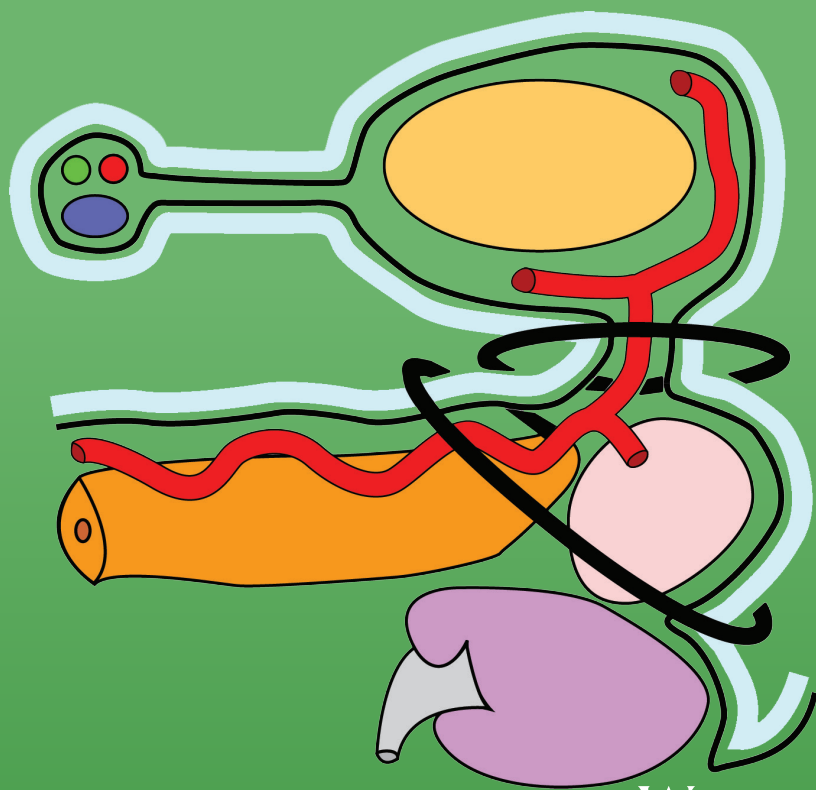
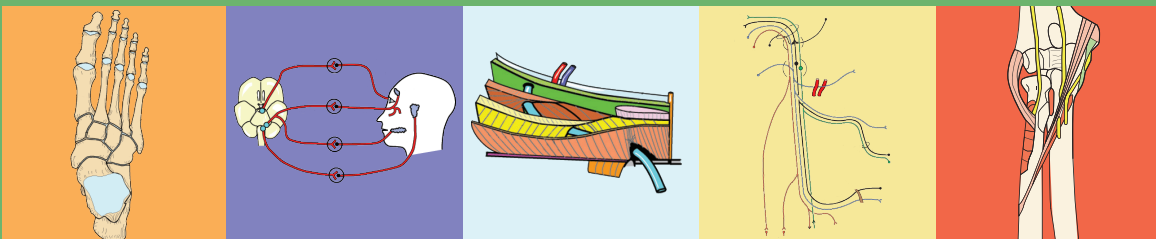


Instant Anatomy

Fifth Edition

Robert H. Whitaker and Neil R. Borley



WILEY Blackwell

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INSTANT ANATOMY

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FIFTH EDITION

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PREFACE TO FIFTH EDITION

We have added some more material to this 5th edition but believe that we have kept to our original plan of a quick reference book that is user friendly. Most of the new material is presented as easy ways to remember tricky little areas of anatomy that our students have found so useful over the years. A good example is the new section entitled “rules and exceptions” which we hope you will find useful and possibly even fun.

As always we continue to believe that anatomy is the language of medicine and that at qualification as a doctor, physiotherapist, nurse or radiographer, to name just a few professions, there is a basic amount of anatomical knowledge that is essential. It is at last beginning to dawn on many specialities in medicine that many mistakes that lead to surgical or other errors are due to inadequate anatomical knowledge.

Most of the expansion in this 5th edition has been in the last section of “Surface

Anatomy and Key Areas” that includes clinically applicable material such as the examination of the heart and chest. We continue to resist the occasional request for an index but please do give us feedback on your assessment of this new edition which, despite a little expansion, remains true to our initial intention to produce an instant reference book for the white coat pocket and briefcase.

Since the previous editions our **Instant Anatomy Website** (www.instantanatomy.net) has continued to flourish and subscriptions (www.instantanatomy.co.uk) have been taken out by a number of universities and many individuals. If you like sitting back and watching and listening to podcasts then this is the site for you.

ROBERT WHITAKER

NEIL BORLEY

Cambridge and Cheltenham, 2016

PREFACE TO FIRST EDITION

How many times have you looked up the course of an artery or nerve in one of the excellent anatomy textbooks that are available today only to find that the details are spread over several sections of the book and that an instant summary is not available? At times like this you wish there was a quick reference book with all the answers neatly catalogued in dictionary format.

We have attempted to provide such a concise text for rapid reference. Of course, we emphasise that this is not a text for learning anatomy from scratch but one that should be used in conjunction with one of the fuller texts that has stood the test of time. The book is designed for those who already have some working knowledge of anatomy and need to find accurate facts quickly.

