

Lymphedema of upper limb after radical treatment of breast cancer patients: current management principles

Obrzęk limfatyczny kończyny górnej po radykalnym leczeniu chorych na raka piersi – aktualne zasady postępowania

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Key words

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Abstract

Upper limb lymphedema (ULL) is the most severe late complication following radical treatment of breast cancer (BC). It can be caused by both cancer recurrence and previous therapy (lymphadenectomy, axillary radiotherapy). In BC survivors, ULL-inducing factors include: previous irradiation treatment, infections within the upper limb or the scar, high BMI. Diagnosis of ULL makes use of measurements of the circumference and volume of the limb, imaging, measuring electrical impedance of tissues and lymphoscintigraphy which determines the type and severity of lymph flow disturbances. ULL has a chronic and progressive nature leading to physical, psychic and social disability and, on rare occasions, to secondary neoplasms of the lymphatic system. Therapeutic management involves: patients' education, complex physical therapy (manual lymphatic drainage, compression therapy), reduction and drainage surgery (microsurgery) as well as liposuction. The most effective conservative procedures include complex physical therapy and particularly manual lymphatic drainage with compression therapy. Failure of conservative therapy indicates the need for surgery. Liposuction is a currently preferred surgical procedure because of its simplicity and a low percentage of complications. Surgery should be complemented by constant compression therapy. Due to low efficiency of all the methods applied, ULL prevention is of paramount importance. It should consist in rationalising indications for oncological treatment (lymphadenectomy, radiation therapy).

Słowa kluczowe

rak piersi, obrzęk limfatyczny, leczenie, kompleksowa fizjoterapia

Streszczenie

Obrzęk limfatyczny kończyny górnej (OLKG) stanowi najcięższe późne powikłanie radykalnego leczenia chorych na raka piersi (RP). Przyczyną ujawnienia się OLKG po leczeniu radykalnym RP może być zarówno nawrót nowotworu jak i przebyte leczenie (limfadenektomia, radioterapia pachy). U chorych wyleczonych z RP czynnikami predysponującymi do powstania OLKG są: przebyte leczenie napromienianiem, infekcje w obrębie kończyny górnej lub blizny, wysoki BMI. W diagnostyce OLKG wykorzystuje się pomiary obwodów i objętości kończyny, badania obrazowe, pomiary impedancji elektrycznej tkanek) oraz limfoscyntyografię określającą rodzaj i stopień zaburzeń odpływu chłonki. OLKG ma charakter przewlekły i postępujący prowadząc do niepełnosprawności fizycznej, psychicznej i społecznej, a wyjątkowo do wtórnych nowotworów układu chłonnego. Postępowanie terapeutyczne uwzględnia: edukację chorych, kompleksową fizjoterapię (ręczny drenaż limfatyczny, kompresjoterapię), operacje redukcyjne i drenujące (mikrochirurgiczne) oraz liposukcję. Spośród metod zachowawczych najlepsze efekty przynosi kompleksowa fizjoterapia, zwłaszcza ręczny drenaż limfatyczny z kompresjoterapią. Nieskuteczność leczenia zachowawczego stanowi wskazanie do leczenia chirurgicznego. Wśród metod chirurgicznych preferuje się obecnie odsysanie tkanki tłuszczowej (liposukcję) jako metodę prostą z niskim odsetkiem powikłań. Leczenie chirurgiczne powinno być uzupełnione stosowaną stale kompresjoterapią. Ze względu na niską skuteczność wszystkich stosowanych metod istotne znaczenie ma profilaktyka OLKG polegająca na racjonalizacji wskazań do leczenia onkologicznego (limfadenektomia, radioterapia).

The letters indicate the authors' contribution to the paper: A – research project; B – data collection; C – statistical analysis; D – data interpretation; E – work on the manuscript; F – literature search; G – funds procurement

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INTRODUCTION

Breast cancer (BC) is the most common malignant tumour among women in Poland. For many years its incidence has tended to grow and currently some 13000 new cases are registered annually¹.

