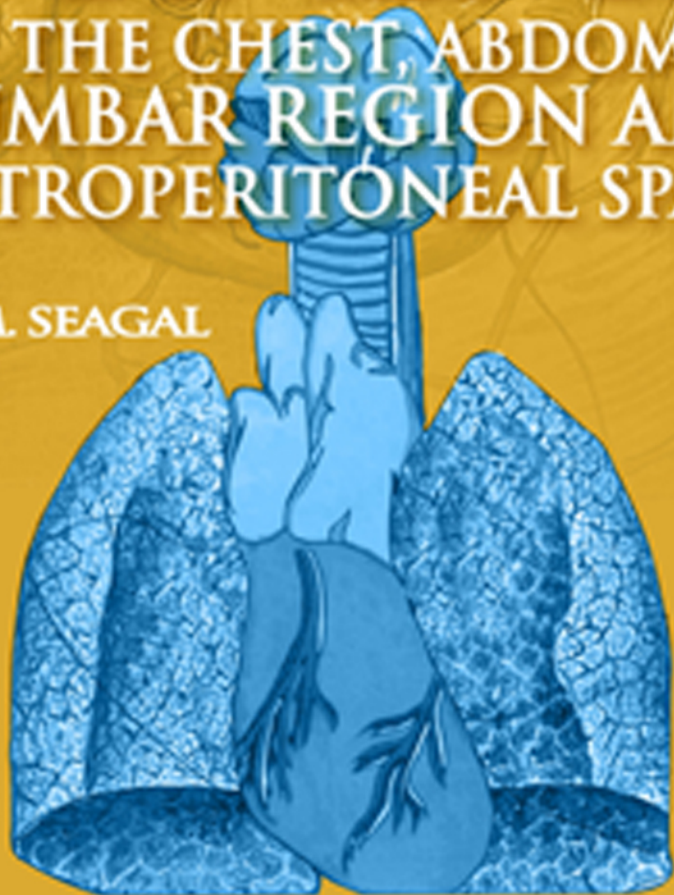


TOPOGRAPHICAL
AND
PATHOTOPOGRAPHICAL
MEDICAL
ATLAS

OF THE CHEST, ABDOMEN,
LUMBAR REGION AND
RETROPERITONEAL SPACE

Z. M. SEAGAL



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Pathotopographical Medical Atlas
of the Chest, Abdomen, Lumbar
Region, and Retroperitoneal Space

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Pathotopographical Medical
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Preface

Atlas of Human Topographical and Pathotopographical Anatomy

Chest, Abdomen, Lumbar Region and Retroperitoneal Space

The atlas presents the topographic and pathotopographic anatomy of a person (adult and child). Sections “chest”, “abdomen”, “lumbar region” and “retroperitoneal space” include layered topographic anatomy, variant, computer and MRI topography and pathotopographic anatomy. Surgical anatomy of congenital malformations includes funnel-shaped deformation of the chest, keeled chest, hernia, aplasia, fistula, etc. Individual and age differences, fascia and cell spaces, triangles and vascular-neural bundles, and collateral blood supply are presented in case of injury or occlusion of the main arteries. All the pictures are colorful and original. The atlas is written in accordance with the educational program of medical universities of the Russian Federation. The original graphs of logical structures are presented according to the sections of topography and congenital malformations. This allows an effective study of the subject.

The atlas is intended for students of General Medicine, Pediatrics and Dentistry faculties, as well as for interns, residents, postgraduate students and surgeons.

The Chest

Topographic Anatomy of the Chest

Chest borders. The chest walls (*paries thoracis*) and chest cavity (*cavum thoracis*) together compose the chest (*thorax*). The superior chest border runs along the upper edge of the clavicle and the manubrium of sternum, and on the back — along the horizontal line drawn through the spinous process of the 7th cervical vertebra. The lower border goes down obliquely from the xiphoid process along the costal arches and on the back along the 12th rib and the spinous process of the 12th thoracic vertebra. The muscular-fascial layer of the chest is presented at the back with the latissimus dorsi muscle, on the sides with the serratus anterior muscles, and in front with the major and minor pectoral muscles. External and internal intercostal muscles are located in the chest itself; the space between these muscles is filled with cellular tissue with intercostal arteries, veins and nerves. The superior chest aperture (*apertura thoracis superior*) is bounded by the posterior surface of the manubrium of the sternum, the inner edges of the first ribs and the first thoracic vertebra. The inferior chest aperture (*apertura*

thoracis inferior) is bounded by the posterior surface of the xiphoid process, the lower margins of the costal arches and the 10th thoracic vertebra anteriorly.

