lain. Frequently the same piece has an opaque, white, outer crust enclosing the glassy variety within. Contact with moist air gradually changes the glassy into the white, opaque variety. Both are odorless and tasteless. In cold water both varieties dissolve very slowly, the glassy variety requiring about 30, the porcelain-like about 80 parts of water at 15° C. (59° F.). Both are slowly but completely soluble in 15 parts of boiling water. In alcohol, arsenous acid is but sparingly soluble, but it is soluble in about 5 parts of glycerin. Oil of turpentine dissolves only the glassy variety. Both varieties are freely soluble in hydrochloric acid, and in solutions of alkali hydrates and carbonates. When heated to 218° C. (424.4° F.), arsenous acid is completely volatilized without melting. When thrown on ignited charcoal, it emits an alliaceous odor. When its vapor is passed through red-hot charcoal, in an arsenic tube, it is deoxidized, and metallic arsenic is deposited on the cooler portion of the tube as a mirror having a metallic lustre. An aqueous solution of arsenous acid has a faintly acid reaction upon litmus paper" (U. S. P.). Arsenous acid is obtained by sublimation, by roasting ores containing arsenic, and is subsequently purified by resublimation. When first obtained it is in transparent glass-like masses, but these, in after-exposure, acquire the porcelain-like appearance in which arsenous acid is commonly met with in the shops. This change, beginning on the surface, gradually extends in time throughout the whole thickness of the mass; not so quickly though but what commercial samples may often be found where the masses, on fracture, show a vitreous interior. For medical use the mineral is pulverized, appearing then as a very fine, white, smooth powder. In this condition it is easily adulterated, but the fraud can readily be detected by submitting the sample to sublimation, when the arsenous acid will all disappear by volatilization, and the impurities be declared by a non-volatile residue.

Arsenous acid possesses all the physiological properties of arsenicals, as set forth above. It does not act upon the sound skin, but upon a mucous membrane or denuded surface produces violent irritation. Taken internally it is capable of sufficient absorption to produce the constitutional effects of arsenic, therapeutic or toxic, and so may be used as a medicine, in doses of 0.003 gm. (gr. $\frac{1}{20}$) three times a day, generally given in pill. But it is not an eligible preparation for internal use, because of the local irritation it is apt to set up. Externally it has been employed to destroy the tissues of cancer or lupus, applied in ointment or paste. For such purpose the arsenous acid is mixed with from four to eight times its weight of inert matter, such as ointment or a paste made of some indifferent powder mixed with mucilage. Such arsenical ointment or paste is then applied to the tissue to be destroyed, the point being observed, if the part be covered by skin, first to remove the epithelium by blistering. The application is to continue for from twelve to twenty-four hours. Weak arsenical mixtures are more dangerous than strong, because of the greater likelihood of constitutional poisoning. Even strong applications, if at all extensive, are risky, and at best the destruction of tissue by arsenic is a slow, uncertain, and very painful process, not to be commended. Most of the numberless caustic pastes of quack "cancer doctors" are preparations of arsenous acid. The following have been celebrated in their day: *Arsenical Paste of Frère Côme:* Arsenous acid and animal charcoal, each one part; mercuric sulphide, four parts; to be used only over a small area at a time. *Sir Astley Cooper's Arsenious Ointment:* Arsenous acid and sulphur, each 1 part; spermaceti cerate, 8 parts. *Plunket's Caustic:* Bruised plant of *ranunculus acris* and of *ranunculus flammula*, each 24 parts; arsenous acid, 3 parts; sulphur, 5 parts; the whole mixed to a paste, rolled into balls, and these dried in the sun. For application the balls are again to be reduced to pasty consistence by rubbing with yolk of egg. In using this preparation, preliminary denudation of the skin is unnecessary, that operation being performed by the acrid matter of the crowfoot. The only preparation of arsenous acid official in the U. S. P. is what is entitled *Liquor Acidi Arsenosi*, Solution of Arsenous Acid. This is a one-per-cent. solution of the arsenical in water slightly acidulated with hydrochloric acid. The preparation is of the same strength as Fowler's solution (see below), and is given in doses of 0.30 gm. (mℏ v.) three times a day, largely diluted with water.

