

ARM AND LEG ARTERIES: BRANCHES, PULSATION POINTS

Abdusattorov Mukhriddin Khusniddin ugli

Oripjonov Azamat Quchkorali ugli

Students of the 1st year group 105-b of the Faculty of Dentistry of
the Tashkent State Dental Institute

Khalilov Sanjar Abdivohid ugli

Assistant teacher of the Department of Anatomy of the Tashkent
State Dental Institute

<https://doi.org/10.5281/zenodo.11077089>

ARTICLE INFO

Received: 24th April 2024

Accepted: 25th April 2024

Published: 27th April 2024

KEYWORDS

*Arm and leg arteries, pulsation,
blood, muscle, oxygen.*

ABSTRACT

This article is about hand and foot arteries, pulsation points, enriched with general and necessary information. First of all, arteries are blood vessels that leave the heart and aorta and deliver oxygen-rich blood to all organs and tissues in the alveoli of the lungs. Arterial blood passes into venous vessels after a person's death. That is why Hippocrates said that the soul flows through the arteries. Usually, all the vessels leaving the heart (regardless of blood composition) are arteries, and the vessels coming to the heart are veins. A vein that leaves the heart and goes to the lungs (contains venous blood) is the pulmonary artery. The wall of arteries consists of three layers (inner - endothelium, middle - muscle, outer - membrane). Arteries with large diameters have a lot of elastic tissue in their walls. Arteries join together many times to form an arterial network and anastomoses. It acts as a substitute when an artery is injured.

The places on the body where the arterial pulse can be felt are usually called pulse points. In some areas of the body where the artery is close enough to the surface of the skin, you can feel the pulse of the artery, which means you can feel the pulse of the blood when the heart muscle contracts.

Depending on where the pulse is being assessed, different amounts of pressure may be needed to feel the pulse. For example, the radial artery lies closer to the surface of the skin than the femoral artery, so less pressure is needed to feel it. In addition, the nurse should be aware that applying too much pressure to the artery can impede blood flow and make it impossible to feel a pulse. Therefore, if the nurse has difficulty feeling a pulse, they should palpate more lightly and then more deeply to find the pulse. Once a pulse is found, the nurse should assess the following features of the pulse.

Rate: A normal rate for adults is between 60-100 beats per minute. However, this may vary depending on the patient's history. Therefore, it is important to monitor the trend of heart rate over time.

Rhythm: Patients without an underlying arrhythmia should have a regular pulse.

Symmetry: The strength of the pulse should be equal on both sides.

Contour: the pulse should be smooth and wave-like

Strength: Normal pulses should be easily felt with gentle palpation

The strength of the pulse is described numerically or using the descriptions 4+ (marginal), 3+ (increased), 2+ (normal), 1+ (weak), or 0 (absent). Pulses that are stronger or weaker than usual can be signs of an underlying pathology.

Causes for stronger than normal pulses include anxiety, fever, hyperthyroidism, and fluid overload. Some causes of a weak pulse include poor perfusion to the extremity, shock, or dehydration.

How to take a pulse

If the heartbeat is regular, 30 seconds is enough to assess the pulse. After counting for 30 seconds, the nurse doubles this number to get the pulse rate. However, if the pulse is irregular, the nurse should count the full minute to ensure an accurate pulse rate.

9 pulse points and their location

Carotid: The carotid pulse is located below the angle of the jaw and next to the trachea. The trachea consists of cartilaginous rings. Feel the side of the trachea and gently press with two fingers. The carotid artery lies close to the surface of the skin and should be palpated with relatively light pressure. Never press on both carotids at the same time. This can reduce blood flow to the brain.

Radial: The radial pulse is located on the lower part of the wrist at the base of the thumb. To detect a pulse, press the soft space between the wrist bone (radius) and the flexor tendons at the bottom of the wrist. The radial pulse is also close to the surface of the skin, so light pressure is usually needed for palpation. The radial pulse is the most commonly used pulse point for assessing pulse rate in adults.

