Lymphatic system

The immune system provides specific and non specific defence mechanisms to protect the body against environmental influence.

During the circulation of blood from arteries to veins, proteins are able to pass through the capillary wall into the interstitial fluid spaces .this clear ,colourless transudate is called lymph and taken up by the blind ending lymphatic capillaries .the lymphatic capillaries form plexuses

1

Lymphatic system :

the lymphatic capillaries form plexuses within most the body tissues from which large lymph vessels take their origin. The lymphatic vessel s open into lymph duct

Lymphatic system consist from :

1-lymphatic fluid (lymph)

2-lymph vascular part:

a)capillary b)lymphatic vessels c)lymphatic duct

3-lymphatic tissues

2

3-lymphatic tissues

a-Lymphatic nodes .

b-hemallymph node

c-spleen

e-Thymus F)Tonsils

g)peyer patches

functions of lymphatic system :

Drain the tissue fluid to blood stream (flew)

Filtrated the lymph from bacteria, virus and debris.

Produce and carry WBC(lymphocytes)and produce antibodies

Absorbed and transport the fats from the intestine to the blood flew .the lymphatic vessels of intestine called (lacteals)

3

Lymph capillaries

: it is thin wall blind capillary are line by a continuous single layered endothelium with incomplete basement membrane unlike the lymph vessels ,they have no valves

Lymphatic vessels:

have thinner wall than those of comparable size vein ,but contain more valves that transport the lymph from the capillary region to a lymph node are termed afferent lymph vessels efferent lymph vessels :leave the lymph node ,carrying lymph that is filtered and enriched with lymphocyte

4

lymphatic duct

it is large lymphatic vessels which received lymph from many lymphatic centers ,example thoracic duct, trachea duct .

lymphatic trunk

it is large lymphatic vessels which collocated the lymph from large area of body.

Lymphatic tissue

1-lymphatic nodules (solitary nodules): is very small lymphatic tissue which may be unit together to from small limited lymphtic tissue example payer petches

5

Movement of lymph in the vessels:

Movement of lymph is effected of external force example tissue pressure which greater than pressure of lumen of lymphatic capillaries

Muscular activity (contraction)

Respiratory movement .

Intestinal movement.

The present of smooth muscle fiber in wall of vessels help the movement of the lymph during contracting ,present bicuspid valve mainly in the large lymphatic vessels

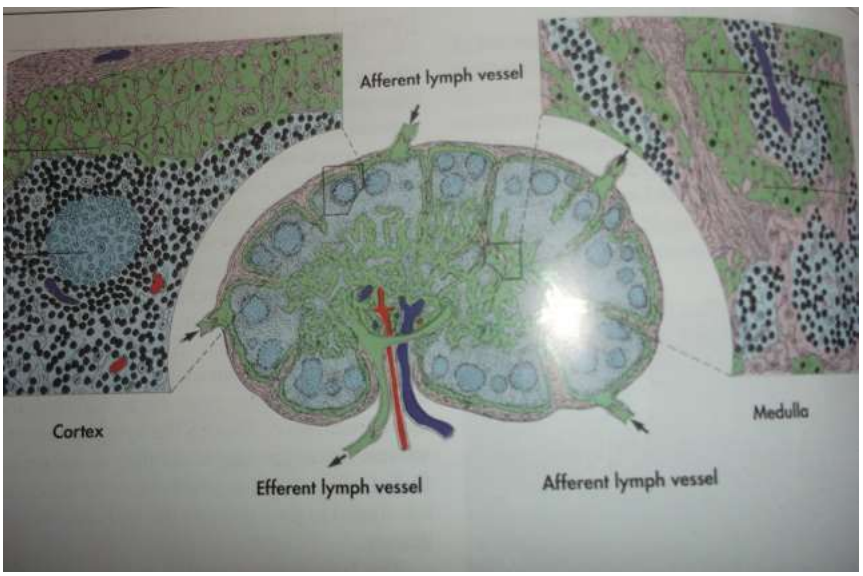
Arrangement of lymph and blood vessels enhanced the forward movement of lymph.

6

Lymph node:

- Lymph node are firm ,smooth surface generally ovoid or bean shaped with large convex surface and smaller concave area the hillus .
- Internally the lymph node is divided into a cortex and medulla, the cortex contain the germinal centers in which lymphocytes are continually produced .the medulla consists of anastomosing cord of lymphocyte .each L.N. is enclosed by soft tissue capsule.