Arsenic Triiodide, AsI_3. This compound is official in the U. S. P. as *Arseni Iodidum*, Arsenic Iodide. It is in "glossy, orange-red, crystalline masses, or shining, orange-red, crystalline scales, having an iodine-like odor and taste, and gradually losing iodine on exposure to air and light. Soluble at 15° C. (59° F.) in 7 parts of water and in about 30 parts of alcohol; also soluble in ether, and in carbon disulphide. The salt is gradually decomposed by boiling water and by boiling alcohol. By heat it is completely volatilized, and if it be heated with diluted nitric acid, vapor of iodine will be evolved. The aqueous solution of the salt has a yellow color, is neutral to litmus paper, and, on standing, gradually decomposes into arsenous and hydriodic acids" (U. S. P.). This iodide has been given internally as an arsenical in doses of 0.008 gm. (gr. $\frac{1}{8}$), and used externally on malignant growths in a one-per-cent. ointment; but its principal purpose among medicines is to furnish the pharmacist with the arsenical ingredient of the official preparation, *Liquor Arseni et Hydrargyri Iodidi*, Solution of Arsenic and Mercuric Iodide, commonly known as *Donovan's Solution*. This is an aqueous solution of one per cent. each of arsenic iodide and red mercuric iodide. It is a pale yellow fluid, slightly astringent in flavor, and precipitating with alkalies, silver solutions, and solutions of alkaloidal salts. It is used as a composite "alterative" internal medicine, its reputation being principally in the line of scaly skin disease, syphilitic or idiopathic, and in rheumatic affections. Dose, from five to ten drops, well diluted with water, after meals.

Potassium Arsenite. An arsenite of potassium is official in the U. S. P. only in the solution entitled *Liquor Potassii Arsenitis*, Solution of Potassium Arsenite, better known by the common name of *Fowler's Solution*. This solution is made by boiling 1 part of arsenous acid and 2 of acid potassium carbonate in water until chemical union is effected, then bringing the solution to the standard strength of one per cent. of arsenous acid, and adding a small charge of compound tincture of lavender. This latter addition is to give the preparation sufficient taste and color to prevent its being mistaken for simple water. Fowler's solution is clear, and tastes only of lavender. It responds to the usual tests for arsenic. Physiologically it acts the same as would a solution of arsenous acid of like strength. It is in imitation of a famous remedy known as "tasteless ague drop," and is the most convenient and commonly used arsenical for internal giving. The average dose is five drops, well diluted with water, to be taken, like all arsenicals, after eating, and repeated two or three times a day.

Sodium Arsenate, $Na_2HAsO_4+7H_2O$. The salt is official under title *Sodii Arsenas*, Sodium Arsenate. It occurs in "colorless, transparent, monoclinic prisms, odorless, and having a mild, alkaline taste (the salt is very poisonous). Efflorescent in dry air, and somewhat deliquescent in moist air. Soluble in 4 parts of water at 15° C. (59° F.), and very soluble in boiling water; very sparingly soluble in cold, but soluble in 60 parts of boiling alcohol. When gently heated, the salt loses five molecules of water (38.8 per cent.), and is converted into a white powder. At 148° C. (298.4° F.), the rest of the water of crystallization is lost, the salt fuses, and at a red heat is converted into pyroarsenate. It imparts an intense, yellow color to a non-luminous flame" (U. S. P.). Sodium arsenate has the usual properties of the arsenicals, but is a little milder than potassium arsenite.[3] It is generally prescribed in the official *Liquor Sodii Arsenatis*, Solution of Sodium Arsenate, which is simply a one-per-cent. aqueous solution of the salt. This solution may be given in the same dose and manner as Fowler's solution.

