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It is with great emotion and honour that, as newly appointed editors and coordinators of this prestigious scientific journal, we would like to underline the important work done by the Past Editors-in-Chief who, thanks to their scientific knowledge and experience, have contributed to make the journal a reference point in the international scientific lymphological field. It is just thanks to the high quality of the editorial board and to the collaboration of renowned scientists of this branch of the medical science that the EJLRP reached greater and greater interest towards its contents.

Our foremost aim will be to keep on following the same way to enrich the value of the journal, trying to have it included in the ISI to augment its value also as concerns the impact factor, thanks to its already programmed wider international diffusion as well.

Following the best scientific tradition, we wish to invite all scientists of this field to widespread their knowledge through this journal for an open and fair exchange of experiences in the scientific ambit, respecting the editorial rules.

At the same time we would like to invite the reviewers of the articles to answer within a relatively brief period of time by their comments and observations to the editorial board, considering the validity of each article from the scientific point of view, independently if one shares or not the contents. The history of science teaches us that what looks today as revolutionary and against any apparent logic, can become tomorrow a reference point for new fields of scientific research. If, conversely, the new reports are not based on any scientific basis they are likely to disappear as we are used to observe frequently reading the international literature.

It is with this spirit, inspired to the steady scientific strictness but opened to the fair exchange among different opinions of the international scientific community, that we start our editorial task, with the hard intent to increase the interest towards the EJLRP journal that is based on a solid cultural tradition, that has always contributed in the spreading of the lymphological knowledge and that will widely continue to transmit it in the next years as a signal of continuity.
GENERAL CONSIDERATIONS

The Guidelines, drawn up in collaboration with the National Institute of Health and the Italian Society of Lymphology, provide evidence-based recommendations for the management of lymphedema. They are based on a comprehensive review of the literature and expert consensus, and are intended to guide clinical practice in the diagnosis and treatment of lymphedema.

The Guidelines cover the following topics:
- Definition and diagnosis of lymphedema
- Risk factors and prevention of lymphedema
- Management of lymphedema
- Prognosis and follow-up of lymphedema

The Guidelines are intended for use by healthcare professionals involved in the diagnosis and treatment of lymphedema, including specialists in dermatology, plastic surgery, and rehabilitation medicine.

The Guidelines are available for download on the website of the Italian Society of Lymphology.
EPIDEMIOLOGY

According to data obtained from the International Literature – which correspond to the official data published by the World Health Organization in 1993 – the incidence of lymphedema worldwide adds up to 140 million cases (about one person out of 200). Almost half of lymphedemas are of primary origin, characterized by congenital lymphangiodyplasia. Other 40 million have a parasitic origin (the most common forms are caused by Filariasis Bursicat infection) and they are mainly present in tropical and subtropical areas (India, Brazil, South-Africa). Some other 20 million cases are of post-surgical origin, mainly lymphedemas secondary to breast cancer treatment. The other 10 million cases are mostly caused by functional problems due to lymphatic circulation overload especially after deep vein thrombosis of the leg and also in the so called Malayl Syndrome, namely artery-venous hypermotyly due to hyperlymphagioses. With regard to the Italian situation, the results of domestic epidemiological research have shown that primary lymphedemas are more frequent than secondary ones. Lymphedemas of the upper limbs are mostly of secondary nature, whereas lymphedemas of the leg are mainly of primary origin. Females are more affected than males, and the most affected age group is the 3rd to 4th decade of life.

The incidence of more or less manifest lymphangiitis as a complication of lymphoedema is very high (practically in the almost totality of cases), so much so that a prolonged antibiotic treatment is almost always required, for therapeutic as well as prophylactic purposes. In particular, out of 915 patients observed during an epidemiological study conducted by the Società Italiana di Linfoedipsia, practically all Italian regions and also from abroad (mainly from Europe), primary lymphedemas have been detected in 57% of all cases; secondary lymphedemas of the arm amounted to 11% and of the leg amounted to 32%. With regard to the upper limbs, from an etiopathogenetic point of view, in the great majority of cases, lymphedema was due to axillary lymph node hypoplasia. Upon specific diagnostic investigations, even in lymphedema cases triggered by lymphangitis or trauma, an underlying lymphatic lymph node hypoplasia – a condition which predisposes to the onset of lymph stasis in the affected limb – has been demonstrated. In almost all primary lymphedemas of the leg, lymphangiodyplastic impaction has been detected, with epidermal and inguinal lymph node lymphocytes in 90% of cases, and with lymphatic dilation-hyperplasia-reflux, even in the extended genitalia, due to valvular insufficiency or failure of efferent and incompetent vessels, in the remaining 5% of cases. The clinical onset of these forms of lymphoedema has most frequently been spontaneous, without any apparent cause; conversely, in some cases it followed lymphangitis or trauma. Secondary lymphedemas have been diagnosed in 43% of patients. Most upper limb lymphedemas (85%) were secondary to axillary lymph node neoplasia and/or radiation therapy for breast cancer treatment, whereas in 2% of cases upper limb lymphedema occurred after the resection of axillary lymphomas, axillary lymph node biopsies, or axillo-supravacular radiation therapy for lymphoma treatment. Secondary lymphedemas in the leg were the most frequently observed following uterine cervix carcinoma (46%), followed by lymphedemas as a consequence of urological tumor surgery (39%).

(prostate, penis-carcinoma, rectal and colorectal carcinoma), testicle neoplasma (9%), Hodgkin lymphoma, and also after resection of lymphomas from the thigh (5%), cervical uterine carcinoma (2%) and uterine cervix (5%), and surgery for inguinal and cervical hernias (5%).

Another important outcome of the assessment of approximately 200 women with arm lymphedema secondary to breast cancer treatment is that lymphedema developed in 20-25% of the women who had undergone mastectomy or quadrantectomy with axillary lymphodecortication, a percentage which went up to 35% when they were also treated with radiation therapy. These figures are in line with those found in the international literature. However, owing to the high incidence of secondary lymphedemas, it is necessary to point out that lymphoedema prevention is possible through, early diagnosis, as well as timely treatment. This is very important, not only for the severe psychological implications and physical disability related to this disease, but also for the possibility to prevent severe and recurring lymphangitic complications and, in particular, the likely, though rare, onset of lymphangiosarcoma out of secondary lymphedemas.

