Thorax pins · front

Superior: thoracic inlet 15

Superior thoracic aperture and suprapleural membrane **Superior thoracic aperture** sup *Boundaries: T1 vertebra, first ribs and their cartilages, superior border of the manubrium; the suprapleural membrane (Sibson fascia) runs from the C7 transverse process to the internal border of the first rib and roofs the cervical pleura*

First rib: head, neck and tubercle B **First rib** sup ★ V **Subclavian vein** ant M **Suprapleural membrane** sup deep B **Head of the first rib** med B **Neck of the first rib** post B **Tubercle of the first rib** post *First rib: shortest, broadest, most curved; single facet on its head (T1 only); its superior surface carries the scalene tubercle between the two subclavian grooves*

Scalene tubercle and subclavian grooves B **Groove for the subclavian vein** sup ★ N **Accessory phrenic nerve** ant B **Scalene tubercle** sup ★ B **Groove for the subclavian artery** sup ★ *Vein, tubercle, artery from anterior to posterior: subclavian vein anterior to the scalene tubercle (scalenus anterior), subclavian artery and inferior trunk posterior to it*

Venous angle and lymph trunks **Venous angle** sup **Vertebral vein** post *Right lymphatic duct drains the right upper quadrant (right head, neck, upper limb, thorax); the thoracic duct drains everything else into the left venous angle*

↳ **Right lymphatic duct** lat

↳ Right lymphatic duct: **Bronchomediastinal trunk** inf

Superior: superior mediastinum 43

Mediastinum and its divisions Or **Mediastinum** Or **Superior mediastinum** sup A **Aortic arch** sup ★ V **Superior vena cava** lat ★ V **Thoracic duct** post ★ Or **Inferior mediastinum** inf *PVT Left BATTLE (superior mediastinum: phrenic nerves, vagus nerves, thoracic duct, left recurrent laryngeal nerve, brachiocephalic veins, aortic arch, thymus, trachea, lymph nodes, oesophagus); a plane through the sternal angle and T4/T5 separates superior from inferior mediastinum*

↳ **Aortic isthmus** post

↳ **Right brachiocephalic vein** lat ★

↳ **Left brachiocephalic vein** ant ★

↳ Left brachiocephalic: **Inferior thyroid veins** ant **Left superior intercostal vein** lat ★

Thymus and thymic vessels Or **Thymus** ant ★ A **Thymic branches** lat V **Thymic veins** post Or **Right lobe of the thymus** lat Or **Left lobe of the thymus** lat *Thymus comes from the 3rd pharyngeal pouch with the inferior parathyroids; large in children, it involutes after puberty into the thymic fat body*

Brachiocephalic veins and superior vena cava **Brachiocephalic lymph nodes** ant deep *Left brachiocephalic vein is the long one, crossing anterior to the arch branches; SVC forms at the right 1st costal cartilage and enters the right atrium at the right 3rd costal cartilage*

Aortic arch and ligamentum arteriosum **Ligamentum arteriosum** inf ★ *Arch begins and ends at the sternal angle (T4/T5); the left recurrent laryngeal nerve hooks around the arch, posterior to the ligamentum arteriosum (right one hooks the right subclavian)*

Trachea and cervical oesophagus Or **Trachea** ant ★ A **Brachiocephalic trunk** ant ★ N **Right vagus nerve** post ★ V **Paratracheal lymph nodes** lat deep Or **Cervical part of the trachea** sup N **Left recurrent laryngeal nerve** med ★ Or **Thoracic part of the trachea** inf A **Left common carotid artery** med ★ Or **Tracheal cartilages** ant ★ Or **Anular ligaments of the trachea** ant Or **Membranous wall of the trachea** post Or **Trachealis** post Or **Cervical part of the oesophagus** post *C6 rule: at the cricoid (C6) the larynx becomes the trachea and the pharynx becomes the oesophagus*

↳ **Right common carotid artery** med **Right subclavian artery** lat **Thyroid ima artery** ant

↳ **Right recurrent laryngeal nerve** med

Tracheal bifurcation and paratracheal nodes Or **Bifurcation of the trachea** inf V **Inferior tracheobronchial lymph nodes** inf deep N **Cardiac plexus** sup A **Pulmonary trunk** ant ★ Or **Carina of the trachea** inf ★ *Trachea bifurcates at the sternal angle (T4/T5); the carina is the cough-sensitive ridge between the main bronchi*

↳ **Superficial cardiac plexus** ant superf. **Deep cardiac plexus** post deep

↳ **Bifurcation of the pulmonary trunk** sup

Anterior: anterior thoracic wall (sternum, costal cartilages, internal thoracic vessels) 33

Manubrium and sternal angle B **Sternum** M **Transversus thoracis** post deep A **Internal thoracic artery** ant deep ★ B **Manubrium of the sternum** sup ★ B **Jugular notch** sup ★ B **Clavicular notch** lat B **Lateral border of the manubrium** lat B **Synchondrosis of the first rib** lat B **Sternal angle** ant ★ B **Manubriosternal joint** inf *RATPLANT at the sternal angle (T4/T5): Rib 2 articulates, Aortic arch begins and ends, Trachea bifurcates, Pulmonary trunk bifurcates, Ligamentum arteriosum, Azygos enters the SVC, Nerve (left recurrent laryngeal) hooks the arch, Thoracic duct crosses right to left; count ribs from the 2nd costal cartilage here*

↳ **Sternal branches** med **Perforating branches** ant

Body of the sternum and sternocostal joints **Body of the sternum** **Costal notches** lat **Sternocostal joint** lat **Radiate sternocostal ligament** ant **Intra-articular sternocostal ligament** lat **Anterior surface of the sternum** ant **Sternal membrane** ant *1st sternocostal joint is a synchondrosis (primary cartilaginous); 2nd to 7th are synovial*

Costal cartilages and costal arch B **Costal cartilage** ant ★ B **Costochondral joint** lat B **Interchondral joint** inf B **Costal arch** inf A **Musculophrenic artery** lat V **Musculophrenic vein** lat B **Infrasternal angle** inf *Costal arch = cartilages 7 to 10; true ribs 1 to 7 reach the sternum by their own cartilage*

Xiphoid process **Xiphoid process** inf ★ **Xiphisternal joint** sup **Costoxiphoid ligament** ant *Xiphisternal joint at T9*

Posterior surface of the sternum: internal thoracic vessels B **Posterior surface of the sternum** post V **Internal thoracic vein** med deep ★ *Internal thoracic artery (first part of the subclavian) branches in order: pericardiacophrenic, mediastinal, thymic, sternal, perforating, anterior intercostal, then musculophrenic and superior epigastric*

Terminal branches of the internal thoracic vessels A **Superior epigastric artery** med V **Superior epigastric vein** med *Internal thoracic artery runs about 1 cm lateral to the sternal border and divides in the 6th intercostal space: musculophrenic (lateral) and superior epigastric (medial, into the rectus sheath)*

Anterior: pectoral region and breast 31

Mammary gland and its vessels Or **Mammary gland** ant superf. A **Medial mammary branches** med M **Pectoral fascia** ant superf. V **Parasternal lymph nodes** lat deep Or **Suspensory ligaments of the breast** ant Or **Lobes of the mammary gland** Or **Axillary process of the breast** lat M **Pectoralis major** ant superf. ★ A **Lateral thoracic artery** lat superf. V **Lateral thoracic vein** lat superf. *Breast extends from rib 2 to rib 6, sternal border to midaxillary line, with the axillary tail (of Spence); about 75% of lymph drains to axillary nodes*

↳ **Lateral mammary branches** lat

↳ **Thoracoepigastric vein** lat superf.

Nipple, areola and lactiferous ducts **Nipple** ant superf. **Areola** ant superf. **Areolar glands** ant superf. **Lactiferous sinus** post deep **Lactiferous ducts** deep *Male nipple at the 4th intercostal space in the midclavicular line (T4 dermatome); 15 to 20 lobes, each with its own lactiferous duct and sinus opening on the nipple*

Retromammary space and pectoralis major Or **Retromammary space** post deep M **Clavicular head of pectoralis major** sup superf. M **Sternocostal head of pectoralis major** med superf. M **Abdominal part of pectoralis major** inf superf. N **Supraclavicular nerves** sup superf. *Breast lies two-thirds on pectoralis major and one-third on serratus anterior, separated by the retromammary space*

Pectoralis minor M **Pectoralis minor** post deep ★ N **Medial pectoral nerve** lat deep *Medial pectoral nerve is lateral, lateral pectoral nerve is medial (named for their cords); the medial pectoral nerve pierces pectoralis minor*

Subclavius M **Subclavius** sup deep N **Nerve to subclavius** post A **Superior thoracic artery** sup *Nerve to subclavius (C5, C6) from the superior trunk; it often gives the accessory phrenic nerve*

Clavipectoral fascia and its piercing structures M **Clavipectoral fascia** sup deep A **Thoracoacromial artery** sup N **Lateral pectoral nerve** med *Two in, two out: cephalic vein and lymphatics pass in; thoracoacromial artery and lateral pectoral nerve come out*

↳ **Pectoral branch of the thoracoacromial artery** inf

Medial: anterior and middle mediastinum (outside the heart) 12

Between sternum and pericardium Or **Anterior mediastinum** V **Anterior mediastinal lymph nodes** ant deep A **Mediastinal branches of the internal thoracic artery** lat Or **Thymic fat body** sup Or **Sternopericardial ligaments** ant *4 Ts of anterior mediastinal masses: thymoma, teratoma, thyroid (retrosternal), 'terrible' lymphoma*

Ascending aorta and pulmonary trunk Or **Middle mediastinum** A **Ascending aorta** med ★ N **Phrenic nerve** ant ★ A **Pericardiacophrenic artery** ant ★ *Pulmonary trunk bifurcates at the sternal angle (T4/T5), in the concavity of the aortic arch*

↳ **Aortic bulb** inf

↳ **Left phrenic nerve** lat ★

Cardiac plexus **Thoracic cardiac branches of the vagus nerve** sup *Superficial cardiac plexus in the concavity of the aortic arch, deep cardiac plexus anterior to the tracheal bifurcation; sympathetic nerves speed the heart, the vagus slows it*

Lateral: ribs (typical and atypical) and serratus anterior 27

Thoracic cage, classes of ribs and twelfth rib B **Thoracic cage** B **True ribs** sup B **False ribs** inf B **Floating ribs** inf B **Tenth rib** inf B **Eleventh rib** inf B **Twelfth rib** inf N **Subcostal nerve** inf deep *7 true, 3 false, 2 floating; atypical ribs 1, 2, 10, 11, 12*

Rib: head and neck **Rib** **Head of the rib** med ★ **Articular facet of the head of the rib** med **Crest of the head of the rib** med **Neck of the rib** post ★ **Crest of the neck of the rib** sup *A typical rib head articulates with its own vertebra and the one superior to it (two demifacets)*

