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Ways to Enhance Lymphatic Dynamics and Their Benefits

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Abstract: The lymphatic system is an important part of the immune system. It helps in removal of interstitial fluid and its dissolved substances from the tissues, initiates and coordinates immune responses for removal of cellular debris and helps to absorb fats and other substances from the GI tract. Consequently, improving the lymph movement is of a great benefit. Unlike the circulatory system, the lymphatic system does not have any pumping mechanism to move the lymph and therefore its upward movement depends upon the movement of the muscles surrounding the lymph vessels.[1],[2] Other factors like sedentary lifestyle, stress, tissue injury, etc, restrict the flow of lymph. Enhancement of the lymph movement helps in improving the detoxification process, regenerating the burned or damaged tissues and many other benefits, all of which prove to improve human health status. Hence, it is important to explore and understand the various ways by which the lymph movement can be enhanced. This review focuses on the various techniques which help enhance the lymph movement and various benefits of enhanced lymph movement.

Keywords: Lymph movement, detoxification, toxins, restricted lymph flow, techniques, enhancement of lymph movement, benefits.

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I. INTRODUCTION

The lymphatic system is a major circulatory system in the body but has received very less attention than the blood vascular system. Only recently researchers have started to study the dynamics of the lymphatic system and its influence on systemic physiology. The decline in the functioning of the lymphatic system may result in the development of chronic diseases. This article aims to develop a deeper insight into the physiology of the lymphatic system, its useful functions in the body, factors which may restrict the lymph flow and various ways by which lymph flow can be enhanced.

II. LYMPHATIC ANATOMY AND PHYSIOLOGY

The cardiovascular system consists of two parts: the circulatory system and the lymphatic system.

1. **The circulatory system:** It comprises of the heart and the blood vessels. The heart pumps the blood through the blood vessels. In this system, nearly 20L of blood is processed daily by capillary filtration which removes plasma from the capillaries to the interstitial fluid while leaving the blood cells. Approximately 17L of this filtered plasma is reabsorbed into the blood vessels and the remaining 3L remains in the interstitial fluid. Blood is a connective tissue making up about 7% of body weight i.e. 5.6L for 70kg body weight. The pumping action of the heart keeps the blood in the blood vessels in motion. Blood serves several functions (exchange of gases; waste removal from cells; transport of antibodies, clotting factors, etc.) providing a means of communication between the cells and external environment [1].

2. **The lymphatic system:** It comprises of lymph nodes and lymph vessels through which a colourless liquid called lymph flows directionally towards the heart along with other organs and structures like red bone marrow, spleen, etc. It provides a return route for the 3L of the filtered plasma remained in the interstitial fluid into the blood [3].

3. **Lymph:** It is a watery fluid with similar composition to that of plasma except for the presence of plasma proteins. It is identical in composition to interstitial fluid.

4. Lymphatic tissue: It is a specialized connective tissue with highly abundant lymphocytes (agranular WBC's). Lymphocytes are of two types i.e. B-cells and T-cells which participate in innate immunity.'

5. Primary functions of the lymphatic system:

1.1. Drainage of excess interstitial fluid from tissue spaces to the blood by lymphatic vessels.
1.2. Transport of dietary lipids and lipid soluble vitamins (A, D, E & K) which are absorbed by GI tract by the lymphatic vessels.
1.3. Carries out immune responses against microbes and abnormal cells.
1.4. Lymph returns lost proteins back to blood.

These two systems communicate with each other with the intimate association at the junction of the internal jugular vein and subclavian vein.

6. Lymph circulation:

Lymphatic vessels begin as lymphatic capillaries which are present in tissue spaces with closed ends. They have the same structure as that of veins but have thinner walls and have more number of valves. In skin, they lie in subcutaneous tissue and follow same route as veins and in viscera, they follow routes same as arteries.
Tissues that lack lymphatic capillaries are:

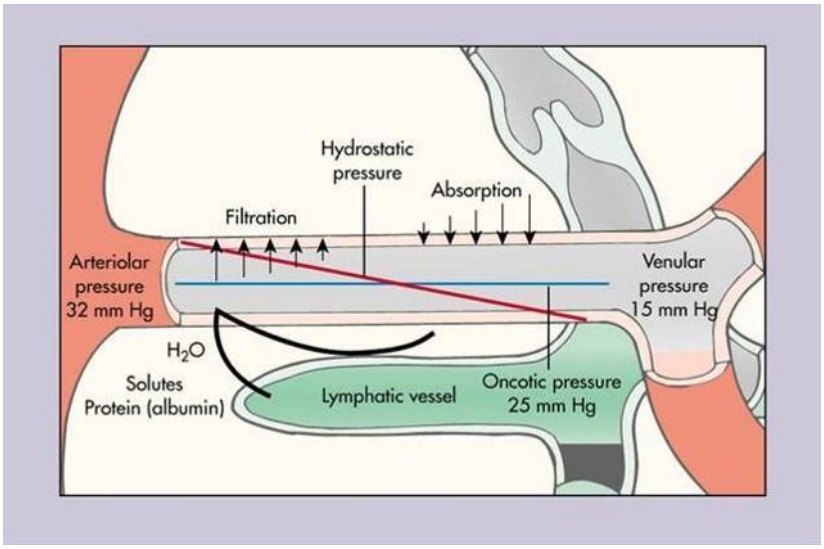
- Avascular tissues like cartilage, cornea, epidermis
- CNS
- Portion of spleen
- Red bone marrow