7



8

Hemal node:

Hemal node: its red small node present only in the ruminants (ox, sheep and goat) and, it is characterized by absent of the afferent and efferent vessels and has only small blood vessels which filtrate the blood.

a. it is present along the length of aorta.

b. accompanying with the ruminal and jejunal L.N.

c. near the superficial L.N.and under the skin and tripizus m.

d. the total number in all animal body is about (127-259) nodes.

e. spleen is consider as the largest hemal node.

9

SPLEEN

The spleen is a reddish-brown to gray organ ,depending on the species ,and is situated caudal to the diaphragm within the left cranial part of the abdomen

The function :

In the embryonic life produce R.B.C.

The main function after birth is storing R.B.CS

Recycle iron from hemoglobin.

Immunological function by presence of lymphocytes and macrophage

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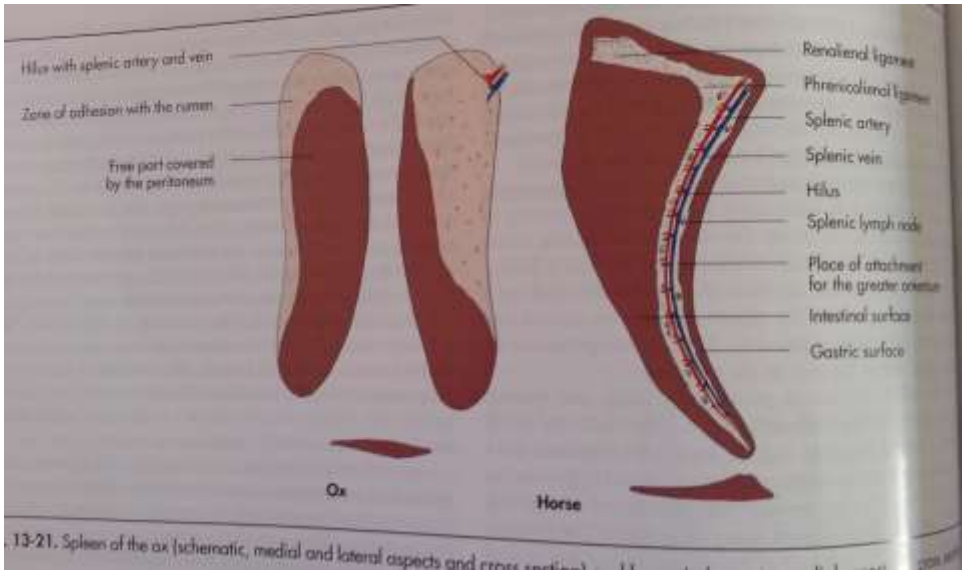


13-21. Spleen of the ox (schematic, medial and lateral aspects and cross sections).

11

Comparative of spleen:

1-horse:

Shape :falciform .

Color :red brown .

Weight: 1Kg. Length :30-50 cm

Two surface ,the diaphragmatic surface and visceral surface :the latter is marked by the hilus. the hilus is along its length.

12

Comparative of spleen

2-OX (large ruminant):

Shape : wide strap

Weight :

200 gm Length :20-40 cm

The hilus is present in small area at cranial end .

3-Sheep and goat (small ruminant):

Shape :leaf-shaped

Weight :100 gm Length 10-12

The hilus is present in small area at dorsal end .

13

4-carinvorus :

Shape :boot shape

Length in dog :15-20 cm

The hillus is along of the spleen .

Note:

Spleen it is located entirely within the peritoneum in all domestic animals except ruminant