Rib: tubercle and angle **Tubercle of the rib** post ★ **Articular facet of the tubercle of the rib** post **Angle of the rib** post ★ *Tubercle of rib N articulates with the transverse process of vertebra N; ribs 11 and 12 have no costotransverse joint*

Rib: body, surfaces and borders B **Body of the rib** M **Serratus anterior** lat superf. ★ B **External surface of the rib** lat B **Internal surface of the rib** med B **Superior border of the rib** sup B **Inferior border of the rib** inf B **Sternal end of the rib** ant *Costal groove on the internal surface at the inferior border holds the intercostal bundle: VAN (vein, artery, nerve, superior to inferior) in the costal groove; pass a needle along the superior border of the rib inferior to the space*

Second rib and serratus anterior B **Second rib** sup B **Tuberosity for serratus anterior** lat N **Long thoracic nerve** lat superf. ★ *C5, 6, 7 - wings of heaven (long thoracic nerve; injury gives a winged scapula); the 2nd rib is found at the sternal angle*

Lateral: intercostal spaces 19

External and internal intercostal layers B **Intercostal space** lat N **Anterior ramus of a thoracic spinal nerve** post deep M **External intercostal muscle** lat superf. ★ M **Internal intercostal muscle** med deep ★ M **Innermost intercostal muscle** med deep ★ M **External intercostal membrane** ant superf. M **Internal intercostal membrane** post deep *Hands in pockets: external intercostal fibres run inferomedially (anteroinferiorly), internal intercostals at right angles to them; external membrane anteriorly, internal membrane posteriorly*

↳ **Intercostal nerve** inf deep ★

↳ Intercostal: **Collateral branch of the intercostal nerve** inf deep **Muscular branches of the intercostal nerve** inf deep

Intercostal space (from superior to inferior: VAN) B **Costal groove** inf ★ V **Anterior intercostal veins** ant deep A **Anterior intercostal branches** ant deep *VAN (vein, artery, nerve, superior to inferior) in the costal groove; pass a needle along the superior border of the rib inferior to the space*

Cutaneous branches of the intercostal nerves **Lateral cutaneous branch of the intercostal nerve** lat superf. **Anterior cutaneous branch of the intercostal nerve** ant superf. **Thoracoabdominal nerves** inf deep *Dermatome landmarks: T4 at the nipple, T10 at the umbilicus*

First and second intercostal nerves **First intercostal nerve** sup **Second intercostal nerve** sup *Intercostobrachial nerve (T2) supplies the medial arm: why cardiac pain refers to the medial left arm*

↳ **Intercostobrachial nerve** lat superf.

Lateral: pleura and pleural recesses 27

Cervical and costal pleura with recesses Or **Parietal pleura** M **Endothoracic fascia** med deep Or **Cervical pleura** sup ★ A **Left subclavian artery** lat ★ A **Costocervical trunk** sup N **Sympathetic trunk** lat ★ Or **Costal pleura** lat Or **Costodiaphragmatic recess** inf ★ M **Costal part of the diaphragm** lat Or **Costomediastinal recess** ant Or **Vertebromediastinal recess** post *2-4-6-8-10-12 rule for the parietal pleura: meets in the midline at rib 2, left diverges at 4 (cardiac notch), right continues to 6, 8 in the midclavicular line, 10 in the midaxillary line, 12 paravertebrally; the lung stops two ribs short (6-8-10)*

↳ **Supreme intercostal artery** ant

↳ **Cervicothoracic ganglion** sup ★

↳ **Thoracic ganglia** lat

↳ Thoracic ganglia: **Grey rami communicantes** med

Diaphragmatic and mediastinal pleura Or **Diaphragmatic pleura** inf M **Diaphragm** A **Superior phrenic arteries** post Or **Phrenicomediastinal recess** inf Or **Mediastinal pleura** med V **Pericardiacophrenic vein** ant Or **Pulmonary ligament** inf ★ V **Right inferior pulmonary vein** inf V **Left inferior pulmonary vein** inf ★ *Parietal pleura, four parts: cervical, costal, diaphragmatic, mediastinal; it is pain-sensitive (intercostal and phrenic nerves)*

Visceral pleura and pleural cavity Or **Visceral pleura** N **Pulmonary plexus** post Or **Pleural cavity** *Visceral pleura has autonomic supply only and is insensitive to pain; parietal pleura is somatic and painful*

Thorax pins · back

Lateral: right lung 52

Apex of the right lung · Or · Right lung · A · **Right pulmonary artery** · ant · ★ · V · **Right superior pulmonary vein** · ant · ★ · V · **Azygos vein** · lat · ★ · Or · **Apex of the lung** · sup · ★ · Or · Groove for the right subclavian artery · sup · Or · Groove for the right brachiocephalic vein · med · *Apex and cervical pleura rise 2 to 3 cm superior to the medial third of the clavicle: a Pancoast tumour at the apex can involve the inferior trunk of the brachial plexus and the sympathetic trunk (Horner syndrome)*

↳ **Arch of the azygos vein** · sup · ★ · **Right superior intercostal vein** · sup · ★

Costal surface and borders of the right lung · Or · Costal surface of the lung · lat · Or · Diaphragmatic surface of the lung · inf · M · **Right dome of the diaphragm** · sup · M · **Left dome of the diaphragm** · inf · Or · Vertebral part of the mediastinal surface · post · A · **Posterior intercostal arteries** · post · deep · ★ · V · **Posterior intercostal veins** · post · deep · N · **Greater splanchnic nerve** · med · ★ · Or · Anterior border of the lung · ant · Or · Posterior border of the lung · post · Or · Inferior border of the lung · inf · *Lung borders two ribs short of the pleura: 6 midclavicular, 8 midaxillary, 10 paravertebral*

↳ **Right posterior intercostal arteries** · post · deep · **Dorsal branch of the posterior intercostal artery** · post · **Collateral branch of the posterior intercostal artery** · inf · deep · **Lateral cutaneous branch of the posterior intercostal artery** · lat · superf.

Mediastinal surface of the right lung · Or · Mediastinal surface of the lung · med · Or · Cardiac impression of the right lung · med · N · **Right phrenic nerve** · lat · ★ · Or · Groove for the superior vena cava · med · Or · Groove for the inferior vena cava · med · V · **Inferior vena cava** · inf · Or · **Groove for the azygos vein** · med · ★ · Or · Azygos lobe · sup · Or · Tracheal impression · med · Or · Groove for the oesophagus · med · *Right lung is the venous side: grooves for the SVC, IVC, azygos arch and right brachiocephalic vein (left lung is the arterial side)*

Fissures and lobes of the right lung · Interlobar surface of the lung · **Oblique fissure of the right lung** · post · ★ · **Horizontal fissure of the right lung** · ant · ★ · **Superior lobe of the right lung** · sup · ★ · **Middle lobe of the right lung** · ant · ★ · Inferior lobe of the right lung · inf · *Right: 3 lobes, 2 fissures; left: 2 lobes, 1 fissure. Oblique fissure from the T2/T3 spine to the 6th costochondral junction; horizontal fissure along the 4th costal cartilage*

Segments of the right superior and middle lobes · Or · Apical segment of the right lung · sup · A · **Lobar arteries** · post · Or · Posterior segment of the right lung · post · Or · Anterior segment of the right lung · ant · Or · Lateral segment of the right lung · lat · Or · Medial segment of the right lung · med · *A PALM Seed Makes Another Little Palm (right lung: apical, posterior, anterior; lateral, medial; superior, medial basal, anterior basal, lateral basal, posterior basal)*

↳ **Segmental arteries**

Segments of the right inferior lobe · Superior segment of the right lung · sup · Medial basal segment of the right lung · med · Anterior basal segment of the right lung · ant · Lateral basal segment of the right lung · lat · Posterior basal segment of the right lung · post · *A PALM Seed Makes Another Little Palm: the last five (superior, medial basal, anterior basal, lateral basal, posterior basal) are the right inferior lobe*

Lateral: left lung 28

Apex of the left lung · Or · Left lung · A · **Left pulmonary artery** · sup · ★ · V · **Left superior pulmonary vein** · ant · ★ · A · **Thoracic aorta** · lat · ★ · Or · Groove for the first rib · sup · Or · Groove for the left subclavian artery · sup · Or · Groove for the left common carotid artery · med · Or · Groove for the left brachiocephalic vein · med · *Apex and cervical pleura rise 2 to 3 cm superior to the medial third of the clavicle: a Pancoast tumour at the apex can involve the inferior trunk of the brachial plexus and the sympathetic trunk (Horner syndrome)*

↳ **Pericardial branches of the thoracic aorta** · ant · **Mediastinal branches of the thoracic aorta** · ant

Mediastinal surface of the left lung · Or · Cardiac impression of the left lung · med · ★ · Or · Groove for the aortic arch · med · ★ · N · **Left vagus nerve** · post · ★ · Or · **Groove for the descending aorta** · med · ★ · Or · Oesophageal impression of the left lung · med · *Left lung is the arterial side: grooves for the aortic arch, descending aorta, left subclavian and left common carotid (right lung is the venous side)*

Fissure and lobes of the left lung · **Oblique fissure of the left lung** · post · ★ · **Superior lobe of the left lung** · sup · ★ · Inferior lobe of the left lung · inf · *Left: 2 lobes, 1 fissure (oblique); no horizontal fissure*

Cardiac notch and lingula · **Cardiac notch of the left lung** · ant · ★ · **Lingula of the left lung** · ant · ★ · *Lingula is the left counterpart of the right middle lobe; the cardiac notch lies at the 4th to 6th left costal cartilages (pleura diverges at 4)*

Segments of the left superior lobe · Apicoposterior segment of the left lung · sup · Anterior segment of the left lung · ant · Superior lingular segment · sup · Inferior lingular segment · inf · *Left lung has 8 segments: apical + posterior fuse (apicoposterior); the lingula takes superior and inferior lingular segments in place of a middle lobe*

Segments of the left inferior lobe · Superior segment of the left lung · sup · Anteromedial basal segment of the left lung · ant · Lateral basal segment of the left lung · lat · Posterior basal segment of the left lung · post · *Left inferior lobe: anterior and medial basal fuse (anteromedial basal), so 4 segments: superior, anteromedial basal, lateral basal, posterior basal*

Medial: lung roots, hila and bronchi 22

Root and hilum of the lung · Or · Root of the lung · med · A · **Bronchial arteries** · post · V · **Bronchial veins** · post · Or · **Hilum of the lung** · med · ★ · V · **Pulmonary veins** · inf · V · **Bronchopulmonary lymph nodes** · lat · deep · N · Bronchial branches of the vagus nerve · post · *Anterior to posterior: vein, artery, bronchus (VAB) on both sides; pulmonary veins are the most anterior and most inferior; phrenic nerve anterior to the root, vagus posterior*