Both authors have been sufficiently recent students of anatomy for higher degrees and for teaching undergraduate medical students that each can remember the problems that both students and they themselves encountered. The book has been compiled with this in mind.

It is designed primarily for undergraduate medical students and prospective surgeons who are studying for a higher degree in surgery. For each of these groups we believe it will be ideal. However, it should also be extremely useful for all clinicians who need to remind themselves of anatomical facts at all stages in their careers and for other professional groups such as nurses, physiotherapists and radiographers.

Inevitably in a book of this size there has been some selection of material for inclusion and no attempt has been made to provide details of minutiae that appear in the fuller text.

The authors' original artwork was redrawn with a graphics program by Jane Fallows, medical illustrator, to whom the authors owe an immense debt of gratitude for her skill and patience.

ROBERT WHITAKER
NEIL BORLEY
Cambridge, 1994

NOTES ON THE TEXT

The illustrations show the **right** side of the body as viewed from in front, unless otherwise indicated. The two exceptions are the cervical and brachial plexuses where it makes little difference as to which side they are viewed and they are more conveniently drawn and remembered as they are shown here. Where there might be confusion, a small compass has been added to indicate the left and right *sides of the body*.

Eponymous names appear sparingly and only when they are in common usage. The following abbreviations have been used as appropriate throughout the text.

List of abbreviations

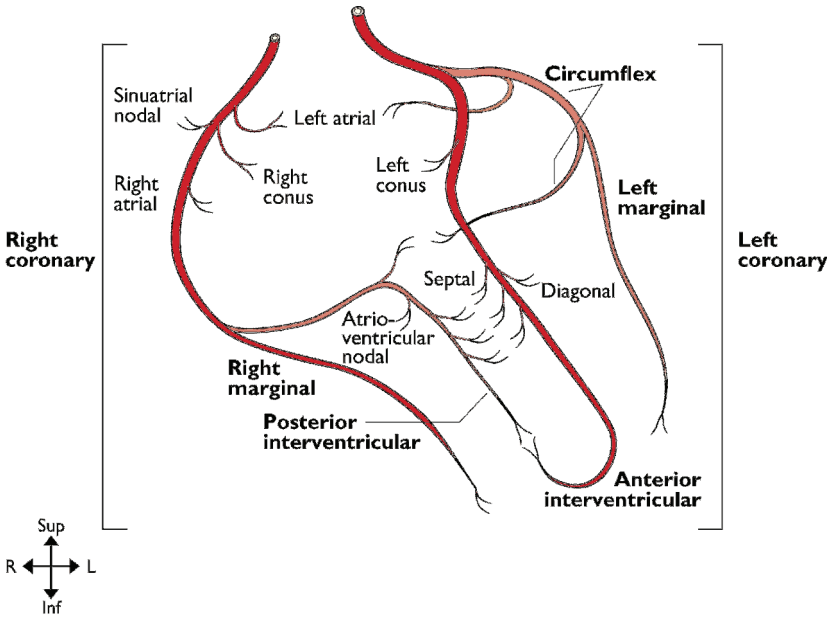
ant	anterior(ly)
art(s)	artery(ies)
br(s)	branch(s)
CMC	carpometacarpal
div(s)	division(s)
ext	external

inf	inferior(ly)
int	internal
IP	interphalangeal
jnt(s)	joint(s)
lat	lateral(ly)
lig(s)	ligament(s)
med	medial(ly)
MC(s)	metacarpal(s)
MCP	metacarpophalangeal
MTP	metatarsophalangeal
MT(s)	metatarsal(s)
N(s) or	nerve(s)
post	posterior(ly)
prox	proximal
sup	superior(ly)
TMT	tarsometatarsal
V(s)	vein(s)

Note: Abbreviations are not used for muscle names or in titles. The following words are always written in full: greater, lesser, middle, superficial and combinations such as posterolateral.

I : ARTERIES

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Coronary arteries

CORONARY ARTERIES

From: Ascending aorta

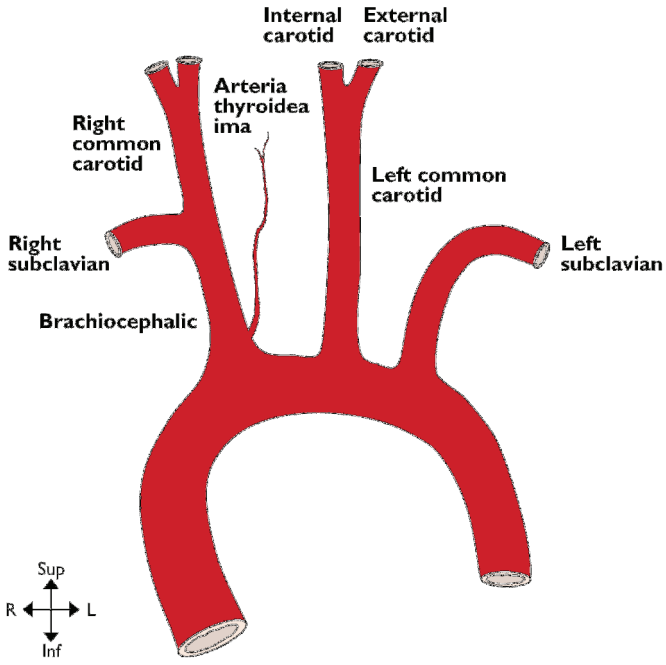
To: Myocardium

Right coronary artery. Originates from the anterior aortic sinus. It passes anteriorly between the pulmonary trunk and the right auricle to reach the atrioventricular sulcus in which it runs down the anterior surface of the right cardiac border and then onto the inferior surface of the heart. It terminates at the junction of the atrioventricular sulcus and the posterior interventricular groove by anastomosing with the circumflex branch of the left coronary artery and giving off the posterior interventricular (posterior descending) artery. It supplies the right atrium and part of the left atrium, the sinoatrial node in 60% of cases, the right ventricle, the posterior part of the interventricular septum and the atrioventricular node in 80% of cases.