BC therapy associates all oncological treatment methods such as local ones – surgery and irradiation as well as systemic ones – chemotherapy and hormone therapy. Surgery has remained basic treatment method for over 100 years. Standard radical surgery of invasive BC always includes dissection of the primary source and regional lymph nodes. The extent of the surgery depends on the cancer progression defined in terms of the TNM UICC² system. Due to a high locoregional advancement of BC at the time of diagnosis in over 80% of Polish women, mastectomy combined with dissection of the axillar lymphatic system remains a standard surgical procedure. In less advanced stages of BC, an alternative to mastectomy is breast conserving therapy (BCT) whereby primary tumour is cut out with a margin of healthy tissues and the breast is irradiated. An indispensable element of both surgical methods is axillar lymphadenectomy. It is a source of the most common and serious complications³.

When cancer has been found to spread to the dissected axillary lymph nodes and in particular to extend beyond the capsule of the affected node and when there occur neoplastic embolisms in lymphatic vessels complementary irradiation of the axilla is indicated due to a high risk of cancer recurrence⁴. Association of lymphadenectomy with axillary irradiation multiplies the risk of the most serious late post-treatment complications which include ULL and impaired mobility of the brachial joint on the side of surgery³.

LYMPHEDEMA OF THE UPPER LIMB

Pathogenesis

Normally there is a balance between the volumes of the fluid flowing into

tissues through arterial vessels with blood and flowing back to the venous system. 90% of the fluid is reabsorbed by venous capillaries. The remaining 10% is drained through lymphatic vessels. The lymphatic system also helps remove microparticles (e.g. protein) from intracellular space. Accumulation of protein in intracellular fluid leads to an increase in osmotic pressure and fluid accumulation resulting in tissue swelling which manifests itself clinically as lymphedema⁵.

Unlike primary lymphedemas, ULL in BC patients is always secondary in nature. ULL in such patients is usually caused by impaired lymph flow in the axilla which can be due to:

1. obliteration of lymph vessels by cancer – in non-treated patients;
2. treatment-induced insufficiency of the lymphatic system due to lymphadenectomy and additional damage to lymphatic vessels caused by irradiation – in patients after therapy.

Since ULL can be the first and often sole symptom of BC recurrence it is necessary to rule out the possibility of failure of oncological treatment before a decision is made to treat the oedema itself.

ULL in BC survivors essentially consists in insufficiency of the so-called second circulation with water, protein, immune cells, erythrocytes and debris of cells after apoptosis in intracellular space and lymphatic vessels gathering in extravascular spaces. The consequence is chronic inflammation and advancing tissue fibrosis with proliferation of keratinocytes, fibroblasts and collagen deposits⁶. In pathogenesis of lymphatic vessels inflammation a significant factor is oxidation stress which causes imbalance between anti-oxidation barrier capacity and intensity of reactions with participation of reactive oxygen forms. In women after mastectomy complicated by ULL, the concentration of free radicals is higher by 2-3 times⁷. Impaired lymph flow from tissue causes accumulation of microorganisms which penetrate the skin and colonize tissues that lie more deeply resulting in recurrent inflammations of lymphatic vessels. The swollen limb becomes

more and more susceptible to infections which intensify the edema. Apart from destroying lymphatic vessels, ULL also increases the mass of the cells and basal tissue substance⁶.

Clinical picture

Likelihood of ULL after radical BC therapy depends on the condition of the lymphatic system before therapy and the extent of its iatrogenic lesion.

ULL covers the anatomical area of lymph flow distal to damaged vessels and lymph nodes. ULL is classed according to the time of occurrence as follows:

1. Early lymphedema (acute, inflammatory) caused by acute lymph stasis and inflammatory reaction around the postoperative wound; the swelling usually subsides after 1-2 weeks as inflammation subsides and collateral routes of lymph flow are established.
2. Late lymphedema caused by permanent and advancing insufficiency of the lymphatic system usually in the axilla.

According to *International Society of Lymphology*⁵ 4 stages of late ULL are distinguished such as:

0. Latent or subclinical lymphedema which remains unnoticed for a period of several months to several years (18 months on average), when only lymph transport is impaired.

I. Transient edema when edema fluid is relatively high in protein content. It is often induced by some unfavourable stimuli (sunbathing, physical effort, infections) and subsides when they disappear, limb elevation reduces the edema.

II. Persistent edema – it is permanent and does not tend to subside when the limb is elevated, there can be hardening of the skin and fibrosis of the subcutaneous tissue.

