Chapter 7: Lymph drainage and the autonomic nervous system

Lymph Drainage

The vessels may be divided into those draining the chest wall and those draining the thoracic viscera.

The chest wall drains by superficial and deep vessels. The superficial vessels drain, together with those of the breast, to the pectoral and central groups of axillary lymph nodes. Some superficial vessels cross the midline and communicate with vessels of the opposite side. The vessels draining the deep tissues of the wall pass to three groups of nodes:

(i) Parasternal nodes - lie alongside the internal thoracic artery. Their efferents pass to the bronchomediastinal lymph trunk.

(ii) Intercostal nodes - lie at the posterior end of the intercostal spaces. Their efferents pass to the right lymph duct and the thoracic duct.

(iii) Diaphragmatic nodes - lie on the upper surface of the diaphragm. Their efferents drain to the parasternal and posterior mediastinal nodes and communicate through the diaphragm with the vessels draining the upper surface of the liver.

The thoracic viscera drain to three main groups of nodes:

(i) Anterior mediastinal nodes - lie in front of the brachiocephalic veins and drain the thymus and anterior pericardium. Their efferents join those of the tracheobronchial nodes.

(ii) Tracheobronchial nodes - lie alongside the trachea and bronchi and drain the lungs, bronchi, trachea and heart. Their efferents join with vessels from the anterior mediastinal nodes and form the bronchomediastinal lymph trunk. On the right side the trunk ascends alongside the trachea to join the right lymph duct, and on the left to join the thoracic duct.

(iii) The posterior mediastinal nodes - lie alongside the oesophagus behind the pericardium. They drain the oesophagus and posterior pericardium. Their efferents pass to the thoracic duct.

The thoracic duct and the smaller right lymph duct are the final vessels along which lymph passes before entering the bloodstream.

The thoracic duct

This is about 45 cm long. It arises in the abdomen from the cisterna chyli and enters the thorax through the aortic opening of the diaphragm to the right of the aorta. It ascends in front of the vertebral column on the left of the azygos vein and behind the oesophagus. In front of the 5th thoracic vertebra it passes to the left behind the oesophagus and continues its ascent to the level of the 7th cervical vertebra where it arches laterally behind the carotid
sheath and then forwards in front of the subclavian artery to enter the beginning of the left brachiocephalic vein.

**Tributaries:** drain all the body below the diaphragm and the left half above the diaphragm and, in addition, the posterior part of the right chest wall. It usually receives the united left jugular and subclavian lymph trunk and the left bronchomediastinal lymph trunk.

**The right lymphatic duct**

This is a short vessel which is often absent. It is formed in the neck by the union of right jugular, subclavian and bronchomediastinal lymph trunks. It enters the beginning of the right brachiocephalic vein and drains lymph from the right upper limb, the right side of the head, neck and the thorax, with the exception noted above.

**Autonomic nervous system**

The autonomic nerve supply of the thoracic viscera is distributed through visceral plexuses, viz. the cardiac, pulmonary and the oesophageal plexuses. These plexuses receive sympathetic contributions from the cervical and thoracic sympathetic trunks and parasympathetic contributions from the vagi.

**The visceral plexuses**

The **cardiac plexus:** the superficial (ventral) part lies in front of the ligamentum arteriosum; the deep (dorsal) part in front of the bifurcation of the trachea. They communicate with each other and functionally are a single unit, receiving branches from each of the cervical sympathetic ganglia, the upper thoracic ganglia, and parasympathetic cardiac branches from both vagi. Branches pass with the coronary arteries to supply heart muscle, coronary arteries, the conducting system of the heart, and some branches pass to the pulmonary plexus.

The **pulmonary plexus** lies in front of and behind the lung roots. It receives branches from the upper four thoracic sympathetic ganglia and from both vagi. It supplies the lung substance and visceral pleura.

The **oesophageal plexus** is a network surrounding the lower oesophagus. It receives branches from the upper thoracic sympathetic ganglia and from both vagi. It supplies the oesophagus and forms anterior and posterior vagal trunks which pass with the oesophagus into the abdomen as anterior and posterior gastric nerves.

**The thoracic sympathetic trunk**

Each ganglionated trunk lies alongside the vertebral column in front of the necks of the ribs. It continues superiorly into the cervical sympathetic trunk and inferiorly into the lumbar. It usually possesses 12 ganglia, one corresponding to each thoracic nerve, but often the 1st is fused with the inferior cervical ganglion to form a large **stellate ganglion** above the neck of the 1st rib. Each ganglion is attached to its spinal nerve by a white (preganglionic) and a grey (postganglionic) ramus.
Sympathetic denervation (sympathectomy) of the upper limb to dilate cutaneous blood vessels or inhibit sweating can be achieved by removing that part of the sympathetic trunk that includes the 2nd and 3rd ganglia. The 1st ganglion is left intact to preserve innervation to the head and neck and prevent the development of Horner's syndrome.

**Branches**

(i) rami communicantes pass to the spinal nerves.

(ii) the upper four ganglia give branches to the cardiac, pulmonary and oesophageal plexuses.

(iii) the greater, lesser and least splanchnic nerves: the greater arises from the 5th-9th ganglia; the lesser from the 10th-11th and the least (renal nerve) from the 12th. They descend over the posterior thoracic wall medial to the sympathetic chain and enter the abdomen by piercing the corresponding crus of the diaphragm to reach the abdominal plexuses. Their fibres synapse in the coeliac and other pre-aortic ganglia.

The **vagi** are described in previous chapters.