Apical: The apical pulse is slightly different from other pulse points because it is located at the apex of the heart, not the artery. The apical pulse is usually located in the fifth intercostal space or medial to the midclavicular line on the left side of the chest. If the patient has an enlarged heart, it may be located lower. Delicate adults and children may have pulsations at this time, but in most cases the nurse will need a stethoscope to assess the apical pulse and will auscultate rather than palpate the apical pulse.

Femoral: The femoral pulse is located under the inguinal ligament. For most people, this is in the crease of the joint between the clavicle and the anterior iliac bone. The femoral pulse is located deeper in the tissue, so more pressure is required for palpation than the radial or carotid pulses.

Popliteal: The popliteal pulse is located behind the knee in the popliteal fossa. It is important to keep the knee bent to feel this pulse. Like the femoral pulse, it is not close to the surface of the skin, so it requires firm pressure to palpate. Palpation of the popliteal pulse may be difficult in some patients. In this case, assess pulse sites distal to the knee (Posterior Tibial and Dorsalis Pedis) for blood flow.

Temporarily: Temporal pulse is slightly less valued, but should be assessed during a comprehensive head examination. To find the temporal pulse point, run two fingers from the top of the cheekbone to the hairline. The pulse point is located in front of the tragus. The temporal pulse point is close to the skin, so light pressure is required for palpation. It is easy to block this pulse point with too much pressure.

Brachial: The brachial pulse is located on the inner side of the biceps muscle. This is the arterial pressure measured using a manual blood pressure cuff. The pulse can be assessed at several points along the arm, but it is easier to feel near the bend of the elbow. This pulse point requires firm pressure to palpate because it is not close to the surface of the skin.

Posterior tibial: The posterior tibial pulse can be felt on the inside of the ankle, behind and below the ankle bone (ankle bone). To find this pulse, use two fingers between the medial malleolus and the Achilles tendon and press down. Moderate pressure is required to feel the posterior tibial pulse. This is an important pulse point for assessing peripheral perfusion.

Dorsalis Pedis: Similarly, the dorsalis pedis pulse point can also be used to assess peripheral vascularity and perfusion of the lower extremities. The impact point of the dorsalis pedis is located on the top of the foot, in the first intermetatarsal space on the side of the tendon that moves the big toe. If the patient is able, ask them to raise the big toe and run two fingers along the tendon to find the dorsalis pedis pulse.

Between the muscles, fascia and bones of the leg there are various openings, pits, canals and foramina, in which blood and lymph vessels and nerves lie. The piriformis muscle passing through the foramen is divided into two: foramen suprapiriformis and foramen infrapiriformis. Blood vessels and nerves from the pelvic cavity to the free part of the leg pass through these holes.

The area between the iliac crest and the iliac bone is divided by the arcus iliopectineus into two: a laterally located muscular lacuna and a medially located vascular lacuna.

Muscular lacuna

The muscular lacuna (lacuna musculorum) is bounded from the front and above by the clavicle, from the back by the iliac bone, and from the medial side by the arcus iliopectineus. The ilio-lumbar muscle and femoral nerve pass through it.

A vascular lacuna

Vascular lacuna (lacuna vasorum) from the anterior side is the chondylar ligament, from the back and lower side, the comb-shaped ligament, from the lateral side, the iliac-comb-shaped arch, from the medial side is the lig. bordered by lacunare. Femoral artery, vein and lymph vessels pass through it. The femoral triangle (trigonum femorale) is located on the front surface of the thigh below the clavicle. It is bordered from the upper side by the chondylar tendon, from the lateral

side by the suture muscle, and from the medial side by the long adductor muscle. From the tip of the femoral triangle, the adductor canal (canalis adductorius) begins. This channel joins the front surface of the thigh to the inguinal fossa. Its medial wall is covered by m. adductor magnus, its lateral wall by m. vastus medialis, and from the front side it is covered by a fibrous layer - lamina vastoadductoria.

