Are There Enigmas Concerning The Pathophysiology Of Lymphedema After Breast Cancer Treatment?

Prof. MED. Michael Földi

Bates, Levick and Mortimer¹ published a paper in 1993 about “the swollen arm after breast cancer treatment,” expressing the view that “there are several quite fundamental uncertainties about this condition.”

Most of the “uncertainties” are only of theoretical interest. However, the authors raised a question on one of the “uncertainties” on which I wish to focus: “…why does swelling usually not commence until months or years after the treatment?”

This question has important practical implications because the answer is linked to the advice that the physician must give a woman who has undergone breast cancer treatment, i.e. the do’s and don’ts.

To appropriately answer the question raised by Bates and his colleagues, I will initially briefly outline the scientific background. There is a fundamental difference between the driving force of the blood in the veins and that of the lymph in lymph vessels. Venous blood is driven in the recumbent position by the heart. The left chamber pumps the blood into the aorta producing a mean pressure of 100 mm Hg; the blood reaches the blood capillaries at a pressure of about 30 mm Hg., while the pressure in the veins in the dorsum of the foot amounts to approximately 8 mm Hg. The pressure from the left chamber then pushes the blood into the veins in the right atrium where the pressure is zero.

The lymph vascular system starts with the initial lymphatics in the tissues and ends at the venous angles, representing only half of a circulation. The heart produces no driving force for the lymph. The necessary force is generated by the lymphangions (segments of lymph vessels bordered by two valves) which act like tiny hearts, or lymph pumps.

The lymphangions’ function is governed by the same mechanism as the heart with analogous consequences in similar situations. If someone suffers from a heart attack triggered, for example, by coronary sclerosis and she/he survives, the following may occur:

(1) Congestive heart failure with cardiac edema and breathlessness at rest appears, if the damage is so severe that the heart is unable to cope with the needs of the resting body;

(2) The functional reserve decreases, however, under normal circumstances, it is still able to supply the body with blood. There are no signs or symptoms while the body is at rest, but a doctor can detect the condition by administering an exercise test;

(3) The functional reserve remains unchanged.

With reference to (2), the functional reserve has a tendency to decrease further due to the progression of coronary sclerosis and aging and, depending on several factors, sooner or later congestive heart failure will occur.

Obesity, high blood pressure and diabetes will cause the heart to fail sooner, while absence of these risk factors plus living and eating healthfully can postpone or even prevent congestive heart failure.

Regarding the lymph pump in an equivalent situation, when the axillary lymph nodes are removed, the following consequences can arise:

(1) Congestive lymphatic failure (lymphedema) can appear if, during surgery, so many lymph vessels were destroyed to transport the normal lymphatic fluid load;

(2) The functional reserve decreases, but the transport capacity still remains higher than the normal lymphatic fluid load. In this circumstance, no swelling of the arm would occur. This condition is detectable through lymphoscintigraphy.

(3) Functional reserve of the lymph vascular system remains unchanged.

The second outcome is relevant to the “uncertainty” in lymphedema of the arm after breast cancer treatment, since it is clear that aging decreases the force of the lymph pumps. And, lymphatics that were spared during surgery compensate by taking on the work load of the missing lymph pumps. Fatigue and structural changes are inevitable, as is lymphedema. At what time the lymph-dema becomes apparent depends on several factors: Lymphedema will manifest itself sooner if healing of the surgical wound is disturbed, or if postoperative radiation therapy is applied, because X-rays hinder the regeneration of lymph vessels; if lymphatics are destroyed through the onset of lymphangitis and/or erysipelas, this will precipitate the appearance of lymphedema; and, if the patient disregards the do’s and don’ts of everyday activity, lymphedema will appear. Summarizing, to postpone lymphedema indefinitely, avoid activities that can trigger a further decrease of the transport capacity of the lymph vessels and/or unnecessarily increase the lymphatic fluid and protein load of the axillary lymphatic system.

Last February, I took part in a conference organized by the American Cancer Society, where a participant gave a paper about post-cancer treatment patient education in which he said that arm and hand precautions should be listed in terms of evidence-based importance. He further stated that 28 factors were analyzed, but that only two of them were found to be statistically significant: (1) arm infection/injury/surgery, and (2) weight gain after cancer treatment. This means that all the other do’s and don’ts are only “anecdotal” (of which are disapproved) and that only “evidence-based medicine” is acceptable.