14

:
Tonsil

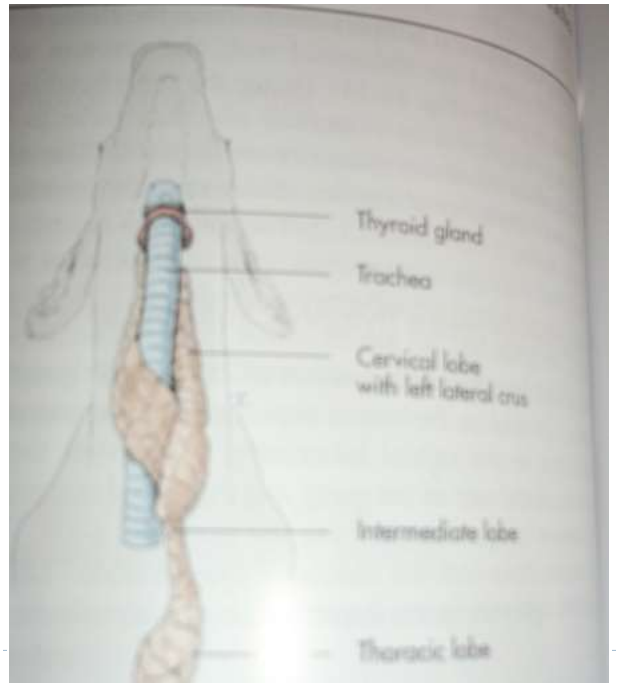
- It is aggregation of lymphoid tissue in the root of tongue ,soft palate and pharynx.
- It has different shape and size according to the species .it has only efferent vessels.

15

THYMUS :

- the thymus is organ of the immune and lymphatic system which well developed and very active during pregnancy and early postnatal live after maturity .as is decreased in size and loses its structure,it replaced by fat

16



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Lymph centers of the head and neck:

2-Mandibular L.C.

A. Mandibular Lnn.: it is about 70-150 Lnn. formed mass of 10-16 cm length.

Location: on the caudal part of the intermandibular space.

Shape: it is V shape in the horse and they are two group Ln. oval in shape in ruminant.

Afferent: from the parts of the face, nasal cavity and tongue.

Efferent: go to cranial deep cervical

18

Lymph centers of the head and neck:

Lymph center :it is one or more of the lymph nodes aggregation in limited area to collected lymph certain (limited)area .

1-parotid lymph center:

Location : caudal border of the ramus of mandible ,imbedded by the parotid salivary gland .

Shape : small of lymph node

Afferent :from skin ,masseter m. , parotid s.g, muscles of eye and lacremal gland

Efferent : drain at the lateral and medial retropharyngeal lymph nodeA

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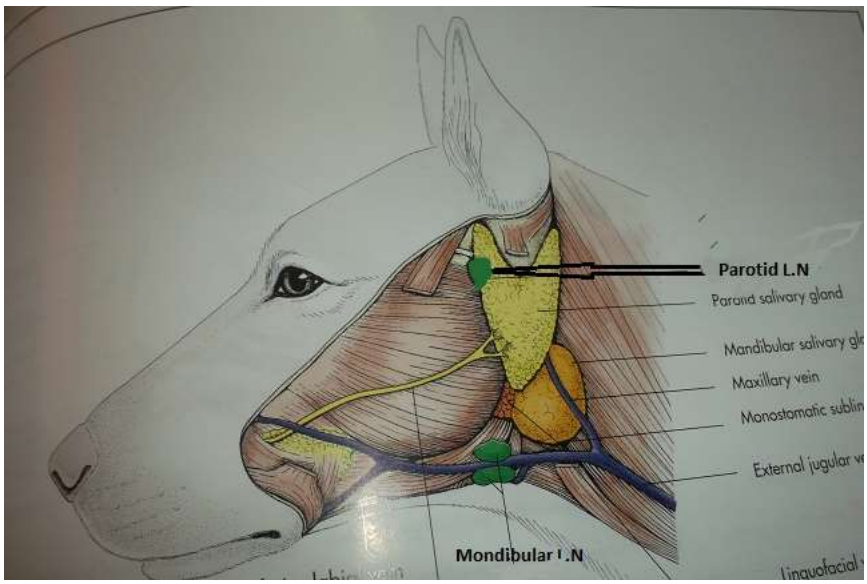


20

3. Retropharyngeal L.C.

A. Lateral Lymph nodes

Location: ventral to the wing of atlas and cover by parotid gland and lateral to the pharynx.

Shape: it is group of 8-15 Ln. of 1.5 cm

Afferent: from the pharynx, muscle of the neck and trachea.

Efferent: go to cranial deep cervical Lnn.

21

B. Medial retropharyngeal Lymph nodes.

Location: on the dorsolateral surface of pharynx.

Shape: small aggregation of Ln.

Afferent: from the pharynx, muscle of the neck, trachea, nasal cavity and larynx.

Efferent: go to cranial deep cervical Lnn

22

B. Pterygoid L.n.:

Location: present only in ruminant on the pterygoid medialis muscle.

Shape: small group.

Afferent: from the hard palate.