The prethoracic, thoracic, inframammary, scapular, subscapular and vertebral regions are identified.

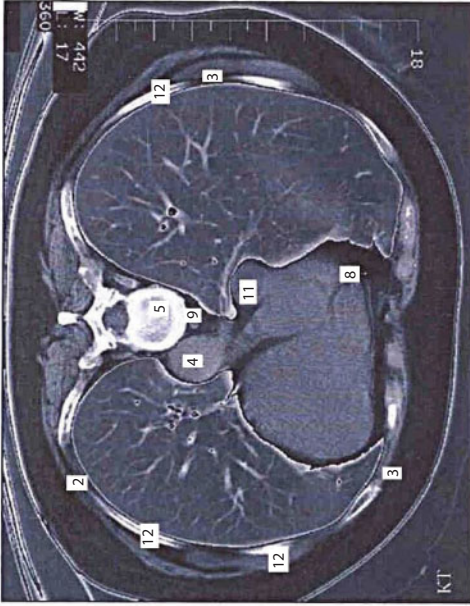
Chest Cavity Organs Projection and Layers of Chest

Pleura projection (Figure 1). Lower pleural margins go on the midclavicular line — along the 7th rib; on the anterior axillary line — along the 8th rib; on the midaxillary line — along the 10th rib; on the scapular line — along the 11th rib; on the paraspinal line — until the 12th thoracic vertebra. Posterior margins correspond to costovertebral joints. The cervical pleura overhang the collar bone and correspond to the level of the spinous process of the 7th cervical vertebra posteriorly and anteriorly it is projected 2-3 cm above the collar bone.

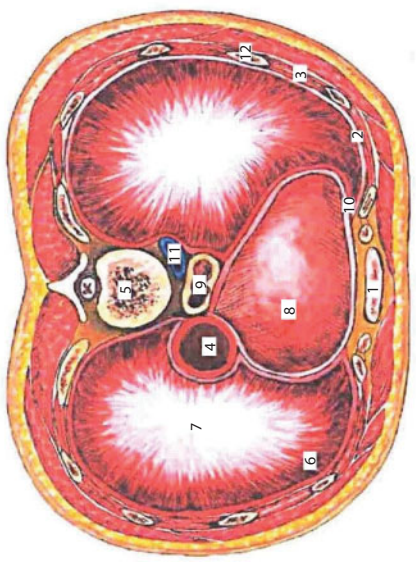
Lung projection (Figure 2). The anterior margin of the left lung starts from the 4th costal cartilage. Then, because of the cardiac notch, it slants to the left midclavicular line. The lower margins of the lungs correspond to the 6th costal cartilage on the right sternal line and on the left parasternal line: on the midclavicular line — to the upper margin of the 7th rib; on the anterior axillary line — to the lower margin of the 7th rib; on the midaxillary line — to the 8th rib; on the scapular line — to the 10th rib, and on the parasinal line — to the 11th rib. The lung margin moves down in inhale. The lung apex is identified 3-4 cm above the collar bone.

Thymus (Figures 3, 4) is located in the superior interpleural space. Superiorly it borders on the jugular notch of the sternum, above the level of the 2nd rib; on the sides — with the parietal pleura margins.

Heart projection (Figure 5). Upper margin of the heart matches a horizontal line, drawn at the level of the 3rd costal cartilage insertion to the breast bone. The right margin is a line, connecting the upper edge



"The sinopia of the chest cavity organs is clearly visible on the computer tomogram: the inferior vena cava (11) and the esophagus (9) are located in front of backbone, to the right of which the aorta (4) is located, to which the heart with the pericardium (8) are attached.



