOMY

Prof. OLIVER LEDUC Ph.D., ERIC FUMIÈRE M.D., SOPHIE BANSE P.T., CHARLOTTE VANDERVORST P.T.  
*Belgium*

In a precedent study, comparing the positioning of the superficial lymphatic pedicles of the upper arm with the positioning of the axillary web syndrom (AWS), the authors seem to identify the cords as being lymph vessels.

To improve the objectivation of the identification of the cords, the authors use MRI and US imaging technics.

The cords are detected by palpation and mobilization of the upper limb in abduction and external rotation. US imaging are performed in different attitudes of the elbow.

The web is followed from distally until the axilla.

In order to obtain the best correlation between US imaging and MRI, before performing MRI, a tube, containing a gel that MRI can detect, is fixed on the skin at the level of the cords trajet. The images are performed on the limb and in the axilla.

The origine of the web is identified as being at the proximity of the localization of the adenectomy.

#### 3. LYMPHATIC DRAINAGE OF THE HEAD AND FACE: A NEW TOPOGRAPHIC CLASSIFICATION - CLINICAL AND SURGICAL APPLICATION

AMORE M.A., MENÉNDEZ J.M., ACOSTA M.L., ABRAMSON L., ÁLVAREZ ESCALANTE A.P., PATTARONE G.R., CIUCCI J.L.

*Laboratorio Cero - Anatomía Quirúrgica - Centro de Disección e Investigaciones Anatómicas (CeDIA) - III Cátedra de Anatomía - Departamento de Anatomía Facultad de Medicina - Universidad de Buenos Aires (U.B.A.) - Ciudad Autónoma de Buenos Aires - Argentina*

##### Introduction and Purpose

The various interpretations and descriptions of the lymphatic system through medical history form one of the most controversial and discussed chapters from the human anatomy. Emphasizing the study of the head and facial lymphatic drainage, the anatomical and surgical discrepancies turn out to be evident.

The aim of this research is to make a comprehensive description from the lymphatic anatomy of the head and face.

##### Materials and Method

(n=30) cadavers were used, without being previously fixed. Following the established research protocol, the work was divided into 5 phases: *Injection and Filling, Fixation, Dissection, Lightening and Diafanization.*

*(Continued on page 20)*

*(Continued from page 19)***Results****1 - Classification of the lymph nodes of the head and face***Lymph nodes of the head:*

- Occipital nodes: superficial and deep
- Mastoid nodes
- Parotid nodes:
  - Superficial or extraglandular: Pre-auricular [Epifascial and Subfascial] and Infra-auricular
  - Deep or intraglandular
- Submandibular nodes:
  - Extracapsular: Preglandular, Retroglandular, Prevascular and Retrovascular
  - Intracapsular
- Submental nodes

*Facial lymph nodes: inconstant*

- Nasolabial node
- Malar node
- Buccinator nodes: anterior and posterior
- Mandibular node

**2 - Classification of the lymphatic currents of the head and face according to the facial regions**

- Frontal region and anterior half of the Temporal region: Frontal-temporal current
- Parietal region and posterior half of the Temporal region: Parietal-temporal current
- Occipital region: Occipital current
- Orbital and Infra-orbital regions: Medial and Lateral orbital currents
- Buccal Region: Anterior, Middle and Posterior buccal currents
- Nasal region: Superior, Middle and Inferior nasal currents
- Oral and Mental region: Superior labial current, Middle and Lateral mentolabial current
- Parotid and Zygomatic Regions: Zygomatic and Masseteric current

**Conclusions**

- 1) The lymphatic currents of the face and head could be described and a new classification was proposed.
- 2) The currents can form five kinds of groups, in accordance to the cephalic nodes they end in: Parotid, Submandibular, Submental-mandibular, Mastoid and Occipital.
- 3) The lymphatic vessels that form the superficial currents are not found together in the same plane. On the contrary, some of them pass over the superficial muscular-fascial layer and, some others, behind it.
- 4) The submandibular and submental-mandibular currents do not necessary respect the middle line and drain its lymph both ipsilaterally and contralaterally.

**4. MICROSURGICAL THERAPY OF LYMPHEDEMA: PHYSIOLOGICAL PRINCIPLES, INDICATIONS AND LONG TERM RESULTS**

Prof. PIERRE BOURGEOIS  
Belgium

**5. THE SIGNIFICANCE OF THE DORSOLATERAL LYMPH VESSEL BUNDLE IN THE LEG UNDER PHYSIOLOGICAL AND PATHOPHYSIOLOGICAL CONDITIONS**

PD. Dr. med. VIVIEN SCHACHT  
Germany



Friday September 14<sup>rd</sup> 2012 - H. 11,00

## 38<sup>th</sup> European Congress of Lymphology

### Session II - Gene and Biology

#### 1. THE METABOLISM OF HYALURONIC ACID IN PERIPHERAL LYMPHEDEMA

NINGFEI LIU

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Lymphatic transport plays a major role in the metabolism of macromolecules of the interstitial matrix and, in particular, hyaluronic acid (HA), a large macromolecule that shares the same catabolic pathways as albumin, being drained away from tissue through lymphatic pathways.

Both animal and clinical studies were carried out in order to explore the effect of lymphatic blockage on the metabolism of HA in the skin. In the animal study, [<sup>3</sup>H] HA was injected subcutaneously into the tail skin of rats that either had no surgical intervention or into those that had the lymphatic drainage blocked two hours earlier or after the lymphatics had been blocked for three months. The removal of tritiated HA from the injection sites was determined by the appearance of [<sup>3</sup>H] in the plasma.

The results showed that the clearance of injected HA was delayed in rats with lymphatic blockage. The half-life of injected HA in the control was 70-75 hr, compared with 105-110 hr in the lymphatic blockage rats. Biochemical analysis revealed that there was a significant increased amount of HA in the tail skin 3 months after lymphatic blocking.

The clinical study enrolled 39 patients with chronic extremity lymphedema. The HA content in lymphedematous interstitial flow was measured using radioimmunoassay. The results showed that the HA concentration in interstitial fluid of lymphedema limb was 22x10<sup>3</sup> (aspiration) and 30x10<sup>3</sup> (wick) ng/ml, which were significantly higher than that in interstitial fluid, serum and lymph of normal limbs (control) and interstitial fluid of limbs with venous edema (P<0.001).

The above findings suggest that lymph absorption is an important factor in the transport of HA from the interstitium. Blockage of regional draining lymphatics likely impairs the catabolism of HA. HA stagnates in the limb with impaired lymph drainage which may exert a deleterious effect on the interstitium.

#### 2. THE MITOGENIC EFFECT OF HUMAN TISSUE FLUID/LYMPH ON KERATINOCYTE PROLIFERATION

Prof. Dr. med. WALDEMAR OLSZEWSKI

*Polen*

#### 3. CLINICAL, GENETIC AND LYMPHOSCINTIGRAPHY STUDY OF NINE FAMILIES AFFECTED BY PRIMARY LYMPHEDEMA CARRYING *VEGFR3* OR *FOXC2* MUTATIONS: COMPARISON OF CLINICALLY AFFECTED AND UNAFFECTED SUBJECTS

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Primary lymphedema is chronic edema due to lymphatic malformations developing in the later stage of lymphangiogenesis. In familial forms, it is usually inherited as an autosomal dominant disease linked to heterozygous mutations in genes involved in lymphangiogenesis, including *VEGFR3* and *FOXC2* genes. Due to its rarity, exhaustive genotype-phenotype correlation studies are lacking and lymphoscintigraphy studies have never been performed on subjects with inherited mutations but without clinical presentation.

We previously reported clinical and genetic analysis of 46 Italian probands screened for *VEGFR3* and *FOXC2* mutations [Michelini S. *et al.*, 2012]. Here, we focus on the nine familial cases with positive molecular diagnosis (6 with mutations in *VEGFR3*; 3 in *FOXC2*).

These patients and their relatives also underwent lymphoscintigraphy. In one of the nine families we identified a clinically normal subject carrying a *FOXC2* heterozygous mutation. The same variant was detected in his daughter, who has an overt phenotype.

The lymphoscintigraphic patterns of affected patients in the same family proved to be very similar. The results of the *FOXC2* patient without clinical manifestations indicated bilateral delay in lymphatic drainage through inguinal nodes. When major parameters (age of onset, clinically involved limbs and evolution) were considered, a genotype-phenotype correlation was observed in patients carrying the same mutations from this and previous case studies.

In conclusion, lymphoscintigraphic features of the clinically normal patient with *FOXC2* mutation indicate that subjects without manifestations but carrying mutations may have silent lymphatic insufficiencies. This suggests that in late forms, subclinical disease is already present at birth and only manifests after physical trauma. Primary lymphedema should therefore be regarded as having variable clinical expression and not, as currently considered, incomplete penetrance.

#### 4. THE BALANCE OF PRO- AND ANTI-LYMPHANGIOGENETIC FACTORS IN DEVELOPMENT AND DISEASE

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Numerous studies show that lymphatic endothelial cells (LECs) are derived during embryonic development by transdifferentiation from specific parts of the venous system. The homeobox transcription factor Prox1 and growth factors such as Vascular Endothelial Growth Factor-C (VEGF-C) and its receptor VEGFR-3 are of major importance in this process. Our studies in avian embryos indicate additional sources of LECs in embryonic mesenchyme, and in peripheral blood of children we could also observe cells that are positive for LEC markers. Their integration into lymphatics needs to be studied in detail.

VEGF-C is the most potent lymphangiogenic growth factor; not only during embryonic development, but also in malignant tumours, where its expression is often positively correlated with the nodal status. VEGF-C binds and activates the transmembrane receptor VEGFR-3, which is abundant on LECs. Recently, an endogenously produced secreted splice variant of the cognate receptor VEGFR-2 has been found and named esVEGFR2. This variant binds VEGF-C already in the intercellular space and thereby blocks its activity. Therefore, esVEGFR-2 is a natural inhibitor of lymphangiogenesis. The genetic ablation of esVEGFR-2 results in the ingrowth of lymphatics into the cornea of murine embryos, or the hyperplasia of dermal lymphatics. EsVEGFR-2 also blocks the induction of proliferation, which is induced by VEGF-C in human lymphangioma-derived LECs. In neuroblastoma, a childhood tumour of the sympathetic nervous system, which metastasizes via both blood and lymphatic vessels, esVEGFR-2 is significantly down-regulated in progressed tumour stages. The loss of anti-lymphangiogenic mechanisms may promote tumour lymphangiogenesis and lymphatic dissemination of tumour cells. We show that lymphangiogenesis is regulated by both activators and inhibitors.