Edward Curtis.

[1] Th. Gies: Archiv für experiment. Path., December, 1877, quoted in Phillips's Materia Medica.
[2] Maclagan: Edinburgh Medical Journal, 1864, p. 203.
[3] Ringer: Journal of Physiology, vol. i., p. 213.

ARTERIES, ANOMALIES OF.—Arteries are subject to frequent variations of size, origin, and distribution. Some of these are so common that it is difficult to decide what is the normal condition. Many anomalous arteries are merely a persistence of an early fetal condition, others are reversions to forms of distribution which are natural in the various species of the lower animals, while some are due to an abnormal enlargement or diminution of vessels which naturally exist. I propose in the present article chiefly to describe those anomalies which are important surgically—that is, those which exist in parts liable to diseases which necessitate a surgical operation for their cure or relief. However interesting would be a consideration of anomalies of arteries from a morphological point of view to pure anatomists, I fear the subject is not of sufficient interest to the general profession to justify me in devoting much space to it here.

AORTA.—This vessel is subject to many variations. It may vary in length and position. The summit of the arch has been seen as high as the top of the sternum and as low as the fifth dorsal vertebra. The distance to which it reaches on the spine before dividing into the two common iliacs also varies, the point of division being occasionally as low as the fifth, and as high as the third, or even the second, lumbar vertebra. The aorta has been seen consisting of two closely united tubes, in part or the whole of its course, due to a persistence of the original double aorta of early fetal life (Fig. 288). The aorta is sometimes very tortuous, of large size, and displaced to one side, especially in old people, but this condition is due more to pathological changes than to congenital malformation.

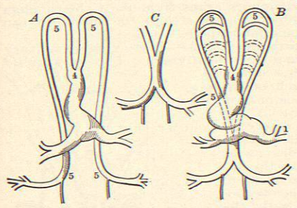

FIG. 288.—Diagrammatic Outlines of Heart and First Arterial Vessels of the Embryo, as Seen from the Abdominal Surface. 4, Aortic bulb; 5, 5, the primitive aortic arches and their continuation as the descending aorta. These vessels are separate in their whole extent in *A* (36 to 38 mm. in thickness), but at a later period, as shown more fully in *C*, have coalesced into one tube in a part of the dorsal region. In *B*, below upper 5, the second aortic arch is formed, and farther down the dotted lines indicate the position of the succeeding arches, numbering five in all. (Quain's "Anatomy.")

The main trunks of the *aorta* and pulmonary artery are (4, Fig. 288) both derived from the arterial bulb of the fetal heart, "and are liable to variations which may be traced to deviations from the natural mode of their septal division and of their union with the left or right ventricles of the heart respectively" (Quain's "Anatomy"). These variations are generally associated with malformations of the heart, and often with patency of the ductus arteriosus. The aortic or pulmonary trunk may be almost obliterated, or the two trunks may communicate freely with each other, owing to the failure of complete septal division; again, their origins may be transposed, the pulmonary artery arising from the left ventricle and the aorta from the right. A very rare anomaly has been reported where the pulmonary artery and aorta form one stem which arises from a simple heart like that seen in fishes. A few cases are reported in which the descending aorta arose from the pulmonary artery and gave off the left subclavian, the left ventricle giving off only the innominate and left carotid. Most of these varieties are incompatible with life, and are fully described in works on pathological anatomy.

Varieties of the Aortic Arch.—The various anomalies of the aortic arch depend on the mode of development of the fourth and fifth fetal branchial arches. In man and nearly all mammalia the arch is a left one, produced by the persistence of the fourth left branchial arch (Fig. 289). In birds the permanent aorta is formed from the right fourth branchial arch; and in reptiles both the right and left fourth branchial arches are persistent. In cases in which there is transposition of the heart, and also, of course, of the arch of the aorta, the aorta is a right one, instead of the usual left, and this is owing to the persistence of the right fourth branchial arch, as in birds. The pulmonary artery in these cases is also transposed and is formed from the right fifth arch in place of from the left. Many of these cases have been reported and have been diagnosed during life, the direction of the apex of the heart being toward the right, the apex beat being felt on the right side between the fifth and sixth ribs. A very good specimen of this anomaly is to be seen in the museum of the Pennsylvania Hospital in Philadelphia.