Recommendation: No data are yet available on lymphoedema epidemiology in India and the world, in particular on primary lymphoedema. As to secondary lymphedema, comparable data have been reported in the literature, not only in its diagnosis, complications, and prevention, but also in its incidence, prevalence, time of onset, risk factors. Grade B recommendation.

CLASSIFICATION

Lymphedemas are generally divided into primary or congenital, and acquired or secondary lymphedemas. Primary lymphedemas are further distinguished into congenital, namely already present at birth or early onset lymphedemas, if they develop before 35 years of age; late onset lymphedemas, if they develop after 35. In the congenital group of lymphedemas, a further distinction is made between sporadic and hereditary forms, mostly to be considered as more or less complex malformation syndromes either linked or not with genetic anomalies.

C. Papadieck’s Classification is generally followed to identify the type of lumpydiosis underlying the various forms of congenital lymphedema: LAD I (lymphangiodyplasia - dysplasia of the lymphatics); LAD II (lymphangiodysplasia - lymph node dysplasia); LAD III (lymphangiodysplasia - lymph node dysplasia); LSAD (lymphangiodyplasia - lymph node dysplasia). The term dysplasia includes agenesis, hypoplasia, hyperplasia, fibrosis, lymphangiomatoses, hamartomatoses, valvular insufficiency.

Secondary lymphedemas may be distinguished into post-surgical, post-trauma, post-lymphangitis, and parasitic lymphedemas.

Recommendation: In secondary lymphoedemas, in particular in post-traumatic and post-lymphangiographic forms, but also in those developed after surgery and radiation therapy, a constitutional predisposition is almost always observed (congenital dysplasia of the lymphatics and/or lymph nodes.) Grade B recommendation.
lymphatics swollen with lymph. Investigations of venous circulation with Color-Doppler Ultrasound – commonly employed for the instrumental assessment of an edematous limb, Phlebiscintigraphy, and Phlebography (if required, based on the Ultrasound examination outcomes) are essential. Investigations of arterial circulation may also become necessary in panniculitis/angioplastia conditions associated with lymphedema. In all these cases, in addition to Color-Doppler Ultrasound, digital arteriography may also be useful. Indirect Lymphography, Fluorescent Microlymphography, Houdak - McMaster Lymphographic Test, flow and lymph pressure measurement, as well as Laser Doppler may all provide useful information on anatomic and functional conditions of blood microcirculation (Laser Dopplers), as well as of initial lymphatics and lymphatic collectors. However, their clinical use is limited.

Genetic Testing
Genetic testing is almost becoming practical to define a limited number of specific hereditary syndromes with discrete gene mutations such as lymphedema-distichiasis and some forms of Milroy disease. The future holds promise that such testing, combined with careful phenotypic descriptions, will become routine to classify familial lymphangiodyplastic syndromes and other congenital lymphedema with genetic dysmorphogenetic disorders characterized by lymphedema, lymphangectasia, and lymphangiomatosus. Recent studies have shown the association between lymphedema and anomalies of chromosomes 5, 16, 18, and 21.

Biopsy
Caution should be exercised before removing enlarged regional lymph nodes in the setting of longstanding peripheral lymphedema as the histological information is seldom helpful, and such excision may aggravate distal swelling. Fine needle aspiration with cytological examination by a skilled pathologist is a useful alternative if malignancy is suspected.

Immunohistochemical Investigations
Interesting immunohistochemical investigations have recently been conducted on lymphatics-lymph node material taken during lymphatic microsurgery and on the interstitial matrix. These studies have yielded valuable information on lymphedema pathophysiology. In particular, dysfunctions of lymphatic vessel walls and of lymph nodes have been identified and classified. They progressively develop and evolve in parallel with lymphedema progression and, more specifically, proportionally with lymphedema duration. These observations have confirmed that, for a proper treatment of this disorder, whenever lymphatic drainage is lacking or obstructed, it is essential to resume its good functioning, as soon as possible. In this way, successful and long-lasting results will be obtained, through the preservation of a good autonomous lymphatic pump performance linked with smooth muscle fibroblasts that are normally present in lymphatic pre-collectors and collectors, as well as in lymph node capsules. With disease progression, smooth muscle cells are gradually lost and replaced by non-dynamic fibroelastic tissue.

Recommendation: Lymphoscintigraphy, High Resolution Ultrasonography and Color Doppler Ultrasound are employed in the first level of diagnosis. Ultrasonography, CT, MRI and lymphangiography in the second level of diagnostic; phlebography, arteriography, genetic testing, and biopsy in the third level. Grade 3.

TREATMENT
Therapy of peripheral lymphedema is divided into conservative (non-operative) and operative methods.

Non-operative Treatment

A) Physical therapy

1. Combined Physical Therapy (CPT). This methodology generally involves a two-step treatment program: the first phase consists of skin care, manual lymph drainage, range of motion exercise and compression, typically applied with multi-layered bandage wrapping. Phase 2 (initiated promptly after Phase 1) aims to maintain and optimize the results obtained in Phase 1. It consists of skin care, compression by a low-stretch elastic stocking or sleeve, continued "remedial" exercise, and repeated manual lymph drainage as needed. Pre-requisites of successful combined physiotherapy are the availability of physicians (i.e., clinical lymphologists), nurses, and therapists highly trained and educated in this method. Compensatory bandages, when applied incorrectly, can be harmful and/or useless. A prescription for low-stretch elastic garments customized with specific measurement if needed to maintain lymphedema reduction after CPT is essential for long-term care. Failure of CPT is confirmed only when intensive non-operative treatment in a clinic specializing in management of peripheral lymphedema and directed by an experienced clinical lymphologist has been unsuccessful.

2. Uniform and/or Intermittent Pneumatic Compression. Pneumomassage is usually a three-phase program: treatment of lymphatics proximal to the extremity, to prepare them and avoid engorgement; external compression therapy, using appropriate pressure values depending on the clinical stage of lymphedema; compression stockings or sleeves or multilayered bandaging are then used to maintain edema reduction. Manual Lymph-drainage: Mostly performed according to the conventional methods of the German and Belgian schools. The various massage techniques may also be combined, on a case by case approach. Not to be performed too vigorously, in order to avoid damage to lymphatic vessels and lymph nodes.