#### 5. IN VIVO IMAGING OF LYMPH VESSELS AND CHANGES TO LYMPH FLOW IN OBESITY

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Lymphatic vascular defects and a lack of dermal lymphatic capillaries can result in adipose tissue accumulation, as shown in mouse knockout models and patients with lymphedema. This suggests a link between lymphatic function and adipose tissue accumulation and proliferation. In order to elucidate changes of the lymphatic vasculature in obesity, we studied the morphology and function of the lymphatic collectors in mice fed with a high-fat diet (HFD) compared to chow-fed controls with a newly established near-infrared(NIR)-Imaging protocol. All HFD mice, but not the control animals, had tortuous collecting lymphatic vessels below the knee region. Irregular pulsing and a weaker reaction to mechanostimulation of the foot were detected in lymphatic collectors of the HFD mouse hind-legs with in vivo NIR-fluorescence imaging. Dermal backflow was detected in one mouse of the HFD group. Importantly, acute elevation of tissue pressure by injection of olive oil into the popliteal fat pad also resulted in decreased lymphatic vessel pulsing and reduced reaction to mechanostimulation. Together, these findings indicate that accumulation of adipose tissue in obesity impairs lymphatic function, at least in part by increasing tissue pressure.

#### 6. DIFFERENCES IN CALCITONIN-GENE RELATED PEPTIDE (CGRP) BETWEEN PATIENTS WITH SECONDARY LYMPHEDEMA AND NORMAL VOLUNTEERS

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In the past the authors have presented CGRP and substance P in secondary lymphedema before and after treatment with magnetic fields, vibration & hyperthermia. These are increased after treatment. This has suggested contraction of the lymphatic smooth muscle cells become intensified by the physiotherapy. This time the former substance of the secondary lymphedema is compared with normal volunteers

##### Materials and Methods:

Five normal volunteers, 5 patients with secondary lymphedema before physiotherapy with magnetic fields, vibration & hyperthermia, 6 patients immediately after treatment and 3 days after the same treatment (5 cases) are evaluated for serum CGRP with the EIA method.

##### Results:

CGRP is raised immediately after the physiotherapy. There are no differences between the volunteers and those with lymphedema before & 3 days after the treatment. There are no correlations with age.

##### Discussion:

One of the reasons why the physiotherapy in this evaluation is effective may be due to increased neurotransmitting substances present after the treatment intensifying lymphatic smooth muscle contraction.

##### Conclusion:

CGRP in patients with secondary lymphedema is not different from that measured in healthy volunteers.

Friday September 14<sup>rd</sup> 2012 - H. 13,30

## 38<sup>th</sup> European Congress of Lymphology

### Session III - Lymphatic Malformations

#### 1. LYMPHEDEMA CHOLESTASIS SYNDROME 1: THE CURRENT SITUATION IN EUROPE AND THE MIDDLE EAST. IS THERE A CONNECTION BETWEEN THE TWO MAIN SYMPTOMS; LYMPHEDEMA AND CHOLESTASIS?

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**Purpose:** LCS1 (Aagaens Syndrome) is very much a Norwegian disease. Updating the data on the Norwegian patients and the course of their disease is therefore of value for the rest of the world, wherever the disease exists. The relationship between the two main symptoms of the disease has never really been discussed.

**Methods:** Patients born between 1960 and 1995 are clinically followed by the first author. Information on patients born before 1960 is sourced from parents and hospital records. Those surviving to 1960 are later clinically followed by the first author. Information on patients born after 1995 is from medical records from the Pediatrics Department, Oslo University Hospital, Rikshospitalet. A follow up of all adult patients was performed by the second author in 2010. A possible connection between the two main symptoms is discussed on the basis of physiological studies and on the clinical findings on cholestasis and lymphedema over the years.

**Results:** The total Norwegian material is now 46 patients. All had different degrees of cholestasis in the first years, and all had different degrees of lymphedema later. The prognosis of patients born between 1933 and 2009 is analyzed in 20 year periods. While there was a definite improvement over the first 3 periods (until 1989), 6 of the 11 patients born between 1990 and 2009 either underwent liver transplant surgery or died of cirrhosis. The possible reason for that is discussed. Numbers of new patients in the four 20 year periods is very stable, around 10 per period, neither increasing nor decreasing. The majority of new patients are located in the South-West of our country, as were the majority of earlier patients. Countries in Europe and the Middle East where patients with the syndrome are known will be shown and discussed.

The last question is if there is a relationship between the degree of cholestasis and the degree of lymphedema, and then finally, can we find physiological studies to support the hypothesis that possible lymphhypoplasia along the smallest part of the bile ducts could produce cholestasis? This will be discussed.

#### 2. LYMPHANGIOMATOSIS/ GORHAM DISEASE IN PEDIATRIC PATIENTS: NEW THERAPEUTIC APPROACH

JOCHEN RÖSSLER

University Hospital Freiburg, Center of Pediatrics and Adolescent Medicine, Germany

Disseminated lymphangiomatosis (L), frequently referred to as Gorham disease (GD), has a very variable clinical course. In the most severe cases it has a progressive and unremitting nature of bone matrix resorption and aggressive lymphatic and venous angiogenesis. Those severe cases should be distinguished from the far more benign multifocal lymphatic lesions of bone that may not require any therapy. The therapeutic options for progressive disease are very limited.

To date, there is no standardised therapy regimen. In single cases, stable disease and/or remission was achieved through treatment with glucocorticoids, pegylated (PEG)-interferon, bisphosphonates, tyrosine kinase inhibitors, bevacizumab or radiotherapy. Recently, the mTOR inhibitor rapamycin has been successfully administered in L/GD patients. However, despite multimodal therapy, L/GD is often lethally complicated by pathological fractures, chyleous pleural effusions, ascites and respiratory insufficiency.

mTOR is a serine/threonine protein kinase that regulates cell growth, cell proliferation, cell motility, cell survival, protein synthesis, and transcription. mTOR stands for mammalian Target Of Rapamycin. The mTOR pathway is dysregulated in human diseases, including vascular anomalies. Rapamycin is a bacterial product that can inhibit mTOR. First case reports on effective therapy of L/GD patients with rapamycin are now available. Data on own patients with successful therapy will be reported.

#### 3. THERAPEUTIC OPTIONS IN THE TREATMENT OF LYMPHATIC MALFORMATIONS WITH AND WITHOUT LYMPHORRHEA

Prof. Dr. med. WALTER WOHLGEMUTH  
Germany

#### 4. GROWTH, ASYMMETRIC GROWTH AND OVERGROWTH BECAUSE OF VASCULAR MALFORMATION

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Growth: lifelong biological phenomenon resulting from the existent balance, between the quantity, quality and the consequent functions of the organic mass. Plasia, trophy and acquired function. This equilibrium is genetically designed and because of environmental aspects – coordinated by intracellular growth factors, and systemic growth hormone (GH), insulin (IGF1/2) steroids and thyroid hormones.

Disturbance in this equilibrium may result in low stature and even with specific signs of syndromes, phenotypes and genotypes, such as the Turner, Noonan, Prader Willi, among others, and syndromic osteo chondro dysplasias; body asymmetries, with pre natal small height, but that can recovered in the puberty, such as the Silver Russell Syndrome, and hemi corporeal asymmetries, hemi hypertrophies, such as the Wiedemann Beckwith Syndrome, which has not known genetic background and has lifelong signs, such as macroglossia, hipoglucemia, umbilical hernia, and others.

Besides, there exist segmentary corporeal dysplasias and dystrophies, dysmorphias, that affect only a part of the mentioned compromised segment: a finger, a foot, a tongue, .... When assessing the hemi corporeal compromise, it is not so clear, if they are over or undergrowth, harmonic hyper or hypotrophies – both halves are normal, and together different.

Antropometric guidelines, growth tables, such as Tanner's, only resolve part of this problem. Vascular malformations, and or combined angiodyplastic syndromes, may be expressed as corporeal asymmetries, segmentary, even very subtle, or hemicorporeal, or systemic overgrowth, in general because hypertrophy, such as the Klippel Trenaunay Syndrome, Weber and Servelle, the Proteus Syndrome, the CLOVEs Syndrome, Cobb Syndrome the Maffucci Syndrome, the NF 1 and 2 Syndromes, and others, or hypotrophies, such as syndromes with extra truncular venous malformation.

It is not so well understood, why in the same syndrome, with the same physiopathology, there may be a hyper or hypotrophy (e.g. in the Klippel Trenaunay Syndrome) Practically all the congenital syndromes with venous hypertension, or adquired venous obstruction, in peditrics, presents hypertrophy in the involved corporeal segment or involved side.(e.g. AV shunts, micro and macro, ex or intrinsic dysplasias of venous trunks, vascular acceses).

The participation of the involved bones, is essential in the evaluation of the hypo or hypertrophy. Its absence may be defined as pseudo hypertrophy, or as overgrowth. All the edemas, are pseudo hypertrophies in peditrics (excluded because of venous occlusion) because initially, there are no discrepancy in the growth of the bones. Unilateral lymphedemas are symmetric, as long as the excess of weight does not induce a hypertrophy. Tumors are dysplasias, and dysmorphias or malformations are growing anomalies of the embryological development, genetically conditioned or not.

Last but not least, as hypothesis, angiodyplastic syndromes are not necessarily the cause of the corporeal asymmetries, though syndromes with truncular venous hypertension, always present hypertrophies. The right interpretation of this analized physiopathological aspects, may be the basis for therapeutical approaches, for the treatment of length discrepancies in peditrics.

#### 5. MANAGEMENT OF LYMPHOEDEMA IN CHILDREN

FAILLA A., CARDONE M., FIORENTINO A., MONETA G., MICHELOTTI L., MICHELINI S.

