

THE DIAPHRAGM.

In *Phoca vitulina* the diaphragm has a costal and a vertebral origin. The costal portion *arises* by a broad fleshy slip from the dorsal surface of the xiphisternum which stretches across its terminal expansion, from the posterior surface only of the cartilage of the 10th rib, and from the posterior and inner surfaces of the cartilages of the 11th to the 15th ribs. These costal origins interdigitate with the transversalis. The vertebral portion *arises* by two crura, the left crus by two tendinous slips, the posterior from the ventral surface of the posterior margin of the body of the 2nd lumbar vertebra, the anterior from the same part of the 1st lumbar; the posterior slip joins the outer side of the anterior opposite the middle of the 1st lumbar vertebra. The right crus also *arises* by two slips, the posterior from the ventral surface of the posterior part of the 2nd lumbar vertebra, the anterior from the back of the 1st lumbar exactly opposite the anterior slip of the opposite side, reaching as far forward as the back of the last dorsal; this slip is much larger than the slip of the opposite side. The lumbar artery of the right side has just sufficient space to pass between the slips, while the corresponding vessel for the left side is in the same relation to the short anterior slip but far removed from the posterior one. In addition the left crus also takes origin from both sides of the transverse process of the 1st lumbar vertebra by tendinous fibres, and both crura from the posterior border of the last rib. It has three openings which are nearly in the middle line. The one for the vena cava lies a little to the right of the mesial plane and most anterior, and is in the tendon of the diaphragm, and therefore is surrounded by fibrous tissue. The middle opening is for the œsophagus and is elliptical, the long diameter being antero-posterior; a small portion of the anterior end is tendinous, the rest is muscular. The third opening gives passage to the aorta, and is also elliptical, the long sides of the ellipse being parallel with the aorta; it is formed by the crura of the diaphragm which meet over the aorta, opposite the posterior part of the last dorsal vertebra, the left crus slightly overlapping the right, but the fibres not crossing each other. The central tendon is a large V-shaped slip of fibrous tissue. It begins on each side of the back about the middle of the penultimate rib as two fine fibrous streaks, which widen as they near the vena cava. These two streaks meet around this vessel, forming a fibrous ring which fills in the space between the opening for the œsophagus and the vena cava.

On the *dorsal margin* of the diaphragm there are two V-shaped slips of fibrous tissue let into its substance on both sides; the outer arches over the psoas secundus, the inner is between the tip of the transverse process of the 1st lumbar vertebra and the last rib. The apices of these V's are directed forwards, the abdominal fascia forming one side of these slips and the pleura the other.

The *muscular fibres* from the xiphisternum go straight to the tendon. The costal fibres run into the front side of the lateral slips of the central tendon, those from the ribs being most oblique, and those next the xiphisternum most transverse. The dorsal fibres take a straight course to the posterior side of the tendon; those from the transverse processes of the lumbar vertebræ pass towards the middle of the last rib, where they reach one side of the central tendon opposite where the last costal fibres reach its other side; between these two is one of the fibrous V's whose base is between the middle of the last rib and the transverse process of the 2nd lumbar vertebra.

The fibres are thus distributed round the openings:—Around the aorta on the under surface the crus of the left side slightly overlaps the right; on the upper surface they touch and run on.