III. Lymphostatic elephantiasis with recurrent inflammations, fibrosis and trophic skin changes.

ULL is a chronic and advancing condition whereby adverse changes tend to become permanent as time goes by.

ULL is estimated to affect some 1/3 of BC survivors⁸. A wide range of ULL percentage in literature is mainly

related to the severity of lesions and diagnostic methods applied⁹.

Even minor surgery within the axilla can induce ULL. It has been observed in 9 out of 303 females, i.e. 3%, who had only sentinel nodes removed (i.e. the first nodes on the way of the lymph flow from the breast tumour) but after axillary lymphadenectomy following diagnosis of cancer spread to the examined nodes, ULL occurred in 20 out of 117, i.e. 17.1% of the patients¹⁰.

According to some authors, ULL is more common after radical mastectomy than after breast conserving therapy¹⁰. According to others it only depends on axillary lymphadenectomy, regardless of the method of treatment of the primary lesion in the breast¹¹. Boston authors observed ULL in 27.8% of 151 patients treated for early breast cancer and they found no difference between the patients after conserving therapy (dissection of the tumour with axillary lymphatic system and irradiation of the breast) and those after classical mastectomy with axillary lymphatic system and no irradiation¹².

Unquestionable factors predisposing to ULL after radical BC therapy include:

- radiation therapy of the axilla,
- infections within the upper limb or the scar⁹.

A prospective study of 251 females after surgical treatment (188 patients had been observed for 3 years) showed ULL to develop in 20.7%. Postoperative irradiation of the lymphatic system, skin punctures during hospital stay, mastectomy and high BMI proved to have the most effect on the incidence and severity of the lymphedema⁹.

Diagnosis

Clinical symptoms of ULL include non-painful increase in circumferences of the upper limb and a feeling of heaviness and discomfort in the limb.

In the anamnesis attention is paid to the type of surgery (lymphadenectomy) and early postoperative complications due to infections, irradiation of the axilla as well as the time period that passed after comple-

tion of oncological treatment (risk of recurrence). Other significant data concern the type of discomfort, lesions (insect bites), infections (erysipelas) and allergic reactions on ULL-affected skin¹³. Attention is also paid to obesity, smoking (chronic obstructive lung disease), drinking alcohol (liver damage with protein production insufficiency), diseases of the kidneys (liquid retention), taking medicine (diuretics, flavonoids), type of work, taking physical exercise, massage and treatment attempts in the past¹⁴.

A study of 183 women after breast cancer surgery according to LBCQ (*Lymphedema Breast Cancer Questionnaire*), included the following terms to describe lymphedema: „heavy last year”, „swollen now”, „numb last year”. They show that the use of the terms „a sense of heaviness” and „swelling” helps predict lymphedema and the difference in the limb circumference > 2 cm¹⁵.

Diagnosing ULL in late stages of development is easy while early stages may require distinguishing it from systemic diseases such as circulatory or renal insufficiency, protein loss syndromes or local venous flow impairment (venous clots or chronic venous insufficiency). Sometimes myxoedema or cyclical idiopathic oedema should also be taken into account⁵.

During physical examination the appearance of the skin is considered (‘orange peel’), its warmth, thickness and susceptibility to pressure (pitting). The examination is completed with simple measurements of the circumference and volume of the limb. Circumference measurements are always carried out under constant conditions, at the same levels and always in comparison with the ‘healthy’ limb. Among the numerous volume measurement methods, the simplest one consists in measuring the volume of water displaced by the limb⁶. Results interpretation takes into account the factors affecting lymph retention such as the patient’s physical activity, time of day, liquid intake, medicine taken or physical therapy. These methods help to monitor ULL progression and response to therapy⁶.

ULL diagnosis also makes use of imaging:

- classical X-ray of soft tissues revealing thickening of the skin and subcutaneous tissue which helps to distinguish it from venous stasis which increases the muscle volume;
- computer tomography (CT) makes possible a more detailed evaluation of the limb: thickening of the skin, extension of subcutaneous tissue, superfascial fatty tissue deposits and its fibrosis with unaltered compartments of muscle tissue;
- magnetic resonance imaging (MRI) that complements CT and allows a more detailed examination of soft tissues revealing oedema with fluid accumulating between fat deposits or deformity of lymph vessels;
- ultrasonography (USG) with Doppler is a simple and readily available examination that allows an additional evaluation of the blood flow in the veins and arteries;
- lymphoscintigraphy (LSC) with 99 technet helps to assess the speed of isotope flow through the lymphatic system, time of lymph nodes marking and the site of marker stasis as well as routes of collateral circulation. The examination, which is considered a golden standard, makes possible not only a qualitative (kind) but also quantitative (degree) evaluation of lymphatic system dysfunctions^{5,11}.