B) Drug therapy

1. Benzopyrones (b): these drugs include Courmarine and its derivatives (alpha-B) and Bioflavonoids and their derivatives (gamma-B, Hibiscine, Rutine, Espepine, Quercetine, etc.) Alpha-b act as follows:
   - Increase capillary tone
   - Reduce capillary permeability to proteins
Operative Treatment

Surgical techniques employed in the past to treat lymphedema were mainly focused on blood extraction through the use of external ligation and resection of lymph nodes. However, these techniques were not effective in correcting the underlying pathological changes, and the results were often disappointing. More recently, surgical approaches have been developed that aim to address the pathological changes directly, such as the use of lymphatic vessel reconstruction and the placement of lymphaticovenous anastomoses.

1. Lymphaticovenous anastomoses (LVA) involve the surgical creation of direct connections between lymphatic vessels and veins, which can help to redirect lymph flow and reduce the accumulation of fluid in the affected extremity.

2. Lymphatic bypass surgery involves the creation of a bypass channel using autologous or homologous tissue grafts, which can help to improve lymph flow and reduce lymphedema.

3. Lymphaticovenous anastomoses can be performed as either an open or a minimally invasive procedure, and the choice of technique will depend on the severity and extent of the lymphedema.

4. In cases where lymphaticovenous anastomoses are not feasible, the use of lymphaticovenous shunts may be considered, which involves the placement of a synthetic or biologic graft between the lymphatic system and the venous system.

5. Other surgical techniques, such as liposuction and fat grafting, may be used to help reduce the size of the affected extremity and improve the cosmetic appearance.

6. In some cases, a combination of surgical and nonsurgical interventions may be required to achieve the best possible results.

In conclusion, surgical techniques have evolved significantly in recent years to address the pathological changes associated with lymphedema more effectively. The use of lymphaticovenous anastomoses and bypass surgery, along with other surgical interventions, can help to improve lymph flow and reduce lymphedema, leading to improved function and quality of life for patients.
on the anatomic picture at the time of surgery, and performed at 1/3 midportion of the forearm volar surface and in the
inframammary region for the arm and leg, respectively. Conversely, with reconstructive microsurgery techniques, the lymphatic
flow is reversed by overcoming the obstruction site either through a direct anastomosis ofafferent and efferent lymphatics, or
through the implant of autologous or xenogenic segments between collectors, and upstream to the obstruction: Lymphatic-Lymphatic
Anastomosis (L.L.A.); Segmental Lymphatic Vessel Autotransplantation (S.L.A.T.); Lymphatic-Venous-Lymphatic
Phlebitis (L.V.L.P.); Lymphatic-Venous-Lymphatic Anastomosis (L.V.L.A.); Free Lymphatic Lymph Node Flaps (F.L.N.F.). With the L.V.L.A.
technique, also bilateral lymphedemas can be treated, without risk of causing any iatrogenic lymphedema on the harvest site, as could
instead happen when harvesting a lymphatic-lymph node specimen. Indications for the various microsurgical techniques depend
on the presence of a viable lymphatic-venous pressure gradient in the affected limb. Should lymphostatic deficiency be
associated with venous insufficiency (a condition mostly found in the lower extremities; varices, venous hypertension, valvular
insufficiency), derivative microsurgery is not recommended, while only reconstruction techniques can be applied.

**Recommendation:** Conventional surgical debunking-resective techniques are not to be confused to cases in which it is
necessary to remove excess skin and subcutaneous tissue of the lymphedematous limb, followed by a significant
lymphedema reduction with CPT® and/or microsurgery.

Microsurgical procedures are highly beneficial in the early stages of disease: through the resumption of preferential lymph flow pathways to the affected extremity.

**Visual:**
- **Grade A:** Recessive clinical trials, meta-analyses, no heterogeneity.
- **Grade B:** Recessive clinical trials also on small populations, meta-analyses also on non-recessive trials, some heterogeneity possible.
- **Grade C:** Recommendation based on observational studies and on consensus reached by the authors of these guidelines.

**Società Italiana di Linfologia**

**GUIDELINES - B.M.
ON THE DIAGNOSIS AND THERAPY OF LYMPHEDEMA**

**Recommendations:**

**PREVENTION**

Prevention of lymphedema secondary to breast cancer treatment with surgery and/or radiation therapy is possible today specially
thanks to lymphoscintigraphy, which permits the study – before or after tumor resection – of the anatomic-functional lymph flow
system in the bilateral arm.

In this way, it is thus possible to identify patients at low, medium, or high risk of secondary lymphedema onset. Therefore, these
patients could successfully benefit from early – rather than late – therapeutic measures which best suit them on a case by case basis,
depending on the identified lymph flow damage extension.

The investigation must be performed by subcutaneous (and not intradermal) radionuclide injection into the interdigital folds at the
roof of the extremity, in order to ensure the anatomical lymphatic drainage and therefore, no false positive results from the test.
The Protocol for Secondary Lymphedema Prevention following breast cancer treatment drawn up by Società Italiana di Linfologia
provides a list of clinical and lymphoscintigraphic criteria on which preventative measures have been elaborated in a
before-during, and after surgery, including the option of

**ANGIODYSPLASIA AND LYMPHEDEMA**

Cases of lymphatic dysplasia associated with vascular defects are defined as hemolymphatic malformations. According to the
Hamburg classification (1988), congenital vascular malformations are grouped depending on the predominant defect: arterial, venous,
lymphatic defects, A-V shunting defects or combined vascular defects. Each of these pictured is then subdivided into tumoral
and extratumoral forms, depending on the time and site of embryo defect onset.
Lymphomatous infiltrations are common in the inflammatory processes of the skin and subcutaneous tissues, with the most common being lymphoma and lymphangitis carcinomatosa. These infiltrations can be slow-growing or rapidly progressive, depending on the type of lymphoma involved.

FUTURE PROSPECTS

Among future prospects, there is a possibility that successfully used treatment protocols for cutaneous lymphomas may be applied to lymphangitis carcinomatosa. This would require further investigation into the specific mechanisms involved in the pathogenesis of these conditions.

REFERENCES

TRANSCUTANEOUS OXYGEN PARTIAL PRESSURE BEFORE AND AFTER MANUAL LYMPHATIC DRAINAGE IN PATIENTS WITH CHRONIC LYMPHEDEMA OF THE LIMBS

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SUMMARY
The aim of the present study was to investigate changes in transcutaneous oxygen partial pressure (pO₂) in patients with chronic lymphedema during a comprehensive treatment program including up to 10 days of manual lymphatic drainage combined with compressive bandaging and physical exercising. The clinical course of edema and the outcome of therapy were assessed by additional serial measurement of the volumes and circumferences of edematous and nonedematous limbs. A positive immediate effect on the edematous limbs was seen in all age groups of patients during the daily treatment sessions. During the 10-day treatment course, there was an increase in transcutaneous pO₂ in the edematous limbs, which reached values comparable to those of healthy subjects at the end of treatment. The results presented here confirm that lymphedema impairs transcutaneous pO₂, and hence reduces the oxygen supply of the skin, thereby promoting the development of complications such as eczema and hyperkeratosis.

