بسم الله الرحمن الرحيم

«وما أوتيتم من العلم إلا قليلاً»

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Surgical Treatment of the Lymphedema of Lower Extremity

Essay
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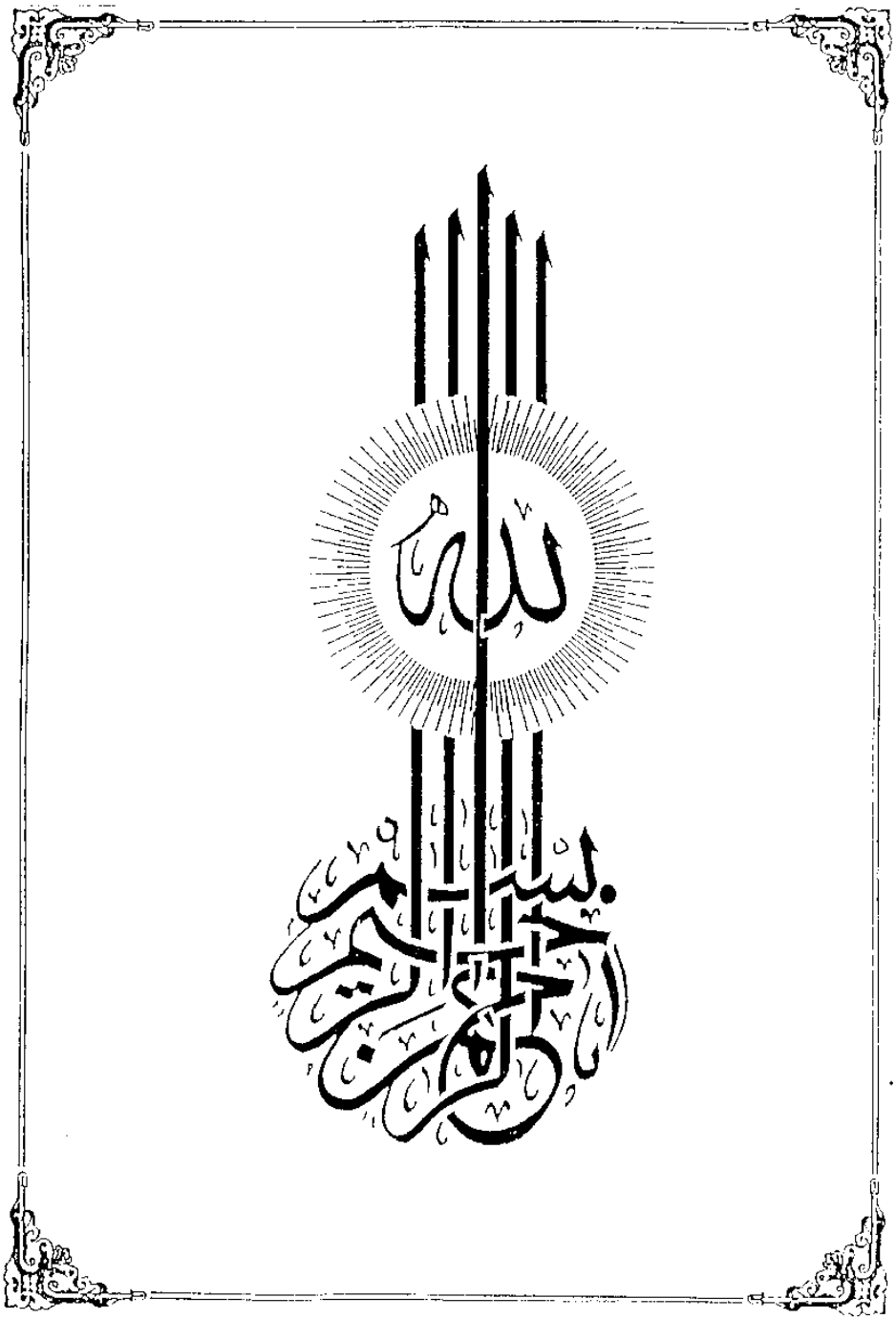

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Introduction

The term lymphedema indicates an abnormal collection of lymph in a region caused by deveative drainage through the lymphatic system (**Wolfe et al., 1989**).