Hip channel

A femoral canal (canalis femoralis) is absent in a healthy person, but there is a femoral ring (anulus femoralis) in the inner corner of the vascular lacuna. Its walls are bounded by the clavicle from the front, the comb fascia from the back, lig.lacunare from the medial side, and the femoral vein from the lateral side. In a healthy person, the internal opening of the femoral canal is bounded by the abdominal transverse fascia from the inside, and the Pirogov lymph node is located on the outside. A hip hernia may occur when the pressure in the abdominal cavity increases. In this case, the femoral ring becomes the entrance of the femoral canal. The hernia entered through this hole passes between the superficial and deep layers of the cerbar fascia of the thigh, goes to the area of the oval fossa, and exits under the skin through the hiatus sapheaus. This hole becomes the exit hole of the femoral canal. There are three walls of the femoral canal, the front wall is formed by the surface of the broad fascia of the thigh, the back wall is formed by the deep sheet of the broad fascia of the thigh, and the lateral wall is formed by the femoral vein.

Takim pit

The popliteal fossa (fossa poplitea) is diamond-shaped and is located behind the knee joint. Its upper corner is bounded laterally by the biceps femoris muscle, medially by the semi-pai muscle, and its lower corner by the heads of the calf muscle. Nerves, blood vessels, and lymph nodes lie in the inguinal cavity.

From the lower corner of the inguinal fossa, the inguinal canal (canalis cruropopliteus) begins. This channel is located between the superficial and deep layers of the posterior group of muscles of the lower leg, and is bounded by the posterior large calf muscle from the front, and the soleus muscle from the back. The posterior great calf artery, vein and great calf nerve pass through the channel.

In the upper part of the lateral surface of the shin, between the small tibial bone and the long muscle of the small shin, there is a superior muscle-small shin canal (canalis musculo-peroneus superior), through which the small shin nerve passes to the surface. The lower muscle-small shin canal (canalis musculo-peroneus inferior) separates from the shin-shin canal laterally in the middle part of the shin. Its anterior wall is formed by the posterior surface of the small tibia, and the posterior wall is formed by the long muscle that flexes the thumb. In this channel lies the small calf artery and vein.

On the palmar surface of the paw there are medial and lateral palmar egates, through which blood vessels and nerves of the same name pass. A newborn baby's leg muscles are not well developed. Because the contractile part of the calf muscle is long, the length of the tendon is the same in the upper and lower parts of the calf. The muscles of the deep floor are not clearly developed and have a general structure. Leg muscles make up 38% of the total muscle mass.

The femoral triangle is relatively large in a newborn baby and occupies 1/3 of the thigh. In it, vascular and muscular lacunae are relatively narrow and vertically located,

The tooth cavity is superficial and passes downwards into the tooth canal. Bone-fibrosis channels and synovial sheaths of the heel are formed. Leg muscles grow rapidly up to 5-6 years of age and in adulthood. First of all, the muscles of the palm of the paw are improved.

Other Arteries of the Thigh

In addition to the femoral artery, there are other vessels supplying the lower limb.

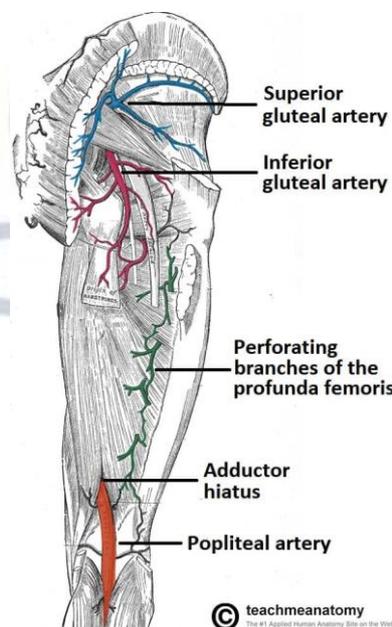
The obturator artery arises from the internal iliac artery in the pelvic region. It descends via the obturator canal to enter the medial thigh, bifurcating into two branches:

Anterior branch – This supplies the pectineus, obturator externus, adductor muscles and gracilis.