- 1 – breastbone;
- 2 – parietal pleura;
- 3 – intercostal muscles;
- 4 – aorta;
- 5 – vertebral body;
- 6 – costal part of diaphragm;
- 7 – tendinous center of diaphragm;
- 8 – pericardium;
- 9 – esophagus;
- 10 – costomediastinal sinus;
- 11 – inferior vena cava;
- 12 – ribs.

Figure 1 Transverse section of the chest. Diaphragm.

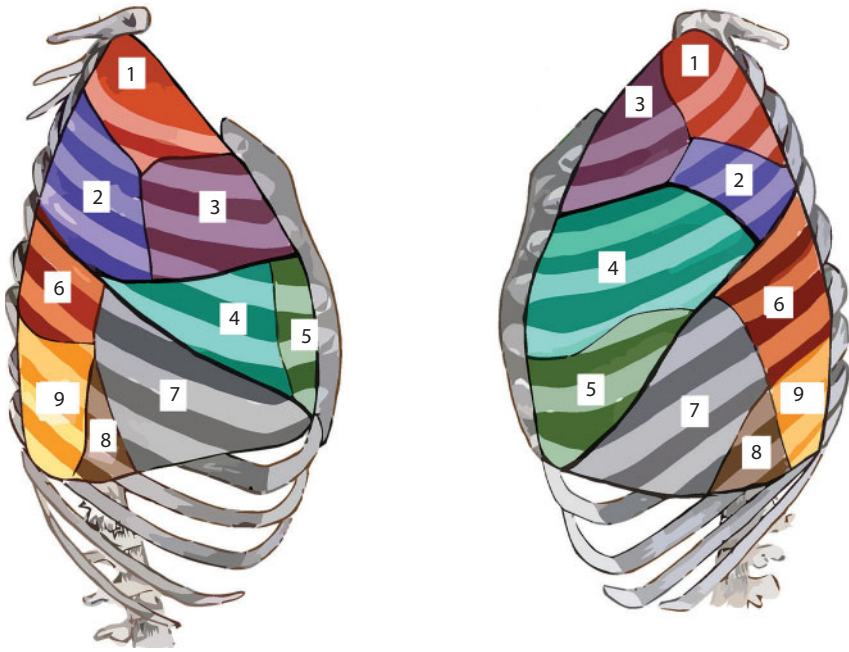
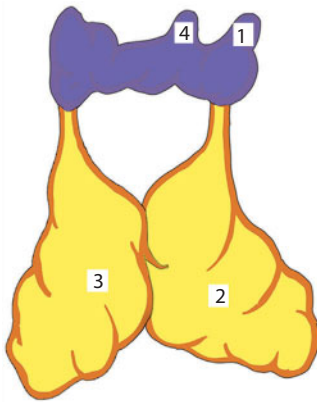


Figure 2 Lung segments.

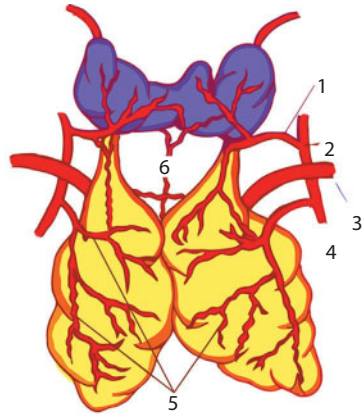
Lobus superior: 1 – seg. apicale; 2 – seg. posterius; 3 – seg. anterior. Lobus medius: 4 – seg. laterale (праворо
 легого) et seg. lingulare superius (left lung); 5 – seg. mediale (right lung) et seg. lingulare inferius (left lung).
 Lobus inferior: 6 – seg. apicale; 7 – seg. basale anterior; 8 – seg. basale laterale; 9 – seg. basale posterius

of the 2nd rib on the right with the upper edge of the 3rd rib 1 cm to the right of the breast bone; then it continues in the form of the arch from the 3rd to the 5th ribs, as a bulge, heading to the right, at a distance of 1.5 cm from the right edge of the breast bone. The lower margin starts from the place where the 5th rib is attached on the right, through the metasternum base to the fifth intercostal space on the left, stopping short 1.5 cm from the midclavicular line.

