

## SYSTEMA LYMPHATICUM

Involves **lymphatic vessels** that convey the **lymph** from tissues into the venous system; lymphatic cells, tissues and organs that work in the defense system of the body: **lymph nodes, follicles, tonsils, spleen, thymus.**

### LYMPHATIC VESSELS

begin in the intercellular spaces as blind **vasa lymphocapillaria** that form **rete lymphocapillare**. The wall of the capillaries - endothelial cells with intercellular gaps up to 2 µm wide - influx of fluid containing large molecules or particles. Lymph capillaries return to the circulation about 10% of tissue fluid. Lymph capillaries are absent in the epidermis and its derivatives, epithelium, sclera, cornea, lens and vitreous body of the eye, in the CNS, placenta, teeth, bones, bone marrow and hepatic lobules. The lumen of lymph capillaries is larger than that of blood capillaries.

**Vasa lymphatica** (lymphatics) - paired semilunar valves. A lymph vessel conveying lymph to the node – **vas afferens** (each node receives several afferent vessels). A vessel that leaves the node – **vas efferens** (only one efferent vessel emerges from the node). Efferent vessels join to form lymphatic trunks – **trunci lymphatici**.

### LYMPH

is colorless or slightly yellow clear tissue fluid. Tissue fluid of extracellular spaces is produced by the metabolism of cells and filtrated from blood capillaries. Lymph in the intestine contains also nutrients and fats in small globules – **chyle**. Lymph contains lymphocytes. The flow of lymph is promoted by the pump, function of muscles, changes of intraabdominal pressure and respiratory movements of the thorax.

### LYMPH NODE (Nodus lymphaticus)

is a bean-shaped organ, 1-30 mm, with smooth surface, whitish or grey-pink, located in the connective tissue as a single organ or in groups. Afferent vessels enter the node at its periphery, the efferent vessel leaves the node from the hilum (together with the vein and artery). A **tributary region - regional nodes**.

**Capsula – trabeculae – reticulum. Sinuses – subcapsular, peritrabecular, terminal (medullary). Folliculi lymphatici (germ centres – immunoblasts) - cortex. Medulla > hilum.** Release of lymphocytes, production of antibodies and other defense mechanisms, filtration of lymph

**Tonsils** – masses of lymphoid tissue - the immunological barrier at the beginning of the respiratory and digestive tracts.

**Lymphatic follicles** - mucous membranes of the respiratory, digestive and urinary tracts.

### SPLEEN (LIEN, SPLEN)

The largest lymphatic organ. Participates in the body's defense system – proliferation of lymphocytes, immune response - **white pulp**. Blood reservoir, storing red blood cells and platelets, identifying, removing and destroying expended red blood cells and platelets - **red pulp**.

### THYMUS

The right and left lobes joined together by a connective tissue, the left lobe – bigger, situated in the superior mediastinum – **area interpleuralis superior (thymica)**. Age changes: 15 g after birth, 30 – 40 g -the 2<sup>nd</sup> to 3<sup>rd</sup> year, after puberty gradual involution, replaced by adipose tissue in old age. Pink in a newborn child, yellow in adults. Soft, elastic structure, with a lobular surface.

Structure: Connective tissue **capsula thymi**, septa divide the organ into **lobuli thymi**, reticulum filled by T-lymphocytes. A dense and darker zone at the periphery – **cortex**, a thin and lighter inner zone – **medulla**.

Functions: Differentiation of lymphocytes in the immuno-competent T-lymphocytes, maintenance of necessary amount of lymphocytes in blood circulation and in peripheral tissues, development and maintenance of the immune system.

#### Trunci lymphatici:

Ductus thoracicus – truncus lumbalis dx. et sin.

truncus intestinalis

cisterna chyli

pars abdominalis, thoracica, cervicalis

truncus intercostalis dx. et sin.

truncus jugularis sin.

truncus subclavius sin.

truncus bronchomediastinalis sin.

→ angulus venosus sin.

Ductus lymphaticus dexter – truncus jugularis dx.

truncus subclavius dx.

truncus bronchomediastinalis dx.

→ angulus venosus dx.

#### Nodi lymphatici (nll.):

##### **Head**

nll.occipitales spf. et prof.

nll.retroauriculares

nll.parotidei spf. et prof.

nll.submandibulares

nll.submentales

All lymphatic vessels from these nodes drain into deep cervical lymph nodes.

##### **Neck**

nll.cervicales anteriores spf. et prof.

nll.cervicales laterales spf. et prof.:

a) nll.jugulares interni – nl. tonsillaris (Wood)

nl. jugulodigastricus (Küttner)

nl. juguloomohyoideus

b) nll.comitantes n. accessorius (CN XI)

c) nll.supraclaviculares (Virchow)

→ **truncus jugularis**

**Upper extremity**

Superficial vessels – collectores laterales  
collectores mediales  
collectores anteriores (medii)  
nll.cubitales spf.

Deep vessels – arcus lymphaticus palmaris spf. et prof., deep lymphatics accompany blood vessels  
nll.cubitales prof.

Nll.axillares:  
nll.axillares centrales  
nll.axillares laterales  
nll.axillares pectorales (Sorgius)  
nll.axillares subscapulares  
nll.axillares apicales (infraclaviculares)

→ **truncus subclavius**

**Thorax**

nll.pulmonales  
nll.bronchopulmonales  
nll.bronchiales  
nll.tracheobronchiales superiores dx. et sin., inferiores  
nll.tracheales  
nll.mediastinales anteriores  
nll.mediastinales posteriores  
nll.phrenici superiores  
nll.parasternales  
nll.intercostales

→ **truncus bronchomediastinalis**

**Abdomen and pelvis**

nll.iliaci externi  
nll.iliaci interni – paravesicales  
paravaginales  
parauterini (Bayer)  
nll.sacrales  
nll.iliaci communes  
nll.lumbales

→ **truncus lumbalis**

nll.coeliaci - gastrici dx. et sin.  
gastroepiploici dx. et sin.  
pylorici  
hepatici  
pancreaticoduodenales sup. et inf.  
pancreatici sup. et inf.  
lienales  
nll.mesenterici  
nll.colici  
nll.mesenterici inferiores

→ **truncus intestinalis**

**Lower extremity**

Superficial vessels – collectores mediales  
collectores laterales  
collectores posteriores

nll.poplitei  
nll.inguinales spf.

Deep vessels – accompany blood vessels  
nll.inguinales prof. (Cloquet – Rosenmüller)

→ **nodi lymphatici iliaci externi**

**DRAINAGE OF THE BREAST**

**Plexus areolaris, plexus subareolaris, plexus circumareolaris.**

1. Lateral quadrants - nll. axillares laterales, subscapulares and centrales.
2. Medial quadrants - nll. parasternales.
3. The center of the breast - nll. interpectorales - nll. infraclaviculares and supraclaviculares.
4. The epigastric pathway – along a. epigastrica inf. - anterior mediastinal and hepatic nodes.
5. The intercostal pathway – nll.intercostales.

Connections are between lymph vessels of both breasts.

**DRAINAGE OF THE UTERUS**

Corpus uteri – **nll. lumbales**

Fundus uteri – along lig. teres uteri – nll. inguinales spf.

Cervix uteri – ant. surface – nll. iliaci ext., lat. parts - nll. iliaci int., post.surface – nll. sacrales.

Ovary – nll. lumbales

Vagina – nll. iliaci int. et ext.

External genital organs – nll. inguinales spf.

#### DRAINAGE OF THE TESTIS

Nll. lumbales, iliaci ext. (along the deferent duct), inguinales spf. et prof. from external gen. organs.