

A Syllabus of Core Surgical Anatomy

Background

In February 2010, it was agreed that the Anatomy Committee would undertake to develop a new generic examination for implementation in 2012 to assess anatomy for surgical trainees.

Content

Anatomical questions relate to:

- clinical examination – surface anatomy, inspection, palpation, percussion, auscultation, pelvic examination, testing for peripheral nerve injuries, potential sites of spread of tumours (as determined by anatomy e.g. lymphatic drainage of the breast)
- urethral catheterization
- vascular access (arterial and venous, peripheral and central)
- the airway: maintenance, access
- chest drainage
- imaging (plain radiographs, CT, MRI, US, contrast studies)
- surgical access – open and minimally invasive
- endoscopy (GI, arthroscopy etc)
- peripheral nerve blocks
- percutaneous liver biopsy
- trauma (aligned to anatomy in EMST)
- common anatomical complications of routine surgical procedures
- principles of anatomy: terminology, anatomical position, planes, relationships in regional anatomy, movements, tissues, systems, and *anatomical variation*.

Syllabus

Essential (+++)

- What an early SET 1 trainee (PGY 2-3 with general experience) should know.
- Must recognise, understand and be able to explain.
- These structures comprise core basic surgical anatomy and are essential in inter-specialty communication.
- Lack of knowledge could jeopardise patient safety.
- Includes all common and important anatomical characteristics of the structure: location, constituent parts, relations, blood supply and lymphatic drainage, innervation, course and distribution, when the structure is at risk, effects of injury, and common variants of clinical importance.

Desirable (++)

- Should be able to describe the basic anatomy/location of the structure, its function, major nerve and blood supply \pm lymphatic drainage, and general relations.

Non-core (+)

- Not considered core knowledge but may be appropriate for specialty-specific anatomy.
- Should be able to recognise the structure and understands its basic function

General (all +++)

1. TERMS
The anatomical position, imaging planes, terms of relationship, movement
2. BODY SYSTEMS & ORGAN STRUCTURE (correlating with function)
Musculoskeletal system: Structure and types of bones (& cartilage), joints (& ligaments) and muscles (& tendons) Parts of a developing long bone, sites of growth and appearance of epiphyses Blood supply of a developing and mature long bone Skeletal muscle form and actions (prime mover, antagonist, fixator & synergist) Myotomes
Integumental system: Skin structure, types, specialisations, tension lines and surface area Dermatomes and sites of cutaneous sensory overlap Referred pain (somatic, visceral & neurogenic) Angiosomes Lymphatic drainage
Visceral systems (respiratory, digestive, urogenital & endocrine): Structure of hollow (tubular) and solid (glandular) viscera Sites of exocrine glands (& their ducts) and of endocrine glands/tissue Serosa and mesenteries, muscularis, and sites of sphincters (anatomical & functional) Mucosa and mucocutaneous junctions
Nervous systems (Central [CNS], Peripheral [PNS], Autonomic [ANS] & enteric): Sympathetic and parasympathetic divisions of ANS CNS (brain & spinal cord) and peripheral nerve structure Functional fibre types in spinal nerves and cranial nerves Types and sites of nerve roots, rami, ganglia and plexuses
Arterial systems (pulmonary & systemic): Structure and types of arteries and arterial branches Sites of arterial anastomoses (true & potential) and of arteriovenous (AV) anastomoses Sites of end arteries (anatomical & functional)
Venous systems (pulmonary, systemic & portal): Caval (superior & inferior), azygos and vertebral components of systemic venous system Structure of veins, sites of major valves & mechanisms of flow (vascular, muscle & thoracic pumps) Sites of venous sinuses, plexuses, and portosystemic anastomoses
Lymphatic and haemopoietic system: Structure and types of lymph nodes & vessels Sites of lymphovenous communications Lymphoid organs and mucosa associated lymphoid tissue (MALT)
3. BODY REGIONS & ORGAN POSITION
Flexor and extensor regions in the trunk and limbs Fascial septa, sheets, sheaths, compartments and planes Arrangement of body wall layers and serous cavities in the trunk Neurovascular bundles and their pathways in the limbs
4. VARIATION
Normal variation (age, sex, body build & functional factors) Anatomical variation (major clinically relevant variants in structure and position)
5. IMAGING
Projectional imaging (Plain radiographs & Contrast studies): Radiographic views and appearance Assessing bone/joint integrity and identifying fat/soft tissue or air/soft tissue interfaces
Sectional imaging (CT & MRI) and Ultrasound (US): Interpreting images