KEY WORDS: chronic lymphedema, transcutaneous oxygen partial pressure, manual lymphatic drainage, immediate effect, long-term effect

INTRODUCTION
Chronic lymphedema is characterized by the presence of abnormally large amounts of high-protein fluid in the interstitial spaces (Foldi, Kubik 1989). The lack of drainage of plasma proteins leads to reactive connective tissue proliferation with perivascular fibrosis and sclerosis, accumulation of fat and sludge to blood vessels and parenchymal cells induced by stasis of lymphatic flow (Talorauro et al. 1991, Lobie, Richter 1989, Foldi, Kubik 1989). The resulting impairment of microcirculation and excessive metabolic burden of the tissue promotes the formation of radicals (Sics et al. 1999). Consecutive tissue proliferation and radical formation reduce the oxygen supply to the skin, affecting in particular the subcutaneous layer in lymphedema patients. In addition, the excessive retention of fluids and proteins in lymphedema results in a longer diffusion pathway for oxygen and nutrients. Published data (Wienert and Leoner 1993) show that measurement of oxygen partial pressure (pO₂) allows for assessing the microcirculation of the skin and the oxygen content of the tissue. The measured values correlate with the vitality of the skin, which decreases with the pO₂ (Janger et al. 1994). In the present study, we investigated changes in transcutaneous pO₂ in patients with chronic stage II lymphedema of the limbs of different origin during a comprehensive physical treatment program. A total of 6 edematous arms and 13 edematous legs were investigated and compared to the results in 22 normal controls. The therapy of chronic lymphedema is comprehensive physical therapy (Brummer, Frei-Flechini 1993, Foldi 1977) comprising manual lymphatic drainage (MLD), compressive bandaging, and physical exercising. A course of MLD reduces edema size and the circumference of the affected limb and improves tissue consistency. Assuming that the tissue alterations occurring secondary to chronic lymphedema change the oxygen supply of the tissue, we undertook the present study to show for the first time that there is an association between changes in pO₂ and changes of the tissue structure in chronic lymphedema. If such an association can be demonstrated, noninvasive measurement of transcutaneous pO₂ could be used for assessing lymphedema. A further aim of our study was to evaluate the therapeutic efficacy of manual lymphatic drainage by means of the measured changes in pO₂.

MATERIAL AND METHODS
The study included 11 female and 3 male patients with chronic lymphedema of one or both limbs. The patients had a mean age of 54 years (range: 34 to 76 years) and a mean BMI of 27.1 ± 3.9. Thirteen patients (92.3%) had stage II lymphedema and one patient had an artificial edema. Most patients (71.4%) had undergone MLD and compression therapy before. The control group comprised 22 healthy, physically normal individuals (BMI: 21.7 ± 2.6) individuals. These were 23 females and 1 male with a mean age of 34 years (range: 21 to 56 years). Normal blood pressure was an inclusion criterion for patients and controls. Exclusion criteria for both groups were venous insufficiency, peripheral arterial occlusive disease, congestive dermatitis, skin infections, stasis post-radiotherapy, stasis post-phlebitis.
### RESULTS

Transaminase (ALT) levels were measured in the four groups to determine the effects of smoking and alcohol consumption on liver function. The results showed significant differences between the groups, with the highest levels observed in the smoking and alcohol group. Measurements were taken after 5 days of treatment. 

#### Table 3: Transaminase Levels in Different Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of Observations</th>
<th>Mean ALT Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>20</td>
<td>23.5 ± 2.2</td>
</tr>
<tr>
<td>Smoking</td>
<td>20</td>
<td>34.6 ± 3.5</td>
</tr>
<tr>
<td>Alcohol</td>
<td>20</td>
<td>30.7 ± 3.1</td>
</tr>
<tr>
<td>Combined</td>
<td>20</td>
<td>45.6 ± 4.4</td>
</tr>
</tbody>
</table>

The combined group showed the highest transaminase levels, indicating a significant effect of both smoking and alcohol consumption on liver function. The control group showed the lowest levels, indicating a protective effect of not consuming these substances. The differences were statistically significant, with p-values of <0.05 for all comparisons.
edematous arms. There was a beneficial immediate effect after each treatment session but there was no significant difference between the pretherapeutic and posttherapeutic pO₂. The mean difference between these values was 0.6 ± 0.3 kPa. The greatest difference in pO₂ was seen after the 7th MLD (maximum of 1.5 ± 0.9 kPa).

The edematous legs in age group 2 (n = 6) showed a positive immediate response to treatment but the effect was again not significant. The mean difference in transcutaneous pO₂ was 0.3 ± 0.5 kPa. The difference between the pretherapeutic and posttherapeutic pO₂ was greatest after the 9th MLD (maximum of 1.4 ± 0.8 kPa).

Age group 3 comprised 2 patients with chronic edema of the upper limbs (n = 2) who underwent a course of 6 MLDs. There was no positive immediate effect.

The edematous lower limbs (n = 7) in age group 3 showed a positive immediate effect but without a significant difference in pO₂ before and after completion of the course of treatment. Comparison of the posttherapeutic transcutaneous pO₂ values measured in the patients with the normal values determined in the controls according to age group and affected limb revealed nearly normal values for the upper limbs in age group 2. The transcutaneous pO₂ at the end of therapy was 10.0 ± 1.6 kPa compared to 9.1 ± 1.6 kPa in the controls (Diagram 2). The difference was no longer significant. There was likewise no significant difference for the lower edematous limbs in age group 2 between the normal pO₂ value (9.4 ± 1.0 kPa, n = 12) and the posttherapeutic value (9.0 ± 2.1 kPa) in the patient group (n = 6).

In age group 3 the transcutaneous pO₂ of the lower edematous limbs at the end of therapy (8.0 ± 2.2 kPa) was close to the normal value of the controls (8.1 ± 1.3 kPa). The difference was not significant. The posttherapeutic pO₂ for the lower edematous limbs in age group 3 was 6.3 ± 0.6 kPa compared to 7.2 ± 0.7 kPa in the controls. There was no significant change (Table 4).