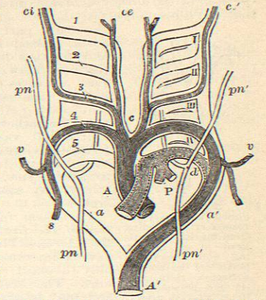

FIG. 289.—Diagram of the Fetal Aortic Arches, Showing Their Transformation into the Permanent Vessels of the Mammal. (After Rathke.) The permanent vessels are represented by the deep shading, the pulmonary arteries lighter, the temporary primitive arches in outline only. A, P, Primitive aortic stem, divided into A, aortic arch, P, pulmonary artery; *a*, right aortic root; *a'*, left aortic root; *A'*, descending aorta; 1, 2, 3, 4, 5, primitive vascular arches; *pn*, *pn'*, right and left pneumogastric nerves; *v*, *v'*, right and left vertebrals; *s*, *s'*, right and left subclavians; *ce*, external carotids; *ci*, *ci'*, internal carotids. (From vol. ii., Quain's "Anatomy.")

Occasionally the aortic arch has been observed completely double (Fig. 290), as in reptiles, due to the persistence of both right and left aortic roots (*a*, *a'*, Fig. 289) and the fourth branchial arches of both sides. The double aorta embraces the trachea and œsophagus, and unites below to form a single trunk on the left side of the spinal column, as in early fetal life (*B*, Fig. 288).

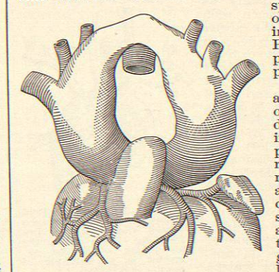

FIG. 290.—Example of a Double Ascending Aorta, from the Arch of Which Arise Six Branches—Two Subclavian and Four Carotid Arteries. (After Malacarne.)

The aorta may pass to the right of the trachea and œsophagus instead of to the left, and this without the transposition of the heart mentioned above. If we study the fetal conditions the explanation of this anomaly is easy. It is a persistence of the right fourth branchial

arch and aortic root instead of the left (Fig. 289). In these cases the recurrent laryngeal nerve of the left side hooks round the subclavian, and that of the right around the arch of the aorta. In some of the cases of right arch that have been observed the left subclavian arose from the back part of the descending aorta, passed behind the trachea, and reached its usual position in the neck between the scalene muscles. In cases of this kind, the first part of the subclavian being absent, owing to the non-development, or rather obliteration, of the fourth left vascular arch, the inferior laryngeal nerve does not hook around it, but goes directly to the larynx, and the vertebral artery may arise directly from the arch.

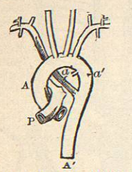

FIG. 291.—The Right Subclavian Artery Displaced or Proceeding from the Right Aortic Root. A, A', ascending and descending portion of the thoracic aorta; *a*, right aortic root persisting as the subclavian artery; *a'*, left aortic root; P, pulmonary artery. (Quain's "Anatomy.")