In order to select women with a high risk of ULL, dynamic lymphoscintigraphy should be performed 2-4 months after BC therapy. Preliminary scintigraphy makes possible an evaluation of the extent of lymphatic system insufficiency which has a negative correlation with the effect of the physical therapy which is being applied¹⁶.

In practice, ULL is diagnosed on the basis of metric measurements compared with values for the ‘healthy limb’. Less common are volumetric studies and measurement of electric bioimpedance of tissues¹¹.

Electric bioimpedance techniques make possible more direct measurements of the differences in the oedema volumes than simple limb volume measurements which do not take into consideration specific changes in the



Photograph 1
Lymphedema of upper limb after mastectomy

tissue composition. The method is thought to be simple and reproducible with regard to monitoring lymphedema and to be able to detect lymphedema in subclinical stage in women under observation after BC therapy⁵.

In studies of 176 women by Hayes et al. anamnesis data revealed ULL in 27.8 % while objective measurements of the differences in arm circumferences (>5 cm) and electric impedance measurements showed ULL to occur in 11,9% and 11,4% of the patients respectively¹⁷.

Studies comparing simple diagnostic criteria of ULL monitoring were carried out in a group of 118 women. Limb volume changes (LVC) were evaluated one year after ULL diagnosis basing on limb circumference measurements and anamnesis. The following results were obtained:

- for 200 ml LVC – 24% of the patients found the edema to increase within 6 months while 42% of the patients noticed it to increase after a year;
- for 10% LVC – 8% of the women noticed an increase in the edema after 6 months and 21% after a year;
- when arm circumferences were measured, a 2-cm increase was noticed by 46% of the patients after 6 months and by 70% of them after one year;

- the anamnesis showed the edema to increase in 19% of the patients after 6 months and in 40% of them after one year¹⁸.

ULL has a progressive nature and its late stages lead to physical, psychic and social disability.

The following complications can occur in the course of ULL:

1. The volume of the upper limb grows and the limb becomes disfigured, heavier and more and more difficult to use.
2. Muscle force and joint mobility become limited and sometimes there occur muscular contractures¹⁹.
3. There occur pains and parestheses – postmastectomy lymphedema and carpal tunnel syndrome is frequent²⁰.
4. ULL predisposes patients to frequent skin and subcutaneous tissue infections caused mainly by streptococcus (70-80% - erysipelas), less often by staphylococcus, enterobacteriaceae or pseudomonas. They are hard to treat and tend to recur which leads to a gradual damage of the functioning of lymphatic vessels and advancement of the oedema²¹.
5. ULL which persists for many years predisposes the patients to rare secondary neoplasms of the lymphatic system such as lymphatic sarcomas and lymphomas²².

Studies of Dolnośląskie Centrum Onkologii (Lower Silesian Oncology Centre) in Wrocław which included 328 women operated on in the years 1998-2005 showed 117 women with ULL to be less fit, to experience limitations in performing social roles and to suffer from more ailments in the affected limb regardless of BMI as compared to 211 controls. The ULL group had significantly lower scores as regards emotional functioning and cognitive scales. The patients more often reported fatigue symptoms, breathing problems and side effects of the therapy. The patients more often had a distorted image of their own bodies which lowered their self-esteem. They more often found it difficult to function within the society and experienced financial and professional problems. All the above factors contributed to a lower quality of life of women with ULL²³.

Therapeutic management of the upper limb lymphedema

The patients' management involves:

1. education of the patients and their family as regards ULL and its complications,
2. complex physical therapy (CPT),
3. pharmacological therapy,
4. surgery.

Education

Education involves the patients and their families who receive instruction about the need to:

- elevate the limb,
- avoid trauma and skin infections,
- maintain skin hygiene,
- avoid isometric efforts,
- control body mass,
- diagnose early and treat properly ULL infection complications²⁴.