Left coronary artery. Arises from the left posterior aortic sinus. It passes laterally, posterior to the pulmonary trunk and anterior to the left auricle to reach the atrioventricular groove where it divides

into an anterior interventricular (formally left anterior descending) artery and circumflex branches. The circumflex artery runs in the atrioventricular sulcus around the left border of the heart to anastomose with the right coronary artery. The anterior interventricular artery descends on the anterior surface of the heart in the anterior interventricular groove and around the apex of the heart into the posterior interventricular groove where it anastomoses with the posterior interventricular branch of the right coronary artery. The left coronary artery supplies the left atrium, left ventricle, anterior interventricular septum, sinoatrial node in 40% of cases and the atrioventricular node in 20%.

Dominance. In approximately 10% of hearts the posterior interventricular artery arises from the circumflex artery (left coronary) and then most of the left ventricle and interventricular septum are supplied by the left coronary artery. The heart is said to have *left cardiac dominance*.



Ascending & arch of aorta

ASCENDING & ARCH OF AORTA**From:** Left ventricle**To:** Descending aorta

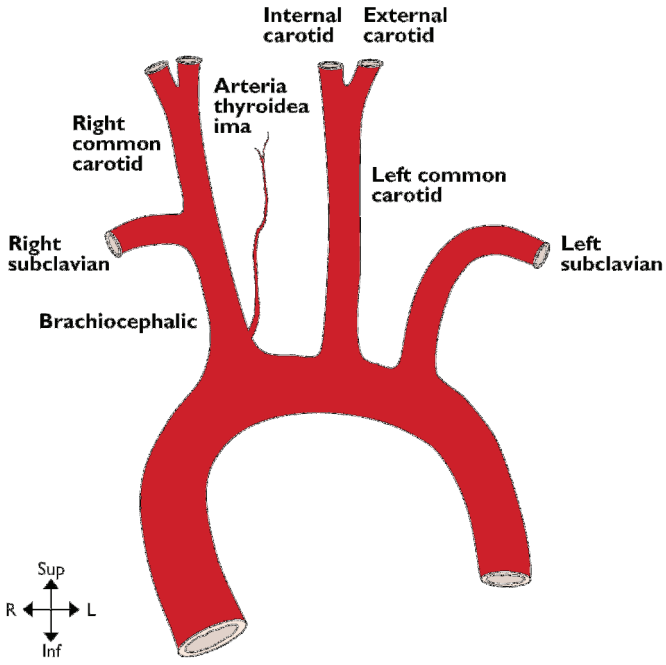
Ascending aorta. Arises at the vestibule of the left ventricle at the level of the third left costal cartilage and passes upwards and slightly to the right to a point behind the sternum at the level of the manubriosternal joint (second costal cartilage) where it becomes the arch of the aorta. It is enclosed in fibrous and serous pericardium. Anterior to it are the right auricle, the infundibulum of the right ventricle and pulmonary trunk. Posterior, lie the left atrium, the right pulmonary artery and right main bronchus. To the left lie the pulmonary trunk and the left auricle. To the right are the superior vena cava and the right atrium.

Arch of aorta. The arch begins posterior to the manubriosternal joint at the level of the second costal cartilage and passes posterior and to the left, over the left main bronchus to end at the left side of the body of T4 vertebra. Its highest level is the mid-point of the manubrium sterni and at this level its three main branches emerge. Anterior and to the left of the arch are (from anterior to posterior) the left phrenic nerve, vagal and sympathetic contributions to the cardiac plexus, and the left vagus. Also, the left superior intercostal vein runs forwards on the arch anterior to the vagus and posterior

to the phrenic nerve. Lateral to all these structures are the pleura and left lung. Posterior and to the right of the arch are the trachea, deep cardiac plexus, left recurrent laryngeal nerve, oesophagus, thoracic duct and the body of T4. Inferior to the arch are the pulmonary bifurcation, the left main bronchus, the ligamentum arteriosum and the left recurrent laryngeal nerve. From its superior surface emerge the brachiocephalic artery, the left common carotid and left subclavian arteries. Within the adventitia of the ascending and arch of the aorta lie baro- and chemoreceptors.

Brachiocephalic artery. Arises from the convexity of the aortic arch behind the manubrium sterni and passes upwards and posteriorly to the right. It divides into the right subclavian and right common carotid arteries posterior to the right sternoclavicular joint. Anterior to it are the left brachiocephalic vein with the right inferior thyroid vein entering it, and the thymic remnants. The artery initially lies anterior to the trachea and then passes to lie on its right lateral side. On the right of the artery are the right brachiocephalic vein, upper part of the superior vena cava, the pleura and the cardiac branches of the vagus. The main vagal trunk is more posterolateral. At the origin of the brachiocephalic artery the left common carotid artery lies posteriorly on its left.

continued



Ascending & arch of aorta

Common carotid arteries. The right common carotid artery arises from the brachiocephalic artery as it divides posterior to the right sternoclavicular joint, whilst the left common carotid arises from the convexity of the aortic arch. Both end as the arteries bifurcate at the level of the upper border of the thyroid cartilage (C4).