Thorax

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1. BONES		
Ribs, sternum, typical thoracic vertebra, scapula, clavicle		
2. JOINTS		
	Sternoclavicular, costochondral, manubriosternal, costovertebral	
3. LIGAMENTS		
Ligamentum arteriosum	Pulmonary ligaments	Pericardial ligaments
4. MUSCLES		
Diaphragm & respiration Intercostal muscles Pectoral muscles Serratus anterior	Scapular muscles	Paravertebral muscles Diaphragm development
5. ARTERIES		
Aorta Brachiocephalic trunk Common carotid arteries Subclavian arteries Internal thoracic arteries Pulmonary arteries Intercostal arteries	Thyrocervical trunk Costocervical trunk Lateral thoracic artery Thoracodorsal artery Coronary arteries Bronchial arteries	Dorsal scapular artery Thyroidea ima artery Branchial arch arteries
6. VEINS		
SVC and IVC Brachiocephalic veins Subclavian veins Azygos vein Pulmonary veins	Hemiazygos and accessory hemiazygos vein Superior and supreme intercostal veins Coronary veins	Internal thoracic veins Thebesian veins Thymic veins
7. LYMPHATICS		
Thoracic duct Major intrathoracic nodal gps	Bronchomediastinal lymph trunks	
8. NERVES		
Recurrent laryngeal nerve Phrenic nerve Vagus nerve Intercostal nerves Sympathetic trunk	Cardiac plexus Dermatomes (T2, T4, T10)	Pulmonary plexus Oesophageal plexus
9. SPACES		
Pleural cavities Pericardial cavity Intercostal	Pericardial sinuses	
10. HOLLOW VISCERA		
Oesophagus Trachea & main bronchi	Bronchopulmonary segments	
11. SOLID VISCERA		
Lungs Heart (chambers, basic conduction system, valves)	Thymus Foramen ovale Cardiac muscle	Cardiac and pulmonary development
12. SURFACE ANATOMY		
Pleura Sternal angle (T4/5) Cardiac borders	Lungs	Cardiac valve projections
13. BREAST		
Quadrants Lymphatic drainage	Structure Sentinel node Blood supply	Development
13. OTHERS		
Superior thoracic aperture Chest radiograph		

Abdomen

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1. BONES		
Ribs & costal margin		
2. LIGAMENTS/FASCIA		
Inguinal ligament Falciform ligament Spleno-renal & gastrosplenic Superficial fascia Preperitoneal, retroperitoneal & renal fascia	Anterior abdominal wall ligts Triangular and coronary ligts	Phreno-oesophageal lig
3. MUSCLES		
External & internal obliques Transversus abdominis Rectus abdominis Psoas major	Quadratus lumborum Iliacus	
4. ARTERIES		
Aorta + all major branches Epigastric arteries Major branches of splenic, common hepatic and mesenteric arteries		Circumflex iliac arteries Median sacral Pancreaticoduodenal
5. VEINS		
IVC and major tributaries Portomesenteric system Portosystemic anastomoses Gonadal veins	Lumbar veins Suprarenal veins	Inferior phrenic veins
6. LYMPHATICS		
Iliac nodes Pre- and para-aortic nodes Paracolic & mesenteric nodes	Cisterna chyli	Intestinal lymph trunk Lumbar lymph trunk
7. NERVES		
Celiac and aortic plexuses Vagi Intercostal/subcostal nerves Dermatomes (T10, L1)	Lumbar plexus & major branches Sympathetic trunk	Greater, lesser, and least splanchnic nerves Superior hypogastric plexus
8. SPACES & FORAMINA		
Retroperitoneal		
Perirenal spaces		
Intraperitoneal		
Peritoneal cavity, spaces, compartments/pouches/gutters Lesser sac/epiploic foramen		
Inguinal canal and contents		
9. HOLLOW VISCERA		
Oesophagus (abdominal) Stomach Duodenum, Jejunum, Ileum Caecum and Appendix Colon Renal pelves and ureters Gallbladder & extrahepatic bile ducts	Layers of stomach/gut wall Cholangiography	Development of gut
10. SOLID VISCERA		
Liver - lobes, ligaments, extrahepatic vessels, structure Spleen & Pancreas Suprarenal glands Kidneys	Development of kidney Histology of liver & kidney	Segmental anatomy of liver Intrahepatic vascular & biliary anatomy Renal segments Devpt: liver, spleen & pancreas
11. SURFACE ANATOMY		
Liver Spleen Appendix base Transpyloric plane	Supracristal plane Abdominal wall hernias	Subcostal plane
12. OTHERS		
Cross-sectional CT scans		