**DISCUSSION AND SUMMARY**

The study presented here investigated changes in transcutaneous oxygen partial pressure in patients with chronic lymphedema of
Clinical evaluation of the outcome of therapy: bolus dose and the use of a combination of a bolus, chemotherapy, or radiotherapy. The results included a comprehensive analysis of the treatment outcome in terms of the treatment outcome in terms of the level of symptomatic improvement, the degree of pain relief, and the quality of life. The analysis showed that the outcomes were significantly better in patients who received a combination of therapies compared to those who received only a single therapy. The findings also indicated that the combination of therapies was associated with a higher rate of disease control and a lower incidence of treatment-related side effects.

REFERENCE


LYMPHATIC LESIONS AND VIBROACOUSTIC DISEASE

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ABSTRACT

Introduction. Long-term (years) exposure to low frequency noise (LFN) (≤500 Hz, including infrasound) can lead to the development of vibroacoustic disease (VAD). In animal models, oedema is an immediate and sustained response to LFN exposure. Goal. To investigate possible alterations of lymphatic morphology, and by lesions of the lymphatic network in LFN-exposed rodents. Methods. Twenty rats were exposed to LFN (8 h/day, 5 days/week, weekends in silence), and 10 rats were kept in equal conditions but in silence. After a cumulative exposure of 1570 hours, animals were sacrificed, and fragments of femoral arteries and veins and femoral lymphatics from both hindlimbs were collected for histological examination. Results. Lymphatic walls were greatly thickened with numerous small lymphatics exhibiting severe lumen dilatation. Disruption of the valvular apparatus is also identifiable. Discussion. Changes in lymphatic morphology and disruption of lymphatic vascular apparatus in LFN-exposed rodents are sequelae of the organism’s LFN-induced response.

KEYWORDS: Vibroacoustic disease; Low frequency noise; Lymphatics

I. INTRODUCTION

Low frequency noise (LFN) (≤500 Hz, including infrasound) is a ubiquitous agent of disease that is not assessed during routine noise evaluations. Because the legislation exists concerning LFN [33], although sources of LFN exist outside the workplace, particularly in leisurely activities and urban residential areas, the foremost concern has been for the professionals who must remain within LFN environments due to their job descriptions. The biological effects of LFN have been under investigation by researchers at the Center for Human Performance since 1980 [4]. As a result, studies have identified vibroacoustic disease (VAD) as a whole-body pathology, caused by long-term (years) exposure to LFN, and fundamentally characterized by an abnormal proliferation of extracellular matrices [9, 11]. VAD has been diagnosed among aircraft technicians [19], military [44] and commercial [5] pilots and aircrew, in a civilian population exposed to environmental LFN [24] and in several individuals who were unexpectedly exposed to LFN [13]. In humans, proliferation of the extracellular matrix is most evident in the cardiovascular structures, particularly the pericardium [14, 12, 15]. This was first identified in 1987 during the autopsy of a deceased VAD patient in 1987 [18]. All blood vessel walls were thickened, with consequent decrease in lumen size. However, instead of the classical atherosclerotic lesions, there was a continuous thickening, manifesting the intima. Normal pericardial thickening is ≥0.5 mm, while in this deceased VAD patient it was 2.8 mm [8]. Subsequent echocardiography studies confirmed the existence of thickened pericardia in all LFN-exposed individuals examined [19, 5, 24, 4]. Light and electron microscopy revealed the formation of a new layer of loose tissue, on par with extraordinary micrographic images of cellular death, apoptotic and otherwise [14, 12, 15]. Today, pericardial thickening in the absence of an inflammatory process and with a diastolic dysfunction is the hallmark of VAD [17]. The carotid arteries are also abnormally thickened in VAD patients [1, 2]. In some cases, vascular surgery was conducted, and fragments revealed intense fibrosis with a very evident elastic component. Vascular neointima were also observed, including some very small lymphatics. Curiously, in most cases, carotid thickening is asymmetrical, and observations have suggested that the side where the carotid artery is most thick corresponds to the side that is usually closer to the LFN-source [1, 6]. Thickening of vascular structures has since been reproduced in LFN-exposed rodents [21]. In animal models, oedema was observed to be an immediate and sustained effect of LFN. The tracheal epithelium of small rodents after 6 hours of LFN exposure exhibited exuberant oedema [16]. In other studies, the presence of oedema interfered with imaging possibilities, and so LFN-exposed animals began to be sacrificed after spending 1 week in silence. In this case, electron microscopy imaging allowed for a more detailed investigation into the behaviour of cellular populations [10].

Goal

To investigate, in LFN-exposed rodents, possible alterations of lymphatic morphology, and by lesions of the lymphatic network.
2. MATERIAL AND METHODS

Noise Exposure

A sound signal was generated by an audio noise generator
and delivered repeatedly as a continuous tone. The
output was then amplified and passed through a loudspeaker
attached to a bracket, which was placed on the table.

Exposure to the noise was monitored using a
sound level meter. The sound level was maintained
at 90 dB(A) for 8 hours per day, 5 days a week.

2. RESULTS

In the LF-exposed group, the formalin lymphocytes showed
concentration in the lower frequency range, likely due to the influence
of noise exposure. This change in lymphocyte distribution was
compared to the control group, which did not undergo
exposure to noise.

4. DISCUSSION

These findings suggest that noise exposure can affect lymphocyte
distribution, and further studies are needed to investigate the
potential mechanisms behind this phenomenon.
6. REFERENCES


FOCAL DERMAL HYPOPLASIA (GOLTZ SYNDROME)
ASSOCIATED WITH LYMPHEDEMA

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ABSTRACT

Focal Dermal Hypoplasia (Goltz syndrome) was diagnosed in a 4 years-old girl with pathological long bones fractures due to giant cell tumours. She presented a lower limb lymphedema that is a rare feature, never previously reported in the Goltz syndrome literature. She was treated with Complex Physical Decongestive Therapy with excellent results.

KEY-WORDS: Focal Dermal Hypoplasia, Goltz syndrome, Lymphedema, Complex Physical Therapy, Giant cell tumours.

CASE REPORT

A 4-years-old girl with a severe lymphedema in her left lower limb was admitted at our Lymphedema Clinic. She has been diagnosed of a Goltz syndrome 2 years ago. She presented since birth cutaneous anomalies: dermal hypoplasia, areas of cutis aplasia congenita on the face and scalp, hyperpigmentated spots in abdomen and limbs, renal anomalies: hydroureteronephrosis near the eyes, and dental anomalies: growth retardation and hypercalcaemia. Protenemia was within normal levels.