Left common carotid artery (thorax). Lying anterior to the thoracic part of this artery are the left brachiocephalic vein and the thymic remnant. Posterior to it in its lower part are the left subclavian artery and the trachea whilst further superiorly there is the left recurrent laryngeal nerve, the thoracic duct and the left side of the oesophagus. On its right at its origin is the brachiocephalic artery but as it ascends the inferior thyroid veins and the trachea come to lie on its

right side. To its left lie the vagus, the left phrenic nerve and the left pleura and lung.

Both common carotid arteries (cervical). Ascend in the neck slightly laterally from a point posterior to the sternoclavicular joint to end at the level of the upper border of the thyroid cartilage (C4) at which point there is a dilatation—the carotid sinus (a baroreceptor). On the posterior aspect of the bifurcation there is the carotid body (a chemoreceptor). Lying between left and right arteries, and medial to each, progressively from below are the trachea, recurrent laryngeal nerves, thyroid gland, larynx and pharynx. Each artery lies in its carotid sheath with the internal jugular vein lateral to it and the vagus nerve between and posterior to them both.

INTERNAL CAROTID ARTERY, VERTEBROBASILAR SYSTEM & CIRCLE OF WILLIS

From: Bifurcation of the common carotid
arts (C4) & first parts of subclavian arts
To: Terminal brs

The internal carotid artery angles from the bifurcation slightly posteriorly to reach the carotid canal through which it enters the skull to end as middle and anterior cerebral arteries. At its origin it possesses a dilatation in which lie the carotid sinus and body. In the neck it is crossed laterally by, from below up, the pharyngeal branch of the vagus (X), glossopharyngeal nerve (IX), stylopharyngeus and styloglossus. It lies on the pharyngeal wall and the pharyngobasilar fascia. Within the carotid canal it turns 90 degrees anteromedially to run through the petrous temporal bone where it lies medial to the middle ear. It then turns 90 degrees superiorly to pass across the upper limit of the foramen lacerum. It then turns 90 degrees anteriorly to pass forwards, lateral to the body of the sphenoid which it grooves. Here it lies in the medial wall of the cavernous sinus with the abducent nerve (VI) on its lateral side. At the anterior end of the cavernous sinus it turns 90 degrees superiorly and then 90 degrees posteriorly to pass medial to the anterior clinoid process and lateral to the pituitary stalk and optic chiasma. It ends as terminal branches on the medial surface of the temporal lobe.

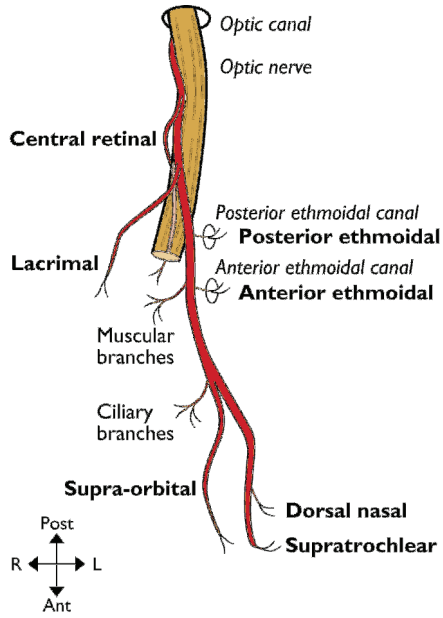
Anterior cerebral artery is formed by the bifurcation of the internal carotid artery. It passes anteriorly over the optic nerve to arch over the genu of the corpus callosum on the medial aspect of the cerebral hemispheres where it ends as terminal branches.

Middle cerebral artery is formed by the bifurcation of the internal carotid artery. It runs laterally into the sylvian fissure and then posterosuperiorly in the sulcus where it divides into terminal branches.

Basilar artery is formed by the junction of the left and right vertebral arteries (see subclavian artery, pp. 16–19) anterior to the upper medulla. From there it ascends lying angled forwards between the pons and the clivus in a slight depression on the anterior surface of the pons. It terminates at the upper border of the pons as posterior cerebral arteries.

Posterior cerebral artery is formed by the bifurcation of the basilar artery. It passes laterally around the cerebral peduncle to run posteriorly above the tentorium cerebelli on the inferomedial surface of the occipital lobe where it divides into terminal branches.

(Other branches of the internal carotid artery, not illustrated, are caroticotympanic, pterygoid and cavernous arteries.)