Pelvis

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1. BONES		
Ilium, Ischium, Pubis Sacrum		
2. JOINTS		
Sacroiliac joints Pubic symphysis	Lumbosacral joint	
3. LIGAMENTS		
	Sacrotuberous ligament Sacrosinous ligament	Sacroiliac ligaments
4. MUSCLES		
Levator ani and pelvic floor Gluteal muscles	Piriformis Obturator internus	
5. ARTERIES		
Internal iliac artery and major branches	Superior & inferior gluteal arteries Obturator artery Vaginal artery Ovarian artery	Umbilical arteries Superior and inferior vesical arteries Iliolumbar and lateral sacral arteries
6. VEINS		
Internal iliac veins	Pelvic venous plexuses: prostate, bladder, uterus, vagina	
7. LYMPHATICS		
	Internal iliac lymph nodes	
8. NERVES		
Sciatic nerve Pudendal nerve Obturator nerve	Sacral plexus & relations Lumbosacral trunk Hypogastric nerves Inferior hypogastric plexus Pelvic splanchnic nerves Sacral splanchnic nerves	Superior & inferior gluteal nerves
9. SPACES AND FORAMINA		
Pelvic inlet and outlet Greater & lesser sciatic foramina Rectouterine & rectovesical pouches Superficial and deep perineal pouches; scrotum Ischioanal fossae	Mesorectal fascia	Presacral and rectovesical fascia
10. VISCERA		
Rectum and anal canal Bladder and urethra Uterus, uterine tubes & broad ligament Ovaries Vagina Pelvic ureters Prostate Testis, ductus deferens & epididymis External genitalia	Testis development Anatomy of micturition, defaecation, sexual function	Cloacal development Seminal vesicles and ejaculatory ducts
11. SURFACE ANATOMY		
Perineum		
12. OTHER		
MRI midline sagittal hemipelvis and cross-section Plain radiograph pelvis		

Upper Limb

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1. BONES		
Clavicle & Scapula Humerus Radius & Ulna Carpal bones Metacarpals & Phalanges	Muscle attachments Sesamoid bones	Epiphyses – sites, dates of appearance/fusion
2. JOINTS		
Shoulder (glenohumeral) joint Acromioclavicular joint Elbow Wrist	Sternoclavicular joint Subacromial bursa Olecranon bursa Fat pads Radioulnar joints 1st CMC, MCP, IP joints	Other bursae Carpal joints
3. LIGAMENTS/FASCIA		
Shoulder girdle Coracoclavicular & Coracoacromial ligaments Elbow: collateral ligaments Radioulnar: anular ligament Wrist/Hand Flexor retinaculum Fibrous flexor sheaths	Costoclavicular ligament Acromioclavicular ligament Glenohumeral ligaments Interosseus membrane Extensor retinaculum Palmar aponeurosis Deep fascia	Sternoclavicular ligaments Coracohumeral ligament Palmar ligaments Transverse metacarpal ligaments Collateral ligaments
4. MUSCLES		
Shoulder girdle & Arm Pectoralis major and minor Serratus anterior Deltoid Latissimus dorsi Rotator cuff muscles Biceps brachii Triceps brachii Forearm Flexor & extensor compartments Hand Intrinsic muscles	Coracobrachialis Brachialis Teres major Rhomboids Pronator teres Flexor carpi radialis/ulnaris Palmaris longus Flexor digitorum superficialis Flexor pollicis longus Flexor digitorum profundus Brachioradialis Extensor digitorum Abductor pollicis longus Extensor pollicis longus/brevis Supinator Pronator quadratus Extensor carpi ulnaris Extensor carpi radialis longus & brevis Extensor indicis Extensor digiti minimi Abductor pollicis brevis Flexor pollicis brevis Opponens pollicis Adductor pollicis Dorsal/Palmar interossei Lumbricals Extensor mechanism	Subclavius Levator scapulae Anconeus Palmaris brevis Flexor digiti minimi Abductor digiti minimi Opponens digiti minimi
5. ARTERIES		
Axillary and major branches Brachial and major branches Radial Ulnar	Subscapular artery Circumflex humeral arteries Profunda brachii artery Interosseous arteries Superficial & deep palmar arches Digital arteries	Collateral and recurrent branches Scapular anastomoses
6. VEINS		