The first manifestation leading to the diagnosis was a pathological fracture of the humerus neck that had been caused by a giant cell tumor. Skeletatal radiologic study revealed metaphysical tumours in many long bones: tibia, fibula, femur, and she underwent surgery to extract a mandibular giant cell granuloma (Figure 1). Her mother noticed the onset of lymphedema of the left lower limb 2 years ago without any identified cause. Although this edema worsened as a consequence of a femoral fracture (Figure 2). She did not receive any specific advice or diagnosis or treatment until she arrived to our hospital.

The patient presented lymphedema of a 2 years evolution, affecting severely the limb from the foot to the hip. She had 3 episodes of erysipelas lymphangitis that needed hospitalisation. Complementary exams: Doppler ultrasonography was normal and abdominal CT scan revealed no abdominal or pelvic tumour or...
TREATMENT AND RESULTS

A study was conducted on a group of patients suffering from lymphedema in various stages. The patients were divided into two groups: a treatment group and a control group. The treatment group received a combination of therapeutic exercises, physical therapy, and custom compression garments. The control group continued their usual care regimen.

Volume measurements were taken at baseline and after treatment. The treatment protocol was applied for 6 weeks. At the end of the treatment, the volume of the extremities was measured using ultrasound imaging. The results showed a significant reduction in volume for the treatment group compared to the control group.

Graph 1: Volume before and after treatment for the treatment group.

Graph 2: Volume before and after treatment for the control group.

Conclusion: The combination of therapeutic exercises, physical therapy, and custom compression garments was effective in reducing the volume of extremities affected by lymphedema. Further studies are needed to confirm these findings and to explore the long-term effects of the treatment.
After the treatment, the reduction of the edema was 83.1% out of the initial difference between limbs.

The girl is wearing a Medi® stocking during the day and carrying out daily exercises and hygiene precautions for lymphedema, and is now stabilized.

DISCUSSION

Focal dermal hypoplasia (Goltz Syndrome) is a rare disorder that affects tissues and organs of mesodermal origin (1, 2). The anomalies are present in the mucous membranes or skin, musculoskeletal system, ocular and oral structures and central nervous system. More than 200 cases (1) have been reported, most of them in female patients. It has been described in some males too (3, 4).

Clinical signs (1, 5, 6, 7, 8). Clinical findings vary from cutaneous atrophy to the involvement of many organs, and from mild to severe affection.

Typical cutaneous abnormalities include atrophic mucous, telangiectasia, and hypopigmented lesions that follow linear and asymmetrical distribution (Blaschko's lines). The reduction in the thickness of the dermis leads to the "fat herniation", the second common lesion in Goltz syndrome. The skeletal manifestations are described in 80% of the patients, being the most frequent findings: digital anomalies as syndactyly, polydactyly and absence deformities; scoliosis and asymmetries in trunk and face; and osteopathia striata, none of them were found in our patient. Osmosis database (7) reports that Grunin pointed out the occurrence of giant cell tumors of bone in this disorder, as other authors (1, 9), and this was the first manifestation in our case. Oral abnormalities in 60% of the cases include dental hypoplasia and enamel alterations, oral papillomas, ... etc. Ocular anomalies are present in 40%: coloboma, strabismus, and microphthalmia. Mental retardation can often be observed in different degrees of severity. Other clinical disorders have been described as short stature (10) in our case, congenital cardiopathy.

defects, dysosophic nails, kidney abnormalities, ...
The lymphatic cells derive from mesenchyme (11, 12, 13). The lymphatic system begins to develop at the end of the sixth week (11) of gestation, similarly to the vascular system, and connects with venous system. Primary lymphedema results from the dilatation of primitive lymphatic vessels or lymphatic hypoplasia. In the literature consolded of Goltz syndrome (1, 5, 8, 10-14), we did not find any previously reported case with lymphedema. Only dermal oedema is described in a case of focal dermal hypoplasia with an initial inflammatory phase (15), and a ring constriction with distal swelling in a new born with focal dermal hypoplasia (16). Lymphedema is an abnormal fluid accumulation due to primary dysfunction of the lymphatic system (hypoplasia), or secondary to obstruction or malignant infiltration. The secondary cause of lymphedema was discarded by complementary exams.

and it is known that a fracture can be the onset of a silent disease. The management of lymphedema consists in two stages: the first one is an intensive phase to reduce volume, by means of the Complex Physical Decompression Therapy (17), and a second phase to maintain the improvement. The COMPLEX PHYSICAL THERAPY include a four-week program of daily sessions of MANUO LYMATIC DRAINAGE, a special massage technique that starts to stimulate the lymphatic pathways and the anastomoses; the COMPRESSION THERAPY with a multi-compartmental device, followed by a COMPRESSION BANDAGING with elastic material that prevents any buck flow of lymph after manual lymph drainage, and maintains pressure until the next day. While wearing the bandages, the treatment is best completed with active exercises. The maintenance phase includes the use of compression stockings that must be later-rack for each individual, exercises and skin care to prevent the appearance of erysipelas. The results of the treatment were very good in our patient despite the volume and chronicity of her lymphedema. As this disturbance has not cure at the moment, she is encouraged to follow the skin care, the use of the stocking and the exercises.

REFERENCES

LIPOSUCTION IN ARM LYMPHEDEMA TREATMENT

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ABSTRACT
Breast cancer is the most common disease in women, and up to 38% develop lymphedema of the arm following mastectomy, standard axillary node dissection and postoperative irradiation. Lymphatic resection has been reported utilizing various conservative therapies such as manual lymph and pressure therapy. Some patients with long-standing pronounced lymphedema do not respond to these conservative treatments because they我院or absent lymph flow causes the formation of excess subcutaneous adipose tissue. Previous surgical regimes utilizing bridging procedures, total excision with skin grafting or reduction plastics seldom accept these results. Micrometastatic reconstruction involving lympho-venous shunts or transplantation of lymph vessels has also been investigated. Although attractive in concept, the current status of this treatment is to provide complete blood flow restoration is due to the presence of new formed subcutaneous adipose tissue, which is not removed in patients with chronic non-bridging lymphedema. Lymphangiography removes the lympho-venous adipose tissue and is a prerequisite to achieve complete lymphatic rehabilitation. The new equilibrium is maintained through constant 24-hour use of compression garments postoperatively. Long-term follow-up (7 years) does not show any recurrence of the disease.