Ophthalmic artery

Note: Right side viewed from above

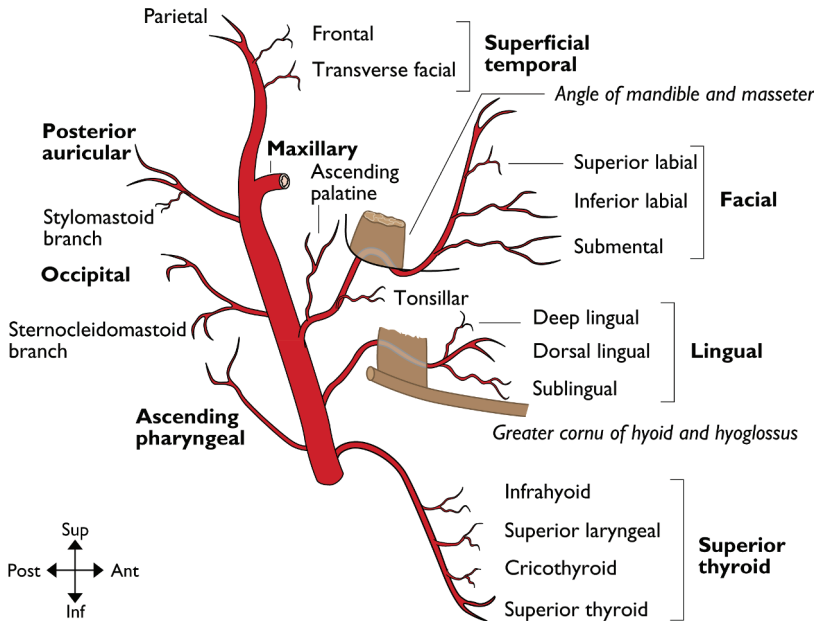
OPHTHALMIC ARTERY**From: Internal carotid art****To: Terminal brs in orbit**

It arises from the internal carotid artery as it lies medial to the anterior clinoid process and runs anteriorly through the optic canal within the optic nerve's dural sheath, lying inferolateral to the nerve. Small branches supply the proximal nerve. In the orbit the artery leaves the dural sheath and passes forwards around the lateral side of the nerve to cross anterior to it to reach the medial orbit. It then continues medially between superior oblique and medial rectus to pass out of the cone of muscles to reach the medial wall of the orbit. The artery continues forwards to terminate at the

medial orbital border deep to the superior tarsal plate as branches which leave the orbit to anastomose with branches of the facial artery.

Central retinal artery. This small, important end artery supplies the optic nerve and retina. It leaves the ophthalmic artery below the optic nerve and then, half way along the orbital part of the optic nerve, enters first the dural sheath and then the nerve itself.

(Other branches, not illustrated, (1) of ophthalmic artery are anterior meningeal and medial palpebral arteries; (2) of lacrimal artery are lateral palpebral, zygomatic and recurrent meningeal arteries; (3) of muscular is anterior ciliary artery.)



External carotid artery

EXTERNAL CAROTID ARTERY

From: Upper border of thyroid cartilage (C4)
To: Terminal brs within parotid gland post to neck of mandible

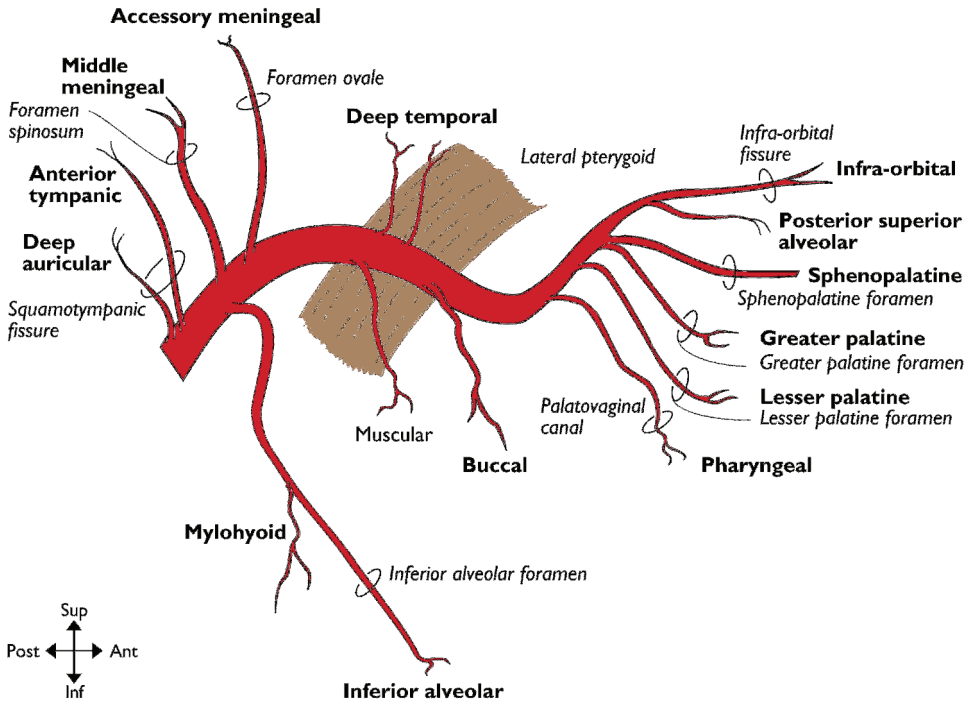
The artery arises within the carotid sheath from the bifurcation of the common carotid artery. It lies at first anteromedial to the internal carotid artery but spirals over it to come to lie lateral to it at the level of C2. Initially, it angles slightly forwards and then curves backwards as it ascends to enter the parotid gland between deep and superficial lobes. During its course it is crossed by, from below upwards: the upper root of the ansa cervicalis, the hypoglossal nerve, the posterior belly of digastric, stylohyoid, the stylohyoid ligament and the facial nerve (within the parotid). Passing between it and the internal carotid artery are, from below upwards, the pharyngeal branch of the vagus (X), glossopharyngeal nerve (IX), stylopharyngeus and styloglossus. It lies on, from below upwards, pharyngeal wall, superior laryngeal branch of the vagus (X) and deep parotid lobe.