Posterior branch – This supplies some of the deep gluteal muscles.

The gluteal region is largely supplied by the superior and inferior gluteal arteries. These arteries also arise from the internal iliac artery, entering the gluteal region via the greater sciatic foramen.

The superior gluteal artery leaves the foramen above the piriformis muscle, the inferior below the muscle. In addition to the gluteal muscles, the inferior gluteal artery also contributes towards the vasculature of the posterior thigh.



In the Leg

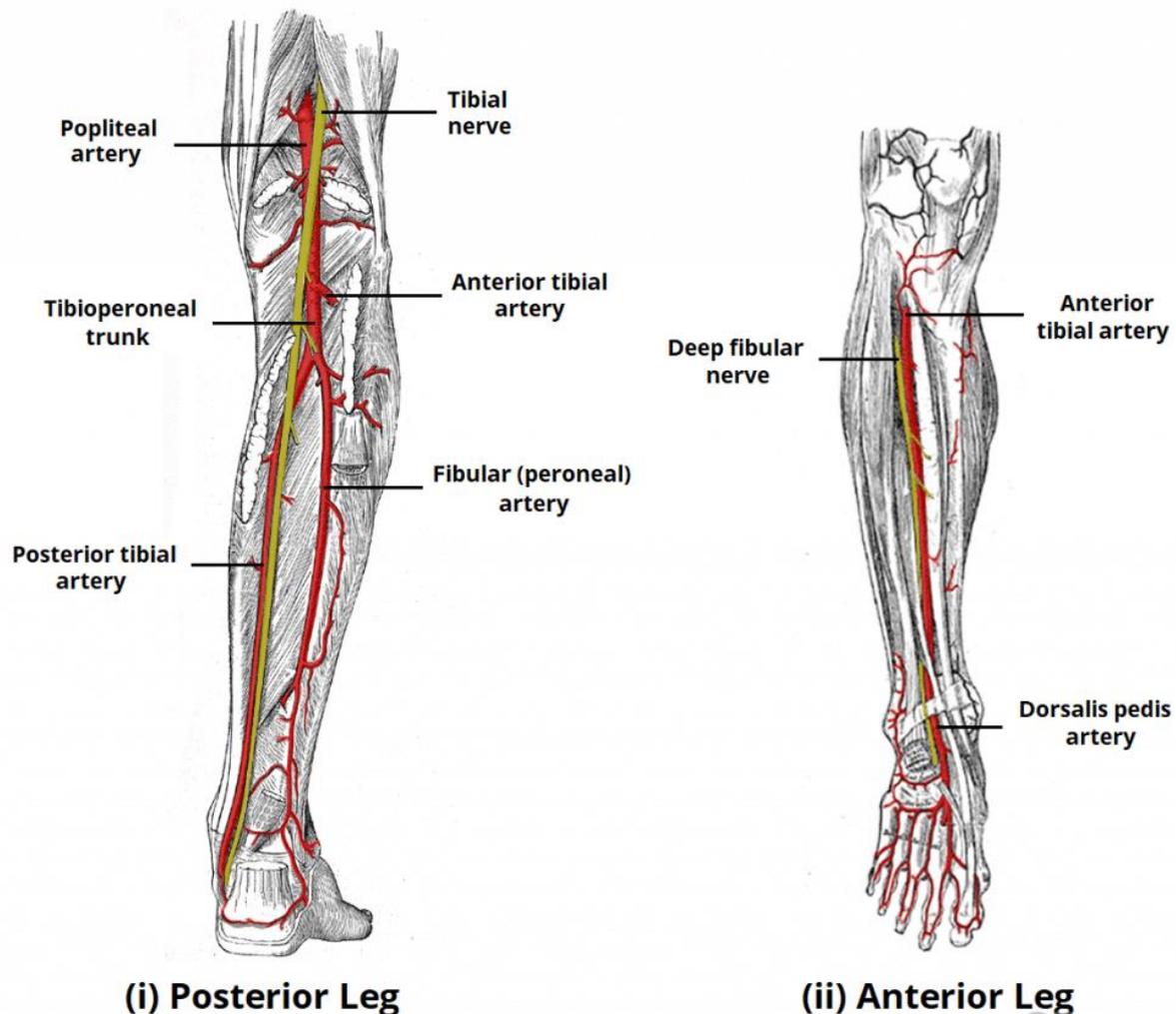
The popliteal artery descends down the posterior thigh, giving rise to genicular branches that supply the knee joint. It moves through the popliteal fossa, exiting between the gastrocnemius and popliteus muscles.