*San Giovanni Battista Hospital - Rome - Italy*

The therapeutic approach for patients in childhood is more difficult for various reasons: It is difficult to make limphoscintigraphic examinations playful, there is poor compliance with physical treatments, psychological involvement (especially at the beginning of schooling), poor compliance with elastic bandaging (which in the first two years of life also requires the use of cohesive bandages); therapeutic class of compression garments (mostly in the first 3 years of age) taking into account the accretion of soft tissue and bone. The AA. studied 54 patients with lymphedema of the lower limbs in children (aged between 0 and 16 years): 39 unilateral, 15 bilateral. Of these 13 had associated edema of the external genitalia. 9 patients presented complications with warts (6 to the toes, of which 4 relapsed after treatment and 3 to the external genitalia).

All patients were treated with manual lymphatic drainage, ultrasound or shock waves on fibrotic tissue, multilayered inelastic bandaging with the application of cohesive bandage on the toe and kinesiology.

At the end of treatment they were prescribed elastic garments; "flat knitted" compression class I in patients under two years of age, class II for patients over two years of age. Some subjects were prescribed an elastic "flat knitted" toe-cap, and ortho-elastic shoes in selected cases.

The results showed a mean decrease in limb circumference of 27% with a reduction of tissue consistency. At 3 months follow-up, 35% of patients showed worsening in the limb, 50% had no clinical change, 15% showed further clinical improvement.

The clinical and instrumental monitoring of patients with lymphedema in childhood must necessarily be more frequent and requires continual updating of the treatment protocols, taking into account the volumetric changes associated with the growth of various tissues.

Friday September 14<sup>rd</sup> 2012 - H. 15,30

## 38<sup>th</sup> European Congress of Lymphology

### Session IV - Physical Treatment

#### 1. THE ROLE OF THE FASCIA IN THE TREATMENT OF LYMPHEDEMA

PT Ph.D. WILLEM FOURIE  
South Africa

#### 2. PROBLEMS AND PITFALLS IN CLINICAL LYMPHOLOGY: TWO CASE REPORTS

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At our specialist lymphological clinic we treat an increasing number of patients with multicausal lymphedema, in addition to patients with secondary lymphedema after cancer treatment and primary lymphedema. In multicausal lymphedema diseases which lead to an increase in the lymphatic load, or disturbances in lymph formation and lymph transport can work together in the manifestation or worsening of lymphedema. In geriatric or multimorbid patients there are often further accompanying diseases which can independently lead to peripheral or central edema. It is essential for the treatment and progress of these patients that diseases are recorded which may negatively influence the edema situation with renal or cardiac edema components.

The first case report is of a patient in which extensive multimorbidity led to the development of multicausal lymphedema in stage III. The patient received no therapy for the edema for over 8 years, in which time extensive skin alterations and complications such as erysipelas infections occurred. The influence of various endocrinological, cardiovascular and inflammatory diseases on the permeability of the capillaries, lymph formation and lymph transport will be presented. The complexity of treatment and the limited therapeutic results due to the multimorbidity of the patient will be discussed. The second case report concerns a young woman who had a severe accident with traumatic injuries as an adolescent, the consequences of which were no longer considered over time. However, the injuries did lead to a gradual worsening of cardiac function and the manifestation of multicausal lymphedema. The patient was misdiagnosed with massive lymphedema; treatment was initially unsuccessful. Extensive diagnostics revealed right heart insufficiency with pericarditis constrictiva as the predominant cause of the massive swelling. A definite diagnosis of pericarditis constrictiva can be difficult even with extensive diagnostic methods. It was possible to improve the patient's health using multimodal therapy and adapted complex physical decongestive therapy with close monitoring of cardiac and renal function. The diagnosis of pericarditis constrictiva was subsequently confirmed and successfully treated with pericardectomy. The patient afterwards received further complex physical decongestive therapy for the chronic multicausal lymphedema of the legs, with further improvement.

The careful consideration and treatment of accompanying diseases is essential in achieving good therapeutic results for lymphedema, and especially for multicausal lymphedema. Therapeutic goals may have to be adapted depending on the patient's general health. Even in patients with extensive edema, with lymphedema components that have persisted for years, careful renewed recording of the history and a clinical examination by a lymphologist may reveal the causal relationships in the formation of the edema in a new light. With multimodal therapy and close clinical monitoring good therapeutic results can be achieved even for patients with severe right heart insufficiency and cardiorenal syndrome in combination with lymphedema.

#### 3. TREATMENT OF LYMPHEDEMA OF THE LOWER LIMBS IN PATIENTS AFFECTED BY SEVERE PERIPHERAL ARTERIAL DISEASE

A. HAMADÉ<sup>1</sup>, M.H. DIANCOURT<sup>1</sup>, M.B. LEIMBACH<sup>1</sup>, P. MICHEL<sup>2</sup>, G. OBRINGER<sup>1</sup>, J.C. STOESSEL<sup>1</sup>, M. LEHN-HOGG<sup>1</sup>, H. METZGER<sup>1</sup>.  
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Normally compression therapy is not indicated in patients with severe peripheral arterial disease (PAD). The problem becomes serious when the PAD is associated with lymphedema of the lower limb (LLL). We thus established a protocol for treating these patients.

In all patients affected by LLL we measure the ankle-brachial systolic pressure index (ABI).

When ABI is lower than 0.50 compression therapy (CT) is not indicated; revascularization of the lower limb is attempted before treatment.

If  $0.50 < \text{ABI} < 0.55$  we use microcirculatory activity: Transcutaneous oxygen tension (TCPO<sub>2</sub>); when TCPO<sub>2</sub> is more than 30 mmHg the patient is treated;  $20 < \text{TCPO}_2 < 30$  mmHg, we use TCPO<sub>2</sub> with hanging legs and when the microcirculatory reserve is  $> 40$  mmHg CT is indicated.

ABI is not applied in diabetic patients with LLL; we use TCPO<sub>2</sub> directly, and the systolic pressure index of the big toe (BTI).

In PAD with significant lymphedema of the foot, we only use ABI associated with BTI (TCPO<sub>2</sub> gives false results).

This protocol allows us to treat these patients without significant adverse effects of compression.

#### 4. LYMPHOLOGICAL COMPLICATIONS AFTER VASCULAR SURGICAL PROCEDURES

INGO FLESSENKÄMPER

Germany

#### 5. THE UNIT OF TREATMENT OF EDEMA IN FRANCE: A PECULIAR STRUCTURE AND ITS PLACE IN THE TREATMENT OF LYMPHEDEMA

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In Europe, there is a very important detrimental situation concerning treatment of edema: that is a sterile concurrence between practitioners because there is no very clear place defined for each one! And very often economy and money disturb the therapeutic schedule. So, we personally underline the importance of the unit of treatment of edema in this therapeutic chain.

Our experience concerns 2150 patients treated in the unit of treatment of edema of the general hospital Louis PASTEUR since 1985.

This concerns primary and secondary lymphedema of upper and lower limbs in men and women. According to our experience we think that the treatment is based upon three components:

1. the unit of treatment of edema,
2. the physician and the physiotherapist,
3. the patient himself actor of his own therapy.

The unit of treatment of edema, inside treatment, is reserved only for very heavy situations. It associates lymphatic manual drainage according to Leduc-Foldi, pneumatic drainage that is very light pressotherapy, multilayer bandages, sloping, physical exercises, medical treatments, choice of socks, contention, and other therapies in experiment.

The treatment is 8 hours per day; the hospitalisation is one or two weeks. The hospitalisation occurs one time the 2 or 3 years and the results are very good. Of course the scheme is possible because it is done here in France in a public structure of hospitalisation.

The main question remains, as we said and wrote in previous congresses: which is the precise mission of each partner to avoid detrimental competition often observed in such situations?

#### 6. LYMPHEDEMA ASSOCIATED WITH MORBID OBESITY: A COMPREHENSIVE THERAPEUTIC CONCEPT

Dr. med. TOBIAS BERTSCH

Germany

Obesity threatens our life like aids and cancer! It cripples human beings and effects all major organ systems.

Obesity has reached epidemic proportions; since 2011 more people die as a result of obesity than of hunger. The causes are multiple and complex, and not simply a result of overeating or a lack of willpower.

Morbid Obesity (BMI > 40 kg/m<sup>2</sup>) is associated with a high risk of severe comorbidities and particularly for lymphedema. Obesity is not only a cause of lymphedema but can also impair lymphedema! The increasing worldwide prevalence of obesity-related lymphedema is also reflected at the Földi Clinic and is a new challenge for the treatment of our patients.

Treatment of lymphedema must be linked to the treatment of obesity if long-term success is to be achieved. At the Földi Clinic we treat our patients with a comprehensive concept which includes bariatric surgery and also plastic surgery. The purpose of this lecture is to educate clinicians regarding the features and treatment of lymphedema in the context of the morbid obesity.

#### 7. EFFECTIVENESS OF CONSERVATIVE COMBINED TREATMENT IN LIPEDEMA PATIENTS

CARDONE M., CAPPELLINO F., FIORENTINO A., FAILLA A., MONETA G., MICHELINI S.

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Lipedema is a chronic disease that results in the symmetrical impairment of fatty tissue distribution with hyperplasia of fat cells. There is often a family history of the condition, it is painful and causes an impairment of daily activities. Traditional conservative treatments combine compression therapy, manual lymph drainage, and diet modification, mainly addressing the reduction of pain. The aim of this study was to evaluate the effectiveness of adding low frequency ultrasound therapy to these treatments, with 40 KHz cavitation, and mesotherapy performed with homeopathic drug (Lymphdiaral Injektopas, with the following composition: Conium Dil. D3 2.5 mg, Hydrastis Dil. D3 2.5 mg, Phytolacca Dil. D4 2.0 mg, Scilla Dil. D1 2.0 mg) in reducing leg measurements after treatment. The study was conducted on 20 healthy patients (all females). The subjects underwent 10 sessions of treatment on the fatty tissue of the legs, twice a week. Each low frequency ultrasound treatment was preceded by mesotherapy and followed by manual lymph drainage. Leg measurements, VAS pain scale and ultrasound measurements of suprafascial thickness were performed before and after the treatment protocol. The results showed a significant reduction in leg measurements and of suprafascial thickness, showing better results in combining all the performed conservative treatments, compared to limited protocols observed in literature. Average values of VAS pain scale showed significant reduction after treatment. No adverse effects were observed. BMI was substantially unchanged before and after the treatment in all patients.