Right hilum · Or · Right main bronchus · post · ★ · A · **Right bronchial artery** · post · V · **Superior tracheobronchial lymph nodes** · sup · deep · Or · **Right superior lobar bronchus** · sup · ★ · *RALS (Right Anterior, Left Superior: the pulmonary artery is anterior to the main bronchus on the right, superior to it on the left); the eparterial bronchus (right superior lobar) arises superior to the artery. Right main bronchus is wider, shorter, more vertical: inhaled bodies go right*

Right intermediate and lobar bronchi · Intermediate bronchus · inf · Right middle lobar bronchus · ant · Right inferior lobar bronchus · inf · *Right main bronchus gives the superior lobar (eparterial) bronchus, then continues as the intermediate bronchus, which splits into middle and inferior lobar bronchi*

Left hilum · Or · Left main bronchus · post · ★ · A · **Left superior bronchial artery** · sup · A · **Left inferior bronchial artery** · inf · Or · **Left superior lobar bronchus** · inf · ★ · *RALS (Right Anterior, Left Superior: the pulmonary artery is anterior to the main bronchus on the right, superior to it on the left); the left pulmonary artery arches over the superior aspect of the left main bronchus (no eparterial bronchus on the left)*

Left lingular and inferior lobar bronchi · Lingular bronchus · ant · Left inferior lobar bronchus · inf · *Left main bronchus is longer, narrower and more horizontal than the right (inhaled objects go right); the lingular bronchus comes from the left superior lobar bronchus*

Lobar and segmental branching · Or · Segmental bronchi · V · **Intrapulmonary lymph nodes** · lat · deep · *Bronchopulmonary segment: segmental bronchus and artery central, veins intersegmental (at the periphery)*

Posterior: posterior thoracic wall (vertebrae, costovertebral joints, posterior intercostal vessels) 42

Vertebral body and joint of the head of the rib · Thoracic vertebra · Vertebral body · ant · **Superior costal facet** · lat · ★ · **Inferior costal facet** · lat · ★ · Joint of the head of the rib · lat · Radiate ligament of the head of the rib · ant · Intra-articular ligament of the head of the rib · med · *Ribs 2 to 9 meet two demifacets (own vertebra + the one superior); ribs 1, 10, 11, 12 have a single full facet*

Pedicles and intervertebral foramen · B · Vertebral foramen · med · B · Pedicle of the vertebral arch · lat · B · Superior vertebral notch · sup · B · Inferior vertebral notch · inf · B · Intervertebral foramen · lat · A · **Spinal branch of the posterior intercostal artery** · med · *Thoracic spinal nerve T(n) leaves through the intervertebral foramen inferior to the pedicle of vertebra T(n); C1 to C7 exit superior to their pedicles, C8 inferior to C7*

Laminae, articular and spinous processes · B · Lamina of the vertebral arch · post · B · Ligamentum flavum · post · B · Superior articular process · sup · B · Inferior articular process · inf · B · Zygapophysial joint · lat · B · Spinous process · post · M · Serratus posterior superior · sup · deep · M · Serratus posterior inferior · inf · deep · *Rule of threes (thoracic spines): T1 to T3 spines are level with their own transverse processes, T4 to T6 half a vertebra inferior, T7 to T9 a whole vertebra inferior, T10 to T12 return towards level*

Transverse process and costotransverse joint · B · Transverse process · lat · M · Levatores costarum · post · deep · B · **Transverse costal facet** · lat · ★ · B · Costotransverse joint · lat · B · Costotransverse ligament · med · B · Superior costotransverse ligament · sup · B · Lateral costotransverse ligament · lat · *Tubercle of rib N to transverse process of vertebra N; no costotransverse joints for ribs 11 and 12*

Intervertebral disc and longitudinal ligaments · Intervertebral disc · med · Anterior longitudinal ligament · ant · Posterior longitudinal ligament · post · *Anterior longitudinal ligament is broad and limits extension; the posterior longitudinal ligament is narrow and limits flexion, so discs herniate posterolaterally*

Levatores costarum · Levatores costarum breves · post · deep · Levatores costarum longi · post · deep

First thoracic vertebra and costocervical trunk · B · First thoracic vertebra · sup · V · **Supreme intercostal vein** · ant · *Costocervical trunk gives the deep cervical artery and the supreme intercostal artery (posterior intercostals 1 and 2)*

Posterior intercostal space (from superior to inferior: VAN) · M · **Subcostales** · post · deep · V · **Intercostal lymph nodes** · post · deep · *VAN (vein, artery, nerve, superior to inferior) in the costal groove; pass a needle along the superior border of the rib inferior to the space; posterior intercostal arteries 3 to 11 come from the thoracic aorta, 1 and 2 from the supreme intercostal*

Tenth to twelfth thoracic vertebrae and subcostal vessels · B · Tenth thoracic vertebra · inf · B · Eleventh thoracic vertebra · inf · B · Twelfth thoracic vertebra · inf · A · **Subcostal artery** · inf · deep · V · **Subcostal vein** · inf · deep · *T10, T11, T12 carry single full costal facets for ribs 10 to 12; oesophageal hiatus at T10, aortic hiatus at T12*

Posterior: posterior mediastinum 25

Thoracic oesophagus · Or · Posterior mediastinum · V · **Hemiazygos vein** · inf · ★ · V · Posterior mediastinal lymph nodes · post · deep · Or · **Oesophagus** · post · ★ · N · **Oesophageal plexus** · inf · ★ · Or · Thoracic part of the oesophagus · post · A · **Oesophageal branches of the thoracic aorta** · ant · V · **Oesophageal veins** · post · V · **Juxta-oesophageal lymph nodes** · lat · deep · Or · Aortic constriction of the oesophagus · lat · Or · Bronchial constriction of the oesophagus · ant · *Oesophageal constrictions at 15, 25, 40 cm from the incisors: cricopharyngeal (C6), aortic arch and left main bronchus (T4/T5), diaphragmatic (T10); DATES (posterior mediastinum: descending aorta, azygos and hemiazygos veins, thoracic duct, oesophagus, sympathetic trunk and splanchnic nerves)*

↳ **Ascending lumbar vein** · inf

Vagus nerves and oesophageal plexus · Oesophageal branches of the vagus nerve · med · *Vagus passes posterior to the lung root, phrenic anterior; the two vagi form the oesophageal plexus on the oesophagus*

Diaphragmatic constriction and vagal trunks · Or · Diaphragmatic constriction of the oesophagus · inf · M · **Oesophageal hiatus** · med · ★ · M · **Right crus of the diaphragm** · post · ★ · N · Anterior vagal trunk · ant · N · Posterior vagal trunk · post · Or · Abdominal part of the oesophagus · inf · *LARP (Left vagus becomes Anterior trunk, Right becomes Posterior trunk); oesophagus and vagal trunks pass the diaphragm at T10*

Thoracic aorta · Thoracic aortic plexus · lat · *Descends from the left side of T4 to the aortic hiatus at T12 (At 12), moving towards the midline anterior to the vertebral bodies*

Hemiazygos veins · Accessory hemiazygos vein · sup · *Hemiazygos crosses to the azygos at T9, accessory hemiazygos at T8*

Sympathetic trunk on the rib heads · White rami communicantes · lat · *White rami only T1 to L2 (thoracolumbar outflow); grey rami to every spinal nerve*

Splanchnic nerves · Thoracic cardiopulmonary splanchnic nerves · sup · Lesser splanchnic nerve · lat · Least splanchnic nerve · inf · *Greater T5 to T9, lesser T10 to T11, least T12*

Inferior: diaphragm and thoracic outlet 14

Domes and central tendon of the diaphragm · B · Inferior thoracic aperture · inf · M · **Central tendon of the diaphragm** · med · M · **Caval opening** · sup · ★ · *I 8 10 Eggs At 12 (IVC T8, oesophagus T10, aortic hiatus T12); letter count also works: 'vena cava' 8, 'oesophagus' 10, 'aortic hiatus' 12; right dome higher (liver), reaching the 5th rib*

Sternal and costal parts of the diaphragm · Sternal part of the diaphragm · ant · Sternocostal triangle · ant · Lumbocostal triangle · post · *Morgagni anterior (sternocostal triangle, superior epigastric vessels); Bochdalek is Back and Left (lumbocostal triangle, posterolateral hernia)*

Crura, arcuate ligaments and hiatuses · Lumbar part of the diaphragm · post · Left crus of the diaphragm · post · Median arcuate ligament · ant · Medial arcuate ligament · med · Lateral arcuate ligament · lat · **Aortic hiatus** · post · ★ · *I 8 10 Eggs At 12 (IVC T8, oesophagus T10, aortic hiatus T12); letter count also works: 'vena cava' 8, 'oesophagus' 10, 'aortic hiatus' 12; median arcuate over the aorta, medial over psoas, lateral over quadratus lumborum; right crus L1 to L3, left L1 to L2*

Thoracic surface of the diaphragm · V · **Superior diaphragmatic lymph nodes** · sup · deep · N · Phrenicoabdominal branches · inf · *C3, 4, 5 keeps the diaphragm alive: central diaphragmatic pain refers to the shoulder tip (C4); the periphery is supplied by intercostal nerves*

Heart pins · front

General: pericardium and heart wall 19

Fibrous pericardium and phrenic nerve
Or Fibrous pericardium superf. N Phrenic nerve ant ⭐ A Pericardiacophrenic artery ant V Pericardiacophrenic vein ant A Pericardial branches of the thoracic aorta post Or Sternopericardial ligaments ant Or Pericardiacophrenic ligament inf *C3, 4, 5 keeps the diaphragm alive; phrenic also carries pericardial pain, referred to the shoulder tip*

Parietal serous pericardium and pericardial cavity
Parietal layer of serous pericardium deep Pericardial cavity *Superficial to deep: fibrous pericardium, parietal serous layer, pericardial cavity, visceral serous layer (epicardium)*

Reflections and pericardial sinuses
Reflection of serous pericardium around the arteries sup Transverse pericardial sinus post ⭐ Superior aortic recess sup Reflection of serous pericardium around the veins post Oblique pericardial sinus post ⭐ Fold of the left vena cava lat *Transverse sinus separates the arteries (aorta, pulmonary trunk, anterior) from the veins (SVC, pulmonary veins, posterior); oblique sinus is the cul-de-sac posterior to the left atrium between the pulmonary veins and IVC*

Layers of the heart wall and coronary sulcus
Visceral layer of serous pericardium (epicardium) superf. Myocardium Endocardium deep Coronary sulcus ⭐ *Inner to outer: endocardium, myocardium, epicardium; the coronary sulcus divides atria from ventricles*