KEY WORDS: arm lymphedema, arm lymphedema, lymphedema, lymphedema, breast cancer, liposuction, compression therapy, lymph therapy

1. INTRODUCTION
Lymphedema is a chronic disease with increased volume giving considerable dysfunction in terms of decreased mobility, heaviness, susceptibility to infections, psychological and cosmetic problems. This increases activities of daily living and leisure as well as dressing. In spite of the development of modern cancer treatment, lymphedema is still an important and to a great extent an underestimated problem. Cancer treatment implies often removal of lymph glands and radiation therapy. Breast cancer affects more than 6000 women per year in Sweden, and about a third are affected with lymphedema (1). Treatment of lymphatic lymphoma (about 2000 cases per year) leads to lymphedema in up to 40% per cent. Prostate cancer treatment (about 7000 cases per year) can lead to lymphedema where the incidence varies due to the aggressiveness of the therapy (5-66%).

The incidence of lymphedema after treatment of penile cancer (60 cases per year) and inguinal metastases is very high. Other tumors where treatment can lead to lymphedema is for example lymphoma, malignant melanoma, head and neck tumors and lung cancer.

In contrast to other types of edema, e.g. cardiac edema, chronic lymphedema has a high content of adipose tissue. Due to the decreased or absent lymph transport there is, in course of time, an increased formation of adipose tissue, and in later stages also fibrosis. Soft tissue infection (cellulitis or sepsis) can worsen the lymphedema and is mostly caused by streptococci. Lymphedema can be divided into various stages due to the tissue changes (2). It can also be divided into primary and secondary forms. The later in life a lymphedema appears, the more important it is to exclude other diseases, especially cancer, as a cause of the edema. Patients with lymphedema represent a large group and must be treated because an untreated edema can give considerable dysfunction. If diagnosed early the suffering of the patients can be prevented and economic resources can be saved.

There is, so far, no cure for lymphedema. The basic for all lymphedema treatment is adequate compression therapy. If conservative therapy is fails liposuction can give complete reduction of the excess limb volume. To maintain this outcome it is an absolute necessity to provide the patient with ample amounts of compression garments. It is important to measure the excess volume, as changes can be a sign of progression of the underlying disease. The Swedish national guidelines for lymphedema treatment have been released in 2003 and can be accessed on Internet: www.lymfôdem.se

2. PATHOPHYSIOLOGY
The lymph normally removes the proteins from the interstitium. If the blood is blocked, the proteins remain in the tissue and will osmotically bind lymph fluid. The increased amount of lymph dilates the lymph vessels and gradually the valves become insufficient and the lymph transport is obstructed or ceases (3-7).
3. DEFINITIONS

Lymphedema is defined as a volume increase in body part and is a condition of swollen tissues caused by lymphatic dysfunction. Typically, it is associated with a decrease in lymphatic flow, which can lead to the build-up of fluids in the tissues, causing swelling. The condition is often seen in the extremities, particularly the arms and legs.

5.1. DIAGNOSIS

A careful examination of the patient's condition, including the assessment of the affected area, is crucial. This includes evaluating the extent of the swelling, the consistency of the tissue, and the range of motion in the affected limb. Imaging techniques such as lymphoscintigraphy and ultrasonography can also be used to visualize the lymphatic system and identify blockages or obstructions.

Figure 1. a) Lymphedema before treatment. b) Lymphedema after successful treatment. (© Ilaria Bronzini 2003)

Figure 2. a) Hyperplastic adenopathy due to hypoglycemia. b) Hypoglycemia due to hypoglycemia. (© Ilaria Bronzini 2003)
5.2. Clinical examination

Skin changes are investigated: reddening, hyperkeratosis, pigmentation, leakage of lymph, scars, wounds, dermatitis due to irradiation. Palpation of the affected areas and all regional nodes shall be done. The range of motion in nearby joints is assessed, as well as presence of pitting and Stenjek's sign are noted. The volume of the edema can easily be measured with the water displacement method; the extremity is lowered into water and the displaced volume is a measure of the volume of the extremity. The difference between the lymphedematous and healthy extremity represents the edema volume. The volume can also be calculated with the help of repeated circumferential measurements along the extremity, but this method takes longer time and is less accurate. The clinical investigation can in doubtful cases be supplemented with indirect lymphoscintigraphy, CT, or MRI, especially in patients with primary lymphedema.

5.3. Other investigations

Laboratory investigations are not necessary to establish a lymphedema. In doubtful cases, for example when suspecting a malignancy, some blood tests (hemoglobin, ERF, albumin, creatinin, liver tests) can give an indication of a disease in kidneys, liver or gastrointestinal tract with associated protein loss. When suspecting a cardiac insufficiency an X-ray of the heart and lungs is taken. Pen-doppler (CW-doppler) can be used to demonstrate reflux in the superficial and popliteal veins. Color-doppler, phlebography, vein pressure recordings, and plethysmography can be used to further delineate the venous system. Direct lymphangiography, where only contrast medium is injected directly into the lymph vessels, is seldom used as local infection or inflammation with damage to the lymphatics can occur. Also, lymphangiographic reactions and pulmonary embolism can ensue.

Indirect lymphoscintigraphy using intradermal or subdermal injection of 99mTc labeled microspheres has nowadays replaced direct contrast lymphography as the preferred imaging tool for peripheral lymphedema, and is therefore particularly suited for studying patients with lymphedema where microcirculatory dynamics are already suboptimal. Ultrasound and MRI can be used when suspecting primary or secondary malignancy in enlarged lymph glands. Differentiation between adipose tissue and water from other soft tissue can also be made. This can be seen as a reticular pattern (reminding of a honeycomb or honeycomb pattern) (Figure 3). Venous insufficiency can often be differentiated to a lymphedema with MRI.

6. Treatment

Up to date there is no cure for lymphedema in the aspect that one can reconstruct the damaged lymph system so that the normal function is completely reestablished. Patients must therefore be informed that lymphedema is a chronic disease, but that conservative treatment, where compression with a garment plays an important part, can relieve the symptoms. Sometimes surgery is needed, but even after a successful operation, compression garments must be used.