Saturday September 15<sup>rd</sup> 2012 - H. 08,30

## 38<sup>th</sup> European Congress of Lymphology

### Session V - Surgery

#### 1. COMBINED SURGICAL TREATMENT FOR LYMPHEDEMA: EXPECTATIONS AND LIMITS

Prof. Dr. med. JAUME MASIA  
Spain

#### 2. PITTING AND NON-PITTING LYMPHEDEMA: THE PRESENCE OF ADIPOSE TISSUE IN LYMPHEDEMA

HÅKAN BRORSON, MD, PhD, Associate Professor (Lund University), Professor (EGAMA, BsAs)  
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In 1987 we noted an excess of adipose tissue in the lymphedematous tissues and recommended liposuction in order to remove the excess volume. This was questioned by several lymphologists. In recent years more and more information show that we now have clear evidence that lymphedema leads to deposition of adipose tissue. Thus we now know that patients with chronic, non-pitting, lymphedema develop large amounts of newly formed subcutaneous adipose tissue, which precludes complete limb reduction utilizing microsurgical reconstruction or conservative treatment. Although incompletely understood, this adipocyte proliferation has important pathophysiologic and therapeutic implications.

1. The findings of increased adipose tissue in intestinal segments in patients with Crohn's disease, known as "fat wrapping", have clearly shown that inflammation plays an important role (Borley NR, Mortensen NJ, Jewell DP, Warren BF. The relationship between inflammatory and serosal connective tissue changes in ileal Crohn's disease: evidence for a possible causative link. *J Pathol* 2000; 190: 196-202).
2. Consecutive analyses of the contents of aspirate removed under bloodless conditions, using a tourniquet, showed a very high content of adipose tissue in 44 women (mean 90%, range: 58-100) (Brorson H, Åberg M, Svensson H. Chronic lymphedema and adipocyte proliferation: Clinical therapeutic implications. *Lymphology* 2004; 37(Suppl): 153-5).
3. In Graves' ophthalmopathy a major problem is an increase in the intraorbital adipose tissue volume leading to exophthalmus. Adipocyte related IEGs (immediate early genes) are overexpressed in active ophthalmopathy and CYR61 (cysteine-rich, angiogenic inducer, 61) may have a role in both orbital inflammation and adipogenesis. (Lantz M, Vondrichova T, Parikh H, Frenander C et al. Over-expression of immediate early genes in active Graves' ophthalmopathy. *J Clin Endocrinol Metab* 2005; 90: 4784-91).
4. A functional inactivation of a single allele of the homeobox gene Prox1 led to adult-onset obesity due to abnormal lymph leakage from mispatterned and ruptured lymphatic vessels. Prox1 heterozygous mice are a new model for adult-onset obesity and lymphatic vascular disease. (Harvey NL, Srinivasan RS, Dillard ME, Johnson NC et al. Lymphatic vascular defects promoted by Prox1 haploinsufficiency cause adult-onset obesity. *Nat Genet* 2005; 37: 1072-81).
5. Tonometry can distinguish if a lymphedematous arm is harder or softer than the normal one. If a lower tissue tonicity value is recorded in the edematous arm it indicates that there is accumulated lymph fluid in the tissue, and these patients are candidates for conservative treatment methods. In contrast, patients with a harder arm compared with the healthy one have an adipose tissue excess that can successfully be removed by liposuction (Bagheri S, Ohlin K, Olsson G, Brorson H. Tissue tonometry before and after liposuction of arm lymphedema following breast cancer. *Lymphat Res Biol* 2005; 3: 66-80).
6. Investigation with VR-CT (Volume Rendering Computer Tomography) in 8 patients also showed a significant preoperative increase of adipose tissue in the swollen arm, followed by normalization at 3 months paralleling the complete reduction of the excess volume. (Brorson H, Ohlin K, Olsson G, Nilsson M. Adipose tissue dominates chronic arm lymphedema following breast cancer: An analysis using volume rendered CT images. *Lymphat Res Biol* 2006; 4: 199-209)
7. Analyses with DXA in 18 women with postmastectomy arm lymphedema showed a significant increase of adipose tissue in the non-pitting swollen arm before surgery. Postoperative analyses showed normalization at 3 months. This effect was seen also at 12 months. These results paralleled the complete reduction of the excess volume ("edema volume") (Brorson H, Ohlin K, Olsson G, Karlsson MK. Breast cancer-related chronic arm lymphedema is associated with excess adipose and muscle tissue. *Lymphat Res Biol* 2009; 7: 3-10).
8. Parathyroid hormone-like hormone (PTHrP), which can inhibit adipogenesis, is downregulated both in active and chronic ophthalmopathy, indicating the possibility of an increased risk of adipogenesis (Planck T, Parikh H, Brorson H, Mårtensson T, Åsman P, Groop L, Hallengren B, Lantz M. Gene expression in Graves' ophthalmopathy and arm lymphedema: similarities and differences. *Thyroid* 2011; 21:663-74).

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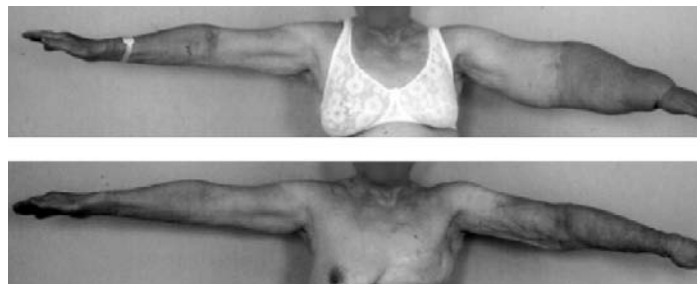
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9. Adipogenesis in response to lymphatic fluid stasis is associated with a marked mononuclear cell inflammatory response (Zampell JC, Aschen S, Weitman ES, Yan A, Elhadad S, De Brot M, Mehrara BJ. *Plast Reconstr Surg* 2012; 129: 825-34).
10. Lymphatic fluid stasis potently up-regulates the expression of fat differentiation markers both spatially and temporally (Aschen S, Zampell JC, Elhadad S, Weitman E, De Brot M, Mehrara BJ *Plast Reconstr Surg* 2012; 129: 838-47).

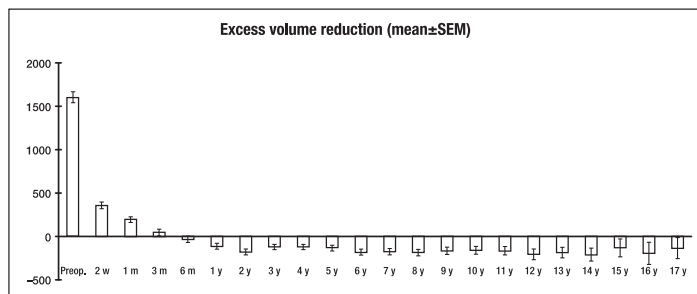
Liposuction can be performed in patients who fail to respond to conservative management or microsurgical reconstruction because the hypertrophy of the subcutaneous adipose tissue cannot be removed or reduced by these techniques.

The long-term results of liposuction for chronic large postmastectomy arm lymphedema (17 years) and primary and secondary leg lymphedema (8 years) leading to complete reduction, without recurrence, will be described.

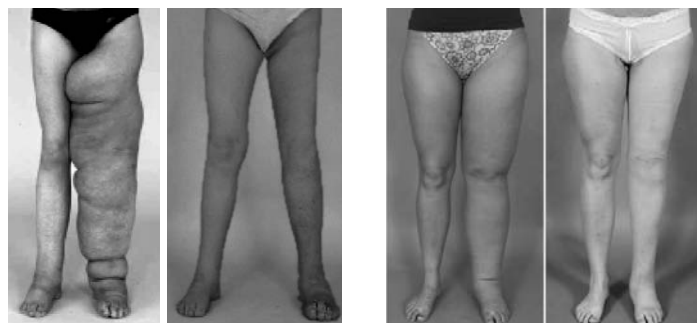
A 74-year old woman with non-pitting arm lymphedema of 15 years. Preoperative excess volume is 3090 ml and postoperative result.



Mean postoperative excess volume reduction in 130 patients with post-mastectomy arm lymphedema.

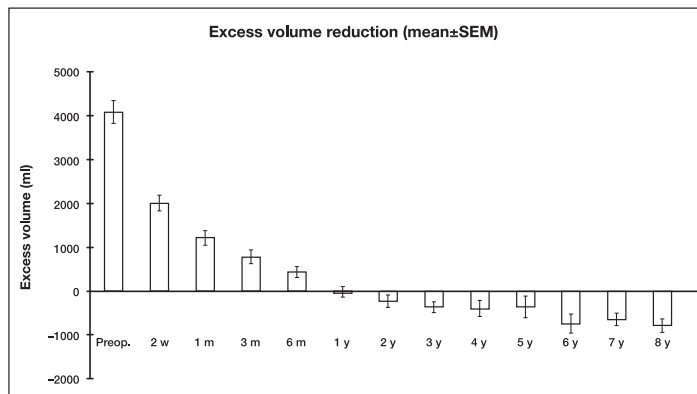


Preop. excess volume 14310 ml (left). 8 years postop (right)



Preop. excess volume 6630 ml (left). 2 years postop (right)

Mean postoperative excess volume reduction in 47 patients with primary or secondary leg lymphedema.





**3. LYMPHATIC SURGERY AND MICROSURGERY TODAY**

Prof. Dr. med. CORRADINO CAMPISI  
Italy

**4. PREVENTION AND TREATMENT OF LYMPHATIC MORBIDITY IN SURGICAL ONCOLOGY**

FRANCESCO BOCCARDO, MD, PHD, CORRADO CAMPISI, MS, CORRADINO CAMPISI, MD, PhD, FACS  
IRCCS S. Martino Hospital – IST (National Institute for Cancer Research) - Department of Surgery - Unit of Lymphatic Surgery - University of Genoa, Italy  
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Lymphatic morbidity in surgical oncology represents a key point for the quality of life of oncologic patients. The authors report their experience in the management of lymphatic injuries in surgery for breast cancer, skin melanoma and vulvar cancer.

They report pre-operative investigations, operative procedures and follow-up of patients undergoing oncological operations.

Results are assessed by volumetry and lymphoscintigraphy, even at over 3 years follow-up.

The author's experience permitted them to demonstrate the usefulness of preventative procedures in surgical oncology, which allow them to bring about a much better quality of life with regard to early and late lymphatic complications.