Complex physical therapy

Complex physical therapy (CPT) plays a key role in advanced ULL. Its basic elements are:

1. manual lymphatic drainage (MLD),
2. compression bandaging (CB),
3. physical exercise activating the so-called muscle pump.



Photograph 2
There is a cannula sucking fat during liposuction

CPT has two essential therapeutic stages:

1. Early therapy which is intense and lasts for several weeks and aims at diminishing the size of the oedema as quickly as possible.
2. Maintenance therapy which starts late and is prolonged; it usually is life-long and aims at maintaining the results obtained in the early stage.

The early (intensive) stage mainly makes use of lymphatic drainage and bandaging combined with physical and breathing exercise so as to diminish the size of the swelling as quickly as possible and to fit the sleeve that is to be used together with physical exercise in maintenance stage²⁵.

Manual lymphatic drainage (MLD) has an effect chiefly on the superficial part of the lymphatic system of the limb which makes it essentially different from classical massage. It aims at activating inactive lymphatic connections between the affected areas and the oedema-free ones, activating the lymphatic vessels which are not used, creating collateral circulation of the lymph and regenerating vessels. It starts with working out the non-affected areas (neck, chest, back) and after healthy, efficient vessels are ready to take in the fluid ex-

cess, the swollen area is worked on beginning from the proximal parts and proceeding to the peripheral region. Representatives of particular therapeutical schools agree that the drainage must not cause any reddening or pain otherwise the excessive pressure on the tissues can damage primary lymphatic vessels. Owing to MLD, excess fluid is drained from the limb which diminishes stretching of the tissues and leads to an increase in their hydrostatic pressure, decrease in protein concentration in inter-cellular space and a drop of oncotic pressure in the space²⁶.

Drainage improves physical and chemical conditions in the inter-cellular space, curbs its expansion and restores the capacity of the valvular mechanism preventing backward skin flow. Pro-infection factor genes expression has also been found to decrease which can prevent inflammatory complications (dermatolymphangiadenitis – DLA)²⁶.

Few randomized studies evaluating CPT efficiency reveal a decrease in the edema size by 40-60%^{5,27,28}.

MLD can be followed with intermittent pneumatic compression (IPC), which causes fluid evacuation but is less effective as regards the removal of bigger particles such as proteins²⁹. Oedemas were observed to subside

most quickly in the first weeks of commencing IPC but the positive effect was observed to last longer³⁰. Authors of cohort studies⁵ stress that there are discrepancies in the opinions about the effectiveness of prolonged use of IPC. No optimum compression value has been determined. However, most authors agree that IPC combined with other methods, and MLD in particular, improves the overall therapeutic effect and therefore should be an integral part of complex physical therapy^{5,30}.

Compression bandaging is a crucial element in the management of advanced ULL. Low-stretch bandages are used. Next, compression sleeves are applied and compression force is adjusted appropriately. Bandaging which is used directly after MLD helps to maintain its effect, restores the shape to the limb and softens fibrosis. According to accepted theories, compression decreases arterial capillaries filtration and increases reabsorption of venous capillaries. In this way, it decreases the volume of tissue fluid and prevents backward lymph flow. Compression also improves the efficiency of muscle pump because it creates a relatively non-flexible barrier over the shrinking muscles³¹. Low-stretch bandages generate resting pressure which is low when there is no movement and which is well tolerated by patients (unlike the high resting pressure generated by high-stretch bandages) as well as working pressure produced mainly by the muscles during physical effort²⁷. Preliminary reports reveal that CB can also be used as initial therapy in oedema reduction²⁷.

A separate problem is a choice of an appropriate compression sleeve class (compression degree) after the reduction of the limb volume as a result of the final stage of intensive physical therapy³². Such a sleeve should be adjusted with the utmost care otherwise it will fail to fulfill its task (preservation of the drainage effect and facilitation of lymph flow) and may even aggravate ULL.

In the case of advanced lymphedema compression sleeves should not be used unless bandaging is done first because they can soon become loose and fail to have an effect¹⁴.

According to German classification (RAL) there are 4 degrees of compression: I degree (18-21 mmHg), II degree (23-32 mmHg), III degree (34-46 mmHg), IV degree (>46 mmHg). In post-mastectomy ULL, I or II degree compression is usually applied³³.