Variations in Number and Position of the Branches of the Arch of the Aorta.—These variations are very numerous; I shall mention only the most common and important. The branches of the aortic arch may be given off from a single trunk, which forms what is called the anterior aorta. This arrangement is seen in the horse. The commonest abnormal arrangement of the branches is that where the left carotid arises from the innominate; thus only two branches are given off from the arch, the left subclavian and the innominate. This is the usual distribution in most of the carnivora. There may be two innominates given off from the arch, each dividing into a carotid and subclavian, as in the bat. Three branches is the normal number arising from the arch in man, apes, and a few other animals. Occasionally we see three branches arising from the arch in a different way from the normal. We may have the two subclavians arising separately, and the two carotids arising from a common stem between them. This is the normal disposition in some cetacea. Sometimes all four vessels arise separately from the arch. Again, the left vertebral may arise from the arch, while the other branches preserve the normal arrangement, or there may be five branches given off separately, viz., the two subclavians, two carotids, and left vertebral. As many as six branches have been seen to come off from the aortic arch. This occurs when, in addition to the above-mentioned five branches, the right vertebral is also given off. A curious anomaly, and one which is interesting from its rarity and manner of development, is that form of arch where the right and left carotids and left subclavian arise separately from the arch, and the right subclavian arises from the back part of the descending aorta, passes behind the trachea and œsophagus and ascending portion of the arch, and reaches its normal place between the scalene muscles (Fig. 291). In this case the right inferior laryngeal nerve, instead of hooking round the subclavian, passes directly to the larynx. The subclavian here represents the persistent right aortic root, and the right fourth branchial arch is obliterated (see Fig. 289). Some years ago I met with a curious anomaly having somewhat this character. I looked upon it as a double subclavian. The right subclavian was given off as usual from the innominate, but was joined in the second part of its course, between the scalene muscles, by a small branch which arose from the back part of the descending aorta. I considered this a case of persistence of the fourth right vascular arch, and also of the right aortic root (Fig. 292). (For a complete description of the very many varieties of the arch of the aorta, see Turner on "Varieties of the Arch of the Aorta," in *Brit. and For. Med.-Chir. Rev.*, 1862; Henle's "Anatomy," vol. iii.; Hyrtl; and Professor Struthers.)

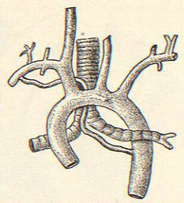

FIG. 292.—Right Aortic Root Persisting as a Small Branch Which Connects the Descending Aorta with the Subclavian. May be regarded as an example of double subclavian.

INNOMINATE, OR BRACHIO-CEPHALIC.—This artery occasionally varies as to the point of its division. In some cases it divides above the sterno-clavicular articulation, and in others considerably below it. When there is a high division, there is danger of its being wounded in tracheotomy, especially in those cases in which the artery inclines to the median line. In cases of ligature, however, the operation would be much facilitated by a high division, and rendered much more difficult by a low one.

The *thyroidea ima* or *middle thyroid* (Fig. 293) is not infrequently given off from the innominate, and ascends to its destination in front of the trachea. When present it would complicate the operations of tracheotomy and excision of the thyroid gland. In observations made by myself on 250 subjects, I found that this artery occurred 12 times, or once in 20.83 cases. Richard Quain, in his valuable work on the arteries, found it 9 times in 291 subjects, or once in 32.33. It is sometimes of large size, dividing into two branches, one of which goes to each lobe of the thyroid gland.

This artery sometimes arises from the right common carotid, and rarely from the arch of the aorta between the left carotid and innominate.

COMMON CAROTID ARTERIES.—These vessels may vary in their origin and place of division. The *right carotid* occasionally arises directly from the arch of the aorta either alone or with the left carotid. In the latter case the artery, to reach its usual position on the right side, crosses the trachea above the upper border of the sternum, a fact worth remembering in connection with the operation of tracheotomy. It may arise above or below the sterno-clavicular articulation, according as the innominate is longer or shorter than usual. The *left carotid* varies more frequently in origin than the right, as it is derived from the innominate in about one case in nine. It may also arise from the arch in common with the right carotid.

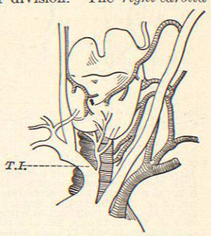

FIG. 293.—Showing a Middle Thyroid Artery (T. I.) Arising from the Innominate and Running up the Front of the Trachea to Supply the Thyroid Gland. (From R. Quain, slightly altered.)