Lymphedema is a lesion in limbs whose effects have largely been treated by dermatologists and plastic surgeons, at times with little regard for its pathologic physiology.

Nonetheless, lymphedema is a part of the vascular disease spectrum and certainly requires understanding and management by the qualified vascular surgeon. (**Andrew, 1985**).

Ever since the lymphatic system was discovered there has been dispute over its relationship to the blood circulatory system. Many questions remain unanswered. What it the initial embryologic derivation of the lymphatics ? what is the balance of tissue pressures that lead to the formation of lymph ? How is the lymph absorbed into the lymphatics ? What is the relative importance of various factors on the flow of lymph ? (**Wolfe et al., 1989**).

These issues are still debated, but the clinical fact remains that once the lymphatic system has failed and lymphedema has developed, the protein - rich extracellular fluid sets off a chain of events that results in irreversible fibrosis of the subcutaneous tissues, once such fibrosis has developed, the likelihood of curing the disease is severely limited. Therefore, the effective treatment of lymphedema must depend on early reconstruction of lymphatic drainage or effective removal of protein from extracellular tissues. (**Wolfe et al., 1989**).

Anatomy of the Lymphatic System of Lower Extermity

The Lymphatic system is composed of three major components, the initial or terminal lymphatic capillaries, which absorb lymph from the various tissues and orangs, the collecting vessels which serve primarily as conduits for lymph trensport, and the lymph nodes, which acts as mechanical filters and serve an immunologic role. Other lymphoid orangs, such as tonsils, adenoids, spleen and thymus, also have filtration and immunologic functions. **(Futrell et al., 1975).**

The lymph capillaries form networks in the tissue spaces. The meshes of which as well as the Lumen of the vessels themselves are larger than the neighbouring blood capillaries. An important feature of the endothelial wall of the lymph capillaries is that its permeable to substances of much greater moleculer size than those which can pass through the endothelial wall of blood copillaries. **(Williams et al., 1989).**

The lymph capillaries form the pathway for absorption of colloid material from the tissues spaces. Whereas the blood capillaries are concerned with the absorption of soluble crystalloid substances. Thus if the lymph vessels become destructed, the tissues drained by them become oedematous and distended with a fluid containing much protein. **(Williams et al., 1989).**

Anatomically, there are no lymphatic vessels in the epidermis of the skin. Likewise, lymphatics have not been found in the cornea, in the central nervous system, beneath the meninges, or in the cartilage, muscle, or tendon. They are numerous, however, in the

intermuscular fascial planes and in the perivascular and adventitial tissues. (**Futrell et al., 1975**).

Developmentally, the lymphatics parallel the veins, and so the epidermis has neither a vascular nor a lymphatic circulation. The dermis is, however, drained by a closed plexus composed of three layers of valveless lymphatics draining into a valved plexus in the deepest dermis and subdermal tissues. This in turn drains through valved collecting vessels into the superficial lymph trunks that lie immediately atop the deep fascia. (**Stark et al., 1989**).

The larger superficial lymph vessels of the skin lie near the deep fascia and tend to accompany the superficial veins, though some run independently they have very few connections with the deep lymphatics. The deep lymphatic trunks generally closelly accompany arteries or veins. Eventually, all the lymph from the body is collected into two channels, the thoracic duct and the right lymphatic duct that pour their lymph into the left and right brachio-cephalic veins respectively. Most lymphatic vessels anestomose freely and those of two sides of the body are in communication across the middle line. (**Williams et al., 1989**).

Beneath the epidermis, in the superficial dermis, are located abundant valveless lymphatic capillaries. These vessels subsequently drain into the valved channels in the deep dermis and subdermal tissues. The superficial lymphatic system above the deep muscle fascia includes numerous valved collecting vessels that branch and reanastomose, as they ascend in the the extremity or trunk. They closely follow the primary venous pathways. The deeper lymph vessels within the muscle sheaths likewise enven-

tally enter collecting trunks, as they progress proximally accompanying the main deep vascular pathways. (**Futrell et al., 1975**).

The larger lymph vessels are supplied with thier own vasa vasorum and are accompanied by a plexus of fine blood vessels, if the walls of the lymphvessels become inflamed (lymphangitis) this plexus become congested and the paths of superficial lymph vessels are after marked by painfull red lines visible through skin. (**Williams et al., 1989**).