Superficial Cephalic Basilic Median cubital vein Deep Axillary Brachial	Dorsal venous arch	Venae comitantes
7. LYMPHATICS		
Axillary (main groups)	Axillary node levels Infraclavicular nodes Supratrochlear nodes	
8. NERVES		
Axillary Radial Musculocutaneous Median Ulnar + major branches & common nerve injuries (+digital)	Brachial plexus Medial & lateral pectoral nerves Suprascapular and subscapular nerves Cutaneous branches	Nerve to subclavius Dorsal scapular nerve
9. REGIONS & FORAMINA		
Axilla Cubital fossa Carpal tunnel Anatomical snuff box (boundaries & major contents)	Compartments of arm, forearm & hand Quadrangular space Guyon's canal	Palmar spaces
10. OTHER		
Dermatomes Reflexes	Myotomes	

Lower Limb

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1. BONES		
Hip Femur Patella Tibia & Fibula Talus Calcaneus	Sesamoid bones of foot Navicular Cuboid Cuneiforms Metatarsals Phalanges	Epiphyses – sites, dates of appearance/fusion
2. JOINTS		
Hip joint Knee joint Ankle joint	Bursae Tibiofibular joints Subtalar joint Talocalcaneonavicular joint	Bursae Fat pads Other intertarsal joints Tarsometatarsal, intermetatarsal, MTP and IP jts
3. LIGAMENTS/FASCIA		
Inguinal ligament Deep fascia (lata/crura) Iliofemoral ligament Patella ligament Collateral ligaments Cruciate ligaments Ankle: medial & lateral ligaments Flexor retinaculum	Transverse acetabular ligament Ligament of head of femur Oblique popliteal ligament Meniscomemoral ligaments Patellar retinacula Extensor retinacula Spring ligament Plantar aponeurosis Long & short plantar ligaments Arches of the foot	Pubofemoral & ischiofemoral ligaments Arcuate popliteal Transverse & Coronary Popliteofibular ligament Fibula retinacula Deep transverse metatarsal ligament Bifurcate ligament Talocalcaneal ligament
4. MUSCLES		
Hip Psoas major Gluteal muscles Piriformis Thigh Quadriceps Adductor longus/brevis/magnus Semitendinosus Semimembranosus Biceps femoris Leg Popliteus Tibialis anterior & posterior Fibularis longus & brevis Gastrocnemius Soleus	Iliacus Obturator internus & externus Quadratus femoris Pectineus Tensor fasciae latae Sartorius Gracilis Extensor hallucis longus Extensor digitorum longus Flexor digitorum longus Flexor hallucis longus Fibularis tertius	Gemelli Plantaris Intrinsic muscles of the Foot
5. ARTERIES		
Femoral artery Profunda femoris artery Popliteal artery Anterior & posterior tibial Dorsalis pedis	Superficial epigastric artery Medial & lateral circumflex femoral arteries Fibular artery	Superficial circumflex iliac External pudendal Perforating & genicular arteries Plantar vascular arches Lateral/medial plantar arteries Digital arteries
6. VEINS		
Superficial Great saphenous vein Sapheno-femoral junction Deep Femoral vein Popliteal vein	Small saphenous vein Tibial veins Soleal plexus	
7. LYMPHATICS		
Superficial/deep inguinal nodes		Popliteal nodes
8. NERVES		
Femoral nerve Saphenous nerve Obturator nerve Sciatic nerve	Lateral & medial plantar nerves	