An indispensable element of physical therapy are physical exercises activating the muscle pump and in this way affecting a deeper part of the lymphatic system (subfascial). Physical exercises should be done both during intensive therapy and maintenance stage. They should not be so intensive as to cause muscle fatigue because elevated concentration of lactic acid results in congestion which can increase the oedema. It is also generally recommended not to subject the affected limb to great effort or even moderate but a prolonged one³⁴. However the authors from Minnesota University suggest reviewing this approach.^{31,35} In their randomized study they did not observe an adverse effect of regular physical exercise (2 times a week for 6 months) on ULL after BC therapy. It is assumed that exercising limbs increases lymph flow and improves protein reabsorption. Breathing exercises on the other hand, improve lymph flow towards the central veins through decreasing intrathoracic pressure on inhaling which can be beneficial to physical therapy³⁵.

Currently there are changes in the approach to the particular components of CPT. Until recently MLD has been the most important CPT component but now more attention is paid to CB and its introduction as the first element is considered especially in the cases of fresh oedemas. The effectiveness of MLD in the early-stage oedema is also questioned²⁸. If MLD is not used in the maintenance stage of the therapy the risk of oedema getting worse does not grow³⁶.

Pharmacological therapy

Pharmacological treatment of ULL after radical BC therapy is regarded as support of physical therapy. The authors of two current literature reviews^{5,31} provide critical evaluation of the medication used.

1. Diuretics should not be recommended in ULL therapy because



Photograph 3
Sucked fat in drain liposuction

- they worsen protein reabsorption from tissue fluid which accelerates fibrosis.
2. Coumarin derivatives in small doses mainly improved subjective perception of the limb but in large doses (400 mg) increased the oedema in comparison to placebo while subjective perception was favourable.
 3. Benzopyrones increase the number of macrophages and decrease permeability of the vessels. The increased number of macrophages causes proteolysis and results in the proteins being removed from the fluid which makes oedemas subside. Randomized studies either revealed good effects or no clinical improvement. However, prolonged use of medication is limited by their hepatotoxicity¹⁴.
 4. Diosmine and hesperidine (detralex®) are supposed to have a protective and anti-inflammatory effect on the venous system with concomitant oedemas. After 3 months of using them in ULL therapy, oedemas decreased by 13% in comparison with placebo. The drugs mainly ease the feeling of discomfort in the limb since it feels less heavy and more mobile.
 5. Supplementing the diet with selenium and vitamin E has had no significant effect on the condition of the edemas.

Drugs based on or combining with proteins and administered subcutaneously or intramuscularly should be avoided since they are absorbed into the lymph (e.g. insulin, vaccines, digoxin). Calcium channel blockers make the smooth muscles of the vessels relax which impairs lymph flow.³⁷

Surgery

Ineffective conservative therapy and increasing ULL are indications for surgery.

During over a hundred years of ULL surgery various methods have been tried from low invasive (incision of the skin surface and subcutaneous tissue) to extremely radical – amputation of the affected limb^{3,5}. So far no surgical method of unquestionable effectiveness has been found.

Currently three basic operative methods are in use⁵:

1. Reduction surgery, resection which consists in dissecting fibrous subcutaneous tissue together with the covering skin (debulking surgery). The method is over a hundred years old and chiefly improves the appearance of the limb and a sense of comfort and sometimes also mobility. It also reduces neurological symptoms such as carpal tunnel syndrome²⁰. However, it can be a source of seri-

ous inflammatory complications, keloid ulceration and lymphatic fistulas, therefore it is applied less and less often. .

2. Microsurgery which consists in creating anastomosis of lymphatic and venous vessels, lymph nodes and veins as well as lymphatic vessels in front of the obstacle and behind it³. Among the patients operated on in Italy³⁸, edema reduction by 69% on average was observed. Lymphatic vessels transplants and bandaging helped reduce the volume of the limb by an average 22-30%³⁹. An alternative procedure is free muscle flap transfer which has proved promising in small series of cases. Regrowth of lymphatic vessels between the transplanted muscle flap and its surroundings has been documented⁴⁰.
3. The latest technique is sucking the fatty tissue from the affected limb which is a variation of liposuction used in plastic surgery. Borson managed to obtain oedema reduction by 106% on average in a large sample of women with ULL after BC therapy during 4 years of observation and positive effects of therapy persisted even as long as 15 years. The patients still required compression therapy after surgery⁴¹.