Lymph vessels have a great capacity for repair and for the formation of new vessels after a lesion has been inflicted. The new vessels are formed first as solid sprouts produced by the mitotic division of the endothelial cells of the persisting vessels, the sprouts later become canalised. (**Williams et al., 1989**).

Lymph vessels either are modified veins or arise in situ from mesenchymal cells. They are closed vessels that possess an unbroken endothelial lining, bathed on the outside by tissue fluid. In general, the lymphatic capillaries have more surface area than blood capillaries. Every main blood vessels has an accompanying lymph vessel. The lymph vessels are as well supplied with valves as the veins. (**Schirger et al., 1980**).

The lymph nodes are small, oval or bean shaped bodies situated in the course of lymph vessels so that the lymph passes through them on its way to the blood. Generally each presents on one side a slight depression, termed the hilus, through which the blood vessels enter and leave the node. The efferent lymph vessel usually single, also emerges from the node at this spot. While the efferent vessels enter it at different parts of the periphery. (**Williams et al., 1989**).

Lymph nodes vary in size according to their location and extent of activity. The nodes themselves have blood and nerve supplies and are encapsulated. Lymph is transported to the individual nodes by afferent lymph vessels, which join the subcapsular cortex and medullary sinuses within the nodes. **(Futrell et al., 1975)**.

The afferent vessels enter at different parts of the periphery of the node, and often branching and forming a dense plexus in the substance of the capsule and then open into the part of the lymph sinus immediately beneath the capsule, this subcapsular lymph space is everywhere in continuity with the lymph sinuses of the cortex, as the afferent vessels enter they lose all their coats expect their endothelial lining, which is continuous with the layer of cells lining the lymph sinuses. **(Williams et al., 1989)**.

The efferent vessels commences from the lymph sinuses of the medulla. The stream of the lymph carried to the nodes by the efferent vessels, thus passes through the plexus in the capsule to the lymph sinuses of the cortex. Where it is exposed to the action of the node pulp, after flowing through these it enters the sinuses of the medulla and finally emerges from the hilus by mean of the efferent vessels. The stream of lymph in its passage through the lymph sinuses is retarded slightly by the presence of the reticulum, hence morphological elements carried in the lymph stream either normal or morbid are easily arrested and deposited in the sinuses. **(Williams et al., 1989)**.

The main communication between the lymphatic and venous system is located at the junction of the thoracic duct and the jugular vein in the left side of the neck. Less well known, but now

clearly established, are lymphovenous communications within the lymph nodes and between the peripheral lymph vessels and viens. **(Futrell et al., 1975).**

The lymphatic drianage of the lower limb :

Most of the lymph from the lower limb traverses a terminal group of lymph nodes in the groin, before reaching these terminal nodes the lymph may have passed through outlying intermediary lymph nodes. Which, however are less numerous in the lower limb than they are in other parts of the body, the terminal lymph nodes are named the inguinal nodes, and they are in two sets : superficial and deep. **(Williams et al., 1989).**

The superficial inguinal nodes, with the saphenous vein and its tributaries, are situated within the deeper, or typically membranous stratum of the superficial fascia of the thigh. Whether fibrous or fatty, the stratum is easily separable from the adjacent fascia late. The nodes vary in number from four to twenty - five and their size is usually inversely proportional to the number present. They are commonly described in five groups receiving their afferent lymphatics from the skin of the anterior and lateral abdomen from about the level of the umblicus downward, the upper gluteal region, the penis, scrotem clitoris vulva and portions of the external genitals outside of the hymen, from the perineum and cutaneous anal area, and from the thigh, leg and foot. Drainage from central areas may pass to both sides, and often there is abundant anastomosis across the mildline. **(Mcvay et al., 1984).**

All the superficial inguinal lymph nodes send their efferents to the external iliac lymph nodes, some traversing the femoral canal, others passing in front of, or lateral to the femoral vessels. In addition numerous vessels connect the individual nodes one with another. **(Williams et al., 1989).**