Efferent: go to mandibular Ln.

23

Lymphocenter of the Neck

1. Superficial cervical L.C. (Prescapular L.C.)

it include superficial cervical Lnn.

Location: cranial to the shoulder joint and cover by brachiocephalic muscle.

Shape: group of Lnn about 5 cm.

Afferent: skin of caudal part of head, neck, shoulder and thoracic limb.

Efferent: go to caudal deep cervical Lnn.

24

2. Deep cervical L.C.

A. Cranial deep cervical L.n.

Location: cranial, dorsal and ventral to the thyroid gland.

Shape: usually chain of 30-40 Lnn of 2.5 cm

Afferent: muscles of the head, neck, trachea, esophagus and thyroid gland.

Efferent: the efferent formed tracheal trunk (duct).

25

B. Middle deep cervical L.n.

Location: along middle part of trachea.

Shape: they make chain of Lnn of 3 cm.

Afferent: from trachea, esophagus, thyroid gland, thymus and cranial deep cervical Lnn.

Efferent: go to the tracheal duct (trunk).

26

C. Caudal deep cervical L.n.

Location: cranial to the first rib at the ventral surface of the trachea.

Shape: group of 20-30 Lnn of 4.5 cm

Afferent: from sternum, superficial and deep cervical Lnn, trachea and muscles of shoulder.

Efferent: they may be go to sternal Lnn or thoracic duct or terminate directly to jugular vein or caudal vena cava.

27

Lymphocenters 0f the thoracic cavity

1. Dorsal thoracic lymphocenter

A. Intercostals L.N.

Location: are located on the intercostal spaces near the head of the ribs.

Shape: usually only one small Ln. less than 1 cm {the first and second intercostal consider as cranial mediastinal Ln.

Afferent: mediastinum, diaphragm, muscles of the thoracic wall and trachea.

Efferent: may be thoracic duct, the last few nodes goes through aortic hiatus to celiac Lnn.

28

B. Thoracic aortic Lnn.

Location: are located on the dorsolateral surface of the aorta along its course

Shape: is vary in shape and size.

Afferent: from intercostal Lnn, caudal mediastinal Ln. , pleura and muscles of the thoracic wall.

Efferent: go to cranial and middle mediastinal Lnn or may be to thoracic duct.

29

2. Ventral thoracic lymphocenter

A. Cranial sternal L.n.

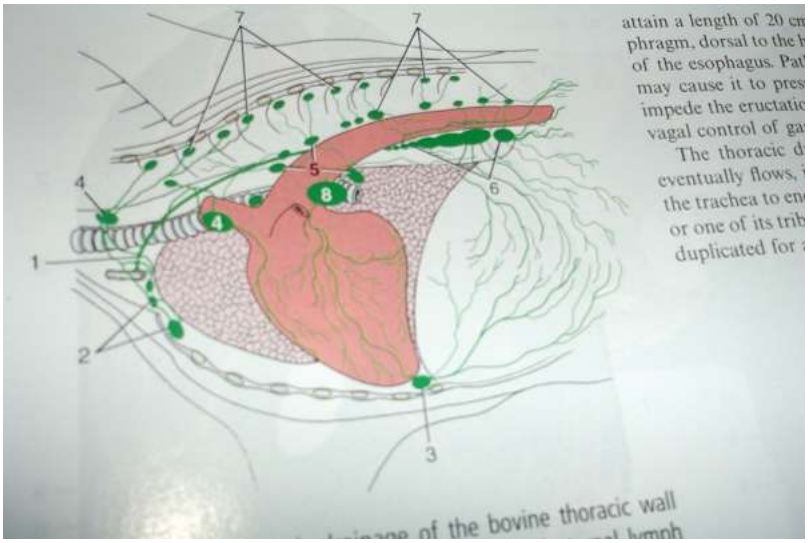
location: on the manubrium of sternum.

Shape: group of vary shape.

Afferent: from pleura, diaphragm, trachea, esophagus, heart and thymus.

Efferent: may go to thoracic duct or cranial mediastinal Lnn.

