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# **ASSINGMENT b Vivah CROSS SECTIONAL ANATOMY**

# **SEMESTER. SIX SEMESTER**

# **SUBMITTED TO. SIR WAQAS**

# **Department Radiology**

# Qno1 . Write about the MRI of Human Heart.

# **Ans Heart MRI**

**The Heart** magnetic resonance imaging is an imaging method that use to powerful magnetic and radio waves to produce the image of heart it does not have the radiation which means X rays the single magnetic resonance imaging images are called slices the images can be stored on a computer or printed the different types of films Heart [magnetic resonance imaging](https://medlineplus.gov/ency/article/003335.htm) is an imaging method that uses powerful magnets and radio waves to create pictures of the heart. It does not use radiation (x-rays).Single magnetic resonance imaging (MRI) images are called slices. The images can be stored on a computer or printed on film. One exam produces dozens or sometimes hundreds of images.The test may be done as part of a [chest MRI](https://medlineplus.gov/ency/article/003794.htm).

## **Explanation about MRI**

You may be asked to wear a hospital gown or clothing without metal fasteners (such as sweatpants and a t-shirt). Some types of metal can cause blurry images or be attracted to the powerful magnet.You will lie on a narrow table, which slides into a large tunnel-like tube.Some exams require a special dye (contrast). The dye is most often given before the test through a vein (IV) in your hand or forearm. The dye helps the radiologist see certain areas more clearly. This is different from the dye used for a CT scan.During the MRI, the person who operates the machine will watch you from another room. The test most often lasts 30 to 60 minutes but may take longerYou may be asked not to eat or drink anything for 4 to 6 hours before the scan.Tell your health care provider if you are afraid of close spaces (have claustrophobia). You may be given a medicine to help you feel sleepy and less anxious, or your provider may suggest an "open" MRI, in which the machine is not as close to the body.

Before the test, tell your provider if you have:

Brain aneurysm clips

Certain types of artificial heart valves

Heart defibrillator or pacemaker

Inner ear (cochlear) implants

Kidney disease or dialysis (you may not be able to receive contrast)

Recently placed artificial joints

Certain types of vascular [stents](https://medlineplus.gov/ency/article/002303.htm)

Worked with sheet metal in the past (you may need tests to check for metal pieces in your eyes)Because the MRI contains strong magnets, metal objects are not allowed into the room with the MRI scanner:Pens, pocketknives, and eyeglasses may fly across the room.Items such as jewelry, watches, credit cards, and hearing aids can be damaged Pins, hairpins, metal zippers, and similar metallic items can distort the images.Removable dental work should be taken out just before the scan.

## **Risks**

## There is no radiation involved in MRI. The magnetic fields and radio waves used during the scan have not been shown to cause any significant side effects.Allergic reactions to the dye used during the exam are rare. The most common type of contrast (dye) used is gadolinium. It is very safe. The person operating the machine will monitor your heart rate and breathing as needed. Rare complications can occur in people with severe kidney problems.People have been harmed in MRI machines when they did not remove metal objects from their clothes or when metal objects were left in the room by others.MRI is most often not recommended for traumatic injuries. [Traction](https://medlineplus.gov/ency/article/002336.htm) and life-support equipment cannot safely enter the scanner area.MRIs can be costly, take a long time to perform, and are sensitive to movement.

An MRI can help your doctor diagnose many different heart conditions, including:

* Tissue damage from a heart attack
* Reduced blood flow in the heart muscle to help determine whether heart artery blockages are the cause of your chest pain ([angina](https://www.heart.org/en/health-topics/heart-attack/angina-chest-pain))
* Problems in the aorta—the heart’s main artery—such as a tear, aneurysm (bulge), or narrowing
* Diseases of the pericardium (outer lining of the heart muscle) such as constrictive [pericarditis](https://www.heart.org/en/health-topics/pericarditis/what-is-pericarditis)
* Heart muscle diseases, such as heart failure or enlargement of the heart, and abnormal growths such as cancerous tumors
* Heart valve disorders, such as [regurgitation](https://www.heart.org/en/health-topics/heart-valve-problems-and-disease/heart-valve-problems-and-causes/problem-heart-valve-regurgitation)
* [Congenital heart problems](https://www.heart.org/en/health-topics/congenital-heart-defects) and the success of surgical repair

## **How prepare for an MRI?**

* Before your MRI scan, eat normally and take your usual medicines unless your doctor tells you not to.
* It’s very important to remove all objects that may contain metal or electronics (jewelry such as rings or earrings, hairpins, dentures, watches and hearing aids) before the test.
* Don’t bring your credit or debit cards into the MRI room. The machine might erase or damage the magnetic strip on the back of the cards.
* If you have any implants or clips in your body, have your doctor write a note to indicate if they are safe for MRI.