The left margin is a line connecting the lower edge of the 1st rib on the left and the upper edge of the 2nd rib where they are attached to the breast bone, at the level of the 2nd intercostal space 2.5 cm to the left of the breast bone edge, then up to the point, placed 1.5-2 cm inwards the midclavicular line. The apex of the heart is projected on the left in the 5th intercostal space lower the 5th costal cartilage junction. An atrial



- 1 –lobus dexter gl. thyroideae;
therocervicalis;
- 2 –lobus dexter thymi;
thoracica interna;
- 3 –lobus sinister thymi;
- 6 –a. thyroidea ima
- 4 –istmus gl. thyroideae (lobus piramidalis)



- Blood supply of thymus gland
- 1 –a. thyroidea inferior; 2 –truncus
- 3 –a. subclavia sinistra; 4 –a.
- 5 –rr. thymici a. thoracicae internae;

Figure 3 Thymus gland and its connection with the thyroid gland.

and ventricular borderline goes between the attachment points of the 3rd left and 6th right costal cartilages to the breast bone.

Thoracic aorta projection (Figure 6). The ascending aorta starts from the left ventricle at the level of the 3rd intercostal space behind the breast bone. It turns left and back, passing into the aortic arch at the level of the 2nd right sternocostal articulation.

Pulmonary trunk projection. The pulmonary artery starts from the right ventricle, left to the ascending aorta, in the 2nd intercostal space on the left.

Superior vena cava projection. The superior vena cava is formed by the confluence of two brachiocephalic veins at the level of the first costal cartilage attachment to the breast bone. It falls into the right atrium at the level of the 3rd costal cartilage.

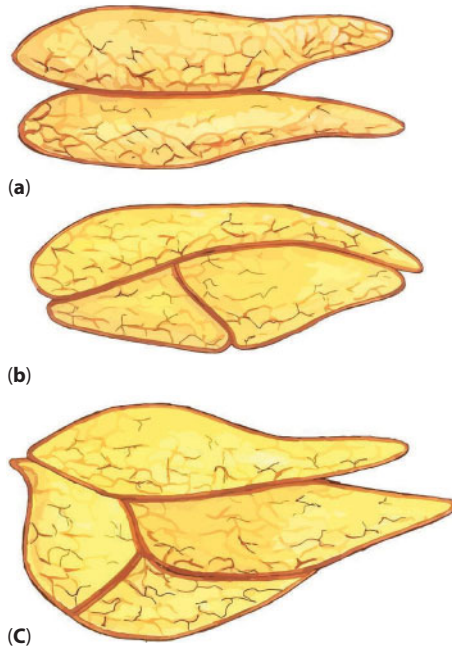


Figure 4 Differences in the shape and number of thymus glands. a – two lobes, b – three lobes, c – four lobes.

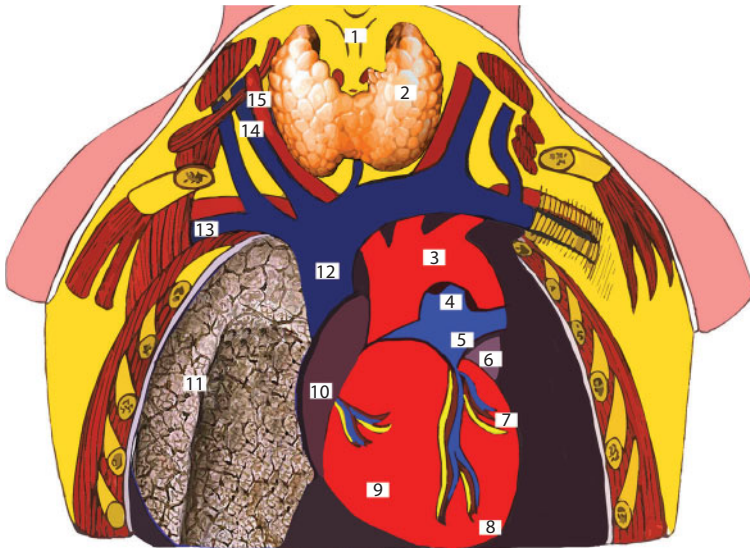
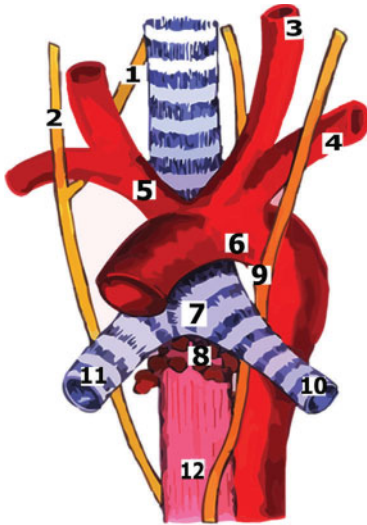