Superior: base and great vessels 24

Base, superior border and ascending aorta
Or Base of the heart (posterior surface) post V Right superior pulmonary vein sup V Right inferior pulmonary vein inf V Left superior pulmonary vein sup V Left inferior pulmonary vein inf ⭐ Or Superior border sup V Superior vena cava lat ⭐ A Ascending aorta med ⭐ A Pulmonary trunk ant ⭐ *Base faces posteriorly (mostly left atrium); apex points anteriorly, inferiorly and to the left*

↳ Aortic bulb inf

↳ Bifurcation of the pulmonary trunk
sup Right pulmonary artery post Left pulmonary artery lat

Pulmonary trunk and its bifurcation
Ligamentum arteriosum sup ⭐ *Pulmonary trunk bifurcates at T4/T5 in the concavity of the arch; ligamentum arteriosum (ductus remnant) joins the left pulmonary artery to the arch, with the left recurrent laryngeal nerve hooking posterior to it*

Cardiac plexus
Superficial part of cardiac plexus ant superf. Deep part of cardiac plexus post deep *Superficial cardiac plexus in the concavity of the aortic arch, deep cardiac plexus anterior to the tracheal bifurcation; sympathetic nerves speed the heart, the vagus slows it*

↳ Coronary plexuses inf

Sympathetic cardiac nerves
Superior cervical cardiac nerve sup Middle cervical cardiac nerve sup Inferior cervical cardiac nerve sup Thoracic cardiac nerves inf *Cardiac sympathetics: 3 cervical ganglia + T1 to T4; cardiac pain travels back to T1 to T4 and refers to the left chest and medial arm*

Vagal cardiac branches
Superior cervical cardiac branches of vagus nerve sup Inferior cervical cardiac branches of vagus nerve sup Thoracic cardiac branches of vagus nerve inf *Vagus slows the heart: right vagus mainly to the SA node, left vagus mainly to the AV node*

Anterior: sternocostal surface, right ventricle, anterior interventricular branch 26

Sternocostal surface and left coronary artery
Or Sternocostal surface ant A Right coronary artery ant ⭐ A Left coronary artery lat ⭐ *Borders: right border = right atrium, inferior border = right ventricle, left border = left ventricle (and left auricle); the right ventricle forms most of the sternocostal surface*

↳ Opening of right coronary artery
ant ⭐ Right conus branch ant
Sinuatrial nodal branch sup ⭐
↳ Anterior interventricular branch
ant ⭐

↳ Anterior interventricular branch:
Diagonal branches lat Anterior septal branches med deep

↳ Opening of left coronary artery
lat ⭐

Anterior interventricular sulcus
Or Anterior interventricular sulcus ant ⭐ V Great cardiac vein ant ⭐ *Veins pair with arteries: great cardiac vein with the anterior interventricular branch, middle cardiac vein with the posterior interventricular branch, small cardiac vein with the right marginal branch*

Right ventricle: wall and inflow part
Or Right ventricle ant ⭐ A Right marginal branch inf ⭐ Or Inflow part of the right ventricle inf M Trabeculae carneae of right ventricle inf M Anterior papillary muscle of right ventricle ant ⭐ Or Interventricular septum (right surface) med M Septomarginal trabecula med ⭐ M Septal papillary muscle of right ventricle med *Septomarginal trabecula (moderator band) carries the right bundle branch to the anterior papillary muscle*

Papillary muscles and chordae of the right ventricle
Or Chordae tendineae of tricuspid valve sup M Posterior papillary muscle of right ventricle inf *Right ventricle: 3 papillary muscles (anterior, posterior, septal) for 3 tricuspid cusps; left ventricle: 2 for 2 mitral cusps*

Supraventricular crest and conus arteriosus
Or Conus arteriosus (infundibulum) sup ⭐ M Supraventricular crest med A Left conus branch lat Or Pulmonary orifice sup *Supraventricular crest separates inflow (rough, trabeculated) from outflow (smooth conus arteriosus)*

Right: exterior (right atrium surface, right coronary artery, small cardiac vein) 7

Right border and terminal sulcus
Or Right pulmonary surface lat Or Right border lat V Inferior vena cava inf Or Terminal sulcus lat M Crista terminalis lat ⭐ *Right border = right atrium from SVC to IVC; the terminal sulcus outside matches the crista terminalis inside, with the SA node at its superior end*

Right auricle and origin of the right coronary artery
Or Right auricle ant ⭐ M Pectinate muscles ant *Right aortic sinus gives the right coronary artery; the SA nodal branch comes from the right coronary artery in about 60%*

Right: interior of the right atrium (sinus venarum, crista terminalis, fossa ovalis, triangle of Koch, openings) 21

Right atrium: venous sinus and pectinate part
Or Right atrium lat ⭐ V Coronary sinus post ⭐ A Atrial branches of right coronary artery sup V Anterior cardiac veins ant Or Sinus of venae cavae post Or Opening of superior vena cava sup Or Intervenous tubercle post Or Opening of inferior vena cava inf Or Valve of inferior vena cava ant *Crista terminalis divides the smooth sinus of the venae cavae (posterior) from the rough pectinate part (anterior, auricle)*

↳ Oblique vein of left atrium post

Interatrial septum, right surface
Interatrial septum (right surface) med Fossa ovalis med ⭐ Limbus of fossa ovalis med Torus aorticus ant *Fossa ovalis = foramen ovale remnant; limbus = septum secundum edge*

Triangle of Koch and coronary sinus opening
Triangle of Koch med Opening of coronary sinus inf ⭐ Valve of coronary sinus inf Tendon of Todaro sup Right atrioventricular orifice ant *Koch's triangle: tendon of Todaro, septal cusp of the tricuspid valve, opening of the coronary sinus; the AV node sits at its apex*

Smallest cardiac veins
Or Openings of smallest cardiac veins V Smallest cardiac veins *Smallest cardiac veins (Thebesian veins) open directly into the chambers, mostly the right atrium*

Heart pins · back

Left (lateral): left ventricle, left border, circumflex branch 17

Apex of the heart — **Apex of the heart** lat ★ **Notch of the cardiac apex** inf *Apex beat in the 5th left intercostal space, midclavicular line (about 9 cm from the midline)*

Left border and left marginal vessels — Or **Left border** lat A **Circumflex branch** lat ★ V **Left marginal vein** lat Or **Left pulmonary surface** lat *Left border = left ventricle (with the left auricle superiorly); circumflex runs in the coronary sulcus and gives the left marginal branch*

↳ **Left marginal branch** lat

Branches of the circumflex and intermediate arteries — **Intermediate branch of left coronary artery** ant **Posterior left ventricular branch** inf *Circumflex gives the SA nodal branch in about 40% (the right coronary in about 60%); an intermediate branch (ramus intermedius) makes the left coronary artery trifurcate*

Left ventricle: inflow and papillary muscles — Or **Left ventricle** lat ★ Or **Inflow part of the left ventricle** inf M **Trabeculae carneae of left ventricle** inf M **Anterior papillary muscle of left ventricle** ant M **Posterior papillary muscle of left ventricle** inf Or **Chordae tendineae of mitral valve** sup *Left ventricle: 2 papillary muscles (anterior, posterior) for 2 mitral cusps; wall about 3 times thicker than the right*

Aortic vestibule — **Aortic vestibule** sup **Aortic orifice** sup *Anterior cusp of the mitral valve separates the inflow from the smooth outflow (aortic vestibule), as the supraventricular crest does in the right ventricle*

Posterior: left atrium, pulmonary veins, coronary sinus 10

Left atrium and pulmonary veins — Or **Left atrium** post ★ A **Left atrial branches** sup Or **Openings of pulmonary veins** post Or **Interatrial sulcus** post *Four pulmonary veins enter the left atrium, the most posterior chamber; it lies directly anterior to the oesophagus (an enlarged left atrium indents it)*

Left auricle — Or **Left auricle** lat M **Pectinate muscles of left auricle** lat *Left auricle is the commonest site of thrombus in atrial fibrillation*

Interior of the left atrium — **Interatrial septum (left surface)** med **Valve of foramen ovale** med **Left atrioventricular orifice** ant *Valve of the foramen ovale = septum primum; the foramen stays probe-patent in about 25% of adults*

Coronary sinus — **Valve of the great cardiac vein** lat *Coronary sinus lies in the posterior coronary sulcus and drains into the right atrium: great, middle, small cardiac veins, posterior vein of the left ventricle, oblique vein of the left atrium*

Inferior: diaphragmatic surface, posterior interventricular branch, middle cardiac vein 12

Diaphragmatic surface and inferior vena cava — Or **Diaphragmatic surface** inf A **Posterior interventricular branch** inf ★ V **Middle cardiac vein** inf ★ Or **Inferior border** inf V **Small cardiac vein** lat *Diaphragmatic surface: left ventricle two-thirds, right ventricle one-third*

↳ **Posterior septal branches** med deep

↳ **Right marginal vein** inf

Posterior interventricular sulcus and crux — Or **Posterior interventricular sulcus** inf Or **Crux of the heart** post A **Atrioventricular nodal branch** post A **Right posterolateral branch** lat V **Posterior vein of left ventricle** inf *Dominance = the artery that gives the posterior interventricular branch: right dominant about 70%, left about 10%, codominant about 20%; the AV nodal branch arises near the crux from the dominant artery*

Inside: valves 28

Tricuspid valve — **Tricuspid valve** inf ★ **Anterior cusp of tricuspid valve** ant **Posterior cusp of tricuspid valve** post **Septal cusp of tricuspid valve** med **Right fibrous ring** *LAB RAT (Left Atrium Bicuspid, Right Atrium Tricuspid); All Physicians Take Money (aortic 2nd right ICS, pulmonary 2nd left ICS, tricuspid 4th left ICS at the sternal border, mitral 5th left ICS midclavicular line); Try Pulling My Aorta (tricuspid, pulmonary, mitral, aortic: the order blood meets them)*

Pulmonary valve — **Pulmonary valve** ant ★ **Anterior semilunar cusp of pulmonary valve** ant **Right semilunar cusp of pulmonary valve** med **Left semilunar cusp of pulmonary valve** lat **Nodule of semilunar cusp of pulmonary valve** med **Lunule of semilunar cusp of pulmonary valve** lat **Pulmonary sinuses** sup *Pulmonary valve cusps: anterior, right, left; All Physicians Take Money (aortic 2nd right ICS, pulmonary 2nd left ICS, tricuspid 4th left ICS at the sternal border, mitral 5th left ICS midclavicular line)*

Mitral valve — **Mitral valve** post ★ **Anterior cusp of mitral valve** ant **Posterior cusp of mitral valve** post **Commissures of mitral valve** **Left fibrous ring** *LAB RAT (Left Atrium Bicuspid = mitral, like a bishop's mitre); All Physicians Take Money (aortic 2nd right ICS, pulmonary 2nd left ICS, tricuspid 4th left ICS at the sternal border, mitral 5th left ICS midclavicular line)*