30



31

B. Caudal sternal L.N. not always present

C. Phrenic LN.

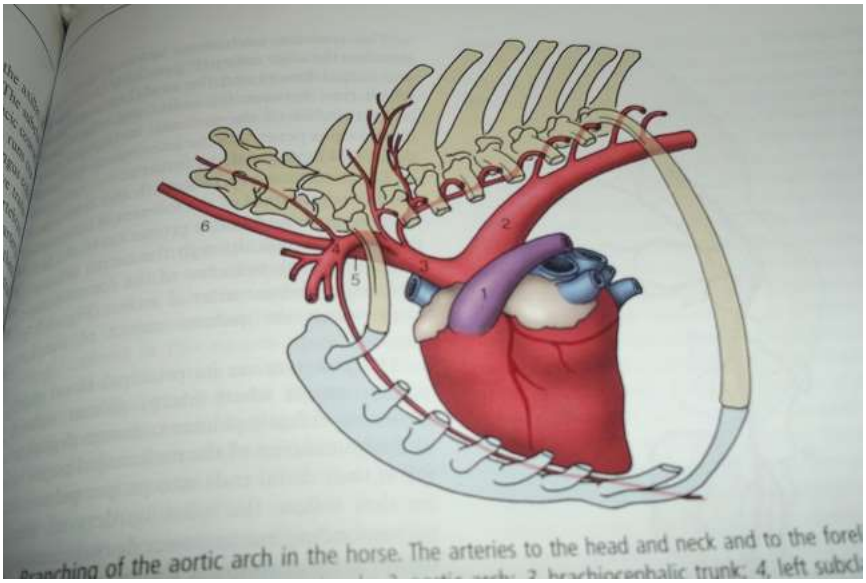
Location: on the ventral border of caudal vena cava at the caudal vena cava foramen.

Shape: one lymph node Ln.

Afferent: from the diaphragm,pleura and liver

Efferent: to the cranial and caudal sternal Lnn.

32



33

3. Mediastinal lymphocenter

A. Cranial mediastinal LN..

Location: are located in the precardial mediastinal associated with brachiocephalic trunk usually they are first and second intercostal Lnn.

Shape: vary in shape and size

Afferent: mediastinum, pleura, heart, trachea esophagus and muscles of shoulder region

Efferent: left side go to thoracic duct and the right side go to jugular vein.

34

B. Middle mediastinal L.N.

Location: dorsal to the heart on the aortic arch.

Shape: small group 1-5 Lnn of 1cm

Afferent: from heart, aorta, lung, trachea, esophagus and intercostal Lnn.

Efferent: go to cranial mediastinal Lnn.

35

C-Caudal mediastinal L.N.

Location: they are located caudal to the aortic arch in the p ostcardial mediastinal space .

Shape: group of lymph nodes .

Afferent : mediastinal ,lung ,esophagus .pleura and the phrenic lymph node.

Efferent :the are going to crainal or middle mediastinal L.N

36

4. Broncholymphocenter

A. Left trachiobronchus L.N.

Location: on the origin of the apical bronchus

Shape: small group of 8-10 Lnn. of 3-5 cm

Afferent: lung, trachea, heart and plura

Efferent: go to cranial mediastinal Ln.

37

B. Right trachiobronchus L.N.

Location: on the origin of right apical bronchus

Shape: small group of Ln 4-6 Ln.

Afferent: lung, trachea, heart and pleura

Efferent: go to middle and cranial mediastinal Lnn.

C. Middle trachiobronchus L.N.

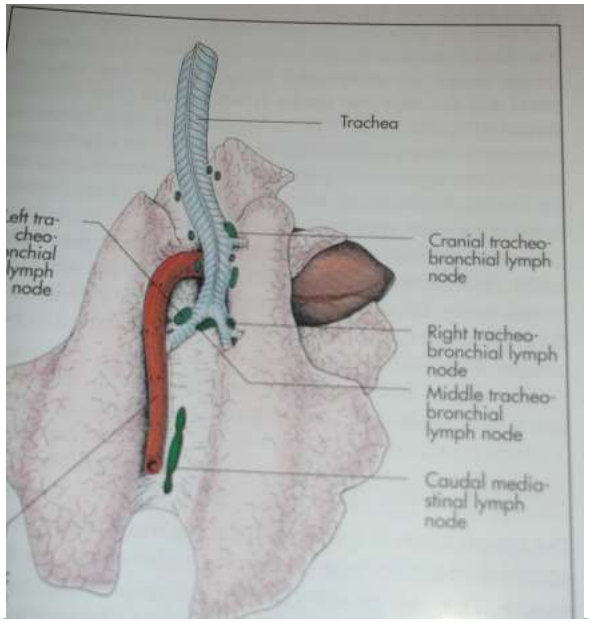
Location: dorsal to the angle of biforcation of the trachea.