Place of Division.—The common carotid often varies as to its place of division. The normal dividing point is opposite the upper border of the thyroid cartilage, but it sometimes divides as high up as the hyoid bone, and as low down as the cricoid cartilage. Morgagni reports a case in which it divided at the root of the neck. Cases are recorded in which it did not divide at all, one or other of its main branches being absent. I have occasionally seen this artery give off the superior thyroid and ascending pharyngeal before its division, and also a small laryngeal. I also once saw the left carotid giving off the left vertebral.

EXTERNAL CAROTID AND ITS BRANCHES.—As mentioned above, the origin of the external carotid varies considerably. It has in rare cases been noticed arising from the innominate, and even from the arch of the aorta itself. Absence of this artery has been met with, the branches arising at varying intervals from a common trunk, representing both internal and external carotids. The artery sometimes passes between the digastric muscle and stylo-hyoid. I have in one case seen it pass up to the parotid gland superficial to both the posterior belly

of the digastric and the stylo-hyoid, instead of behind them.

The origin of the branches varies considerably; they may be crowded together at the commencement of the vessel, or at a point higher up. Sometimes they arise from the main trunk at nearly regular intervals, and occasionally we find several branches arising from a single stem. Accessory arteries may arise from the external carotid, such as the accessory superior thyroid and accessory ascending pharyngeal. The sterno-mastoid, which usually arises from the occipital, occasionally arises from the main trunk, and when this occurs the hypoglossal nerve hooks around this small branch instead of around the occipital. In consequence of the lower origin of the sterno-mastoid, the nerve in such cases passes lower down the neck before crossing the vessels to reach the hyoglossus muscle.

Superior Thyroid.—This vessel may be very small or absent, its place being taken by the artery of the opposite side and the inferior thyroid of the same side. It sometimes arises from the common carotid. The *crico-thyroid* may be of considerable size, and its *superior laryngeal* branch may arise from the main trunk, or pierce the thyroid cartilage instead of the thyro-hyoid membrane, as is the case in many mammals. Mr. Walsham ("St. Bartholomew's Hosp. Rep." 1880) has several times met with a large branch from the superior thyroid crossing the trachea between the cricoid cartilage and isthmus of the thyroid. He once wounded it in performing tracheotomy.

Lingual.—This artery often arises in common with the facial, and occasionally with the superior thyroid. Instead of passing beneath the hyoglossus muscle it has been seen to pierce it.

In some rare cases it has been absent, and its place has been taken by a branch from the internal maxillary. Its place has been taken also by a branch from the facial, the submental. Its sublingual branch is occasionally derived from the facial. The hyoid branch is often wanting, and in such cases the hyoid branch of the superior thyroid takes its place. The lingual sometimes gives off the submental and ascending palatine artery. In one case of operation on the dead subject, the writer could not find the artery in the usual place, but it was found coming off from the superior thyroid, passing up to the median line of the neck on the thyro-hyoid muscle. It crossed the hyoid bone internal to the lesser cornu, pierced the hyoglossus muscle, and thence onward its course was normal (*Annals of Surgery*, vol. ix., 1889, p. 33).

Facial.—This artery is very variable in size and also in extent. When the facial is deficient its place is taken by the transverse facial, internal maxillary, or ophthalmic, most frequently the first mentioned.

Occipital.—This artery usually arises opposite the facial, but its place of origin may be above or below this point. Sometimes it is derived from the internal carotid or the ascending cervical branch of the inferior thyroid. It occasionally passes to its destination superficial to the trachelo-mastoid muscle, or it may pierce the sterno-mastoid and splenius capitis muscles. R. Quain mentions a case in which it passed superficial to the sterno-mastoid muscle. It not infrequently gives off the posterior auricular and ascending pharyngeal.

Posterior Auricular.—Often a branch of the occipital; sometimes of small size, ending in the sterno-mastoid muscle.