Figure 5 Topography of blood vessels, heart, right lung.
 1 – larynx; 2 – gl. thyroidea; 3 – arcus aortae; 4 – truncus arteriosus; 5 – truncus pulmonalis; 6 – auricula sinistra; 7 – ventriculus sinister; 8 – apex cordis; 9 – ventriculus dexter; 10 – atrium dextrum; 11 – pulmo dextrum; 12 – v. cava superior; 13 – v. subclavia dextra; 14 – v. jugularis interna; 15 – a. carotis communis dextra.



- 1 – n. recurrens dexter;
 2 – n. vagus;
 3 – a. carotis communis;
 4 – a. subclavia;
 5 – truncus brachiocephalicus;
 6 – arcus aortae;
 7 – bifurcatio tracheae;
 8 – nodus lymphaticus tracheobronchialis;
 9 – n. recurrens sinister;
 10 – bronchus sinister;
 11 – bronchus dexter;
 12 – oesophagus



- Топография аорты
 1 – общая сонная артерия;
 2 – подключичная артерия;
 3 – плечеголовный ствол;
 4 – дуга аорты

Figure 6 The relationship of the trachea, esophagus and aorta. Topography of the aorta.

Esophagus projection. The thoracic esophagus stretches from the superior thoracic aperture at the level of the 2nd thoracic vertebra; then at the level of the 2nd–4th thoracic vertebra, it lies to the right of the median line. Below the thoracic esophagus it crosses the median line again, and at the level of the 10th thoracic vertebra it enters through the esophageal opening, positioning itself 2.5 cm to the left of the median line.

Chest wall layers (Figure 7):

1. Skin - *derma*;
2. Subcutaneous fat - *panniculus adiposus*;

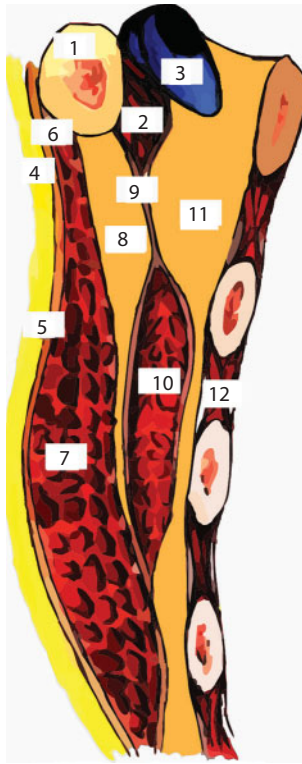


Figure 7 Layers of the front upper region of the sternum.

1 - clavícula; 2 - *m. subclavicularis*; 3 - *v. subclavia*; 4 - *panculus subdermalis*; 5 - *fascia superficialis*; 6 - *fascia propria*; 7 - *m. pectoralis major*; 8 - *spatium subpectorale superficialis*; 9 - *fascia coracoclavodcostalis*; 10 - *m. pectoralis minor*; 11 - *spatium subpectorale profundum*; 12 - *mm. intercostales*

3. Subcutaneous veins
4. Suphenous nerves
5. Superficial pectoral fascia - *fascia pectoralis superficialis*;
6. Pectoral fascia - *fascia pectoralis propria*;
7. Major and minor pectoral muscles - *mm. pectoralis major et minor*;
8. Coracoclavicular pectoral fascia - *fascia coracoclavipectoralis*;
9. Endothoracic fascia - *fascia endothoracica*.