Aortic valve cusps — **Aortic valve** med ★ **Right semilunar cusp of aortic valve** ant **Left semilunar cusp of aortic valve** lat **Posterior semilunar cusp of aortic valve** post **Nodule of semilunar cusp of aortic valve** med **Lunule of semilunar cusp of aortic valve** lat *Aortic valve cusps: right, left, posterior (non-coronary); All Physicians Take Money (aortic 2nd right ICS, pulmonary 2nd left ICS, tricuspid 4th left ICS at the sternal border, mitral 5th left ICS midclavicular line)*

Aortic sinuses — **Aortic sinuses** sup **Right aortic sinus** ant **Left aortic sinus** lat **Posterior aortic sinus** post **Sinotubular junction** sup *Right aortic sinus gives the right coronary artery, left sinus the left coronary artery, posterior sinus none (non-coronary)*

Inside: septa, fibrous skeleton and conducting system 15

Sinuatrial node and interatrial septum — **Sinuatrial node** sup ★ **Interatrial septum** **Atrioventricular node** inf ★ *Conduction order: SA node, AV node, AV bundle (of His), right and left bundle branches, Purkinje fibres*

Fibrous trigones and atrioventricular bundle — **Fibrous rings** **Right fibrous trigone** med **Left fibrous trigone** lat **Tendon of the infundibulum** ant **Atrioventricular bundle** med *AV bundle pierces the right fibrous trigone (central fibrous body): the only electrical path from atria to ventricles*

Interventricular septum and bundle branches — **Interventricular septum** ★ **Membranous part of interventricular septum** sup **Atrioventricular septum** sup **Muscular part of interventricular septum** inf **Right bundle branch** med deep **Left bundle branch** med deep **Subendocardial branches (Purkinje fibres)** deep *SA, AV, His, bundle branches, Purkinje; the membranous septum is the commonest VSD site*

Neck pins · front

General: bones, cartilages and superficial neck 35

Mandible (neck boundary) B Angle of the mandible inf V External jugular vein lat superf. ★ N Cervical plexus lat deep B Mylohyoid line med B Digastric fossa med B Superior mental spine med B Inferior mental spine med B Mental foramen lat ★ *Mylohyoid line: sublingual fossa superior to it, submandibular fossa inferior to it; mental foramen at the second premolar*

↳ Posterior auricular vein post superf. Retromandibular vein ant ↳ Lesser occipital nerve post superf. Great auricular nerve sup superf. Transverse cervical nerve ant superf. Supraclavicular nerves inf superf.

Mastoid and styloid processes B Mastoid process inf M Sternocleidomastoid lat superf. ★ B Jugular foramen inf B Styloid process inf B Stylohyoid ligament inf *Three styloid muscles, three nerves: stylohyoid (VII), styloglossus (XII), stylopharyngeus (IX); jugular foramen transmits IX, X, XI and the internal jugular vein*

Hyoid bone (stylohyoid ligament to lesser horn) Hyoid bone ★ Body of the hyoid bone ant Greater horn of the hyoid bone lat Lesser horn of the hyoid bone sup *Vertebral levels: hyoid C3, thyroid cartilage C4 to C5, cricoid C6*

Cervical transverse processes, first rib and manubrium (superior to inferior) B Anterior tubercle of the transverse process ant B Carotid tubercle (C6) ant B Scalene tubercle sup B Sternoclavicular joint inf M Sternal head of the sternocleidomastoid med B Jugular notch sup V Anterior jugular vein ant superf. *Carotid tubercle (Chassaignac) on C6: the common carotid can be compressed against it*

↳ Jugular venous arch inf superf.

Platysma, its nerve and the anterior jugular veins M Platysma ant superf. ★ Or Investing layer of the deep cervical fascia superf. *Platysma is a facial-expression muscle: cervical branch of the facial nerve (VII). Deep cervical fascia: investing, pretracheal, prevertebral, carotid sheath*

Sternocleidomastoid and the external jugular vein on it Superficial cervical lymph nodes lat superf. *External jugular vein = posterior auricular + posterior division of the retromandibular vein at the angle of the mandible, crossing SCM superficially; SCM divides the neck into anterior and posterior triangles*

Nerve point of the neck: cutaneous nerves (superior to inferior) Nerve point of the neck post *Erb's point (midpoint of the posterior border of SCM), superior to inferior: lesser occipital (C2), great auricular (C2, C3), transverse cervical (C2, C3), supraclavicular (C3, C4)*

Superior: submental triangle 6

Submental triangle Or Submental triangle med M Anterior belly of the digastric lat superf. ★ M Mylohyoid inf ★ V Submental lymph nodes med superf. A Submental artery inf *Submental triangle: both anterior bellies of the digastric and the body of the hyoid; floor = mylohyoid*

Mylohyoid floor: nerve to mylohyoid and submental artery Geniohyoid sup deep ★ *Suprahyoid nerves 2-2-1: mylohyoid and anterior digastric (V3, nerve to mylohyoid); posterior digastric and stylohyoid (VII); geniohyoid (C1 via XII)*

Superior: submandibular triangle 23

Submandibular triangle: posterior belly of the digastric and stylohyoid Or Submandibular triangle lat A Facial artery med deep V Facial vein lat superf. V Submandibular lymph nodes sup superf. N Hypoglossal nerve lat superf. ★ N Nerve to mylohyoid inf M Posterior belly of the digastric post ★ M Stylohyoid sup ★ M Intermediate tendon of the digastric inf Or Tail of the parotid gland inf N Cervical branch of the facial nerve inf deep *Two bellies, two nerves: anterior digastric V3, posterior digastric VII (with stylohyoid)*

Submandibular gland: facial vein superficial, facial artery deep Or Submandibular gland ★ Or Superficial part of the submandibular gland lat superf. N Marginal mandibular branch of the facial nerve sup superf. *Facial artery grooves the gland deeply, facial vein passes superficial to it; marginal mandibular branch of VII superficial to both*

Lateral surface of the hyoglossus (superior to inferior) M Styloglossus sup Or Deep part of the submandibular gland med deep M Hyoglossus med deep N Lingual nerve sup superf. Or Submandibular duct med M Genioglossus med deep ★ V Lingual vein inf *Superior to inferior on hyoglossus: lingual nerve, submandibular duct, hypoglossal nerve; the lingual nerve double-crosses the duct (lateral, then inferior, then medial); the lingual artery runs deep to hyoglossus*

↳ Submandibular ganglion sup

Sublingual gland on the genioglossus Sublingual gland sup *Parotid is serous, submandibular mixed (mainly serous), sublingual mixed (mainly mucous); the sublingual gland opens by many small ducts on the sublingual fold*

Anterior: carotid triangle 22

Carotid sheath: common carotid artery, vagus nerve, internal jugular vein Or Carotid triangle sup ★ A Common carotid artery med ★ V Internal jugular vein lat deep ★ N Vagus nerve post ★ A Superior thyroid artery sup ★ Or Carotid sheath lat deep ★ N Ansa cervicalis ant superf. ★ V Deep cervical lymph nodes lat deep *I See 10 CCs in the IV (internal jugular vein lateral, vagus (X) posterior between, common and internal carotid medial)*

↳ Carotid bifurcation sup ★ ↳ Carotid bifurcation: Carotid body post ↳ Internal carotid artery lat ★ ↳ Internal carotid: Carotid sinus sup ↳ Common facial vein ant ↳ Cervical cardiac branches of the vagus nerve inf ↳ Superior root of the ansa cervicalis med Inferior root of the ansa cervicalis lat ↳ Jugulodigastric lymph node sup deep Jugulo-omohyoid lymph node inf deep

Carotid bifurcation Carotid sinus branch sup *Bifurcation at the superior border of the thyroid cartilage (C3/C4); carotid sinus senses pressure, carotid body senses chemistry (both IX); the internal carotid has no branches in the neck*

Nerves crossing the internal carotid artery (superior to inferior) Inferior ganglion of the vagus nerve sup *Between internal and external carotids: styloglossus, stylopharyngeus, glossopharyngeal nerve, pharyngeal branch of the vagus; the superior laryngeal nerve passes deep (medial) to both carotids*

↳ Pharyngeal branch of the vagus nerve med Superior laryngeal nerve med deep ★

Anterior: muscular triangle 9

Muscular triangle: sternohyoid and superior belly of the omohyoid Or Anterior triangle of the neck ant ★ Or Muscular triangle med M Sternohyoid med superf. ★ M Superior belly of the omohyoid lat superf. ★ M Sternothyroid inf deep M Thyrohyoid sup deep M Intermediate tendon of the omohyoid inf deep *Anterior triangle splits into 4: submental, submandibular, carotid, muscular. Strap muscles: superficial sternohyoid and omohyoid, deep sternothyroid and thyrohyoid*

Sternothyroid, thyrohyoid and the pretracheal fascia N Nerve to thyrohyoid sup Or Pretracheal layer of the deep cervical fascia ant *Ansa cervicalis (C1 to C3) supplies sternohyoid, sternothyroid, omohyoid; thyrohyoid (and geniohyoid) get C1 via the hypoglossal nerve*

Medial: larynx 47

Thyroid cartilage Or Thyroid cartilage ★ M Cricothyroid ant superf. M Inferior pharyngeal constrictor inf superf. Or Laryngeal prominence ant ★ Or Superior thyroid notch sup Or Lamina of the thyroid cartilage lat M Thyropharyngeal part of the inferior constrictor sup Or Oblique line of the thyroid cartilage lat Or Superior horn of the thyroid cartilage sup N Internal laryngeal nerve sup ★ Or Inferior horn of the thyroid cartilage inf N Recurrent laryngeal nerve med ★ *Thyroid cartilage at C4 to C5; carotid bifurcation at its superior border (C3/C4)*

↳ Right recurrent laryngeal nerve med ★ Left recurrent laryngeal nerve med

Cricoid cartilage and the arytenoids on its lamina Or Cricoid cartilage ★ M Cricopharyngeus inf ★ M Posterior cricoarytenoid post ★ M Lateral cricoarytenoid lat deep Or Arch of the cricoid cartilage ant Or Lamina of the cricoid cartilage post Or Arytenoid cartilage post M Transverse arytenoid post deep M Oblique arytenoid post superf. M Thyroarytenoid lat deep Or Muscular process lat Or Vocal process ant M Vocalis med deep Or Corniculate cartilage sup Or Cuneiform cartilage ant *C6 rule at the cricoid: larynx becomes trachea, pharynx becomes oesophagus. Laryngeal cartilages: 3 unpaired (thyroid, cricoid, epiglottis), 3 paired (arytenoid, corniculate, cuneiform)*