Shape: 9-20 Ln. form mass of 2-4 cm

Afferent: trachea, heart and pleura

Efferent: middle and cranial mediastinal Lnn.

38



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D. Pulmonary L.N.

Location: are located along the corss of the bronchus tree inside the lung tissue.

Shape: small nodules

Afferent: from the lung

Efferent: trachiobronchus Lnn.

40

Lymphocenters of the abdominal and pelvic wall

1. Lumber lymphocenters

A. Lumber aortic L.N.

Location: along of the abdominal aorta from the kidney to cranial deep circumflex iliac artery.

Shape: it is different small nodules

Afferent: from the peritoneum ,lumber muscles

Efferent: go to go to lumber trunk .

41

42

B. Renal L n.

Location: are associated with the renal vesseles and same of them are found at the renal hilus embedded in fatty C.T.

Shape: small lymph node (10-18)

Afferent: from kidney, ureter, adrenal glands.

Efferent: go to lumber aortic Lnn.

43

C. Ovarian L. nn

Location: on the ovary

Shape: small nodules

Afferent: from the ovary

Efferent: lumber aorta L.nn

44

2. Ilio sacral lymphocenter

A. Medial iliac L. N.

Location: on the origin of the cranial deep circumflex iliac artery

Shape: 30-35 L. N. about 3-5 cm

Afferent: from the musles of the lumber region

Efferent: to the lumber aortic L. nn.

45

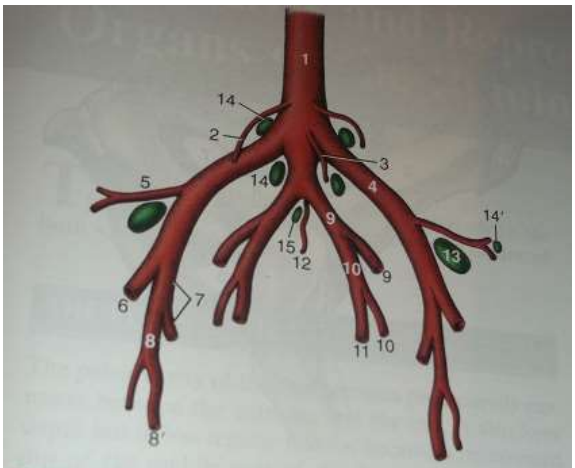


Figure 29–4 Branching pattern of the caudal part of the bovine abdominal aorta. *1*, Aorta; *2*, ovarian artery; *3*, caudal mesenteric artery; *4*, external iliac artery; *5*, deep circumflex iliac artery; *6*, femoral artery; *7*, deep femoral artery; *8*, pudendoepigastric trunk; *8'*, external pudendal artery; *9*, internal iliac; *10*, umbilical artery; *11*, uterine artery; *12*, median

46

B. Lateral iliac L.N.

Location: at the cranial and ventral branch of the cranial deep circumflex artery.

Shape: 4-20 L. n

Afferent: peritoneum

Efferent: medial iliac L. N.

47

C. Sacral L.N.

Location: on the angle formed by the left and right internal iliac artery

Shape: mass of 5-10 cm

Afferent: from the sex accessory glands,urinary bladder and muscle of pelvic

Efferent: go to medial iliac L.n

48

D. Uterine L.N

Location: are located on broad ligament of uterus

Shape: small nodules

Afferent: from uterus

Efferent: medial iliac L.nn

49

D. Obturator L.N.

Location along of the oburator artery

Shape: chain of small nodules

Afferent: from the hip joint and muscles of the thigh

Efferent: go to medial iliac L.nn

50

F. Anorectal (recto-anal L.N.) this group is divided into:

1. Cranial group (rectal L.N)

Location: are located on the dorsal surface of the rectum

Shape: chain of small nodules

Afferent: from the rectum and muscles of the pelvic

Efferent: go to caudal mesentery L.N

3. Inguinal femoral lymphocenter (superficial inguinal lymphocenter)

A. Superficial inguinal L.N.

In the female they are called mammary L.N.

Location: they are located between the abdominal wall and the udder

Shape: mass of 10-14 cm L.nn

Afferent: from the udder

Efferent: in both sex go to deep inguinal L.N.