Common peroneal nerve & branches Sural nerve Effects of major nerve injuries		
9. REGIONS & FORAMINA		
Femoral triangle Adductor canal Gluteal region Osteofascial compartments Popliteal fossa Tarsal tunnel		Sole of foot
10. OTHER		
Dermatomes Reflexes	Myotomes	

Back & Spine

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1. BONES		
Cervical, thoracic & lumbar vertebrae Sacrum & coccyx Features of vertebrae Intervertebral foramina		
2. JOINTS		
Atlantoaxial joints Intervertebral discs Sacro-iliac joints	Atlanto-occipital joints Costovertebral joints Zygapophyseal (facet) joints	Costotransverse joints
3. LIGAMENTS/FASCIA		
Transverse ligament of atlas	Anterior & posterior longitudinal ligaments Apical & alar ligaments Cruciform ligament Thoracolumbar fascia	Interspinous, supraspinous & intertransverse ligaments Ligamentum nuchae Ligamentum flavum Tectorial membrane Anterior & posterior atlanto-occipital and atlantoaxial membranes
4. MUSCLES		
Latissimus dorsi Trapezius	Rhomboids	Levator scapulae Serratus posterior Splenius capitis & cervicis Erector spinae group Transversospinal group Segmental muscle group Suboccipital muscles
5. ARTERIES		
Vertebral artery	Spinal arteries Artery of Adamkiewicz	
6. VEINS		
	Internal (epidural) venous plexus Intervertebral veins (Batson)	External vertebral venous plexuses Basivertebral veins
7. CONTENTS OF VERTEBRAL CANAL		
Spinal cord and nerve roots Cauda equina Meninges Subarachnoid space Epidural space		

Neck (excluding spine)

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1. BONES		
Hyoid bone	Hyoid ligaments	
2. FASCIA		
Superficial fascia Deep investing fascia Prevertebral/Pretracheal fascia Carotid sheath & contents		Buccopharyngeal fascia Pharyngobasilar fascia
3. MUSCLES		
Platysma Sternocleidomastoid Trapezius Scalenus anterior Suprahyoid /Infrahyoid muscles	Scalenus medius & posterior	Anterior vertebral muscle group
4. ARTERIES		
Common carotid artery Internal carotid artery External carotid + branches Vertebral artery	Thyrocervical trunk: inferior thyroid artery	Deep cervical artery Ascending cervical artery Transverse cervical artery Suprascapular artery
5. VEINS		
Internal jugular vein & major tributaries External jugular veins	Anterior jugular veins	
6. LYMPHATICS		
Superficial cervical nodes Spinal accessory chain Deep cervical nodes including jugulodigastric & jugulomohyoid nodes Retropharyngeal nodes		Level I-VII nodes
7. NERVES		
Glossopharyngeal Vagus Accessory Hypoglossal Phrenic Brachial plexus (formation, roots & trunks)	Carotid sympathetic plexus Carotid body Cervical plexus	Greater occipital nerve
8. REGIONS & SPACES		
Anterior, posterior & submandibular triangles Retropharyngeal space		Parapharyngeal spaces
9. VISCERA		
Larynx (cartilages, divisions [supraglottic, glottic, subglottic], vestibule, ventricles, cords) Cricothyroid membrane Pharynx (nasopharynx, oropharynx, laryngopharynx) Constrictor muscles Palatine tonsil Sphenoethmoidal recess Thyroid gland Parathyroid glands Trachea & Oesophagus	Vestibular folds Intrinsic muscles Piriform fossa Stylopharyngeus Palatopharyngeus Pharyngotympanic (Eustachian) tube	Laryngeal saccule Salpingopharyngeus
10. SURFACE ANATOMY		
Carotid artery bifurcation C6/cricoid transitions Internal jugular vein Accessory nerve		
11. OTHER		
CT axial sections & midline sagittal MRI		Branchial arches, pouches and clefts

Head (excluding CNS)