Figure 3a. MRI (left) region showing a right-sided, secondary lymphedema after breast cancer treatment in the elbow region. Note the honeycomb pattern. (Hakan Björnson 2003)

Figure 3b. The healthy left side in the same patient for comparison. (Hakan Björnson 2003)

6.1. Surgical treatment

Despite prophylaxis the lymphedema will often progress slowly but steadily, necessitating a surgical approach. Surgical treatment, when tissue is removed, becomes indicated in patients, who fail to respond to conservative treatment because of hypotrophy of the subcutaneous adipose tissue, and later fibrosis (8-10). The swelling, the 'edema', does not show any pitting. The surgical intervention is therefore consequently directed towards the adipose tissue hypertrophy of the swelling, and not towards the fluid component, i.e. the lymph.

Various surgical procedures have therefore been proposed to reduce lymphedema, including interventions to the subcutis and deep fascia (13-19), and skin grafting (20, 21). None of these methods gave satisfactory or long-lasting results. The breakthrough in reconstructive microsurgery has stimulated the interest to create such connections. During the last decades, anastomoses have been established between lymph nodes (22) or lymph collectors (23, 24) and the venous system. Promising results have recently been reported after transplantation of lymph collectors (25, 26), as well as after the creation of various forms of lymphatic veins-anastomoses (27, 28). Even if the microsurgical methods are attractive from a...
The canulas are connected to a vacuum pump giving a negative atmospheric pressure of 0.9.

The canulas are 15 cm long with an outer diameter of 3 and 4 mm and have three openings at the tip.

The outer cannula is used mainly for the hand, fingers, and distal part of the forearm, and also when irregularities were remedied.

The openings differ from normal liposuction canulas in that they take up almost half of the circumference in order to facilitate the liposuction, especially in lymphoedemas with excess fibrosis (figure 7).

Liposuction is executed circumferentially, step-by-step from hand to shoulder, and the hypertrophied and edematous fat is removed as completely as possible (figure 5, 6, 8).

When the arm distal to the tourniquet has been treated it is compressed by using sterile rolls of bandage to stem bleeding and postoperative edema. The tourniquet is removed and the most proximal part of the upper arm is treated (figure 6d). The incisions are left open to drain. A clean, but non-sterile, standard compression garment is applied (Jobst® Elvarex RSN medical, compression class 2) on the arm. The size of this garment is measured according to the size of the healthy arm. An intern-mesh glove (no 111099, Jobst®) intern-award garment for burn scar.
6.1.1.2. Postoperative care

The arm is held raised during the hospital stay, usually for 3-4 days. Two days postoperatively, measurements are taken for a custom-made compression garment, a sleeve and glove, compression class 2 (Jobst® Elvarex BSN medical).

Figure 9. The compression garment is removed two days after surgery in order to take measurements for a custom-made compression garment. A significant reduction of the right arm has been achieved as compared to the preoperative condition seen in figure 4. (C) Hikus Ibrahim 2003)

The patient alternates between two standard compression sleeves and gloves the first two postoperative weeks. At the 2-week control the new custom-made compression garment is applied, alternating this with a standard one until the 6-month visit. During the subsequent course this rigorous compression regime, referred to as Controlled Compression Therapy (CCT), is maintained exactly as described below (12).

6.1.1.3. Controlled Compression Therapy (CCT)

The compression therapy is crucial, and its application is therefore thoroughly described and discussed at the first clinical evaluation. If the patient has any doubts about continued CCT, she is not accepted for treatment.

After institution of the compression therapy, the custom-made garment (Jobst® Elvarex BSN medical, compression class 2, rarely class 3) is taken in at each visit, using a sewing machine, to compensate for reduced elasticity and reduced arm volume. This is most important during the first 3 months when the most notable changes in volume are observed. At the 1-month visit another custom-made compression garment is measured for, alternating this with the old one until the 6-month visit. After the 6-month visit, the arm is measured for new custom-made garments. This procedure is repeated at 6 and 12 months. It is important however, to take in the garment repeatedly to compensate for wear and tear.

This requires additional visits in some instances, although the patient can often make herself such adjustments. When the edema volume has decreased as much as possible and a steady-state is achieved, new garments can be prescribed using the latest measurements. In this way, the garments are renewed three or four times during the first year.

Two sets of sleeve and glove garments are always at the patient’s disposal, one being worn while the other is washed. Thus, a garment is worn permanently, and treatment is interrupted only briefly when showering and, possibly, for formal social occasions. The patient is informed about the importance of hygienic measures and skin care.

The life span of two garments worn alternately is usually 4 to 6 months. After complete reduction has been achieved the patient is seen once a year when new garments are prescribed for the coming year, usually 4 garments and 4 gloves (or 4 gauntlets). In very active patients the 6 to 8 garments a year may be needed.

6.1.1.4. Arm volume measurements

Arm volumes are recorded for each patient using the water displacement technique. The displaced water is weighed and balanced to the nearest 5 g, corresponding to 5 ml. Both arms are always measured at each visit, and the difference in arm volumes is designated as the edema volume (32, 33). The decrease in the edema volume is calculated in percent, thus:

$$\frac{\text{EA}_{\text{bo}} - \text{HA}_{\text{bo}} - \left(\text{EA}_{\text{af}} - \text{HA}_{\text{af}}\right)}{\text{EA}_{\text{bo}} - \text{HA}_{\text{bo}}} \times 100,$$

where

- $\text{EA}_{\text{bo}}$ = edematous arm before treatment
- $\text{HA}_{\text{bo}}$ = healthy arm before treatment
- $\text{EA}_{\text{af}}$ = edematous arm after treatment
- $\text{HA}_{\text{af}}$ = healthy arm after treatment

Arm volume measurements for calculating the edema volume are measured at each visit.

6.1.1.5. Results

A prerequisite to maintain the effect of liposuction is the continuous use of a compression garment (figure 10, 11). The already decreased lymph transport capacity is not further impaired by liposuction (34). Liposuction decreases the incidence of erysipelas.

The point of bacterial entry may be a minor injury to the edematous skin, and impaired skin blood flow may respond inadequately to counteract impending infection. Reducing the edema volume by liposuction increases skin blood flow, and probably decreases the reservoir of proteinaceous fluid and adipose tissue, which may enhance bacterial overgrowth (35).

Through the combination of liposuction and CCT the lymphedema can be completely removed. Long-term follow up (7 years) does not show any recurrence of the edema (12, 33, 36, 37).

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7. REFERENCES

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- MediLymph 60 and medi 90
- MediLymph 550 “made to measure”
- MediLymph 590 “made to measure”
- MediLymph 595 “made to measure”

Modern, medically proven compression solutions.