Superior thyroid artery. Arises from the anterior surface of the external carotid artery near its origin and runs inferiorly and forwards deep to omohyoid and lateral to the inferior constrictor and external laryngeal nerve to reach the upper pole of the thyroid gland.

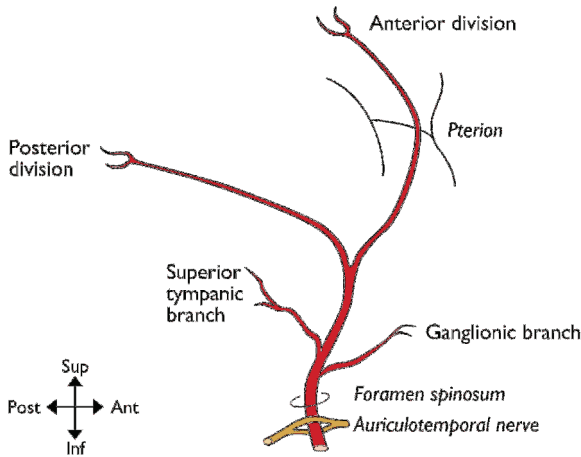
Lingual artery. Runs superiorly looping over the greater cornu of the hyoid bone and passes medially (deep) to hyoglossus and then into the substance of the tongue.

Facial artery. Arises from the anteromedial surface of the external carotid artery and runs above the hyoid bone deep to digastric and passes upwards to reach the posterior surface of the submandibular gland which it grooves deeply, lying medial to the body of the mandible. Here it lies on superior constrictor, directly lateral to the palatine tonsil. It then follows a tortuous course looping at first inferiorly and then upwards around the lower border of the mandible to cross the bone anterior to the insertion of masseter (where it is easily palpable). It then runs in the superficial tissues of the face towards the angle of the mouth where it turns superiorly towards the medial canthus of the eye. (Other branches, not illustrated, are glandular (to submandibular gland) and lateral nasal arteries.)

Superficial temporal artery. Runs superiorly between the deep and superficial lobes of the parotid gland, over the posterior end of the zygomatic process (where it is easily palpable) and terminates in the subcutaneous tissues of the lateral scalp.



Maxillary artery



Middle meningeal artery

MAXILLARY ARTERY

From: External carotid within parotid gland
To: Terminal brs in pterygopalatine fossa

It arises from the external carotid artery within the parotid gland posterior to the neck of the mandible and ends as the sphenopalatine artery. The artery is divided into three portions by its relationship posterior, in, or anterior to the lateral pterygoid muscle. The first part passes deep to the neck of the mandible between the bone and the sphenomandibular ligament and runs anteriorly lateral to the inferior alveolar nerve to reach the border of the lateral pterygoid. The second part angles anteromedially between the two heads of lateral pterygoid between anterior and posterior divisions of the mandibular nerve. The third part leaves the lateral pterygoid to enter the pterygopalatine fossa where it terminates as branches which accompany

the branches of the maxillary division of the trigeminal nerve (Vb).

Inferior alveolar artery. Passes inferolaterally posterior to the inferior alveolar nerve onto the medial surface of the ramus of the mandible which it grooves as it enters the inferior alveolar (mandibular) foramen in the mandible. It is distributed along the mandibular canal to the lower jaw and teeth. Its terminal branch appears as the mental branch through the mental foramen.

(Other branches, not illustrated, (1) of maxillary artery (third part) is artery of pterygoid canal; (2) of inferior alveolar artery are dental and mental; (3) of infraorbital artery are dental and anterior superior alveolar; (4) of posterior superior alveolar artery is dental.)