As a group, the superficial inguinal lymph nodes are drained by means of efferent lymphatics chiefly into the external iliac group of glands, located along the course of the external iliac artery and vein. However they may also empty into the deep inguinal glands situated beneath the fascia lata on the femoral triangle. **(Mcvay et al., 1984).**

The deep inguinal lymph nodes vary from one to three in number, and are placed deep to the fascia lata, on the medical side of the femoral vein. When three are present, the lowest is situated just below the junction of the great saphenous and femoral veins, the middle in the femoral canal, and the highest in the lateral part of the femoral ring. The middle one is the most inconstant, but the highest is frequently absent, they recieve as afferents the deep lymph vessels which accompany the femoral vessels, the lymph vessels from the glans penis (or glans clitoridis) and a few of the efferents from the superficial injuinal lymph nodes, their efferent pass through the femoral canal to the external iliac lymph nodes. **(Williams et al., 1989).**

While the deep inguinal glands are rather evenly distributed along the femoral vessels, a most constant and usually the largest member of the chain is the gland of Rosenmuller or Cloquet, situated in the femoral canal beneath the inguinal ligament and medi-

al to the vein. **(Mcvay et al., 1989).**

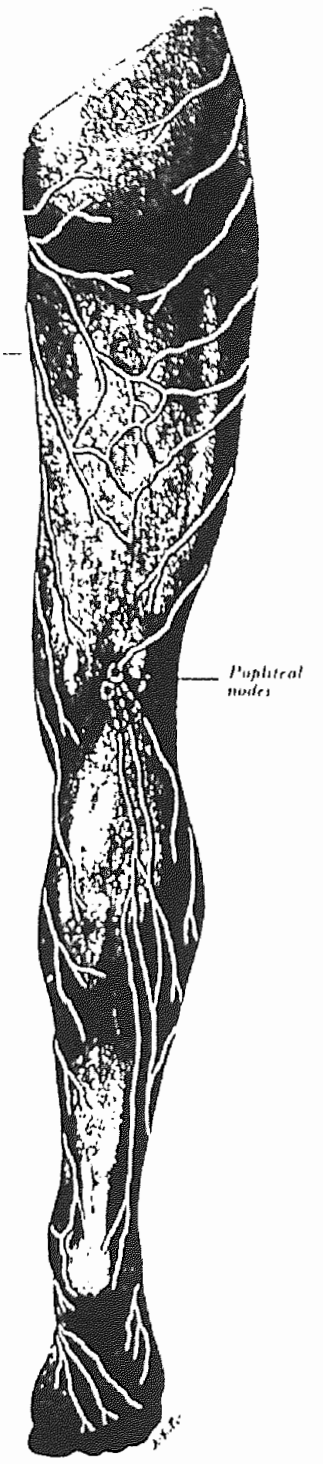
The popliteal lymph nodes, small in size and six or seven in number one embedded in the fat contained in the popliteal fossa, one lies near the termination of the small saphenous vein and drains the region from which this vein derives its tributaries, another is placed between the popliteal artery and the posterior surface of the knee joint, it recieves the lymph vessels from the knee joint together with those which accompany the genicular arteries.

The remainder lies at the sides of the popliteal vessels, and recieve as afferents the trunks which accompany the anterior and posterior tibial blood vessels. The efferents of the popliteal lymph nodes ascend in close relation with the femoral blood vessels to the deep inguinal lymph nodes, but a few may accompany the great saphenous vein and in the superficial inguinal lymph nodes. **(Williams et al., 1989).**

In the legs the lymph vessels are arranged in a superficial and a deep system. The main communications between these systems are through the popliteal and inguinal lymph nodes. **(Schirger et al., 1980).**

The superficial lymphatic system, which can be studied by lymphangiography, drains in two pathways closely corresponding to the venous drainage of the lef. One system (approximately vessels seem along the medial aspect of the extremity) paralles the greater saphenous vein and a second drainage system parallels the lesser saphenous system (seen along the lateral aspects of the lower leg). These trunks are also valved. They bifurcate, rejoin, and maintain the same diameter as they ascend the extremity. **(Turk et al., 1990).**

The lymphatic drainage of the superficial tissues of the lower limb: anteromedial aspect (semi-diagrammatic).



The lymphatic drainage of the superficial tissues of the lower limb: posterior aspect (semi-diagrammatic).