## **What happens during an MRI?**

A radiologist or MRI technologist usually performs the scan in a hospital, clinic or imaging center using special equipment.

* You’ll lie down on a moveable table that slides into the MRI machine. The machine looks like a long metal tube.
* Depending on which part of your body needs to be checked, a small coil may be placed on that part of the body to send the radio waves and receive the MRI signal.
* Your technologist will watch you from another room. You can talk with him or her by microphone. In some cases, a friend or family member may stay in the room with you.
* The MRI machine will create a strong magnetic field around you, and radio waves will be directed at the area of your body to be imaged. You won’t feel the magnetic field or radio waves.
* During the MRI scan, the magnet produces loud tapping or thumping sounds and other noises. You may be given earplugs or you may listen to music with headphones to help block the noise.
* In some cases, you may have an intravenous (IV) line in your hand or arm for injecting a contrast agent into your veins (for an MRA). The contrast agent produces better images of your tissues and blood vessels. It does not contain iodine and is less likely to cause an allergic reaction compared to the agents used for computed tomography (CT) scans.
* An MRI scan lasts between 30 and 90 minutes.You’ll need to lie still during the exam because movement can blur the images of your body. If you aren’t comfortable in close spaces, tell your doctor before the test. You can get a sedative to help you stay calm. Some clinics have machines with shorter magnets or wider openings to make you more comfortable.

**Qno2 . Write about the bones of upper limb.?**

# **Ans The bones of the upper limb**

## **Clavicle**

The clavicle, or collar bone connects the trunk to the upper limb by extending from the manubrium of the sternum to the acromion of the scapula. It is technically a long bone with a shaft and two ends, it can be readily palpated, and it is one of the most commonly fractured bones in the body (usually at the junction of its medial two thirds and lateral one third).The medial end is rounded and is part of the sternoclavicular joint. The medial two thirds of the shaft is convex anteriorward and arches anterior to the brachial plexus and subclavian vessels. The costoclavicular ligament is attached to its inferior aspect, and a shallow groove lodges the subclavius muscle. The lateral third of the shaft is concave anteriorward and is flattened. The conoid and trapezoid parts of the coracoclavicular ligament are attached to the inferior aspect and resists upward displacement of the lateral part of the clavicle. The lateral end of the clavicle is part of the acromioclavicular joint. A vertical line through the midpoint of the clavicle is used in surface anatomy to define the midclavicular line.

## **Scapula**

The scapula, or shoulder blade is a large, flat, triangular bone that connects the clavicle to the humerus. Its body rests on the superior part of the posterolateral thorax, and the bone includes both a spine that articulates with the acromion and a coracoid process.The scapula is highly mobile. In the anatomical position, the glenoid cavity is directed anteriorward as well as lateralward. Thus, abduction of the arm in the plane of the scapula moves the arm in an anterolateral direction.The body of the scapula is triangular and has a concave costal surface (subscapular fossa) applied to the thorax and a dorsal surface, which is divided by the spine of the bone. The smaller superior part is the supraspinous fossa, and the inferior portion is the infraspinous fossa. The superior border of the scapula has the suprascapular notch. The medial border, usually convex, can be seen and felt. The inferior angle and the medial border usually ossify from separate epiphysial centers.