In the male called scrotal L.nn

Location: between the abdominal wall and the scrotum

Shape: two group of cranial and caudal to the spermatic cord

Afferent: scrotum, testes, spermatic cord and penis

Efferent: go to deep inguinal L.nn

B. Accessory mammary L.nn

Location: caudal to the mammary gland

Shape: small group

Afferent: udder

Efferent: go to deep inguinal L.nn

C. Sub iliac L.nn (prefemoral L.nn)

Location: cranial to the tenser fascia lata muscle

Shape: mass of 15-20 L.nn

Afferent: muscle of the thigh and abdominal muscle

Efferent: to the medial and lateral iliac Lnn

D. Coxal L.nn

Location: on the medial surface of the hip joint

Shape: small nodule

Afferent: from the hip joint and muscles of the thigh

Efferent: go to lateral; and medial iliac L.N

Lymphocenter of the abdominal viscera

I. Celiac lymphocenter

A. Celiac L.N

Location: are located at the origin of the celiac artery

Shape: small group of L. N

Afferent: stomach, spleen, liver and pancreas

Efferent: celiac trunk

B. Gastric L.nn

Location: along the crouse of left gastric artery

Shape: small nodes

Afferent: stomach, omentum and pancreas

Efferent: celiac L.N

C. spleenic L.N

Location: along the crouse of spleenic artery

Shape: chain of L.nN

Afferent: spleen, stomach, gastro-spleenic ligament

Efferent: celiac L.N

D. Hepatic L.nn

Location: along the crouse of hepatic and caudal vena cava

Shape: chain of small nodes

Afferent: liver, pancreas and stomach

Efferent: celiac L.N

E. Pancreatico-duodenal L.N

Location: along to the crouse of pancreatico-duodenal artery

Shape: chain of small nodes

Afferent: pancreas and duodenum

Efferent: celiac L.N

F. Omental L.nn

Location: on the omentum and gastrospleenic ligament

Shape: small node

Afferent: stomach and omentum

Efferent: celiac L.N

D. Hepatic L.nn

Location: along the crouse of hepatic and caudal vena cava

Shape: chain of small nodes

Afferent: liver, pancreas and stomach

Efferent: celiac L.N

E. Pancreatico-duodenal L.N

Location: along to the crouse of pancreatico-duodenal artery

Shape: chain of small nodes

Afferent: pancreas and duodenum

Efferent: celiac L.N

2. Cranial mesenteric lymphocenter

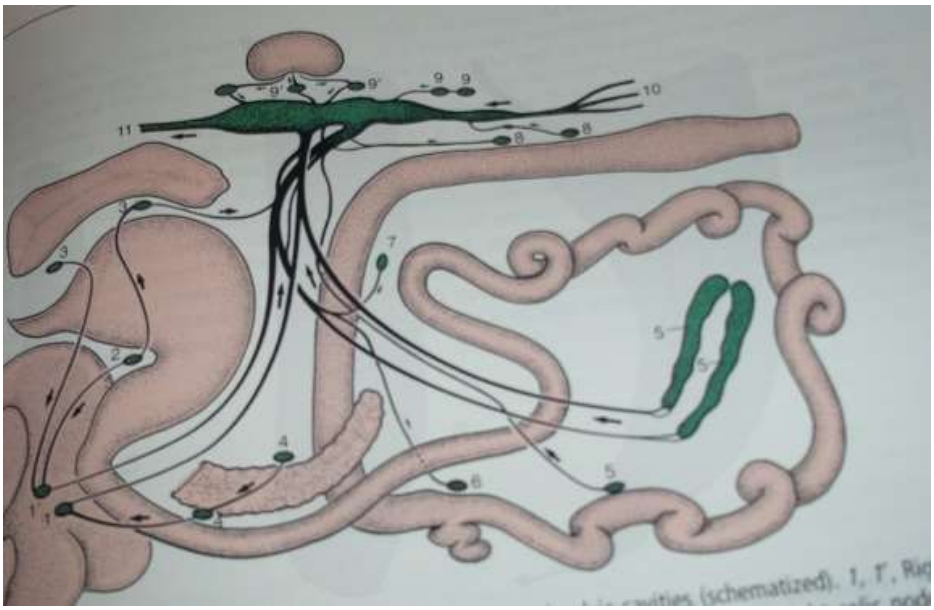
A. Cranial mesentric L.N

Location: at the origin of the cranial mesentric artery

Shape: small L.N

Afferent: duodenum, jejunum, ileum, cecum and colon

Efferent: the efferent form the intestinal trunk



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B. Jejunal L.N

Location: are associated with jejunal vessels

Shape: small L.N

Afferent: from jejunum and ileum

Efferent: go to cranial mesenteric L.nn

C. Cecal L.N

Location: on the lateral, dorsal and medial band of the cecum

Shape: 500-700 small L.N

Afferent: cecum and ileum

Efferent: go to cranial mesenteric L.N

D. Colic L.N

Location: in the fold between the dorsal and the ventral parts of colon

Shape: 3000-6000 small L.N

Afferent: great colon (ascending colon) and ileum

Efferent: go to cranial mesenteric L.Ns

3. Caudal mesentric lymphocenter

A. Caudal mesenteric L.N.

Location: are associated with the caudal mesenteric artery

Shape: group of L.N