Vessels and nerves of the thoracic wall (Figures 8, 9) are divided into superficial and deep ones. Cutaneous branches of intercostal

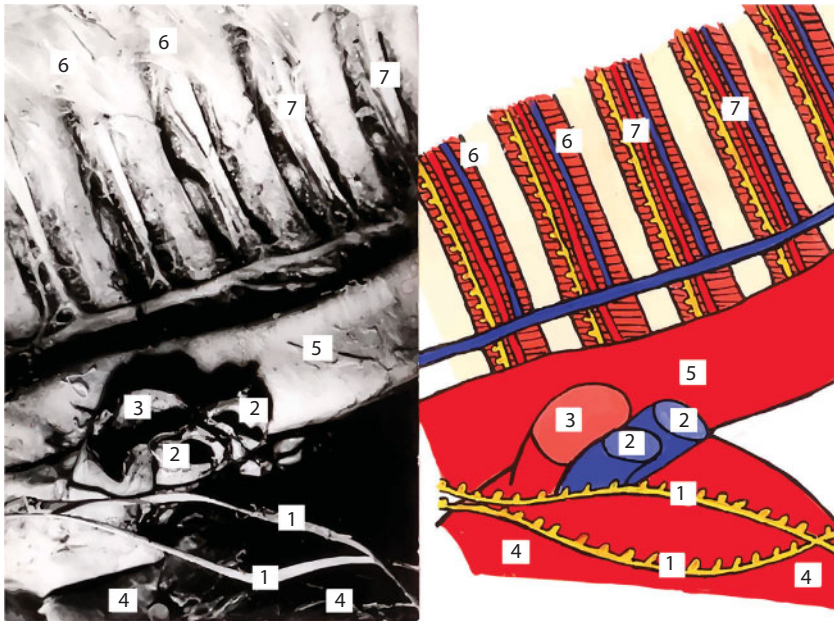


Figure 8 Vessels and nerves of the chest wall.

1 – n. vagus; 2 – vv. pulmonales; 3 – a. pulmonalis; 4 – cor; 5 – aorta; 6 – mm. intercostalis internii; 7 – a. intercostalis posterior et n. intercostalis

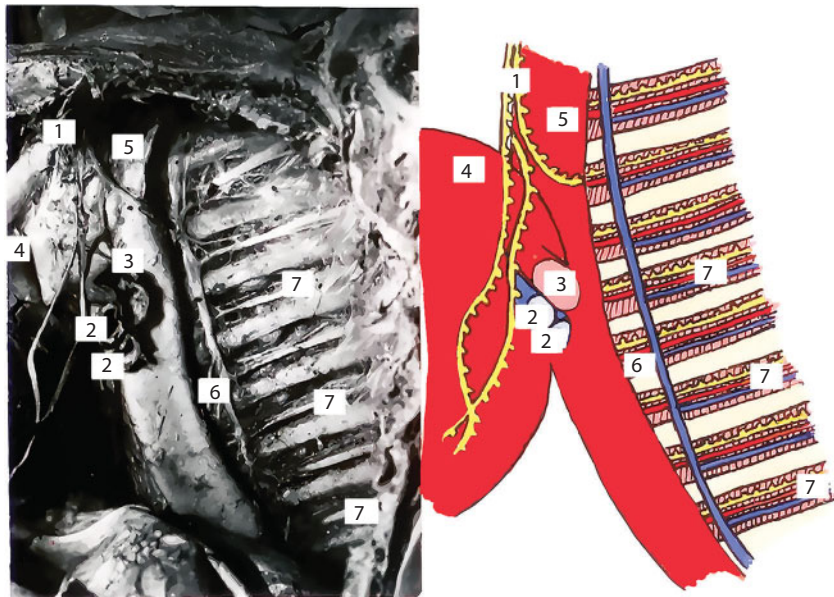


Figure 9 Vessels and nerves of the chest wall.

1 – n. vagus sinistra; 2 – vv. pulmonales; 3 – a. pulmonalis; 4 – cor; 5 – aorta; 6 – mm. intercostales; 7 – fasciculus vasus intercostalis