Lymphatic capillaries have the following characteristics:

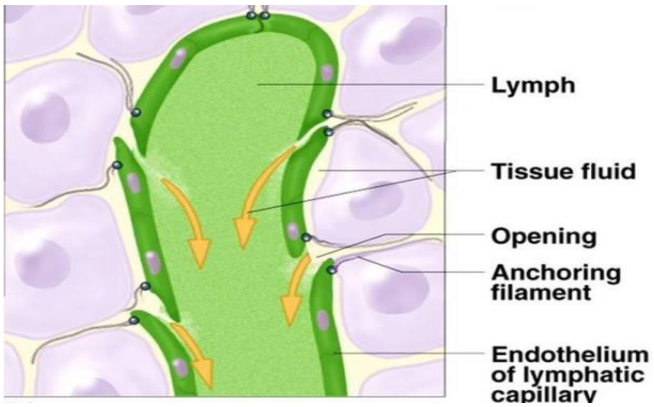
- Greater permeability than blood capillaries and hence absorb large molecules like proteins and lipids.
- Larger diameter than blood capillaries.
- Have one-way flow of lymph i.e. lymph moves in but not out.
- Their walls have overlapping endothelial cells.

Pressure	**Changes in lymphatic endothelial cells**	**Lymph flow**
Interstitial fluid>Lymphatic capillary	Cells separate slightly like a one way swinging door	Interstitial fluid enters lymphatic capillary and becomes lymph
Lymphatic capillary>Interstitial fluid	Cells get more tightly packed	Lymph can't escape out from capillary through tight cellular junctions

As lymph moves down the capillary pressure is decreased.



7. Anchoring filaments: They contain elastic fibres and are attached to the lymphatic capillaries as extensions which bind the endothelial cells to surrounding tissues. When interstitial fluid accumulates leading to tissue swelling, these filaments get pulled making the opening between cells more larger leading to increased fluid entry into the lymphatic capillary.



8. **Lacteals:** These are the specialized lymphatic capillaries that carry dietary lipids present in the lymph draining from the small intestines into the blood through the lymphatic vessels. This lymph appears creamy white in colour and is called chyle.
   Lymphatic trunks are the collection of lymphatic vessels which in turn drains into lymphatic ducts.

9. **The Sequence of fluid flow:**
   Arteries (blood/ plasma) →Blood capillaries (blood) →Interstitial spaces (interstitial fluid) →Lymphatic capillaries (lymph) →Lymphatic vessels (lymph) →Lymphatic duct (lymph) →Junction of internal jugular and subclavian vein (blood).

10. **Lymph flow regulation:** Unlike blood which is pumped by the heart, the flow of lymph lacks a pumping organ. Its flow completely relies on compression action of skeletal muscles around the vessels. Hence, enhancing the lymph flow by using alternative ways poses many benefits [2].

III. WAYS TO ENHANCE LYMPHATIC DYNAMICS AND THEIR BENEFITS

The lymphatic system is crucial for regulating homeostasis in humans. Hence, it is important to have a proper lymph dynamics for a healthy immune system, aiding various cellular processes and cellular waste removal [4][5][6][7][8]. But there are several intrinsic and extrinsic factors which lead to congestion of the lymphatic system, which includes tissue injury, reduced blood flow due to focal ischemia, sedentary lifestyle, tight-fitting clothing, stress, allergies and systemic illnesses [7]. There are several ways to address the problem of restricted lymph dynamics. These include,

1. Manual lymphatic drainage (MLD): It is a massage technique involving only the skin surface and following the anatomic lymphatic pathways of the body. Initially, the massage is done at the neck and the trunk to clear out the central main lymphatic pathways which enhance drainage from the arms. This massage does not cause pain and blush as in the case of other massages and it does not even produce a stimulant effect. A deep knowledge of lymphatic anatomy is necessary to successfully perform this technique [9].