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1. BONES		
Cranial vault & face Mandible	Sutures Orbital bones	Teeth (numbering, naming & parts)
2. JOINTS		
	Temporomandibular joint	
3. LIGAMENTS/FASCIA		
Layers of scalp		Fascial sheath of eyeball Check ligaments
4. MUSCLES		
Mylohyoid Hyoglossus Digastric	Muscles of facial expression Muscles of mastication Extraocular muscles Extrinsic muscles of tongue	Intrinsic muscles of tongue Stapedius Tensor tympani
5. ARTERIES		
Major arteries of scalp Internal carotid artery Middle meningeal artery Vertebral artery Ophthalmic artery	Facial artery Lingual artery Central artery of retina Anterior & posterior ethmoidal Major arteries to nasal cavities	Ciliary arteries Zygomaticofacial & temporal
6. VEINS		
Extracranial/intracranial venous anastomoses	Sup & inf ophthalmic veins Facial & angular vein	Central retinal vein
7. LYMPHATICS		
Superficial: submental, submandibular/preauricular parotid/postauricular/mastoid		
8. NERVES		
Scalp innervation Cranial nerves I: Olfactory bulb & tract II: Retina, optic nerve & chiasm III: Oculomotor nerve IV: Trochlear nerve V: Trigeminal ganglion, division & major branches VI: Abducens nerve VII: Facial nerve & major branches VIII: Vestibulocochlear nerve IX: Glossopharyngeal nerve X: Vagus nerve XI: Accessory nerve XII: Hypoglossal nerve Effects of common lesions	Ciliary ganglion & nerves	Nerve supply of nasal cavities Tympanic (Jacobsen's) nerve
9. REGIONS & FORAMINA		
Anterior, middle, & posterior cranial fossa Major skull foramina (contents) External auditory meatus & tympanic membrane Temporal fossa Oral cavity	Nasal cavity & paranasal sinuses Mastoid air cells Middle ear Infratemporal fossa Pterygopalatine fossa Palate	Ossicles Inner ear
10. VISCERA		
Parotid gland Submandibular gland	Sublingual salivary glands	
10. SURFACE ANATOMY		
Pterion Parotid duct Facial nerve		
12. OTHER		
	Lacrimal apparatus Cornea Lens Retina	Eyelids & tarsal plates Conjunctival sac Sclera, iris, fovea, choroid

Central Nervous System

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1. BRAIN		
White matter Grey matter Cerebral cortex Frontal, temporal, parietal, & occipital lobes Precentral & postcentral gyri Interhemispheric fissure Lateral (Sylvian) fissure	Corpus callosum Optic tract Internal capsule Basal ganglia Central sulcus Broca & Wernicke areas Visual & auditory cortex	Reticular formation Hippocampus & limbic system
2. BRAINSTEM		
White matter Grey matter	Cerebral peduncles Pyramidal decussation Cranial nerve nuclei & roots Thalamus Pineal gland Hypothalamus Superior & inferior colliculi	Cerebellar peduncles Pontine, olivary nuclei etc
3. VENTRICULAR SYSTEM & CSF CIRCULATION		
Lateral ventricles Third ventricle Cerebral aqueduct Fourth ventricle	Choroid plexus CSF circulation	Basal CSF cisterns Walls of lateral & 3 rd ventricle Floor of 4 th ventricles Boundaries of Foramen on Monro
4. PITUITARY GLAND		
Adeno- and neurohypophysis		Blood supply
5. MENINGES		
Pia, arachnoid & dura Reflections: falx cerebri, tentorium cerebelli Middle meningeal artery Subarachnoid, subdural, & extradural space		Meningeal blood supply Meningeal innervation
6. THE CEREBELLUM		
	Vermis, lobes & tonsils	Nuclei & connections
7. ARTERIES		
Internal carotid arteries, major branches & segments Vertebral & basilar arteries	Ophthalmic artery Circle of Willis Middle cerebral artery Anterior cerebral artery	Cerebellar arteries Anterior choroidal artery Perforating arteries
8. VENOUS SINUSES		
Major venous sinuses (superior sagittal, cavernous, straight, transverse, sigmoid)	Cerebral veins Petrosal sinuses	
9. SPINAL CORD		
Basic organisation of grey & white matter (corticospinal and spinothalamic tracts and dorsal columns) Spinal nerve, ventral & dorsal nerve roots, dorsal root ganglia Autonomic outflow Meninges Filum terminale Subarachnoid and epidural space & central canal	Cervical & lumbar enlargements Spinal cord arteries	
9. SURFACE ANATOMY		
Central sulcus & primary motor/sensory cortex	Transverse sinus Sylvian fissure	