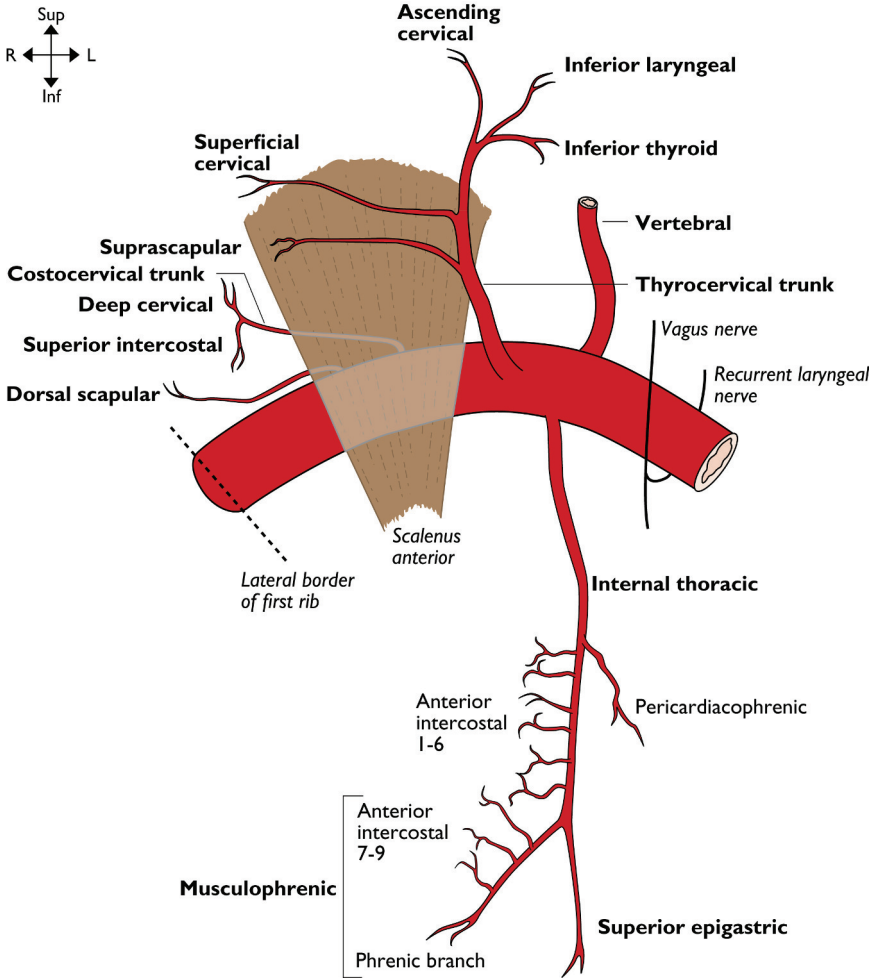
MIDDLE MENINGEAL ARTERY

From: First part of maxillary art
To: Terminal brs

It arises from the superomedial surface of the maxillary (first part) to run between the two rootlets of the auriculotemporal nerve as it passes vertically into the foramen spinosum in the greater wing of the sphenoid bone. After a very short course laterally over the greater wing of the sphenoid in the middle cranial fossa it divides into anterior and posterior divisions. The anterior division runs anterolaterally on the floor of the middle cranial fossa beneath the dura mater and grooves the greater wing of the sphenoid as it passes upwards to the junction of the lesser and greater wings. Here it may

groove deeply or tunnel through the bone at the apex of the greater wing. It passes across the inner aspect of the pterion onto the parietal bone. The posterior division runs almost horizontally posterolateral over the inner aspect of the squamous temporal bone onto the lower parietal bone where it gives terminal branches.

Because of the problem of extradural haemorrhage caused by damage to this artery, the surface anatomy is important. Anterior branch: 3cm above mid-point of zygomatic arch. Posterior branch: on a line vertically from the mastoid process and horizontal from the upper margin of the orbit.



Subclavian artery

Note: (1) The superficial cervical artery is named 'transverse cervical artery' if it gives origin to the dorsal scapular artery instead of the latter arising separately from the second part of the subclavian artery; (2) phrenic branch of musculophrenic artery anastomoses with inferior phrenic artery

SUBCLAVIAN ARTERY

From: Right—brachiocephalic trunk

Left—aortic arch

To: Axillary art

The subclavian arteries arise as indicated above and end at the outer border of the first rib where they become the axillary arteries. They each have three parts: (1) medial (three branches); (2) behind (two branches); and (3) lateral (no branches) to scalenus anterior.

Right subclavian artery—first part. Arises from the brachiocephalic artery behind the right sternoclavicular joint, lying initially posterior to the right common carotid artery, and then passing upwards and laterally to reach the medial side of scalenus anterior. Anterior to this first part are the vagus (X), its cardiac branches, sympathetic nerves, the internal jugular and vertebral veins. The ansa subclavia (sympathetic nerves) curls around the artery to lie both anterior and posterior to it. As the artery arches laterally the suprpleural membrane and the right recurrent laryngeal nerve lie inferior and posterior to it.