## **Humerus**

The humerus and is the bone of the shoulder and arm. It articulates with the scapula at the shoulder and with the radius and ulna at the elbow.The proximal end consists of the head, anatomical neck, and greater and lesser tubercles separated from each other by an intertubercular groove. The head, almost hemispherical, faces medial, superior, and posterior. The anatomical neck is at the periphery of the head, The greater tubercle projects laterally, beyond the acromion. Unless the shoulder is dislocated, a ruler will not make contact simultaneously with the acromion and the lateral epicondyle. The greater tubercle is covered by the deltoid muscle, which is responsible for the normal, rounded contour of the shoulder. The lesser tubercle projects anteriorward (see fig. [6-13](https://www.dartmouth.edu/~humananatomy/figures/chapter_6/6_13.htm)). The intertubercular groove contains the tendon of the long head of the biceps. The surgical neck, a common site of fracture of the humerus, is the point at which the superior portion of the bone meets the shaft. The axillary nerve lies in contact with the surgical neck

The shaft has anterolateral, anteromedial, and posterior surfaces and lateral, anterior, and medial borders. The deltoid muscle is inserted into a tuberosity on the anterolateral surface at about the middle of the shaft. The radial nerve runs inferiorward and lateral on the posterior surface in a shallow, oblique groove

The distal end of the humerus includes the lateral and medial epicondyles and a condyle consisting of the capitulum and trochlea. The lateral epicondyle gives origin to the supinator and to the extensor muscles of the forearm. The capitulum articulates with the head of the radius. The trochlea is a pulley-shaped projection that articulates with the trochlear notch of the ulna. It is set obliquely, so that a "carrying angle" exists between the arm and the extended and supinated forearm. Radial and coronoid fossae are situated anterior and superior to the capitulum and trochlea, respectively. A deeper olecranon fossa is located posteriorly, superior to the trochlea. The medial epicondyle gives origin shaft begins to ossify during the eighth postovulatory week, and a center is usually present in the head at birth. Centers for the greater and lesser tubercles appear postnatally, as do four centers for the distal end.

## **Radius**

The radius is shorter than and lateral to the ulna. The proximal end articulates with the humerus, the medial aspect with the ulna, and thedistal end with the carpus.The proximal end consists of a head, neck, and tuberosity. The superior, concave surface of the head articulates with the capitulum of the humerus. The circumference of the head articulates with the ulna medially but is elsewhere covered by the annular ligament (see fig. [9-6](https://www.dartmouth.edu/~humananatomy/figures/chapter_9/9-6.htm)). The head of the radius can be felt immediately inferior to the lateral epicondyle (in the "valley" behind the brachioradialis), particularly during rotation. The tuberosity of the radius is situated on the anteromedial aspect, immediately distal to the neck.The shaft has anterior, posterior, and lateral surfaces and anterior, posterior, and interosseous borders. The interosseous border is attached by the interosseous membrane to a corresponding border on the ulna (see fig. [6-23](https://www.dartmouth.edu/~humananatomy/figures/chapter_6/6_23.htm)).

## **Ulna**

The ulna is longer than and medial to the radius. It articulates with the humerus proximally, the radius laterally, and the articular disc distally.The proxiaml end includes the olecranon and the coronoid process. The olecranon is the prominence of the posterior elbow, which rests on a table when a subject leans on his elbow. The lateral epicondyle, the tip of the olecranon, and the medial epicondyle are in a straight line when the forearm is extended, but form an equilateral triangle when the forearm is flexed. The superior aspect of the olecranon receives the insertion of the triceps. The posterior aspect, covered by a bursa, is subcutaneous. The antierior part of the olecranon forms a part of the trochlear notch, which articulates with the trochlea of the humerus. The coronoid process, which completes the trochlear notch, projects anteriorward and engages the coronoid fossa of the humerus during flexion. It is prolonged inferiorward as a rough area termed the tuberosity of the ulna. The radial notch is on the lateral aspect of the coronoid process and articulates with the head of the radius.The shaft has anterior, posterior, and medial surfaces and anterior, posterior, and interosseous borders. The posterior border is completely subcutaneous and readily palpable. It separates the flexor from the extensor muscles of the forearm.

The relationships of joint capsules to epiphysial lines (see figs. [6-15](https://www.dartmouth.edu/~humananatomy/figures/chapter_6/6_15.htm) and [6-26](https://www.dartmouth.edu/~humananatomy/figures/chapter_6/6_26.htm)) are important, because epiphysial discs tend to limit the extent of infection, but it is possible for infection to spread from the shaft to the joint when part of the diaphysis is intracapsular.