Epiglottis Epiglottis ★ Stalk of the epiglottis inf *Elastic cartilages: epiglottis, corniculate, cuneiform and the apex of the arytenoid; thyroid, cricoid and most of the arytenoid are hyaline and calcify with age*

Thyrohyoid membrane: internal laryngeal nerve and superior laryngeal artery Or Thyrohyoid membrane sup ★ A Superior laryngeal artery inf Or Median thyrohyoid ligament med *Internal laryngeal nerve and superior laryngeal artery pierce the thyrohyoid membrane; sensation superior to the vocal folds = internal laryngeal, inferior = recurrent laryngeal*

Laryngeal vestibule and ventricle Laryngeal vestibule Quadrangular membrane lat Vestibular fold sup Laryngeal ventricle lat *Superior to inferior: vestibular folds (false cords), laryngeal ventricle, vocal folds*

Vocal fold and rima glottidis Vocal fold inf ★ Vocal ligament med Rima glottidis med ★ *Vocal ligament = free superior edge of the conus elasticus; rima glottidis lies between the vocal folds*

Conus elasticus and infraglottic cavity Conus elasticus lat Median cricothyroid ligament ant ★ Infraglottic cavity inf Cricotracheal ligament inf *Median cricothyroid ligament is the emergency airway (cricothyrotomy)*

Cricothyroid and the external laryngeal nerve Cricothyroid joint lat *Cricothyroid is the only intrinsic laryngeal muscle supplied by the external laryngeal nerve (all others: recurrent laryngeal); the nerve runs with the superior thyroid artery*

Cricoarytenoid joint and its muscles Cricoarytenoid joint post *Posterior cricoarytenoid is the only abductor of the vocal folds*

Neck pins · back

Medial: pharynx 59

Nasal cavity: lateral wall (superior to inferior)

Superior nasal concha [lat] Middle nasal concha [lat] Ethmoidal bulla [lat] ⭐ Semilunar hiatus [lat] Inferior nasal concha [lat]

Drainage: sphenoethmoidal recess = sphenoid; superior meatus = posterior ethmoidal; middle meatus (semilunar hiatus) = frontal, maxillary, anterior ethmoidal; inferior meatus = nasolacrimal duct

Nasopharynx: opening of the auditory tube

Or Nasopharynx Or Choanae [ant] Or Pharyngeal opening of the auditory tube [lat] ⭐ M Levator veli palatini [med] Or Torus tubarius [lat] ⭐ M Salpingopharyngeus [lat] Or Salpingopharyngeal fold [lat] Or Pharyngeal recess [post] Or Pharyngeal tonsil [sup]

Pharyngeal tonsil (adenoids) on the roof and posterior wall; salpingopharyngeus runs from the torus tubarius inside the salpingopharyngeal fold

Oropharynx and soft palate Or

Oropharynx Or Oropharyngeal isthmus [ant] M Palatoglossus [ant] Or Soft palate [sup] M Tensor veli palatini [lat] M Palatopharyngeus [post] A Ascending palatine artery [sup] Or Uvula [sup] *All palate muscles are vagus (pharyngeal plexus) except tensor veli palatini (V3)*

Tonsillar bed between the palatine arches

Or Palatoglossal arch [ant] Or Palatine tonsil [lat] ⭐ A Tonsillar branch [lat] M Superior pharyngeal constrictor [sup] [deep] N Glossopharyngeal nerve [ant] ⭐ Or Palatopharyngeal arch [post] *Palatoglossal arch anterior, palatopharyngeal arch posterior; palatoglossus is the only tongue muscle supplied by the vagus*

↳ Branch to stylopharyngeus [post]

Base of the tongue and valleculae Or

Root of the tongue [inf] A External carotid artery [med] ⭐ Or Terminal sulcus [sup] Or Foramen caecum of the tongue [sup] Or Lingual tonsil [ant] Or Median glossoepiglottic fold [med] ⭐ Or Epiglottic vallecula [ant] Or Lateral glossoepiglottic fold [lat] ⭐

Terminal sulcus divides anterior two-thirds from posterior third; posterior third: IX for taste and touch; foramen caecum = origin of the thyroid

↳ Ascending pharyngeal artery [med] [deep] Lingual artery [ant] [deep] Occipital artery [post] Posterior auricular artery [post] Maxillary artery [med] [deep] Superficial temporal artery [sup] [superf.]

Laryngeal inlet and laryngopharynx

Laryngeal inlet [sup] Aryepiglottic fold [lat] ⭐ Laryngopharynx [post] Piriform recess [lat] ⭐ Fold of the superior laryngeal nerve [lat]

Internal laryngeal nerve runs in the mucosa of the piriform recess (fish bones lodge there)

Superior and middle constrictors Or

Pharyngobasilar fascia [sup] M Pterygomandibular raphe [ant] M Stylopharyngeus [lat] Or Pharyngeal raphe [post] M Middle pharyngeal constrictor [inf] N Pharyngeal plexus [lat] Or Retropharyngeal space [post] M Longus colli [med] [deep] M Longus capitis [lat] [deep] *All pharyngeal muscles are vagus (pharyngeal plexus) except stylopharyngeus (IX); stylopharyngeus and IX enter between the superior and middle constrictors*

Inferior constrictor and the Killian dehiscence

Inferior pharyngeal dehiscence (Killian) [post] Pharyngo-oesophageal junction [inf]

Killian's dehiscence between thyropharyngeus and cricopharyngeus: site of the Zenker diverticulum

Medial: thyroid and parathyroid glands 15

Thyroid gland: lobes and isthmus Or

Thyroid gland ⭐ A Inferior thyroid artery [post] [deep] ⭐ Or Lobes of the thyroid gland [lat] V Middle thyroid vein [lat] Or Isthmus of the thyroid gland [ant] V Inferior thyroid veins [ant] A Thyroid ima artery [inf] Or Pyramidal lobe of the thyroid gland [sup] ⭐ Or Suspensory ligament of the thyroid gland [med] [deep] *Isthmus lies on tracheal rings 2 to 4; pyramidal lobe = thyroglossal duct remnant*

Superior pole: superior thyroid vessels

Or Superior pole of the thyroid gland [sup] V Superior thyroid vein [sup] N External laryngeal nerve [med] [deep] ⭐ *Superior thyroid artery: first branch of the external carotid, with the external laryngeal nerve; ligate it close to the gland*

Posterior border of the lobe: parathyroid glands and middle thyroid vein

Superior parathyroid gland [post] ⭐ Inferior parathyroid gland [post] ⭐ *Inferior parathyroids come from the 3rd pouch (with the thymus) and migrate further; superior from the 4th. Superior and middle thyroid veins to the internal jugular, inferior to the brachiocephalic*

Inferior pole: inferior thyroid vessels

Inferior pole of the thyroid gland [inf] *Inferior thyroid artery from the thyrocervical trunk, close to the recurrent laryngeal nerve: ligate it away from the gland; thyroid ima artery (about 10%) from the brachiocephalic trunk or arch*

Medial: cervical trachea and oesophagus 14

Tracheo-oesophageal groove and the recurrent laryngeal nerves

Or Cervical part of the trachea [ant] A Brachiocephalic trunk [med] ⭐ Or Tracheal cartilages [ant] Or Tracheo-oesophageal groove [lat] Or Cervical part of the oesophagus [post] V Venous angle [post] *Right recurrent laryngeal hooks the right subclavian, left hooks the aortic arch (posterior to the ligamentum arteriosum); both ascend in the tracheo-oesophageal groove*

↳ Subclavian artery [lat] ⭐

↳ Subclavian: First part of the subclavian artery [med]

↳ First part of the subclavian:

Vertebral artery [sup] ⭐ Internal thoracic artery [inf] ⭐ ↳ Jugular lymphatic trunk [sup] Subclavian lymphatic trunk [lat] Thoracic duct (cervical part) [post] Right lymphatic duct [med]

Lateral: posterior triangle 26

Occipital triangle: accessory nerve on the levator scapulae

Or Posterior triangle of the neck [lat] ⭐ M Descending part of trapezius [post] [superf.] N Accessory nerve [sup] [superf.] ⭐ M Inferior belly of the omohyoid [inf] ⭐ N Roots of the brachial plexus [med] A Transverse cervical artery [sup] Or Occipital triangle [sup] M Levator scapulae [post] [deep] M Scalenus medius [post] [deep]

Accessory nerve lies superficially on levator scapulae: enters at the junction of the superior and middle thirds of the posterior border of SCM, reaches trapezius at the junction of its middle and inferior thirds

↳ Superior trunk [sup]

↳ Superior trunk: Suprascapular nerve [lat]

↳ Middle trunk [lat] Inferior trunk [inf] Divisions of the brachial plexus [inf]

Scalenus medius: dorsal scapular and long thoracic nerves

N Dorsal scapular nerve [post] A Dorsal scapular artery [post] N Long thoracic nerve [post] ⭐ M Scalenus posterior [post] [deep]

C5, 6, 7 - wings of heaven (long thoracic nerve, winged scapula); dorsal scapular (C5) and long thoracic pierce scalenus medius

Omoclavicular triangle Or

Omoclavicular triangle [inf] A Third part of the subclavian artery [lat] V Subclavian vein [ant] ⭐ A Thyrocervical trunk [med] ⭐ V Supraclavicular lymph nodes [inf] V Transverse cervical vein [sup] V Suprascapular vein [inf] *Inferior belly of the omohyoid divides the posterior triangle into occipital (superior) and omoclavicular (inferior) triangles*

↳ Suprascapular artery [ant]

Inferior and posterior: root of the neck, prevertebral region, sympathetic trunk 16

First part of the subclavian artery: vertebral and internal thoracic branches

Vertebral vein [ant] *VIT C and D (vertebral, internal thoracic, thyrocervical trunk, costocervical trunk, dorsal scapular); first part medial to scalenus anterior gives the first three*

Thyrocervical trunk at the medial border of scalenus anterior

Ascending cervical artery [med] *Thyrocervical trunk: inferior thyroid (gives ascending cervical), transverse cervical, suprascapular; SIT on the thyrocervical trunk (suprascapular, inferior thyroid, transverse cervical)*

Scalenus anterior: phrenic nerve and the scalene interval

Or Scalene interval [post] M Scalenus anterior [ant] ⭐ A Second part of the subclavian artery [post] *C3, 4, 5 keeps the diaphragm alive: phrenic descends on the anterior surface of scalenus anterior. Subclavian vein anterior to scalenus anterior, subclavian artery and plexus posterior to it (scalene interval); artery parts 1, 2, 3 = medial, posterior, lateral to the muscle*

↳ Costocervical trunk [post]

Venous angle: veins and lymphatic ducts

Or Lesser supraclavicular fossa [ant] [superf.] M Clavicular head of the sternocleidomastoid [lat]