**5. INTERCONNECTED TREATMENT OPTIONS FOR LYMPHEDEMA: A BENEFIT FOR THE PATIENT!**

Prof. Dr. med. RÜDIGER BAUMEISTER  
Germany

**6. THE IMPORTANCE OF ADDITIVE PLASTIC SURGERY PROCEDURES IN THE TREATMENT OF CHRONIC LYMPHEDEMA**

Ass. Prof. Dr. med. NESTOR TORIO-PADRON  
Germany

*Saturday September 15<sup>rd</sup> 2012 - H. 10,30*

**Session VI - Miscellaneous****1. EFFECT OF DECONGESTIVE LYMPHATIC THERAPY IN THE MAINTENANCE PHASE OF LYMPHEDEMA: LONG TERM RESULTS OF A RANDOMIZED, MULTICENTER STUDY**

ISABEL FORNER-CORDERO<sup>1</sup>, JOSÉ MUÑOZ-LANGA<sup>2</sup>, PILAR REL-MONZÁ<sup>1</sup>, JUAN M DEMIGUEL-JIMENO<sup>3</sup>

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<sup>2</sup> Hospital DrPeset, Valencia.

<sup>3</sup> Hospital San-Pedro, Logroño, Spain

**Background:** Previous results showed that neither MLD nor pneumatic-massage (PM) appear to add any benefit to intermittent-pneumatic-compression therapy (IPC) followed by multilayered-bandages (MB) in DLT, but they may have some influence in maintaining the volume at long-term.

**Objectives:** To compare the progression rate of lymphedema in the maintenance phase after 3 different modalities of DLT.

**Methods:** randomized, multicenter study in patients with primary or secondary lymphedema, stage II-IV, when EV>10%. Patients were randomized to receive:

- A (control group): MLD+IPC (multi-compartmental pump)+MB;
- B: PM+IPC+MB;
- C: only IPC+MB.

After DLT, garments were prescribed (flat-knitted, custom-made, ccl2 UL, and ccl3 LL) and their fit was checked.

Patients were assessed with perometry at 1, 6 and 12 months.

At each time point (tx), the relative-volume-change (RVC) of the treated limb was calculated using volume ratios of the treated (T) to non-treated (N) side compared to the baseline (t1) [RVC=(Tx/Ntx)/(Tt1/Nt1)-1]. We used a 10%-threshold of RVC to define the progression of lymphedema.

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**Results:** All of 181 treated patients started the maintenance phase. Demographic and clinical characteristics were well balanced between the 3 groups.

Global mean RVC was 1.95% (95%CI:1.08-2.83), 4.2% (95%CI:3.02-5.39) and 5.76% (95%CI:4.32-7.19) at 1, 6 and 12 months after the end of DLT, respectively, without significant differences between groups.

The rate of progression during follow-up was 28.7% (95%CI:22.6-35.7) without differences between groups: 20 patients in Group A, 16 in Group B, and 16 in Group C (p=0.349).

Among the 52 patients that progressed, 25 presented a documented cause for the progression (13 non-compliance with garment; 7 trauma, 4 lymphangitis and 1 weight-gain) and 27 patients without a known cause.

We found no differences between groups in adverse events: Discomfort (48), Lymphangitis (7), Edema-displacement (1), Fibrosclerotic-ring (2), Loss of mobility (4).

**Conclusions:** The modality of DLT did not have any effect on the progression of lymphedema during the maintenance phase.

## 2. RISK FACTORS FOR ERYSIPELAS IN LYMPHEDEMA PATIENTS

WALTER DOELLER, MD

*Centre of Lymphology, State Hospital Wolfsberg, Austria*

Erysipelas is the most common complication in untreated lymphedema. In English-speaking countries the term erysipelas, cellulitis, and infectious panniculitis are sometimes used synonymously.

However erysipelas is defined as a bacterial infection of the upper skin layers, including the lymph vessels and it appears as a sharply circumscribed redness of the skin, sometimes with a raised edge and systemic signs of illness. Trigger of this infection is the intrusion of *Streptococcus pyogenes* group B, C, G or *Staphylococcus aureus*.

The differential-diagnostic distinctions of erysipelas are stasis dermatitis, contact dermatitis, and also necrotizing fasciitis in severe cases.

There are local and systemic circumstances known as risk factors for erysipelas. Most frequently erysipelas infections are observed in legs, but they can occur in all body regions with impaired lymphatic drainage. General risk factors are obesity, peripheral arterial disease, diabetes mellitus, hepato- and nephropathy. Local risk factors are fungal interdigital infections, trauma, previous surgery, lymphatic cysts and fistulas and lymphostatic papillomatosis cutis.

This presentation will cover the diagnosis of erysipelas, differential diagnosis, general and local risk factors, preventive measures and treatment options.

**Key words:** Erysipelas, lymphedema, *Streptococcus pyogenes*, *Staphylococcus aureus*. risk factors, definition – diagnosis – treatment.

## 3. LYMPHEDEMA OF THE BREAST: DIAGNOSTICS AND CONTROLLING THE THERAPEUTIC RESULTS

M. OBERLIN

*Foeldi Clinic Hinterzarten, Germany*

Numerous studies have reported lymphedema morbidity after breast cancer treatment. Diagnostic and treatment plans for arm lymphedema are well known and practiced in CDT. Breast lymphedema morbidity has been investigated in only a few studies. The incidence of breast lymphedema in the literature shows a extremely wide range between 10% and 70%. Breast lymphedema seems to increase after more extensive axillary surgery and postoperative radiotherapy. Also in some papers the location of the tumor in the breast may influence the prevalence of breast lymphedema. Prevalence of breast lymphedema after sentinel node biopsy has not been widely reported.

High resolution ultrasound plays a important part in detecting and observing skin edema caused by disturbances to lymphatic transport. If lymphedema occurs, the skin thickens and the superficial layer of the skin shows reduced echogenicity. The subcutaneous tissue is thicker than normal but has an increased echogenicity; sometimes the borderline between dermis and subcutis is not or only poor visible and in some cases less echogenic or echofree gaps can be detected. With modern ultrasound probes objects down to 0.05 mm in size can be detected, the extremely sensitive color-doppler probe shows speed velocities up to 1.3 cm/sec. For many years normal skin thickness was measured from 0.5 mm to 2 mm in patients without edema although in a normal population. Most of the authors diagnose lymphedema if the skin thickness is more than 2 mm.

We measured skin thickness in different areas of the human body with an 17 Mhz high-resolution ultrasound probe: 1.32 - 1.65 mm were measured in the thigh, 1.26 - 1.43 mm in the lower arm, 1.4 - 1.8 mm in the abdominal wall and 1.1 - 1.3 mm in the breast.

In order to make the right diagnosis for the long-term treatment plan we measured skin thickness in breast edema patients, when during the initial examination at the Foeldi Clinic at the outset of phase I CDT palpation showed suspected lymphedema of the breast.

In 22 patients we measured skin thicknesses from  $1.43 \pm 0.22$  mm in the non-affected breast versus  $2.60 \pm 0.60$  mm on the edema side.

This year we started a specific ultrasound protocol for all patients after breast cancer treatment with breast-saving surgery with or without clinically obvious breast edema. The total skin thickness of the four quadrants of the breast were recorded for both the operated breast and the contralateral breast. The measurement was made by the same examiner on the first day of treatment and there was a

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control measurement the day before discharge. To date the number of patients is still too small in order to generate statistics. We present our first results, and further investigation will continue.

Depending on the ultrasound picture with the diagnosis of concomitant breast lymphedema, patients undergo regular CDT for lymphedema of the arm, or additional treatment for the breast lymphedema with manual lymph drainage and special compression pieces for placing inside a bra.

**Conclusion:** High resolution ultrasound is a good and cost-saving method for diagnosing breast edema and for monitoring and recording the edema-reducing effect of manual lymph drainage and specialist compression therapy.

#### 4. LYMPH COLLECTOR TRANSPLANTATION FOR LYMPHEDEMA MANAGEMENT IN CANCER PATIENTS: A PROSPECTIVE STUDY

THIHA AUNG<sup>1,2</sup>, MIKHAIL ZVONIK<sup>1</sup>, DALIA TOBBIA-SATTLER<sup>1</sup>, JÖRG WILTING<sup>3</sup>, GUNTHER FELMERER<sup>1</sup>

<sup>1</sup> Division of Plastic Surgery, Department of Trauma Surgery, Plastic and Reconstructive Surgery, University of Medicine, Goettingen, Germany

<sup>2</sup> Department of Hematology and Oncology, Georg-August-University Goettingen, Germany

<sup>3</sup> Center of Anatomy, Department of Anatomy and Cell Biology, University Medicine Goettingen, Goettingen, Germany

**Background:** Secondary lymphedema is a debilitating condition which commonly causes complications in cancer therapy. This prospective study provides an overview on the treatment of secondary lymphedema by use of lymph collector transplantation as well as pre- and post-operative examination using the DASH-Score and UEL-Index for upper lymphedema and LEL-Index and AOFAS for lower extremity lymphedema.

**Method:** Twenty patients with secondary upper-extremity lymphedema and fifteen with lower extremity lymphedema underwent surgery for lymph collector transplantation. The mean duration of lymphedema was 3 years ranging I-III. The pre- and post-operative severity of their condition was evaluated with the DASH-Score, L-Dex and moisture content. The evaluation took place once before the surgery, then 14 days, 3 and 6 months and 1 year after the procedure. The evaluation includes MRL, lymph scintigraphy and PDE.

**Results:** The standard treatment involved the transplantation of 3-4 lymph collectors of 25-30cm length from the ventromedial bundle of the upper leg. The mean follow-up time was 18 months. MRL and PDE show that after 1 year the transplanted lymph collectors remain fully functional. 35 patients showed a constant decrease of edema and stabilization of the DASH-Score and UEL-Index, AOFAS and LEL index through 18 months.

**Conclusion:** Lymph collector transplantation may be a treatment option for secondary lymphedema management. The evaluation results from both DASH-Score and UEL-Index point towards a strong correlation for upper extremities, while LEL-Index and AOFAS can be used for lower extremity evaluations.

#### 5. PRIMARY PREVENTION AFTER BREAST CANCER SURGERY: ECHO-COLOUR-DOPPLER DIAGNOSTICS VERSUS LYMPHOSCINTIGRAPHY EXAM

MARINA CESTARI, MD

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In this study a venous upper limb echo-colour-doppler exam is carried out in patients with no clinical evidence of edema, who had previously undergone monolateral breast cancer surgery.

