

# ANATOMICAL TRIANGLES

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Anatomical description is given of certain areas in the human body which have a triangular shape and which are of anatomical or surgical importance.

There are at least 30 described anatomical triangles, many of which receive eponymous names. Some are of marked importance and well known e.g. Scarpa's femoral triangle, Hesselbach's inguinal triangle, and Petit's lumbar triangle; others are of relatively minor importance and not so well-known e.g. Elau's, Friteau's and Assezat's triangles.

Anatomical triangles are described in various regions of the body e.g. Macewen's and Trautmann's in the head region, Beclaud's and Pirogoff's in the neck region, Hesselbach's, Henke's, Petit's and Grynfeldt's in the abdominal wall region and Scarpa's and Weber's in the lower limb region. Their size varies, some being large e.g. Scarpa's triangle, others being very small e.g. Macewen's triangle.

The boundaries of these triangular areas may consist of muscle borders e.g. the triangle of Lannier and the various triangles of the neck; of muscle borders and bony surfaces e.g. Petit's triangle, the triangle of Marcille and the triangle of Auscultation; of muscle borders and blood vessels e.g. Hesselbach's; of imaginary lines drawn between fixed bony points e.g. Macewen's, Bryant's and Assezat's triangles; and others have boundaries seen only on X-Ray pictures e.g. Ward's and Codman's triangles.

The contents within these anatomical triangles vary. Some contain numerous anatomical structures including arteries, veins, nerves and lymphnodes e.g. Marcille's and Scarpa's triangles. Most, usually those of surgical importance, enclose no contents at all.

A few of these triangles are primarily of anatomical importance as they contain or are related to a host of important structures. Such are Scarpa's femoral triangle, Marcille's lumbosacral triangle, the six triangles of the neck, the anal and urogenital triangles and, amongst the less common, Elau's and Trautmann's triangles.

Other triangles are primarily of surgical importance. Some are potential sites of weakness where a hernia or diverticulum may form e.g. Hesselbach's inguinal triangle, Petit's lumbar triangle and the Triangle of Lannier (Killian-Jamison dehiscence). Others are of importance as surgical markings for easy localisation of anatomical structures at operation e.g. Macewen's supræmental triangle for localising the mastoid antrum and Langenbeck's triangle employed in arthrotomy of the hip. Others are made use of in surgical clinical diagnosis e.g. Bryant's ileofemoral triangle for diagnosing fractures of the neck of the femur, Sherren's triangle which marks the site of tenderness in acute appendicitis and the Triangle of Auscultation which is of no importance nowadays but which was made use of in pre-X-Ray days for diagnosing cases of oesophageal obstruction.

Other triangles are of use in other branches of medicine e.g. Assezat's triangle is of use in comparative craniology.

*Scarpa's femoral triangle* was named after Antonio Scarpa (1747-1832) an Italian surgeon and anatomist who was a pupil of Morgagni and a friend of Volta and Spallanzani.

Situated in the upper third of the front of the thigh, the femoral triangle is bounded laterally by the Sartorius, medially by the medial border of the Adductor longus and superiorly by the inguinal ligament; its roof consists of the fascia lata and cribriform fascia, and its floor is formed from the lateral to medial side by the Psoas, Pectineus, and Adductor longus.

Its contents are the femoral artery, the femoral vein lying on its medial side (but behind it lower down) and lateral to the artery, the femoral nerve above and the saphenous nerve and nerve to Vastus medialis below.

### The Triangles of the Neck

The side of the neck is quadrilateral in shape being bounded above by the base of the mandible, below by the upper surface of the clavicle, in front by the anterior median line and behind by the anterior margin of the Trapezius. The Sternomastoid divides this quadrilateral space into anterior and posterior triangles. The anterior triangle is sub-divided by the Digastric and the superior belly of the Omohyoid into 4 triangles viz. muscular, submental, carotid and digastric. The posterior triangle is sub-divided by the inferior belly of the Omohyoid into 2 triangles viz. the occipital and the supraclavicular. Within these, smaller triangles are delimited which are of no importance e.g. Beclaud's, Farabeuf's, Malgaigne's and Pirogoff's triangles.

The most important contents of the carotid triangle are the common, external and internal carotid arteries with their branches and corresponding veins, the hypoglossal nerve and its descending branch and the external and internal laryngeal nerves.

The chief contents of the digastric triangle are the accessory nerve, the cervical plexus, part of the brachial plexus and numerous cervical lymphnodes.

The supraclavicular triangle contains the subclavian vessels, the external jugular vein, the transverse cervical vessels, the brachial plexus and some lymphnodes.

### The Urogenital and Anal Triangles

The urogenital triangle is contained between the ischiopubic rami and the line passing between the anterior parts of the ischial tuberosities. This line forms the base of the anal triangle, the sides being formed by the sacrotuberous ligaments.

The contents of the urogenital triangle in the male are the root of the penis and its muscles and the bulbo-urethral glands and in the female the openings of the vagina and urethra as well as the bulb of the vestibule and the vestibular glands. The contents of the anal triangle are the anal canal and the ischio-rectal fossae with their contents.

### The Triangle of Marcille (the lumbosacral triangle).

Nothing is practically known of Maurice Marcille (1871- ?) after whom this triangle is named.

The boundaries of this triangle are the side of the body of the 5th lumbar

vertebra medially, the inner border of the Psoas major laterally and the upper surface of the ala of the sacrum below, its posterior wall consisting of the transverse process of L. 5 and the ileo-lumbar and lumbosacral ligaments.