Thoracic duct ends at the left venous angle (internal jugular + subclavian); right lymphatic duct drains only the right upper quadrant

Prevertebral fascia and muscles Or

Prevertebral layer of the deep cervical fascia [post] [deep] N Phrenic nerve [ant] [deep] ⭐ N Cervical sympathetic trunk [ant]

Deep cervical fascia: investing, pretracheal, prevertebral, carotid sheath; the danger space (anterior to the prevertebral layer) runs from skull base to diaphragm

↳ Superior cervical ganglion [sup] ⭐ Middle cervical ganglion [ant] Ansa subclavia [ant] Cervicothoracic ganglion [inf] ⭐ Cervical cardiac nerves (sympathetic) [inf]

Back pins · front

Superior: suboccipital triangle 25

Occiput: protuberance, nuchal lines and nuchal ligament
B External occipital protuberance post B Superior nuchal line post A Occipital artery lat ★ N Greater occipital nerve med ★ B Inferior nuchal line post M Rectus capitis posterior major med deep ★ M Rectus capitis posterior minor med deep M Obliquus capitis superior lat deep B Nuchal ligament med ★ B Mastoid process lat *External occipital protuberance (inion) anchors the nuchal ligament and trapezius; superior nuchal line for trapezius and sternocleidomastoid, inferior nuchal line for the suboccipital muscles*

↳ Descending branch of the occipital artery inf deep

Greater occipital nerve with the occipital vessels V Occipital vein lat N Third occipital nerve med *Posterior rami: C1 suboccipital (motor only), C2 greater occipital, C3 third occipital*

Suboccipital triangle: its muscles M Suboccipital muscles deep M Obliquus capitis inferior inf deep ★ B Posterior tubercle of the atlas post *Boundaries: rectus capitis posterior major (superomedial), obliquus capitis superior (superolateral), obliquus capitis inferior (inferior); rectus capitis posterior minor is not a boundary*

Floor of the suboccipital triangle: vertebral artery and suboccipital nerve
B Posterior arch of the atlas post ★ A Vertebral artery lat deep ★ N Suboccipital nerve inf deep ★ M Suboccipital triangle deep ★ B Groove for the vertebral artery sup ★ B Posterior atlanto-occipital membrane sup V Vertebral vein lat deep *Contents on the posterior arch of the atlas: vertebral artery and suboccipital nerve (C1); the greater occipital nerve crosses the roof*

↳ Atlantic part of the vertebral artery sup deep

↳ Suboccipital venous plexus post deep

Superior: craniovertebral joints (atlas, axis, ligaments of the dens) 30

Atlas (C1): ring and transverse process Atlas ★ Lateral mass of the atlas lat Transverse process of the atlas lat Foramen transversarium of the atlas lat *Atlas holds the globe: no body, no spinous process*

Axis (C2) and the lateral atlanto-axial joint Axis Body of the axis ant Superior articular facet of the axis sup Inferior articular facet of the atlas inf Lateral atlanto-axial joint lat Inferior articular process of the axis inf Spinous process of the axis post *C2 spinous process is the first large palpable spine inferior to the occiput*

Atlanto-occipital joint Occipital condyle inf Superior articular facet of the atlas sup Atlanto-occipital joint lat Anterior atlanto-occipital membrane ant *Atlanto-occipital = 'yes' joint (nodding: flexion and extension)*

Median atlanto-axial joint: dens in the ring of the atlas
Anterior arch of the atlas ant Anterior tubercle of the atlas ant Facet for the dens post Dens of the axis sup ★ Anterior articular facet of the dens ant Apex of the dens sup Posterior articular facet of the dens post Median atlanto-axial joint med *Atlanto-axial = 'no' joint (rotation around the dens)*

Ligaments of the dens (anterior to posterior)
Apical ligament of the dens sup Alar ligament lat Transverse ligament of the atlas post ★ Tubercle for the transverse ligament med Cruciate ligament of the atlas post Longitudinal bands of the cruciate ligament sup Tectorial membrane post *Anterior to posterior: apical ligament, alar ligaments (check rotation), cruciate ligament (transverse ligament), tectorial membrane (continuation of the posterior longitudinal ligament)*

Superior: cervical vertebrae 11

Cervical transverse process: vertebral artery and spinal nerve groove
B Typical cervical vertebra B Foramen transversarium lat ★ A Cervical part of the vertebral artery lat deep B Anterior tubercle of the transverse process ant B Carotid tubercle (C6) ant B Posterior tubercle of the transverse process post B Groove for the spinal nerve sup *Vertebral artery enters the foramen transversarium at C6 (not C7); C1 to C7 nerves exit superior to their vertebra, C8 inferior to C7*

Uncinate processes and cervical spines Uncinate process sup Uncovertebral joint lat Bifid spinous process post Vertebra prominens (C7) post ★ *Bifid spines C3 to C6; C7 vertebra prominens; uncovertebral joints (of Luschka) C3 to C6*

Posterior: superficial layer (trapezius, latissimus dorsi, rhomboids, levator scapulae) and intermediate layer (serratus posterior) 26

Trapezius: accessory nerve and transverse cervical vessels on its deep surface
M Descending part of trapezius sup superf. N Accessory nerve sup deep ★ A Transverse cervical artery sup ★ V Transverse cervical vein sup *Trapezius: motor from the accessory nerve (XI), proprioception C3, C4; the only back muscle supplied by a cranial nerve*

↳ Superficial branch of the transverse cervical artery sup

Trapezius insertion: spine of the scapula and acromion
B Spine of the scapula post M Trapezius sup superf. ★ M Transverse part of trapezius med superf. M Ascending part of trapezius inf superf. M Rhomboid minor med deep B Acromion lat *Trapezius and deltoid mirror each other: lateral clavicle, acromion, spine of the scapula*

Latissimus dorsi at the inferior angle B Inferior angle of the scapula inf M Latissimus dorsi inf superf. ★ N Thoracodorsal nerve lat deep A Thoracodorsal artery lat deep *Lady between two majors (latissimus dorsi inserts in the intertubercular groove between pectoralis major and teres major); thoracodorsal nerve C6 to C8*

Levator scapulae and rhomboids along the medial border
B Superior angle of the scapula sup M Levator scapulae sup deep ★ N Dorsal scapular nerve med deep A Dorsal scapular artery med deep B Medial border of the scapula med M Rhomboid major inf deep ★ *Medial border, superior to inferior: levator scapulae (superior angle), rhomboid minor (root of the spine), rhomboid major (spine to inferior angle); dorsal scapular nerve (C5), levator scapulae also C3, C4*

Serratus posterior over the rib angles; intercostal vein and artery (VAN)
M Serratus posterior superior sup deep M Serratus posterior inferior inf deep B Angle of the rib post A Posterior intercostal artery post V Posterior intercostal vein post *VAN (vein, artery, nerve, superior to inferior) in the costal groove; pass a needle along the superior border of the rib inferior to the space; serratus posterior superior and inferior form the intermediate layer, supplied by intercostal nerves*

Medial (deep): splenius, erector spinae, transversospinales 36

Nuchal fascia and splenius Nuchal fascia post superf. Splenius capitis sup superf. ★ Splenius cervicis inf superf. *Splenius = bandage: superficial layer of the intrinsic back muscles, wrapping the deeper columns*

Erector spinae: iliocostalis (lateral column)
Erector spinae ★ Common tendon of erector spinae inf Iliocostalis lat ★ Iliocostalis lumborum inf Iliocostalis thoracis lat Iliocostalis cervicis sup *I Love Spine (iliocostalis, longissimus, spinalis, lateral to medial)*

Erector spinae: longissimus (intermediate column)
Longissimus med ★ Longissimus thoracis inf Longissimus cervicis lat Longissimus capitis sup deep *I Love Spine (iliocostalis, longissimus, spinalis, lateral to medial)*

Erector spinae: spinalis (medial column) Spinalis med ★ Spinalis thoracis med Spinalis cervicis sup Spinalis capitis sup *I Love Spine (iliocostalis, longissimus, spinalis, lateral to medial)*

Semispinalis and the deep cervical vessels between its parts
M Semispinalis capitis sup deep ★ M Semispinalis cervicis med deep M Semispinalis thoracis inf deep A Deep cervical artery post deep V Deep cervical vein post deep *Some Men Rarely (semispinalis, multifidus, rotatores, superficial to deep)*

Multifidus and rotatores Multifidus med deep ★ Rotatores med deep Rotatores longi med deep Rotatores breves med deep *Some Men Rarely (semispinalis, multifidus, rotatores, superficial to deep)*

Short segmental muscles Interspinales med deep Intertransversarii lat deep Levatores costarum lat deep *Deepest segmental layer: interspinales, intertransversarii, levatores costarum*

Posterior rami and dorsal branches between the muscle columns
N Posterior ramus of a spinal nerve post deep ★ A Dorsal branch of the posterior intercostal artery post deep V Dorsal branch of the posterior intercostal vein post deep A Dorsal branch of the lumbar artery post deep *Intrinsic (true) back muscles are all supplied by posterior rami; extrinsic back muscles by anterior rami (trapezius by XI)*

↳ Medial branch of a posterior ramus med deep Lateral branch of a posterior ramus lat deep Posterior cutaneous branch of a posterior ramus post superf.