Deep and superficial veins of compared arms were explored by echo-colour-doppler (Sonoline Antares 7.5 MHz probe) and their sizes measured. Patients lie supine on the bed (inclined at 30°) with arms alongside the body.

During the evaluations already performed, we noticed an asymmetrical calibre of cephalic veins in most cases, due to the decrease or increase of the homolateral side and so we decided to focus our attention on these measurements, and furthermore, to compare them to the lymphoscintigraphy previously carried out (normal or slower radiotracer flow), in order to investigate an eventual correlation.

So far this study highlights how the asymmetry of cephalic veins seems to have a correlation with the lymphoscintigraphy results both in lymphadenectomy (homo-lateral increased size corresponds to slower radiotracer flow) and in sentinel node biopsy (symmetrical size corresponds to normal radiotracer flow).

Further investigation is required in order to understand the significance of changes in the calibre of the cephalic vein size in the ambit of sub-clinical stage.

## 6. ULTRASOUND ELASTOGRAPHY AS AN OBJECTIVE DIAGNOSTIC MEASUREMENT TOOL FOR LYMPHEDEMA OF THE TREATED BREAST IN CANCER PATIENTS FOLLOWING BREAST CONSERVING SURGERY AND RADIOTHERAPY

Dr. med. NELE ADRIAENSSENS  
Belgium

## 7. PATHOLOGICAL STEPS OF CANCER-RELATED LYMPHEDEMA: HISTOLOGICAL CHANGES IN THE COLLECTING LYMPHATIC VESSELS AFTER LYMPHADENECTOMY

MAKOTO MIHARA

*The university of Tokyo - Department of Plastic and reconstructive surgery . Bunkyo-ku, Hongo 7-3-1 - 1330655 Tokyo - Japan*  
*E-mail: mihara.plasticsurgery@gmail.com*

**Introduction:** To date, an electron microscopy study of the collecting lymphatic vessels has not been conducted in order to examine the early stages of lymphedema. Such histological studies could be useful however, in elucidating the mechanism of lymphedema onset. The aim of this study was to clarify the changes occurring in collecting lymphatic vessels after lymphadenectomy.

**Patients and Methods:** The study was conducted on 114 specimens from 37 patients who developed lymphedema of the lower limbs after receiving surgical treatment for gynecological cancers and who consulted the University of Tokyo Hospital and affiliated hospitals from April 2009 to March 2011. Lymphatic vessels that were not needed for lymphaticovenous anastomosis surgery were trimmed and subsequently examined using electron microscopy and light microscopy.

**Results:** Based on macroscopic findings, the histochemical changes in the collecting lymphatic vessels were defined as follows: Normal, ectasis, contraction, and sclerosis type (NECST). In the ectasis type, an increase in endolymphatic pressure was accompanied by a flattening of the lymphatic vessel endothelial cells. In the contraction type, smooth muscle cells were transformed into synthetic cells and promoted the growth of collagen fibers. In the sclerosis type, fibrous elements accounted for the majority of the components, the lymphatic vessels lost their transport and concentrating abilities, and the lumen was either narrowed or completely obstructed.

**Conclusions:** The increase in pressure inside the collecting lymphatic vessels after lymphadenectomy was accompanied by histological changes that began before the onset of lymphedema.

## 8. LYMPHATIC CLINICAL SEVERITY SCORE (LCSS) AND LYMPHEDEMA DISABILITY

MICHELINI S., CARDONE M., CAPPELLINO F., FIORENTINO A., FAILLA A., MONETA G.

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To facilitate the study of the natural history and management of venous diseases, a 10-component venous clinical severity (VCS) score has been proposed as an objective measure of disease severity, similar to what is proposed for venous diseases. The AA. have identified 10 scores that define the severity of primary or secondary lymphedema. The 10 scores proposed are: 1) Lymphatic edema (from 0: absent; to 3: elephantiasis with loss of normal morphology of the limb); 2) Tissue induration (in three items); 3) Inflammation (from 0: absent; to 3: diffuse cellulitis); 4) Skin dystrophy (from 0: absent, to 3: diffuse); 5) Recurrent lymphangitis (from 0: absent, to 3: > 2 episodes of lymphangitis); 6) Pain (from 0: absent, to 3); 7) Lymphatic ulcers (from 0: absent, to 3: > 2 ulcers); 8) Articular involvement, of most important joint of limb (from 0: absent, to 3: 3 most important joints involved); 9) Muscular Hypotrophy (from 0: absent; to 3: diffuse); 10) Compression therapy (from 0: un-necessary, to 3: full necessity of garments). The total amount of this score can be divided in: Stage 1 (0-5): no treatment; Stage 2 (6-15) Outpatients with indications for drug treatment, physical therapy and microsurgery; Stage 3 (16-22) out-patient rehabilitative treatment with drugs and microsurgery; Stage 4: (23-30) Hospitalization with indication for physical treatment of the edema and other therapies for clinical complications.

In the casuistry of 112 patients (47 primary and 65 secondary) the AA. observed 13 pts (11.7%) in Stage 1, 44 (39.3%) in stage 2; 32 (28.5%) in Stage 3 and 23 (20.5%) in Stage 4.

The study demonstrated the easy definition of the clinical evolution of illness and subsequent therapeutic indications.

## 9. PREREQUISITES FOR SUCCESSFUL CONSERVATIVE TREATMENT OF EXTREMITY LYMPHEDEMA

PT PhD JEAN-PAUL BELGRADO

Belgium

Saturday September 15<sup>rd</sup> 2012

## Poster Session

### 1. EARLY CONTRALATERAL SHOULDER-ARM MORBIDITY IN BREAST CANCER PATIENTS ENROLLED IN A RANDOMIZED TRIAL OF POST-SURGERY RADIATION THERAPY

ADRIAENSSENS NELE

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**Introduction:** Shoulder/arm morbidity is a common complication of breast cancer surgery and radiotherapy (RT), but little is known about acute contralateral morbidity.

**Methods:** Patients were 118 women enrolled in a RT trial. Arm volume and shoulder mobility were assessed before and 1 to 3 months after RT. Correlations and linear regression were used to analyze changes affecting ipsilateral and contralateral arms, and changes affecting relative interlimb differences (RID).

**Results:** Changes affecting one limb correlated with changes affecting the other limb. Arm volume between the two limbs correlated ( $R = 0.57$ ). Risk factors were weight increase and axillary dissection. Contralateral and ipsilateral loss of abduction strongly correlated ( $R = 0.78$ ). Changes of combined RID exceeding 10% affected the ipsilateral limb in 25% of patients, and the contralateral limb in 18%. Aromatase inhibitor therapy was significantly associated with contralateral loss of abduction.

**Conclusions:** High incidence of early contralateral arm morbidity warrants further investigations.

### 2. EFFECTS OF COMBINED DECONGESTIVE PHYSIOTHERAPY WITHOUT BANDAGING IN INTENSIVE LYMPH DRAINAGE AND SUBSEQUENT MAINTENANCE

AYAKO TOSAKI

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For the long-term medical therapy of lymphedema, our clinic has been trying to make use of elastic stockings without bandages in order to reduce edema, while at the same time placing much value on patients' daily-lifestyle and improving QOL. The aim of this study is to assess the effect of our method. The intensive lymph drainage phase (phase 1) consists of the following steps: During the day, patients wear a flat-knitted elastic stocking, with a second round-knitted elastic stocking worn over the flat-knitted stocking, if required. At night patients wear a simplified compressive-treatment aid made of urethane polymer, fitted to each patient. During the maintenance phase (phase 2), patients wear the customized elastic stocking. 37 women with secondary lower extremity lymphedema were enrolled in this study. For a total period of 300 days, circumference measurements were performed when patients attended our clinic. The time-series measurement data for non-regular visiting patients were pre-processed using the Centered Moving Average method for statistic data. The percentage reduction was calculated for the excess lower and upper thigh volume. During phase 1, which lasted on average 21.2 days, the mean volume of the affected lower thigh decreased significantly from 3057 ml to 2564 ml ( $p < 0.001$ ); the percentage of edema reduction was 16.1%. At 300 days, percentage of edema reduction in the affected lower thigh was 26.6%. In our country bandaging is applied to lymphedema patients on an outpatient basis, which reduces the patients' QOL. Compression with elastic stockings is much easier for controlling edema for patients in both phases. Our method was useful not only in reducing edema but also for fixing the affected thigh in shape and is thought to be an alternative to conventional methods.

### 3. THE CURRENT TREATMENT FOR LYMPHEDEMA IN TURKEY

BAKAR YESIM

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Lymphedema is a worldwide problem, and yet until recently it has been considered a relatively unimportant health concern. In developed countries it mainly occurs following surgical treatment for cancer. Many studies have shown that this condition decreases quality of life. While many patients in Turkey suffer from lymphedema, there is no data currently available on this condition. As survival rates after cancer surgery are expected to improve, there is likely to be an increase in the prevalence of lymphedema.

The history of lymphedema treatment in Turkey begins in the 2001. Before then healthcare professionals did not know much about lymphedema. Although they described it as a post-operative side effect of cancer, they concluded that it was an untreatable symptom once acquired. Patients could only hope that swelling would not occur in their limbs, and uninformed patients did not understand what was happening when swelling began.

The main strategy at that time was to treat lymphedema with pneumatic compression devices, which was not significantly effective.

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Also surgical treatment (Charles-Thomson operations) and supermicrosurgery was attempted. Recently the number of surgical interventions decreased because the long-term effects have been serious side effects.

The current treatment for lymphedema today in Turkey is known as complete decongestive physiotherapy (CDP). CDP consists of two phases. The first phase of treatment consists of MLD, skin care, compression bandaging and decongestive exercises. Phase 2, consists of MLD, skin care, compression garments and decongestive exercises.

In Turkey, the Földi method is the most popular treatment method for lymphedema because the first therapist in Turkey was educated at the Földi School and Földi Clinic in Germany in 2001.

In 2008 the first lymph drainage course was held in Turkey; a turning point for physiotherapists which helped to raise considerable interest in the condition. This course was organized by the Földi School, Training Institute for Manual Lymph Drainage, CDP. Since 2008 the Földi School trained approximately 200 certified lymphedema therapists in Turkey.