## **Carpus**

The carpal bones, usually eight in number, are arranged in two rows of four Their names are scaphoid, lunate, triquetrum (or triquetral), pisiform, trapezium, trapezoid, capitate, and hamate. The pisiform lies anterior to the triquetrum, whereas each of the other carpals has several facets for articulation with adjacent bones.The posterior aspect of the intact carpus is convex and the anterior aspect is concave, where it is bridged by the flexor retinaculum to form the carpal canal or tunnel for the flexor tendons and the median nerve. Hence, the posterior surfaces of the carpals are generally larger than the anterior, with the exception of the lunate, where the converse holds. The flexor retinaculum extends between the scaphoid and trapezium laterally and the triquetrum and hamate medially (see fig. [11-2](https://www.dartmouth.edu/~humananatomy/figures/chapter_11/11-2.htm)). These four bones can be distinguished by deep palpation.the radius only, whereas in the neutral position or in abduction, it articulates with the articular disc also (see fig. [6-19](https://www.dartmouth.edu/~humananatomy/figures/chapter_6/6_19.htm)). The pisiform, the smallest of the carpals and the last to ossify, lies anterior to the triquetrum and can be moved passively from side to side when the flexor carpi ulnaris is relaxed.Each carpal bone usually ossifies from one center postnatally. Those for the capitate and hamate develop first and may appear before birth. Radiography of the carpus is frequently used for the assessment of skeletal maturation: the carpus under consideration being compared to a series of standards.

**Metacarpus**

The carpus is connected to the phalanges by five metacarpal bones, referred to collectively as the metacarpus. They are numbered from 1 to 5, from the thumb to the little finger. The first is the shortest and the second the longest. They contribute to the palm, and their posterior aspects can be felt under cover of the extensor tendons.Each metacarpal is technically a long bone, consisting of a base proximally, a shaft, and a head distally. The base articulates with the carpus and, except for that of the first, with the adjacent metacarpal(s) also. The base of the first metacarpal has a saddle-shaped facet for the trapezium. The head of each metacarpal articulates with a proximal phalanx and forms a knuckle of the fist.The shaft of each metacarpal begins to ossify during fetal life, and centers appear postnatally in the heads of the four medial bones and in the base of the first metacarpal. Accessory centers termed "pseudoepiphyses" are sometimes seen in the head of the first and in the base of the second metacarpal.

## **Phalanges**

The thumb has two phalanges, whereas each of the other fingers has three. They are designated proximal, middle, and distal. Each phalanx is technically a long bone, consisting of a base proximally, a shaft, and a head distally. The base of a proximal phalanx articulates with the head of a metacarpal, and the head of the phalanx presents two condyles for the base of a middle phalanx. Similarly, the head of a middle phalanx presents two condyles for the base of a distal phalanx. Each distal phalanx ends in a rough expansion termed its tuberosity.Each phalanx begins to ossify during fetal life, and centers appear postnatally in their bases.

Sesamoid bones are found related to the anterior aspects of some of the metacarpophalangeal and interphalangeal joints. Two located anterior to the head of the first metacarpal are almost constant.

Qno3 What are the planes used in cross sectional anatomy?Explain them.

Ans



Anatomical planes in a human:

  median or sagittal plane

  a parasagittal plane

  frontal or coronal plane

  transverse or axial plane

**The anatomical plane**

 is a hypothetical [plane](https://en.m.wikipedia.org/wiki/Mathematical_plane) used to transect the body, in order to describe the location of structures or the direction of movements. In human and animal anatomy, three principal planes are used:

* The [sagittal plane](https://en.m.wikipedia.org/wiki/Sagittal_plane) or median plane (*longitudinal, anteroposterior*) is a plane parallel to the [sagittal suture](https://en.m.wikipedia.org/wiki/Sagittal_suture). It divides the body into left and right.
* The [coronal plane](https://en.m.wikipedia.org/wiki/Frontal_plane) or frontal plane (*vertical*) divides the body into dorsal and ventral (back and front, or posterior and anterior) portions.
* The [transverse plane](https://en.m.wikipedia.org/wiki/Transverse_plane) or axial plane (*lateral, horizontal*) divides the body into cranial and caudal (head and tail) portions.