Back pins · back

Medial: thoracic vertebrae, joints and ligaments of the column 43

Vertebral body, intervertebral disc and longitudinal ligaments

Vertebral body (ant) ★ **Epiphysial rim of the vertebral body** (sup) **Cartilaginous end plate** (sup) **Intervertebral disc** (ant) ★ **Anulus fibrosus** (superf.) **Nucleus pulposus** (post) (deep) ★ **Anterior longitudinal ligament** (ant) ★ **Posterior longitudinal ligament** (post) ★ *Disc herniates posterolaterally and hits the nerve root of the lower level (L4/L5 disc compresses L5); anterior longitudinal ligament limits extension, posterior limits flexion*

Pedicles and the intervertebral foramen

Vertebral arch (post) **Pedicle of the vertebral arch** (lat) ★ **Superior vertebral notch** (sup) **Inferior vertebral notch** (inf) **Intervertebral foramen** (lat) ★ **Vertebral foramen** **Vertebral canal** *C1 to C7 exit superior to the pedicle of their vertebra, C8 and all others inferior to it*

Laminae and spines with their ligaments

Lamina of the vertebral arch (post) ★ **Ligamentum flavum** (post) (deep) ★ **Spinous process** (post) ★ **Interspinous ligament** (post) **Supraspinous ligament** (post) (superf.) *Lumbar puncture, superficial to deep: skin, supraspinous ligament, interspinous ligament, ligamentum flavum (the 'give'), epidural space, dura, arachnoid*

Articular and transverse processes: zygapophysial joint

Superior articular process (sup) **Inferior articular process** (inf) **Pars interarticularis** (post) **Zygapophysial joint** (post) ★ **Transverse process** (lat) ★ **Intertransverse ligament** (lat) *Scottie dog (oblique radiograph): nose = transverse process, eye = pedicle, ear = superior articular process, neck = pars interarticularis (collar = spondylolysis), front leg = inferior articular process*

Thoracic vertebra: costal facets and joint of the head of the rib

Thoracic vertebra **Superior costal facet** (sup) **Inferior costal facet** (inf) **Joint of the head of the rib** (med) **Radiate ligament of the head of the rib** (ant) **Intra-articular ligament of the head of the rib** (med) *Ribs 2 to 9 meet two demifacets (own vertebra + the one superior); 1, 10, 11, 12 single full facets*

Costotransverse joint and its ligaments

Transverse costal facet (ant) ★ **Tubercle of the rib** (post) **Costotransverse joint** (lat) **Costotransverse ligament** (med) **Lateral costotransverse ligament** (lat) **Superior costotransverse ligament** (sup) *Tubercle of rib N to transverse process of vertebra N; no costotransverse joints for ribs 11 and 12*

Named thoracic vertebrae (superior to inferior)

Spinous process of a thoracic vertebra (post) **First thoracic vertebra (T1)** (sup) **Tenth thoracic vertebra (T10)** (inf) **Eleventh thoracic vertebra (T11)** (inf) **Twelfth thoracic vertebra (T12)** (inf) *Spine levels: T3 at the root of the spine of the scapula, T7 at the inferior angle; T1, T10, T11, T12 have full facets for one rib*

Medial: meninges, epidural space and venous plexuses 20

External vertebral venous plexus

External vertebral venous plexus (superf.) *Vertebral venous plexuses (Batson) are valveless: route for prostate and breast metastases to the spine*

↳ **Anterior external vertebral venous plexus** (ant) (superf.) **Posterior external vertebral venous plexus** (post) (superf.)

Epidural space: internal vertebral venous plexus

Epidural space (V) **Internal vertebral venous plexus** (deep) ★ *Epidural space holds fat and the valveless internal vertebral venous plexus (Batson); reached caudally through the sacral hiatus*

↳ **Anterior internal vertebral venous plexus** (ant) (deep)

↳ Anterior internal vertebral venous plexus: **Basivertebral vein** (ant) (deep)

↳ **Posterior internal vertebral venous plexus** (post) (deep)

Dura and arachnoid mater

Spinal dura mater (superf.) ★ **Dural sac** (inf) (N) **Cauda equina** (inf) ★ **Spinal arachnoid mater** **Subarachnoid space** (A) **Anterior spinal artery** (ant) (A) **Posterior spinal artery** (post) *PAD (pia, arachnoid, dura, inner to outer); dural sac and subarachnoid space end at S2*

Pia mater and denticulate ligament

Spinal pia mater (deep) **Denticulate ligament** (lat) ★ (N) **Anterior root** (ant) (N) **Posterior root** (post) ★ *21 pairs of denticulate ligaments, between the anterior and posterior roots, anchor the cord to the dura*

↳ **Spinal ganglion** (post) ★

Medial: spinal cord, roots and arteries 34

Spinal cord and its enlargements

Spinal cord ★ (N) **Rootlets** (lat) **Cervical enlargement** (sup) **Lumbosacral enlargement** (inf) (A) **Great anterior segmental medullary artery** (ant) ★ *Cord ends at L1/L2 in adults (L3 at birth); cervical enlargement for the brachial plexus, lumbosacral for the lumbosacral plexus*

Conus medullaris, cauda equina and filum terminale

Conus medullaris (inf) ★ **Filum terminale** (inf) ★ **Pial part of the filum terminale** (inf) **Dural part of the filum terminale** (inf) **Lumbar cistern** (inf) *Cord ends L1/L2, sac ends S2; lumbar puncture at L3/L4 or L4/L5, using the intercristal (Tuffier) line at L4*

Anterior surface of the cord: anterior spinal vessels

Anterior median fissure (ant) (V) **Anterior spinal vein** (ant) **Anterolateral sulcus** (ant) *One anterior spinal artery (from both vertebral arteries), two posterior spinal arteries*

Posterior surface of the cord: posterior spinal vessels

Posterior median sulcus (post) (V) **Posterior spinal vein** (post) **Posterior intermediate sulcus** (post) **Posterolateral sulcus** (post) *Two posterior spinal arteries (posterolateral sulci), one anterior spinal artery*

Grey matter and central canal

Grey matter of the spinal cord **Anterior horn** (ant) ★ **Lateral horn** (lat) (N) **Spinal nerve** (lat) ★ **Posterior horn** (post) **Central canal** (med) *SAME DAVE (sensory afferent, motor efferent; dorsal = afferent, ventral = efferent): posterior root and horn sensory, anterior root and horn motor; lateral horn = sympathetic, T1 to L2*

↳ **Meningeal branch of the spinal nerve** (med)

↳ **Anterior ramus** (ant)

↳ Anterior ramus: **Rami communicantes** (ant)

White matter funiculi

Anterior funiculus (ant) **Lateral funiculus** (lat) **Posterior funiculus** (post) *Posterior funiculus = fine touch and proprioception; lateral = corticospinal and spinothalamic; anterior = anterior spinothalamic and corticospinal*

Spinal nerve roots in the dural root sleeve

Dural root sleeve (lat) *SAME DAVE (sensory afferent, motor efferent; dorsal = afferent, ventral = efferent): posterior root and horn sensory, anterior root and horn motor; the spinal ganglion sits on the posterior root*

Intervertebral foramen: spinal nerve and segmental vessels

(A) **Spinal branch of a segmental artery** (med) (deep) (V) **Intervertebral vein** (lat) *31 pairs of spinal nerves: 8 cervical, 12 thoracic, 5 lumbar, 5 sacral, 1 coccygeal; white rami communicantes only T1 to L2*

Radicular and medullary arteries

Radicular artery (lat) **Segmental medullary artery** (lat) *Great anterior segmental medullary artery (Adamkiewicz) usually from the left, T9 to T12*

Lateral: triangles of the back and thoracolumbar fascia 17

Triangle of auscultation

Triangle of auscultation (med) ★ *Boundaries: trapezius, latissimus dorsi, medial border of the scapula (rhomboid major)*

Superior lumbar triangle

(B) **Twelfth rib** (inf) (A) **Subcostal artery** (sup) (M) **Quadratus lumborum** (ant) (deep) (M) **Superior lumbar triangle** (sup) (deep) (M) **Internal oblique** (lat) (deep) *Grynfeltt: 12th rib, internal oblique, erector spinae / quadratus lumborum*

Inferior lumbar triangle and the iliac crest

(M) **Inferior lumbar triangle** (inf) (superf.) ★ (B) **Iliac crest** (sup) (N) **Superior clunial nerves** (inf) (superf.) (M) **External oblique** (lat) (superf.) *Petit: iliac crest, latissimus dorsi, external oblique; floor = internal oblique*

Thoracolumbar fascia (posterior to anterior layer)

Thoracolumbar fascia ★ **Posterior layer of the thoracolumbar fascia** (post) (superf.) **Middle layer of the thoracolumbar fascia** (lat) (deep) **Anterior layer of the thoracolumbar fascia** (ant) (deep) *Three layers wrap two muscles: posterior layer superficial to erector spinae, middle layer between erector spinae and quadratus lumborum, anterior layer anterior to quadratus lumborum*

Quadratus lumborum: subcostal and lumbar vessels

(A) **Lumbar artery** (med) (deep) (V) **Lumbar vein** (med) (deep) (V) **Ascending lumbar vein** (med) (deep) *Quadratus lumborum: 12th rib, transverse processes L1 to L4, iliolumbar ligament and iliac crest; anterior rami T12 to L4*

Inferior: lumbar vertebrae 5

Lumbar vertebra: processes

Lumbar vertebra **Spinous process of a lumbar vertebra** (post) **Costal process** (lat) **Accessory process** (post) **Mammillary process** (post) *Breakfast at 7, lunch at 12, dinner at 5 (7 cervical, 12 thoracic, 5 lumbar vertebrae); lumbar: no costal facets, no foramina transversaria*

Inferior: sacrum and coccyx 36

Lumbosacral junction: L5, sacral base and iliolumbar ligament

(B) **Fifth lumbar vertebra (L5)** (inf) (B) **Lumbosacral joint** (inf) (B) **Sacrum** ★ (B) **Base of the sacrum** (sup) (B) **Sacral promontory** (ant) ★ (A) **Median sacral artery** (med) (B) **Ala of the sacrum** (lat) (B) **Superior articular process of the sacrum** (sup) (B) **Iliolumbar ligament** (lat) *Spondylolisthesis is commonest at L5 on S1; the sacral promontory is the posterior landmark of the pelvic inlet*

Pelvic surface of the sacrum: anterior foramina and sacral arteries

(B) **Pelvic surface of the sacrum** (ant) (A) **Lateral sacral artery** (lat) (B) **Transverse lines of the sacrum** (ant) (B) **Anterior sacral foramina** (ant) *Four pairs of anterior sacral foramina for the anterior rami S1 to S4*

Dorsal surface of the sacrum: crests and posterior foramina (medial to lateral)

(B) **Dorsal surface of the sacrum** (post) (B) **Median sacral crest** (post) ★ (B) **Intermediate sacral crest** (post) (B) **Posterior sacral foramina** (post) (N) **Middle clunial nerves** (post) (superf.) (B) **Lateral sacral crest** (post) *Median crest = fused spines, intermediate = fused articular processes, lateral = fused transverse processes (medial to lateral)*

Sacro-iliac joint (superficial to deep)

Posterior superior iliac spine (post) **Posterior sacro-iliac ligament** (post) (superf.) **Sacral tuberosity** (lat) **Interosseous sacro-iliac ligament** (post) (deep) **Auricular surface of the sacrum** (lat) ★ **Sacro-iliac joint** (lat) *S2 level: posterior superior iliac spines (dimples of Venus), end of the dural sac, middle of the sacro-iliac joint*

Sacral canal and hiatus

Sacral canal **Sacral hiatus** (post) ★ **Sacral cornu** (inf) **Apex of the sacrum** (inf) *Sacral hiatus at S5 (unfused laminae), found between the sacral cornua: caudal epidural access*

Coccyx and sacrococcygeal joint

Coccyx **Base of the coccyx** (sup) **Coccygeal cornu** (sup) **Transverse process of the coccyx** (lat) **Apex of the coccyx** (inf) **Sacrococcygeal joint** (sup) **Superficial posterior sacrococcygeal ligament** (post) (superf.) *Coccyx: 3 to 5 (usually 4) fused vertebrae; only the first carries cornua and transverse processes*