The triangle is related to several important structures. The left common iliac artery crosses the triangle and divides into internal and external iliacs at its distal angle where it is crossed by the ureter. The iliac veins follow the arteries. The inferior mesenteric artery crosses these vessels from left to right and becomes the superior haemorrhoidal. The testicular (or ovarian) vessels pass along the outer border of the triangle. The common iliac lymphnodes lie deep in the triangle medial to the vessels. From the medial to the lateral side of the triangle are the sympathetic trunk, the lumbosacral trunk (L. 4-5) hugging the body of L. 5 and joining S. 1 nerve just below, the ileolumbar artery, the obturator nerve and the genitofemoral nerve on the Psoas just outside the triangle. On the right side both common iliac veins and the inferior vena cava overlie the triangle, the inferior mesenteric vessels being present only on the left side.

#### Hesselbach's Inguinal Triangle.

Franz Kaspar Hesselbach was a German surgeon and a Professor of Surgery at Wurzburg.

This triangle is situated in the lower part of the anterior abdominal wall, being bounded laterally by the inferior epigastric artery, medially by the outer border of the Rectus abdominis and below by the inguinal ligament. It is divided into medial and lateral halves by the lateral umbilical ligament (obliterated umbilical artery).

As the inferior epigastric artery is medial to the internal inguinal ring only a *DIRECT* hernia can push through the triangle of Hesselbach.. The direct hernia may leave this triangle through its outer part (lateral direct hernia) or through its inner part (inner direct hernia).

#### Petit's Lumbar Triangle.

Jean Louis Petit (1674-1750) was a French surgeon and anatomist. He learned anatomy from Littrè at the age of 7, attended lectures at the age of 12, became, Littrè's demonstrator at the age of 14 and by the age of 16 was already a surgeon!

This triangle is bounded in front by the posterior border of the External oblique, behind by the anterior border of the Latissimus dorsi and below by the iliac crest, its floor being formed by the lumbodorsal fascia and the Internal oblique.

This triangle is also known as the 'triangle of lumbar hernia' because, rarely, a hernia, the so called 'upper lumbar hernia', may occur here. In such a hernia the gut escapes at the anterior border of the Quadratus lumborum and appears at the surface through the triangle of Petit just above the highest point of the iliac crest. The hernia therefore pushes before it the floor of the triangle which therefore forms the coverings of the sac.

#### Triangle of Lannier (Killian - Jamison dehiscence).

This triangle is found only in upright animals and is due to descent of the larynx which occurs in these animals.

The base of the triangle is formed by the transverse fibres of the Cricopharyngeus and its sides by the oblique fibres of the Thyropharyngeus which ascend slightly from the anterior cornu of the thyroid cartilage and the fibrous band which covers the Cricothyroid muscle, and pass upwards and backwards to reach the apex of the triangle in the posterior midline.

This triangle is a potential source of weakness in the posterior pharyngeal wall. Weakness of the triangle gives rise to pharyngeal pouch or diverticulum.

### Macewen's Suprameatal Triangle.

Sir William Macewen (1848-1924) was a Scottish surgeon who was interested in the growth of bone and in bone lesions. Macewen described the suprameatal triangle in his book, *Pyogenic Infections of the Brain* (1893) in these words: "Roughly speaking if the orifice of the external osseous meatus be bisected horizontally the upper half would be on the level of the mastoid antrum. If this segment be again bisected vertically, its posterior half would again correspond to the junction of the antrum and the middle ear, and immediately behind this lies the supra meatal fossa".

This small depression just above and behind the external acoustic meatus marks a point, 1 cm. medial to which is the mastoid antrum of the tympanic bone. The triangle corresponds to the uppermost part of the concha of the auricle.

### Triangle of Auscultation.

The upper border of the Latissimus dorsi is overlapped by the lateral border of the Trapezius. This angle is converted into a triangle by the medial border of the underlying scapula. The floor is formed by the Rhomboids, which are superficial to the 7th rib and the 6th and 7th intercostal spaces.

The triangle is so named because deep to it on the left side is the cardiac orifice of the stomach where the splash of swallowed liquids was timed in cases of oesophageal obstruction in pre-X-Ray days.

### Other Triangles.

Assezat's triangle is situated between the nasal point, the alveolar point and the basion and is used as an index of prognathism in comparative craniology.

Triangles which are related to abdominal wall structures are:

a. Grynfeltt's fascial triangle (Grynfeltt and Legshaft) is bounded by the posterior border of the Obliquus internus abdominis, the anterior border of the Quadratus lumborum and above by the 12th rib.

b. Henke's triangle. This is situated between the descending part of the inguinal fold, the lateral part of the fold and the lateral border of the Rectus abdominis.

c. Labbè's triangle. This is a triangular area included between a horizontal line along the lower border of the 9th rib, the line of the false ribs and the line of the liver. It is the area where the stomach is in contact with the abdominal wall.

Two triangles are seen only on X-Rays viz. Ward's triangle which is an area among the trabeculae of the cancellous tissue of the neck of the femur and Codman's

triangle which is a deposit of new bone in the angle where the periosteum is stripped up from the surface of the bone by the swelling of an osteogenic sarcoma.

Other triangles are Elaut's (between common iliac arteries and promontory of sacrum), Friteu's (an area of cheek devoid of facial nerve), Calot's (cystohepatic triangle), Sherren's (bounded by lines joining the umbilicus, right anterior superior iliac spine and symphysis pubis) and Weber's triangle (between the heads of the 1st and 5th metatarsals and the midpoint of the plantar surface of the heel).

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