**Terminology**

There could be any number of sagittal planes; however, there is only one cardinal sagittal plane. The term *cardinal* refers to the one plane that divides the body into equal segments, with exactly one half of the body on either side of the cardinal plane. The term *cardinal plane* appears in some texts as the *principal plane*. The terms are interchangeable.[[1]](https://en.m.wikipedia.org/wiki/Anatomical_plane#cite_note-1)

## Human anatomy[Edit](https://en.m.wikipedia.org/w/index.php?title=Anatomical_plane&action=edit&section=2)The following terms are defined in reference to the anatomical model being in the upright orientation (standing):

* A **transverse** (also known as **axial** or **horizontal**) plane is parallel to the ground; in humans it separates the [superior](https://en.m.wikipedia.org/wiki/Anatomical_terms_of_location#Directions:_human_anatomy) from the [inferior](https://en.m.wikipedia.org/wiki/Anatomical_terms_of_location#Directions:_human_anatomy), or put another way, the head from the feet.
* A **coronal** (also known as **frontal**) plane is [perpendicular](https://en.m.wikipedia.org/wiki/Perpendicular) to the ground; in humans it separates the anterior from the posterior, the front from the back, the ventral from the dorsal.
* A **sagittal** (also known as **anteroposterior**) plane is perpendicular to the ground, separating left from right. The midsagittal plane is the specific [sagittal](https://en.m.wikipedia.org/wiki/Sagittal#General_usage) plane that is exactly in the middle of the body.
	+ The **midsagittal** or **median** plane is in the midline; i.e. it would pass through midline structures such as the [navel](https://en.m.wikipedia.org/wiki/Navel) or [spine](https://en.m.wikipedia.org/wiki/Vertebral_column), and all other sagittal planes (also referred to as **parasagittal planes**) are parallel to it. Median can also refer to the midsagittal plane of other structures, such as a digit.

The axes and the sagittal plane are the same for bipeds and quadrupeds, but the orientation of the coronal and transverse planes switch. The axes on particular pieces of equipment may or may not correspond to axes of the body, especially since the body and the equipment may be in different relative orientations.

* 

Brain viewed from below. This is an example of a *transverse plane*.

* 

Brain cut in half through the midsection. This is an example of a *sagittal plane*.

[**Anatomical terms of motion**](https://en.m.wikipedia.org/wiki/Anatomical_terms_of_motion)

When describing anatomical motion, these planes describe the axis along which an action is performed. So by moving through the transverse plane, movement travels from head to toe. For example, if a person jumped directly up and then down, their body would be moving through the transverse plane in the coronal and se perpendicular to the transverse plane. The [coronal plane](https://en.m.wikipedia.org/wiki/Coronal_plane) and the [sagittal plane](https://en.m.wikipedia.org/wiki/Sagittal_plane) are examples of longitudinal planes.

Medical imaging the orientation of certain planes needs to be distinguished, for instance in [medical imaging](https://en.m.wikipedia.org/wiki/Medical_imaging) techniques such as [sonography](https://en.m.wikipedia.org/wiki/Medical_ultrasonography), [CT scans](https://en.m.wikipedia.org/wiki/Computed_axial_tomography), [MRI scans](https://en.m.wikipedia.org/wiki/Magnetic_resonance_imaging), or [PET scans](https://en.m.wikipedia.org/wiki/Positron_emission_tomography). There are a variety of different standardized coordinate systems. For the [DICOM](https://en.m.wikipedia.org/wiki/DICOM) format, the one imagines a human in the anatomical position, and an X-Y-Z [coordinate system](https://en.m.wikipedia.org/wiki/Cartesian_coordinate_system) with the y-axis going from front to back, the x-axis going from right to left, and the z-axis going from toe to head. The [right-hand rule](https://en.m.wikipedia.org/wiki/Right-hand_rule) applies.

[**Anatomical landmark**](https://en.m.wikipedia.org/wiki/Anatomical_landmark)**and**[**List of anatomical lines**](https://en.m.wikipedia.org/wiki/List_of_anatomical_lines)



[**Axillary lines**](https://en.m.wikipedia.org/wiki/Axillary_lines).