Afferent: small colon , transverse colon, rectum and peritoneum

Efferent: go to medial iliac or lumber trunk

B. Vesical L.N

Location: on the lateral ligament of urinary bladder

Shape: group of small L.N

Afferent: urinary bladder and prostate glands

Efferent: medial iliac L.N

Lymphocenter of the pelvic limb

A. Iliofemoral (deep inguinal L.C.)

Location: are located at the proximal part of inguinal canal

Shape: elongated group of 8-12 cm

Afferent: skin, muscles of the thigh, pelvic superficial inguinal L.N

Efferent: go to medial iliac L.N

B. Popliteal lymphocenter

Location: are located behind the origin of gastrocnemius muscle

Shape: 3-12 L.nn about 3-5 cm

Afferent: skin, muscle of leg and hock, pastern and coffin joints

Efferent: go to deep inguinal L.N

Lymphocenter of the thoracic limb
* Axillary lymphocenter

A. Proper axillary L.N

Location: are located caudal to the shoulder joint

Shape: group of 12-20 L.N formed mass of 3-4 cm

Afferent: from the skin, muscles of the shoulder joint, cubital or elbow joint and skin of the lateral thoracic wall

Efferent: go to axillary L.Nof the first rib and the caudal deep cervical L.N

B. Axillary L.N. of first rib (in all animals except dog and horse)

Location: are located at the lateral side of the first rib

Shape: mass of 0.5-3 cm

Afferent: from the muscle of thoracic wall and proper axillary L.N.

Efferent: go to the caudal deep cervical L.N.

B. Cubital L.N.

Location: on the medial side of the elbow joint

Afferent: from skin and muscle of distal to L.N.

Efferent: go to proper axillary L.N.

B. Axillary L.N. of first rib (in all animals except dog and horse)

Location: are located at the lateral side of the first rib

Shape: mass of 0.5-3 cm

Afferent: from the muscle of thoracic wall and proper axillary L.N.

Efferent: go to the caudal deep cervical L.N.

B. Cubital L.N.

Location: on the medial side of the elbow joint

Afferent: from skin and muscle of distal to L.N.

Efferent: go to proper axillary L.N.

Large lymphatic trunk and ducts

1. Tracheal trunk:

They are large lymphatic vessels located along the lateral surface of the trachea and they are formed by the efferent vessels of the cranial deep cervical L.N. Also they are receive from the middle deep cervical L.N. and terminated in the caudal deep cervical L.N. Then they may be go to the sternal LNor thoracic duct or terminate directly to the jugular vein or caudal vena cava.

3. Cisterna chyli: It is an elongated irregular sac like dilatation of large lymphatic trunk located between the aorta and right crura of diaphragm extend from 2nd to 3rd lumber vertebra to the last thoracic vertebra. It is about 10-18 cm in length and 1.5- 2 cm in width which contain of 2-5 simple or paired valves. It is receive from the lumber trunk, intestinal trunk and celiac trunk.

The superficial lymph nodes in animals

1. Parotid L.n.
2. Mandibular L.N.
3. Superficial cervical L.n. (pre scapular L.nn.)
4. Proper axillary L.n.
5. Axillary of the first rib
6. Cubital L.n.
7. Superficial inguinal L.n
   A. scrotal L.n. (male)
   B. mammary L.n. (female)
8. Iliofemoral (prefomeral) L.n.
9. Popliteal L.n.