I must declare that I regard medicine as a natural science and that I agree with this principle. Nevertheless, there are cases in which “anecdotal observations” are in harmony with...
scientific facts and established knowledge, are looking for evidence by prospective, random clinical studies, but are prohibited by ethical considerations. For example, some of the don’ts, which fall into the category of “anecdotal observations” are:

1. **One should not administer intravenous injections and infusions into the endangered arm.** There are several cases in which lymphedema has arisen within hours of such injection/infusion. Although observance of these cases is “anecdotal,” and, therefore, disregarded by “evidence-based medicine” advocates, this don’t is in harmony with established knowledge, i.e., by piercing a cannula into a vein, perivenous lymph vessels can be severed, possibly causing phlebitis, periphlebitis, phlyangitis, lymphangitis and lymphangiophlebitis. And what concerns a study: should one collect a homogenous group of women who, after breast cancer treatment and free of lymphedema necessitate some kind of operation – say an orthopedic intervention – which has to be performed under general anesthesia which is then administered in a random manner to 50% of the women into the cubital vein of the endangered arm and to the other 50% don’ts, which fall into the category of “anecdotal observations” are:

2. **Avoid sunbathing and sunburns.** It has been shown that soon after excessive exposure, inflammatory edema (a symptom of erysipelas) often appears, turning into lymphedema. Despite the “anecdotal” character of this observation, clinical lymphologists accept this don’t, because it is text-book knowledge that healthy elastic fibers are a prerequisite for lymph formation and that sunshine can destroy those elastic fibers, leading to lymphedema. To try to achieve an evidence-based study would be unethical.

3. **Never carry heavy handbags or bags with over-the-shoulder straps.** From time-to-time, patients who have disregarded this advice appear with a swollen arm. Again, although “anecdotal,” the advice is sound, based on established knowledge. It has been shown that when a woman who has undergone breast cancer surgery (but is free of lymphedema) carries a bag weighing 4 kg, her axillary vein becomes markedly constricted, causing the blood capillary pressure in the arm to increase which, subsequently, increases the lymphatic fluid load. Performing a random study on this “don’t” would be absurd.

By pointing out these facts, I could be misunderstood. Therefore, I would like to declare that I reject the so-called “alternative medicine” with its anecdotal observations. The methods of “alternative medicine” lack any scientific evidence. It would be possible to carry out prospective random studies in order to examine these methods, however, physicians who practice “alternative medicine” object to the performance of such studies.

“Coping With Lymphedema,” is a very useful book about lymphedema written by Swirsky and Sackett Nannya. However, I object to their inclusion of the “alternative medicine” with its obscure methods. We must not give the impression that lymphedema is a disease that can be managed easily by these methods. The consequences, especially with regards to health insurance companies, could be disastrous.

I also want to discuss and give explanation to a statement in Rockson’s article, “Secondary Lymphedema of the Lower Extremities,” published in the July-September 1998 NLN Newsletter. Rockson wrote, “Curiously…some patients with otherwise clear-cut primary lymphedema report injury as an initiating event.”

This fact can be explained easily: Before the injury, due to a malformation of the lymphatics, the patients are living free of symptoms in the “Stage ‘0’ of latency.” A minor trauma is enough to reduce the transport capacity of the lymphatics to below the level of the normal lymphatic fluid load, causing the patient to exhibit signs of the early stage of lymphedema.

My goal in this writing primarily has been to explain some specific questions concerning lymphedema. However, I do want to intrude briefly into the topic of my dear friend, Dr. Marlys Witte, namely “medical ignorance.”

An example of such, in my opinion, is found in the book, “Lymphedema: Diagnosis and Therapy,” written by Weissleder and Schuchhardt. It contains a table in which the authors propose that “an increase of the interstitial protein concentration causes fibrosarcomas, liposarcomas, basal cell carcinomas and, perhaps, melanomas.” I would like to reassure the patients suffering from the high-protein edema lymphedema that this is absolutely not true. The only malignant tumor that can arise (rarely) as a complication of lymphedema is “angiosarcoma” (Stewart-Treves Syndrome).

Weissleder and Schuchhardt also state that lymphangiosarcoma arises from lymph cysts and fistulae; These authors have misunderstood the following fact: Immune deficiency exists in the lymphedematous area. If a patient, who suffers from lymphedema in the arm after breast cancer treatment, later on contracts a carcinoma of the uterus, which starts to disseminate, the lymphedematous arm will be a preferential site for metastases. For the patient who suffers from lymphedema, this does not mean an additional risk, because, in such cases, metastases will appear in other parts of the body, also. Only angiosarcoma constitutes a real risk in lymphedema, but I can set the mind of lymphedema patients at ease: in all probability, a good Complex Decongestive Physiotherapy will prevent angiosarcoma to recur.

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Prof. MED Michael Földi was a Professor of Internal Medicine at the University of Szeged, Hungary, where he concentrated in basic lymphology. Former President and General Secretary of the International Society of Lymphology (ISL). He currently directs the Földi Schools in Germany.