At the lower border of the popliteus, the popliteal artery terminates by dividing into the anterior tibial artery and the tibioperoneal trunk. In turn, the tibioperoneal trunk bifurcates into the posterior tibial and fibular arteries:

Posterior tibial artery – continues inferiorly, along the surface of the deep posterior leg muscles (such as tibialis posterior). It enters the sole of the foot via the tarsal tunnel, accompanying the tibial nerve.

Fibular (peroneal) artery – descends posteriorly to the fibula, within the posterior compartment of the leg. It gives rise to perforating branches, which penetrate the intermuscular septum to supply muscles in the lateral compartment of the leg.

The other division of the popliteal artery, the anterior tibial artery, passes anteriorly between the tibia and fibula, through a gap in the interosseous membrane. It then moves inferiorly down the leg. It runs down the entire length of the leg, and into the foot, where it becomes the dorsalis pedis artery.



© TeachMeAnatomy...

ARM

Brachial Artery. The brachial artery is a blood supply vessel and is a continuation of the axillary artery. It begins under the pectoralis muscle and travels down the arm before splitting into two arteries (the radial artery and the ulnar artery) at the elbow.

FOREARM. Radial Artery. The radial artery is one of two major blood vessels that supply blood to the forearm and hand. The radial artery comes from the brachial artery and travels across the front of the elbow. In the forearm, it travels deep under muscle until it comes closer to the skin surface near the wrist. You can feel the pulse of the radial artery just under the skin on the thumb side of the wrist. After it travels across the wrist, the radial artery branches to form a network of blood supply vessels in the hand. One of these vessels is called the deep palmar arch.

Ulnar Artery. The ulnar artery is one of two major blood vessels that supply blood to the forearm and hand. The ulnar artery comes from the brachial artery and travels across the front of the elbow. In the forearm, it travels deep under muscle along the small finger side of the forearm. After it travels across the wrist, the ulnar artery branches to form a network of blood supply vessels in the hand. One of these vessels is called the superficial palmar arch.

HAND

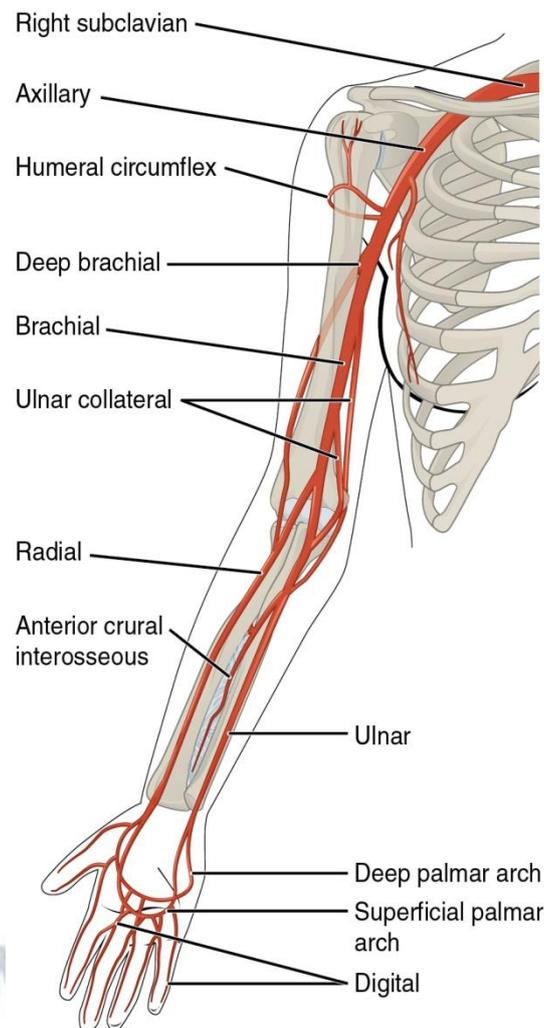
Deep Palmar Arch. As the radial artery continues in the hand, it wraps around the thumb and comes across the deep palm. This vessel, which resembles the shape of an arch, is called the deep palmar arch. This small but important vessel sends off small branches to supply blood to the thumb and index finger. It also connects to the superficial palmar arch in most people.