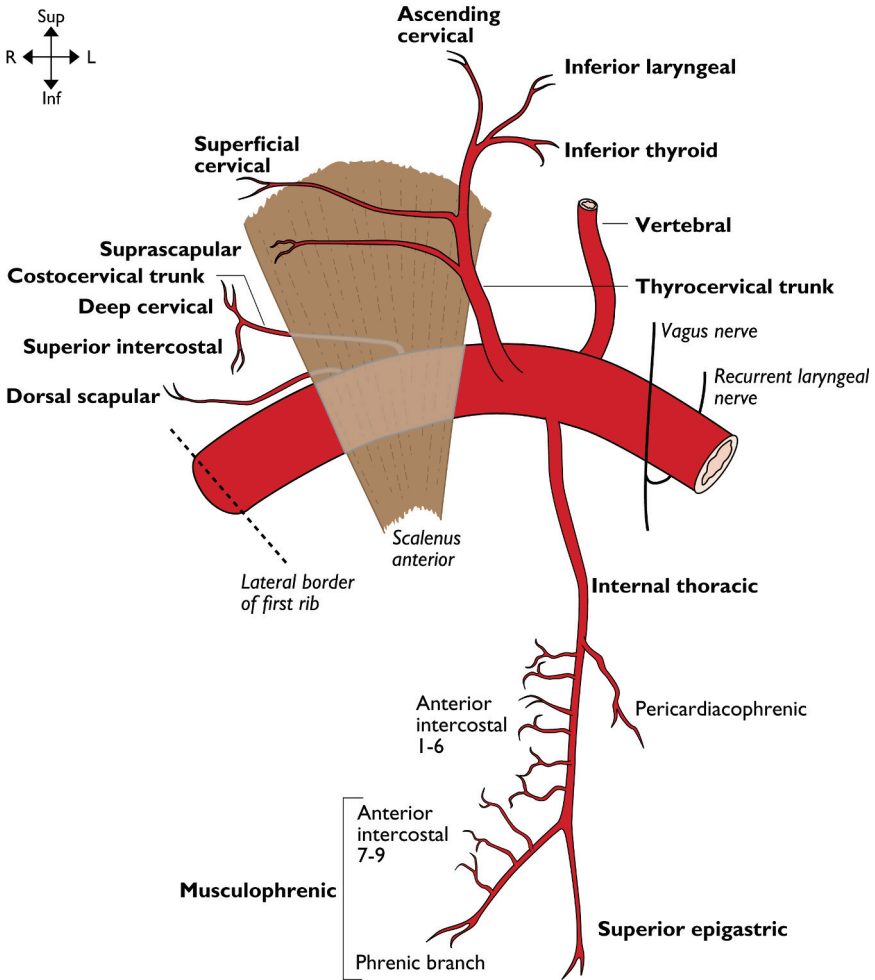
Left subclavian artery—first part. Arises from the arch of the aorta just posterior and slightly to the left of the origin of the left common carotid artery at the level of the intervertebral disc of T3/T4. It passes upwards and then, behind the left sternoclavicular joint, it arches laterally over the suprpleural membrane to the medial edge of scalenus anterior. Anterior to it in the thorax are the left common carotid artery, the left brachiocephalic vein, the left vagus and its cardiac branches and the left phrenic nerve. Posterior to it lie the left side of the oesophagus, the thoracic duct and longus colli. Medial to it is the trachea, the left recurrent laryngeal nerve and, more superiorly, the thoracic duct. In the neck it is crossed anteriorly by the left phrenic nerve and the thoracic duct.

Subclavian artery—second part. Lies posterior to scalenus anterior and anterior to scalenus medius. Anterior to scalenus anterior are the phrenic nerve and, slightly inferior, the subclavian vein. Postero-inferior are the suprpleural membrane and the lower trunk of the brachial plexus. Superior to it are the upper and middle trunks of the brachial plexus.

Subclavian artery—third part. Begins at the lateral margin of scalenus anterior and extends to the outer (lateral) margin of the first rib where it becomes the axillary artery. Anterior to it is the external jugular vein and its tributaries. Antero-inferior is the subclavian vein. Postero-inferior is the lower trunk of the brachial plexus and the first rib. Posterosuperior are the upper and middle trunks of the brachial plexus.

Vertebral artery (see also internal carotid, vertebrobasilar system & circle of Willis, pp. 8–9). Arises from the posterosuperior aspect of the first part of the subclavian artery and ends where the arteries from the two sides join to form the basilar artery at the lower pons. It angles posteriorly between the medial border of scalenus anterior and the lateral border of longus colli in the apex of the pyramidal space before entering the foramen in the transverse process of C6 behind its anterior tubercle (carotid tubercle of Chassaignac). Lying anterior to this first part are the common carotid artery and the vertebral vein and, more medially, the inferior thyroid artery and middle cervical ganglion. On the left the thoracic duct crosses it anteriorly. Posterior to it are the anterior primary rami of C7 and C8 nerves and more medially the inferior cervical (stellate) ganglion. The second part of the artery ascends within the foramina of the transverse processes of C6 to C1, accompanied by sympathetic nerves and vertebral veins. It passes out posteriorly behind the lateral mass of the atlas before turning medially over its posterior arch. It then turns anteriorly

continued



Subclavian artery

Note: (1) The superficial cervical artery is named 'transverse cervical artery' if it gives origin to the dorsal scapular artery instead of the latter arising separately from the second part of the subclavian artery; (2) phrenic branch of musculophrenic artery anastomoses with inferior phrenic artery

to pierce the atlanto-occipital membrane lateral to the cervicomedullary junction. It pierces the dura and arachnoid to ascend superomedially around the anterior aspect of the medulla where it joins the artery from the opposite side at the lower border of the pons to form the basilar artery. (Other branches, not illustrated, are spinal, meningeal and muscular.)

Internal thoracic artery. Arises from the anterior aspect of the first part of the subclavian artery and passes inferiorly behind the brachiocephalic vein and the phrenic nerve to reach the dome of the pleura. It then angles medially to lie posterior to the upper six costal cartilages, between the internal intercostal and transversus thoracis muscles. It terminates at the sixth intercostal space to give the superior epigastric and musculophrenic

arteries. (Other branches, not illustrated, are mediastinal, thymic, sternal and perforating (mammary).)

Inferior thyroid artery. Ascends along the medial edge of scalenus anterior. Just below the anterior tubercle of C6 it turns medially to reach the lower thyroid gland, passing between vertebral artery and vein (posteriorly) and carotid sheath and sympathetic chain (anteriorly). Its terminal branches are often amongst the recurrent laryngeal nerve. (Other branches of inferior thyroid artery, not illustrated, are glandular, pharyngeal, oesophageal and tracheal.)

Superior intercostal artery. Passes inferiorly, anterior to the necks of the first two ribs to provide the posterior intercostal arteries for the first two intercostal spaces.