A number of difficulties have arisen for the treatment of lymphedema in Turkey. Firstly, it is difficult to find a certified lymphedema therapist. Secondly, the therapy for lymphedema is not covered by national health insurance, so patients must pay more than 5000 YTL (nearly 3000 US\$) for their treatment and compression hosiery per year and this is the main reason for patients discontinuing therapy. Lastly patients often refuse to wear compression garments because of the weather, discomfort etc.

Preventive education for postoperative patients with cancer (gynecological, breast, prostate) will only reduce some of the costs for lymphedema patients. The education of healthcare professionals is also important because they have not as yet received education in lymphedema care.

#### 4. EVALUATION OF JOINT POSITION SENSE IN PATIENTS WITH PRIMARY LYMPHEDEMA - A CASE REPORT

AKIN BASKENT<sup>1</sup>, ISMAIL YILDIZ<sup>2</sup>, AYSE KILIC<sup>2</sup>, EMIN UNUVAR<sup>2</sup>

<sup>1</sup> Istanbul University, Istanbul Medical Faculty, Department of Thoracic Surgery - E-mail: akinbaskent@yahoo.com

<sup>2</sup> Istanbul University, Istanbul Medical Faculty, Department of Pediatrics

**Background and Purpose:** The aim of this case report is to evaluate joint position sense in patients with bilateral primary lymphedema. Primary lymphedema can negatively affect function. Lower extremities were affected and gait parameters were impaired. Proprioception has an important role in obtaining joint stability and maintaining it. This case report describes the effects of primary lymphedema on joint position sense in the lower extremities.

**Case Description:** The patient was a 12-year old child with primary lymphedema of both lower limbs. The patient attends school every day, and he no limitation in joint mobility. The right lower limb is more affected than the left, and there is more edema on this side too. There was 1 cm difference between both sides for the circumferential lower-extremity measurement above the knee and 4 cm difference below the knee. Joint position sense was measured with an electrogoniometer. The average absolute angle error value (AAAEV) was calculated.

**Outcomes:** In order to perform daily living activities and weight-shifting in the lower extremities, stability and balance is required in the joints. Average absolute angle error value (AAAEV) was 3.00 in the right lower extremity and 1.83 on the left side for this primary lymphedema patient. There was an error value higher on the right side than the left; the position sense is thus more affected.

**Discussion:** We need more clinical research with more patients, beyond the scope of this one case report. It may help to include balance and proprioceptive exercises when preparing exercise programs for these patients.

#### 5. LYMPHATIC COLLECTOR VESSEL PUMP FUNCTION IS NOT ACUTELY INFLUENCED BY AXILLARY SURGERY FOR BREAST CANCER

CINTOLESI V., STANTON A.W.B., LEVICK J.R., MORTIMER P.S.

Breast cancer-related lymphoedema (BCRL), a permanent swelling of the arm, affects up to 1-in-4 women following axillary lymph node removal during breast cancer treatment.

The contractile strength of the lymphatic collector vessels can be assessed by their maximum pumping pressure ( $P_{\text{pump}}$ ), using lymphatic congestion lymphoscintigraphy (LCL).  $P_{\text{pump}}$  is 38% lower in the swollen BCRL arm ( $24 \pm 19$  [SD] mmHg) than in normal arms ( $39 \pm 14$  mmHg; Modi S, *et al.* J Physiol 2007; 583: 271-285). We proposed that axillary surgery chronically increases lymphatic afterload, leading eventually to pump failure and BCRL in some women.

It is unknown whether  $P_{\text{pump}}$  is constitutionally lower in such patients, or if it is impaired by surgery. We therefore measured  $P_{\text{pump}}$  in women with newly diagnosed breast cancer before (visit 1, n=17) and after (2.6±1.3 months, visit 2, n=5) breast cancer surgery, using LCL (Modi *et al.*, 2007).

Arm volumes were measured by perometry. 11±8 lymph nodes were removed. Arm volumes (ipsilateral, contralateral) were 2133±607 ml and 2134±594 ml on visit 1 and 2702±597 ml and 2663±578 ml on visit 2.

BCRL was clinically evident in 2/5 women at 2 months post-surgery, with increases in ipsilateral arm volume of 129 and 434 ml. Ipsilateral arm volume in the 3/5 non-BCRLs rose by 13, 49 and 108 ml.  $P_{\text{pump}}$  on visit 1 ( $28 \pm 13$  mmHg, n=17) did not change significantly on visit 2 ( $30 \pm 16$  mmHg; n=5, P=0.42, Wilcoxon test).  $P_{\text{pump}}$  on visit 1 in the future BCRLs (40, 40 mmHg) was higher than in the non-BCRLs (20, 20, 10 mmHg).

Therefore, surgical removal of axillary lymph nodes does not immediately affect lymphatic collector contractility. Continuing studies will test whether  $P_{\text{pump}}$  is higher pre-surgery in patients who later develop BCRL.

## 6. RESEARCH OF BIOMECHANICAL AND LABORATORY ANORMALITIES OF PATIENTS WITH LYMPHEDEMA OF LOWER EXTREMITIES

Dr. med. SERGEY KATORIKIN  
Russia

## 7. AUTOLOGOUS GROIN LYMPH NODE TRANSFER FOR "SENTINEL LYMPH NETWORK" RECONSTRUCTION AFTER HEAD-AND-NECK CANCER RESECTION AND NECK LYMPH NODE DISSECTION

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Local or distant metastatic recurrence after therapy is observed in 20-30% of cases of head and neck cancer. An unfavorable course may occur after cervical lymph node dissection due to loss of immunoprotective lymph nodes in the head and neck region. To overcome this problem, we performed autologous lymph node transplantation from the groin after head and neck cancer resection and cervical lymph node dissection. The patient was a 63-year-old man with squamous cell carcinoma in the mesopharyngeal lateral wall. After tumor resection and right cervical lymph node dissection, a lymph node-containing superficial circumflex iliac artery perforator (SCIP) flap was transplanted from the left groin. Pathological examination showed that cancer had invaded the primary tumor tissue stump. Thus, radiotherapy (66 Gy) was performed for the residual tumor from days 28 to 84 after surgery. At 12 months after surgery, no recurrent lesion has developed. The biopsy of flap and lymphatic vessel endothelial hyaluronan receptor-1 (LYVE1) immunostaining shows creditable lymph network in the flap, compared to the normal free flap. This case suggests that autologous lymph node transplantation may keep watch on cancer recurrence by reconstruction of the lymph node system in the resected region, and we suggest that this approach may be very useful in cancer therapy.

## 8. AXILLARY WEB SYNDROME COMBINED WITH LONG THORACIC NERVE INJURY AFTER AXILLARY DISSECTION. A CASE REPORT

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**Introduction:** Cording, an unusual form of superficial sclerosing thrombophlebitis, is a variant of the disease described by Henri Mondor in 1939. In the axilla, the condition is called axillary web syndrome (AWS) and is frequently seen following axillary lymph node clearance and sentinel lymph node biopsy. First described by Moskowitz in 2001 (3). The incidence for the development of AWS following axillary surgery increases with the complexity of surgery (1), 57-72% after lymphadenectomy and 0.5-20% after sentinel lymph node biopsy (2).

**Materials and methods:** We report a case of a 41 year-old woman affected by AWS and long thoracic nerve injury after a wide local excision with direct side-to-side closure for a ductal carcinoma in the left axilla.

**Physical examination:** The abduction of the arm revealed 2 cords in the lateral axilla extending to the mid-upper arm and a further cord-like lesion in the anterior cubital fossa without signs of infection, inflammation, or swelling. The range of motion in the shoulder was limited. We also found a serratus anterior weakness with scapular winging.

**Treatment:** Physiotherapy: ROM exercises. Stretching of shoulder and elbow. Cord stretching. Axillary massage. Neuromuscular bandaging. TENS. Serratus anterior exercises.

**Results:** Complete recovery after 4 weeks.

### Conclusions:

1. AWS is a self-limited and frequently overlooked cause of significant morbidity in the early post-operative period after axillary surgery.
2. However, whereas physiotherapy often accompanies the resolution of symptoms, it is difficult to determine a causal relationship between the two.
3. More collaboration between surgeons and rehabilitation would improve education about, and treatment of AWS, which can have an important impact on the quality of life of breast cancer patients.

## 9. MICROSURGICAL LYMPHOVENOUS ANASTOMOSES AFTER 45 YEARS: FOLLOW-UP AND INDICATIONS

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### Background:

Microsurgical lympho-venous shunts have an established position in the treatment of certain types of lymphedema in all parts of the world.

### Methods:

Over the last 45 years we have performed over 1000 microsurgical lympho-venous shunts (lymphnode-vein, lymphatics-vein) in patients with lymphedema of the lower limbs. The follow-up was 5 to 40 years. Improvement criteria were: Decrease in limb circumference (compared to the contralateral normal limb), range of movement in knee and ankle joints, no progress in hyperkeratosis, decrease in the frequency of inflammation attacks.

### Results:

The five year results were 80% for the postsurgical group (cancer survivals), 40-50% in the postinflammatory group, above 80% in the inborn hyperplastic group, and 5-10% in the idiopathic group. Stabilization of clinical status after initial improvement was observed in all patients followed for 5-40 years. The present conditions which must be met for lv shunts: (i) at least one lymphatic and fragment of inguinal lymph node visualized on lymphoscintigraphy within 3h, (ii) fast growing edema after hysterectomy or groin dissection not controlled by elastic support, (iii) hyperplastic lymphedema in children and teenagers, (iv) decompression of thigh lymph stasis before lower leg debulking. Contraindications: (i) lack of lymphatics on lymphoscintigraphy, (ii) inflammatory changes in skin and lymphatics, (iii) idiopathic lymphedema. Postoperative evaluation: lymphoscintigraphy with liver scanning (time of appearance of tracer in blood circulation), subsidence of DLA attacks, lack of increase of circumference.

### Conclusions:

The 5-year follow-up of patients operated on in the 1960s and 70s showed evident efficacy of microsurgical shunting. Today's evaluation is partly overshadowed by MLD, administration of long-lasting penicillin and elastic support.