In all the massage techniques, skin contact is used to stimulate receptors and the nature of the contact determines which receptor is stimulated. MLD consists of four stroke techniques which can be applied in any combination. It is a combination of large or small circular motions that move the skin without sliding over it. The softer the tissue, the lighter the pressure of contact should be [10].

Benefits: MLD stimulates the lymphatic system via an increase in lymph circulation, expedites the removal of biochemical wastes from body tissues, and enhances the body fluid dynamics, thereby facilitating edema reduction [11]. MLD is not reserved for any particular population. It helps improving post surgery edema in patients of all ages, decreasing pain and improving mobility [12]. MLD aids cosmetic local fat reduction especially in thigh circumference in women with cellulitis [13].

2. Integrated massage therapy: Traditional massage therapy increases circulation resulting in better distribution of nutrition and oxygen to tissues, increase water content in local interstitial tissues which stimulate the formation of lymph fluid, hence, increase lymphatic fluid return to the venous system.. Therefore , these traditional massages positively affect the circulation of blood and lymph fluid in a healthy individual. But in lymphedema or in cases of toxin overload, traditional massage is contraindicated. The same is true for breast cancer surgery patients, where the axillary lymph nodes have been removed resulting in the insufficient lymphatic system. This contraindication exists because traditional massage releases histamines from the mast

cells in the skin where the pressure is applied. Histamines cause vasodilation or active hyperaemia, as well as more capillary pressure is created resulting in more capillary filtration which is desirable in a healthy individual but increases water content in already swollen body parts. Thus, increasing the risk of lymphedema or making that pathological condition worse when already present. Integrated massage therapy combines the traditional lymphatic drainage massage with acupuncture and use of essential oils. Acupressure and essential oils stimulate release of hormones like endorphins, enkephalins, dopamine, serotonin etc and thus activate central nervous system and endocrine system. Thus they lengthen and deepen the effects of MLD by directly affecting the physiological systems that help in getting rid of edema [14].

3. Herbal supplements: Many herbs boost the function of the lymphatic system. These include:

- **Manjistha:** Manjistha is an Ayurvedic medicine which has been traditionally used for reducing the toxic load carried by the body. This herb cleanses the liver and purifies the blood. Consequently, boosts the process of detoxifying the lymphatic system. Consuming manjistha tea improves skin problems, regulates the menstrual cycle and stimulate the immune system.

- **Essiac Tea:** Essiac tea helps in detoxification and improving the immune system function. It is recommended to the cancer patients who are newly diagnosed, as an alternative medicine for improving immune function.

- **Milk Thistle:** It contains powerful antioxidants which fight inflammation as well as stimulate the production of other immune supporting healing agents such as enzymes and other antioxidants thus help purify the kidneys, liver and GI tract and improve thyroid function.

- **Essential Oils:** Aromatherapy with essential oils in cancer patients with weakened immunity reduces stress and anxiety leading to a positive emotional and physiological response called neuroimmunomodulation [15].

4. Diet: Consuming a diet of anti-inflammatory foods, like raw fruits and vegetables, hydrate the body and promote an alkaline environment which does not support pathogens growth. Fresh and healthy foods expedite the removal of pathogens stagnant in lymph fluid and boost lymphatic function. These include red fruits and vegetables, like pomegranates, cranberries, beets, manjistha, cherries, and raspberries. They also thin the bile which aid in the regulation of the immune response in the gut. Consuming a diet rich in omega-3s helps fight inflammation and infectious agents [16]. The lymphatic system is primarily made up of about 95% water [11]. Drinking purified water and lemon water is a great detoxification strategy because it not only hydrates the body but it also encourages an alkaline environment [18].

5. Exercises: Daily exercises improve the immune function because exercises increase the oxygen supply to tissues. Lack of physical activities results in accumulation of toxins in muscles and also hypoxia which results in cancer invasion and its growth [19].

6. Stress reduction techniques: Stress reducing techniques improves the flow of lymph. These include yoga, deep breathing exercises, stretching, maintaining good posture [20]. These practices relieve congestion and stimulate the circulation and detoxification of lymph. Stagnant lymph in the extremities leads to decline in health because stagnant lymph cannot clear off the toxins from the body [21].

7. Regular chiropractic care: Chiropractic care help remove anatomical obstructions that block the lymphatic flow and thus relieve tension present in the lymphatic vessels and stimulate the process of detoxification [20].

IV. CONCLUSION

In order for the immune system and homeostatic functions to run healthy, the lymphatic system needs to function properly. The lymphatic system helps to oxygenate cells and eliminate toxins from the body. Therefore, incorporating these methods can help improve the function of lymphatic system by improving circulation, lymphatic flow, and overall toxin elimination.

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