In humans, reference may take origin from [superficial anatomy](https://en.m.wikipedia.org/wiki/Superficial_anatomy), made to [anatomical landmarks](https://en.m.wikipedia.org/wiki/Anatomical_landmark) that are on the skin or visible underneath. As with planes, lines and points are imaginary. Examples include:

* The **midaxillary line**, a line running vertically down the surface of the body passing through the apex of the [axilla](https://en.m.wikipedia.org/wiki/Axilla) (armpit). Parallel are the **anterior axillary line**, which passes through the anterior axillary skinfold, and the **posterior axillary line**, which passes through the posterior axillary skinfold.
* The [**mid-clavicular line**](https://en.m.wikipedia.org/wiki/Mid-clavicular_line), a line running vertically down the surface of the body passing through the midpoint of the [clavicle](https://en.m.wikipedia.org/wiki/Clavicle).

In addition, reference may be made to structures at specific levels of the [spine](https://en.m.wikipedia.org/wiki/Vertebral_column) (e.g. the 4th [cervical vertebra](https://en.m.wikipedia.org/wiki/Cervical_vertebra), abbreviated "C4"), or the rib cage (e.g., the 5th [intercostal space](https://en.m.wikipedia.org/wiki/Intercostal_space)).

Occasionally, in medicine, [abdominal](https://en.m.wikipedia.org/wiki/Abdomen) organs may be described with reference to the **trans-pyloric plane**, which is a transverse plane passing through the [pylorus](https://en.m.wikipedia.org/wiki/Pylorus).

### Comparative embryology[Edit](https://en.m.wikipedia.org/w/index.php?title=Anatomical_plane&action=edit&section=7)

In discussing the [neuroanatomy](https://en.m.wikipedia.org/wiki/Neuroanatomy) of animals, particularly [rodents](https://en.m.wikipedia.org/wiki/Rodent) used in [neuroscience](https://en.m.wikipedia.org/wiki/Neuroscience) research, a simplistic convention has been to name the sections of the brain according to the homologous human sections. Hence, what is technically a *transverse* (orthogonal) section with respect to the body length axis of a rat (dividing anterior from posterior) may often be referred to in rat neuroanatomical coordinates as a *coronal* section, and likewise a *coronal* section with respect to the body (i.e. dividing ventral from dorsal) in a rat brain is referred to as *transverse*. This preserves the comparison with the human brain, whose length axis in rough approximation is rotated with respect to the body axis by **90 degrees** in the ventral direction. It implies that the planes of the brain are not necessarily the same as those of the body.

However, the situation is more complex, since comparative embryology shows that the length axis of the neural tube (the primordium of the brain) has three internal bending points, namely two ventral bendings at the [cervical](https://en.m.wikipedia.org/wiki/Cervical_flexure) and [cephalic flexures](https://en.m.wikipedia.org/wiki/Cephalic_flexure) (cervical flexure roughly between the [medulla oblongata](https://en.m.wikipedia.org/wiki/Medulla_oblongata) and the [spinal cord](https://en.m.wikipedia.org/wiki/Spinal_cord), and cephalic flexure between the [diencephalon](https://en.m.wikipedia.org/wiki/Diencephalon) and the [midbrain](https://en.m.wikipedia.org/wiki/Midbrain)), and a dorsal ([pontine or rhombic flexure](https://en.m.wikipedia.org/wiki/Pontine_flexure)) at the midst of the hindbrain, behind the [cerebellum](https://en.m.wikipedia.org/wiki/Cerebellum). The latter flexure mainly appears in mammals and sauropsids (reptiles and birds), whereas the other two, and principally the cephalic flexure, appear in all vertebrates (the sum of the cervical and cephalic ventral flexures is the cause of the 90 degree angle mentioned above in humans between body axis and brain axis). This more realistic concept of the longitudinal structure of vertebrate brains implies that any section plane, except the sagittal plane, will intersect variably different parts of the same brain as the section series proceeds across it (relativity of actual sections with regard to topological morphological status in the ideal unbent neural tube). Any precise description of a brain section plane therefore has to make reference to the anteroposterior part of the brain to which the description refers (e.g., transverse to the midbrain, or horizontal to the diencephalon). A necessary note of caution is that modern embryologic orthodoxy indicates that the brain's true length axis finishes rostrally somewhere in the hypothalamus where basal and alar zones interconnect from left to right across the median line; therefore, the axis does not enter the telencephalic area, although various authors, both recent and classic, have assumed a telencephalic end of the axis. The causal argument for this lies in the end of the axial mesoderm -mainly the notochord, but also the prechordal plate- under the hypothalamus. Early inductive effects of the axial mesoderm upon the overlying neural ectoderm is the mechanism that establishes the length dimension upon the brain primordium, jointly with establishing what is ventral in the brain (close to the axial mesoderm) in contrast with what is dorsal (distant from the axial mesoderm). Apart from the lack of a causal argument for introducing the axis in the telencephalon, there is the obvious difficulty that there is a pair of telencephalic vesicles, so that a bifid axis is actually implied in these outdated versions