## 10. TISSUE FLUID HYDRAULICS: NEW DATA

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## 11. WHERE DOES TISSUE FLUID/LYMPH ACCUMULATE DURING MANUAL AND PNEUMATIC MASSAGE AND ELASTIC GARMENT COMPRESSION IN LYMPHEDEMATOUS LOWER LIMBS?

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**Background:** Edema fluid accumulates predominantly in soft tissues and perivascular spaces but differently in various topographical parts of the limbs. Knowledge of accumulation sites is necessary for effective compression therapy. The aim was to visualize sites with the highest accumulation of edema fluid where most of the compression force should be applied and to measure the mobility parameters.

**Methods:** Lymphoscintigraphy with <sup>99</sup>Tc Nanocoll was used to visualize the topographical distribution of edema fluid and wick-in-needle and strain gauge plethysmography were used to measure the mobility of fluid pressure. The tonometry of soft tissues and limb circumferences were measured. Studies were carried out in 30 patients with obstructive post-inflammatory lymphedema in stage II to IV. In group 1 30 min of manual massage was applied, and in group 2 30 min pneumatic massage was applied. Elastic bandaging with Coban 2 (3M) was tried in group 3.

**Results:** During pneumatic massage and bandage compression, lymphoscintigraphy showed that fluid was partly retained in the foot, fragmented collecting lymphatics were visualized, accumulating in the calf and popliteal region, and reaching the groin and upper thigh but it was unable to pass through the inguinal crease. Tissue fluid pressures were high in the mid-calf but low below and above knee and in the groin. Flow was low above the ankle, high in the mid-calf, low at knee level, increasing in mid-thigh and low again in the groin. Tonometry showed a decrease in the mid-calf but an increase below and above the knee and groin. Circumference measurements showed the same pattern. During and after manual massage these changes were less expressed.

**Conclusions:** The bulk of edema fluid accumulates in the foot, popliteal fossa and below groin; sites with loose connective tissue. Selectively more compression force should be applied in these regions in order to move fluid.



## 12. VEGF-C-APPLICATION AND THE REGENERATION AND RECONNECTION OF AUTOTRANSPLANTED LYMPH NODE FRAGMENTS IN RATS: THE EFFECTS OF TIME POINT, LOCATION AND DOSAGE

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Since there is no adequate surgical therapy for secondary lymphedema after breast cancer treatment, the purpose of this study was to improve the application pattern of VEGF-C in order to achieve a higher regeneration rate of autologous transplanted lymph node fragments. We focused on the time point, location and injected dosage. All right inguinal lymph nodes of adult, healthy female Lewis rats (~200g) were removed; three nodes were fragmented and transplanted back into a subcutaneous pouch.

The lymphatic-transplant-reconnection was tested by Patent Blue and regeneration was investigated by B- and T-lymphocyte-, HEV- and lymph endothelial cell- distribution (fluorescent immunohistochemistry).

Time point and location do not have a statistical effect on regeneration. However, the study also illustrates that early application (day 1,2,3 post-OP) and application in the medial side of the thigh, have a significant influence (53%, control: 15%) on reconnection, whereas application into the abdominal wall showed only a statistical tendency (50%) and a late time point (day 14,15,16 post-OP) revealed no statistical effect at all (35%).

A higher dosage (13.34 µg/rat) results in 95% regenerated lymph node fragments whereas the control group ends up with only 70%. Reconnection also benefits from a high VEGF-C dose, with an outcome of 80% compared to 15% in the control group, the reconnection rate is extremely significantly enhanced.

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## 13. FORMATION OF TISSUE FLUID CHANNELS IN LYMPHEDEMATOUS SUBCUTANEOUS TISSUE DURING INTERMITTENT PNEUMATIC COMPRESSION THERAPY

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### Background:

In advanced lymphedema of the lower limbs pressures generated by muscular contractions and massage move fluid through spontaneously formed tissue channels. We tried to enhance formation of these channels by high pressure long-term pneumatic massaging. The aim was to observe the formation of tissue channels during high pressure pneumatic therapy using lymphoscintigraphic and biopsy histochemical methods.

### Methods:

Ten patients with lymphedema of the lower limbs in stage II/III were investigated. The parameters of compression were: Inflation pressure 120-100mHg, sequentially from chamber 1 to 8, inflation time of each chamber 50", daily for 1 h and for a period of 12 months. Lymphoscintigraphy with Nanocoll was performed before and after 6 and 12 months of treatment. Skin and subcutaneous tissue biopsies were taken before and after treatment. Specimens were injected with Paris Blue in chloroform and made translucent in order to visualize spaces filled with mobile tissue fluid and subepidermal lymphatics.

### Results:

Lymphoscintigraphic imaging: After one year of massaging multiple wide channels filled with tracer could be seen in the subcutis on the internal aspect of thigh and along large blood vessels running to the groin. There were no channels around the hip, in the hypogastrium and the buttocks. Immunohistochemistry of the biopsies revealed the presence of open spaces negative on staining with LYVE1 in the subcutis and around veins. These spaces were stained with Paris Blue and were of irregular shape with many interconnections.

### Conclusions:

Long term high pressure pneumatic compression brings about formation of multiple fluid channels running to the groin and femoral channel but not to the lateral parts of the limb.

#### 14. PHYSIOLOGICAL PARAMETERS FOR EFFECTIVE COMPRESSION THERAPY OF SWOLLEN LOWER LIMBS; TISSUE FLUID PRESSURE AND FLOW, TONOMETRY

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##### Background:

Mechanical compression is an effective conservative method enabling tissue fluid (TF) to overcome tissue resistance and flow to the non-swollen regions. How high should externally applied forces be, and what timing of the compression is necessary in order to move stagnant tissue fluid?

##### Methods:

We studied the hydraulics of tissue fluid in swollen lower limbs using intermittent pneumatic compression in 30 patients with lower limb lymphedema stage II/III. Inflation pressure ranged from 50 to 120mmHg, sequentially from chamber 1 to 8, inflation time of each chamber ranged from 5 to 20 to 50 sec. Skin tonometry was measured. TF pressure was measured in the calf and thigh with use of a subcutaneously placed pressure sensor. Changes in the circumference of compressed limbs were measured continuously using a plethysmograph.

##### Results:

Inflation for 5 and 20 sec did not allow TF pressure to be reached as it was in the inflated chamber. In advanced cases of lymphedema, in order to obtain the transmural (TF) pressure of 40 mmHg, pressures in the sleeve had to be raised as high as 150 mmHg and timing increased to 50 sec. Tonometry: The tonometer plunger was pressed against the swollen tissue to a depth of 10 mm and the applied force was read off on the scale. The applied force was plotted against pressure, and it gave an indication of how high massage pressure would be required in order to move TF. A tonometer force of 1000g/sq.cm generated average TF pressures of 25-40 mmHg, tonometer forces of 2000g/sq.cm generated TF pressures of 50-60mmHg, and above 2000g/sq.cm TF pressures of 70mmHg were generated. TF flow at an inflation pressure of 120 mmHg and 50 sec inflation ranged from 1 to 20 ml per inflation cycle.

##### Conclusions:

In order for pneumatic compression to be effective it should be based on prior skin tonometry and TF pressure/flow measurements. The optimum inflation pressures seem to be 80-120mmHg with an inflation time for each chamber of 50+ sec.

#### 15. TONOMETRY OF LIMB LYMPHEDEMATOUS TISSUES PROVIDES DATA FOR APPLYING EFFECTIVE COMPRESSION FORCE

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##### Background:

Manual and pneumatic compression as well as elastic garments exert force which in turn generate the tissue fluid (TF) pressure gradients necessary for fluid flow. The level of the applied force propelling the fluid is never exactly known. The generated transmural fluid pressures should exceed 30 mmHg, which is known from our previous studies. Generated pressures depend on skin compliance (rigidity) and subcutis hydraulic conductance. In order to learn what external force should be applied in order to produce flow-effective TF pressure, we pressed skin with a tonometer with an in-built force gauge and recorded fluid pressure with a subcutaneously placed sensor.

##### Methods:

A tonometer with a force gauge 0 to 2500g per sq.cm, 10mm deep and 11.8mm diameter plunger was constructed. It was pressed against soft tissues at 5 limb levels to a depth of 10mm and the exerted force was read off on the scale. TF pressure was simultaneously recorded. Studies were carried out on 50 patients with lymphedema stage I to IV. A chart was created with TF pressures on the y-axis and applied force on the x-axis. A correlation curve was drawn.

##### Results:

There was a good correlation between the applied force and fluid pressure in stage I and II with soft skin. Forces of 1000g/sq.cm produced pressures of 25-40 mmHg. In stages II and IV the correlation curve was flattened and a high force was needed in order to obtain >30 mmHg. In some cases 2500 g was needed for generation of TF pressures of 50mmHg.

##### Conclusions:

Tonometer data for a given patient allow us to set the pneumatic device at a pressure ensuring TF flow. They also aid in the selection of garments with the proper degree of elasticity. Therapists can modulate the force of manual treatment depending on tonometry measurements.

**16. LYMPHANGIOSARCOMA, A LATE BUT RARE COMPLICATION IN LYMPHOSTASIS: THE ROLE OF PHYSIOTHERAPISTS IN EARLY RECOGNITION AND MANAGEMENT**

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Lymphangiosarcoma, an angiosarcoma that develops in lymphedema patients (Stewart-Treves syndrome), represents the most feared complication of chronic lymphostasis in terms of mortality, whether primary or secondary.

Modern techniques of cancer surgery and treatment of lymphedema have not altered the incidence of this serious cancerous event of known malignancy and pathological aggression.

We can also say that the success of modern chemotherapy and complex rehabilitation for cancer have increased the median survival of patients with secondary lymphedema increasing "de facto" the possibility of rare but late complications such as lymphangiosarcoma.

To date, specific therapies for this cancer are mainly related to the timeliness of diagnosis and an aggressive surgical approach (disarticulation/amputation of the limb).

Within the rehabilitation team, physiotherapists are those most directly involved with patients through their daily management of patients with lymphedema, their professional abilities are crucial in the early recognition of complications and early management in cooperation with a surgeon.

In this study we will discuss the specific clinical manifestation, physiopathological aspects (local immunosuppression as found in Kaposi sarcoma) and, first of all, the formation of the rehabilitation team in recognition of this deadly disease, which is secondary to lymphostasis.

We will propose strict protocols for preliminary examinations, for use even in daily physiotherapy.



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