Ascending Pharyngeal.—Varies greatly in its place of origin; may arise from the internal carotid, occipital, or a linguo-facial branch. It is occasionally double.

Superficial Temporal.—This vessel is very often tortuous, especially in the aged.

The *transverse facial* is occasionally of large size, and takes the place of the facial. It is sometimes double.

Internal Maxillary.—This artery frequently arises in common with the temporal. R. Quain has observed it in two instances arising from the facial, "from which it coursed upward, to pass beneath the ramus of the maxillary bone in the usual situation."

It very frequently (in about 4.5 per cent.) is covered by the external pterygoid muscle, instead of lying superficially to that muscle. It sometimes perforates the external pterygoid, and rarely the internal. It may replace the facial by a branch from the posterior dental, buccal, or infra-orbital artery.

INTERNAL CAROTID AND ITS BRANCHES.—This artery in the neck is occasionally very tortuous. It has been known to be absent, its place being taken by the artery of the opposite side or by a branch from the internal maxillary. It is sometimes very small, smaller than the vertebral (Hyrtl). The ascending pharyngeal, occipital, lingual, or transverse facial may arise from the internal carotid.

A large communicating branch has been seen going from this artery, while in the cavernous sinus, to the basilar artery; in such a case the posterior communicating branch is wanting. The posterior cerebral not infrequently comes off from one of its branches, the posterior communicating.

Ophthalmic Branch.—This has been seen to come off from the middle meningeal artery. Occasionally the middle meningeal comes off from the ophthalmic. The ophthalmic may, by its nasal branch, supply a deficiency in the facial. In fifteen per cent. of cases it crosses beneath instead of over the optic nerve. It has been seen to go through the sphenoidal fissure.

Cerebral Arteries.—The *anterior cerebral* of one side is often much larger than that of the other. In some rare cases the two anterior cerebral arteries are united into a common trunk, like the basilar. The *anterior communicating* artery is sometimes double; I have once seen it treble. It is often very short. The *posterior cerebral* may arise from the internal carotid by a large posterior communicating. It has been seen by Hyrtl to give off the middle cerebral.

The *posterior communicating* artery occasionally comes off from the middle cerebral instead of from the internal carotid.

SUBCLAVIAN.—The varieties of origin of this artery have already been mentioned in the account of the anomalies of the arch of the aorta and innominate artery. It is generally given off from the innominate on the right side, opposite the sterno-clavicular articulation, but occasionally the innominate reaches nearly as high up as the cricoid cartilage before it divides, and in these cases the artery would be at an unusually high level. The highest part of the artery is the second portion, and it is normally about 1.2 to 2.7 cm. (one-half to three-quarters of an inch) above the clavicle, with the shoulder depressed, but not infrequently it may be below, or on a level with, the clavicle, and sometimes, especially on the right side, it may be placed as high as 3.7 cm. (one inch and a half) above the level of the clavicle. It may, in those rare cases in which a cervical rib is attached to the seventh cervical vertebra, pass over this rib in place of the first dorsal, and be raised fully two inches above the clavicle. I have seen this occur once in two hundred and fifty subjects examined. In the living, when this condition exists, it may be, and has been, mistaken for aneurism. Sir James Paget has diagnosed this anomaly four times during life. It is obvious that the height to which the artery reaches is important in cases in which ligature is necessary. I have seen in one case in which there was an incomplete left first rib the artery pass over the second rib. On the right side there was also a rudimentary first rib completed by fibrous tissue. There was a deep groove in this rib, in which rested the artery; before complete dissection this was taken for a cervical rib. The cases for which ligature is undertaken are chiefly those of aneurism of the axillary artery, in which, in consequence of the condition of the parts, the shoulder is elevated. If the artery should be at an unusually low level, or even just behind the clavicle, the operation, as may be conceived, would be rendered extremely difficult.

The third part of the artery in thin people with small muscles is very superficial, but in stout, muscular individuals it is very deeply placed. Dupuytren says: "The