Nowadays it is estimated that every fifth patient may need surgery⁶. Multitude of microsurgical methods of repairing routes of lymph flow from the limb (lymphatic, lymphatic-venous or nodular-venous anastomosis, free or pedicle muscle flap transplants) proves that none of them is sufficient and faultless. It is pointed out that the lower the ULL degree the more effective the surgery. At the same time there is a tendency to delay surgery because its efficiency has not been completely proved and because of fear of complications which can make the limb condition deteriorate^{3,6}.

Liposuction is gaining more and more supporters because it is simple and has promising results while the risk of complications is low.

Comparative studies carried out at the Gdańsk and Warsaw Oncology Centres showed that in patients subjected to liposuction the volume of

the oedema decreased twice as much as in patients subjected to drainage directly after surgery. One year later the reduction rates were 84% and 22%, respectively³.

All the authors agree that ULL surgery, regardless of its type, should always be combined with appropriate conservative therapy, mainly compression therapy.

It must be pointed out that despite proper therapy making use of all the above mentioned conservative and surgical procedures it is often impossible to reduce the oedema. Therefore much attention is paid nowadays to rationalising indications for lymphadenectomy and irradiation of the axilla as ULL prevention methods. The concept of biopsy of sentinel node (the first node where lymph from primary tumour flows) in breast cancer is now one of the treatment methods that aim at reducing the number of axillary lymphadenectomies¹⁰.

CONCLUSION

Radical BC therapy is nearly always associated with lymphadenectomy and often irradiation of the axilla. This kind of therapy blocks the main route of lymph flow from the limb and creates conditions for lymphedema.

Before ULL therapy is started it is necessary to rule out the possibility of tumour recurrence.

ULL diagnosis makes use of measurements of the circumferences and

volume of the affected limb in relation to the healthy one as well as classical imaging (RTG, USG, CT, MRI) to help rule out oedema of venous origin. In case of clinical doubts, lymphoscintigraphy (LSC) has a decisive role. In ULL therapy monitoring, simple comparative measurements of the limbs and electric bioimpedance are helpful.

ULL has chronic nature and tends to turn into elephantiasis. This favours recurrent skin and subcutaneous infections which results in the damage to functioning lymphatic vessels and oedema progression.

A significant role in the management of ULL patients is played by education – avoiding skin lesions and situations that lead to oedema increase. (position, work, limb position, clothes).

At the moment there is no effective therapy leading to permanent cure of ULL. All the methods applied aim at curbing progression of the disease, reducing the limb volume and preventing infections. An important role is played by methods improving the patient's quality of life through making ULL symptoms milder and improving the shape and mobility of the limb.

There is a wide range of extreme opinions as to the effectiveness of both the conservative methods such as CPT, compression therapy and surgery: debulking surgery, microsurgery or liposuction. Last year American and Swedish authors⁵ made an attempt at systemizing and evaluating the methods bas-

Table 1

Effectiveness of conservative treatment of lymphedema of upper limb according to Moseley and co-workers³¹

Management method	% ULL reduction
Manual lymphatic drainage + compression therapy	40-45
Complex physical therapy (self-performed)	25-30
Pneumatic pumps	25-27
Manual lymphatic drainage (self-performed)	23-25
Pharmacological treatment	15-17
Compression therapy (bandaging and sleeves)	10-12
Laser therapy	10-12
Exercise	4-5
Limb elevation	3-4
Self- massage	3-4

ing on English language publications of the last decade contained in MEDLINE and recommendations of the International Society of Lymphology. A systematic review of world literature and an attempt at evaluating the methods basing on Evidence Based Medicine was also undertaken by Australian authors in the same year³¹. They ranked the effectiveness of conservative therapy of ULL secondary to breast cancer treatment taking into consideration the percentage of the limb volume reduction in patients completing randomized, cohort clinical studies. The methods ranked from the most to the least effective are presented in the table³¹.

Among surgical methods, liposuction is considered to be the most effective and causing the least complications. Microsurgery is second most effective method. The least effective and charged with the highest risk of complications is debulking surgery (dissection of subcutaneous tissue)⁵.

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