Superficial Palmar Arch. As the ulnar artery continues in the hand, it travels across the palm. The vessel creates the shape of an arch, and is called the superficial palmar arch. This vessel communicates with the deep palmar arch and also gives off important branches which supply blood to the fingers. These are called the common digital arteries.

Common Digital Arteries. The common digital arteries are small vessels that come from the palmar arches and supply blood to the fingers. They are called “common” because most of these vessels travel in the palm toward the fingers and then split to provide blood to two different fingers. The splits, which occur in the palm, become the proper digital arteries to the fingers.

Digital Arteries to the Thumb. The thumb receives its blood supply from the digital arteries to the thumb. The largest of these is a branch from the deep palmar arch and is called the “princeps pollicis” artery.

Proper Digital Arteries to the Fingers. As the common digital arteries travel from the palm toward the fingers, they split near the finger web spaces to become the proper digital arteries. The split feeds two different fingers. For example, the common digital artery that travels in the palm between the middle and ring fingers splits and then gives one vessel to the ring finger and one vessel to the middle finger. Each finger has two proper digital arteries that run on either side along its length. If one of these vessels is injured, the several connections between these two proper digital arteries usually maintain the blood supply to the entire finger.



References:

- Gersch CJ, Heimgartner NM, Rebar CR, Willis LM, eBook Nursing Collection – Worldwide, Books@Ovid Purchased eBooks. Medical-Surgical Nursing Made Incredibly Easy! Fourth; 4; Wolters Kluwer; 2016. <https://go.exlibris.link/M02mGY9N>
2. Chakravarthi KK, Ks S, Venumadhav N, Sharma A, Kumar N. Anatomical variations of brachial artery - its morphology, embryogenesis and clinical implications. J Clin Diagn Res. 2014 Dec;8(12):AC17-20. [PMC free article] [PubMed]
3. Cherukupalli C, Dwivedi A, Dayal R. High bifurcation of brachial artery with acute arterial insufficiency: a case report. Vasc Endovascular Surg. 2007 Dec-2008 Jan;41(6):572-4. [PubMed]
4. Shen S, Hong MK. A rare case of bilateral variations of upper limb arteries: brief review of nomenclature, embryology and clinical applications. Surg Radiol Anat. 2008 Oct;30(7):601-3. [PubMed]

5. Natsis K, Papadopoulou AL, Paraskevas G, Totlis T, Tsikaras P. High origin of a superficial ulnar artery arising from the axillary artery: anatomy, embryology, clinical significance and a review of the literature. *Folia Morphol (Warsz)*. 2006 Nov;65(4):400-5. [PubMed]
6. Coskun N, Sarikcioglu L, Donmez BO, Sindel M. Arterial, neural and muscular variations in the upper limb. *Folia Morphol (Warsz)*. 2005 Nov;64(4):347-52. [PubMed]
7. Yoshinaga K, Tanii I, Kodama K. Superficial brachial artery crossing over the ulnar and median nerves from posterior to anterior: embryological significance. *Anat Sci Int*. 2003 Sep;78(3):177-80. [PubMed]