**Qno4 What are the protocols used while performing CT abdomen?**

**Ans Explanation**

[Have a technologist meet with the patient before the exam to confirm that symptoms match the indications for the CT exam.Choose a specific exam protocol which addresses the clinical question while minimizing dose Center the patient carefully in the CT gantry. Asymmetric positioning can result in decreased image quality and an increase in patient dose.Minimize “image creep” so only the area requested is imaged. For example, if a chest CT is ordered, a full abdomen should not be performed. Likewise, if a renal mass is the clinical question, a pelvis should not be routinely performed.](https://www.radiologyinfo.org/%22%20%5Ct%20%22_top)

**CT protocol**

A CT protocol is a set of parameters that specify a specific exam and contrast delivery requirements. When a CT scan is requested, it will be vetted by a radiologist or radiographer to determine the study is justified and what the most suitable parameters by which that CT should be performed - this may lead to a different CT examination being performed or an alternative modality recommended.

**Radiological protocol**

The radiological protocol is the 'type' of scan that will best suit the clinical question and patient presentation. It requires detailed knowledge of the radiological appearance of pathology, the parameters of the available CT scanner, and a thorough knowledge of the types of protocols the institution performs.

Once the protocol has been determined by the qualified party, it will then be discussed exactly how the scan will be performed from a technical aspect. In simple instances, i.e. a CT head this is quite straight forward. However, in more technically challenging cases hat include multiple radiological protocols, for example, a CTPA + triphasic liver, will require expert radiographer guidance to ensure that scan is performed correctly taking into account contrast delivery timing, scan speed and patient presentation. Computed tomography (CT) of the abdomen and pelvis is a diagnostic imaging test used to help detect diseases of the small bowel, colon and other internal organs and is often used to determine the cause of unexplained pain. CT scanning is fast, painless, noninvasive and accurate. In emergency cases, it can reveal internal injuries and bleeding quickly enough to help save lives.Tell your doctor if there's a possibility you are pregnant and discuss any recent illnesses, medical conditions, medications you're taking, and allergies. You will be instructed not to eat or drink anything for a few hours beforehand. If you have a known allergy to contrast material, your doctor may prescribe medications to reduce the risk of an allergic reaction. These medications must be taken 12 hours prior to your exam. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown.

 **CT Scanning of the Abdomen/Pelvis**

Computed tomography, more commonly known as a CT or CAT scan, is a diagnostic medical imaging test. Like traditional x-rays, it produces multiple images or pictormatted in multiple planes. They can even generate three-dimensional images. These images can be viewed on a computer monitor, pprinted on film or by a 3D printer, or transferred to a CD or DVD.CT images of internal organs, bones, soft tissue and blood vessels provide greater detail than traditional x-rays, particularly of soft tissues and blood vessels.

 Procedure

This procedure is typically used to help diagnose the cause of abdominal or pelvic pain and diseases of the internal organs, small bowel and colon, such as:infections such as appendicitis, pyelonephritis or infected fluid collections, also known as abscesses.inflammatory bowel disease such as ulcerative colitis or Crohn's disease, pancreatitis or liver cirrhosis.cancers of the liver, kidneys, pancreas, ovaries and bladder as well as lymphoma.kidney and bladder stones.abdominal aortic aneurysms (AAA), injuries to abdominal organs such as the spleen, liver, kidneys or other internal organs in cases of trauma.CT scanning of the abdomen/pelvis is also performed to:guide biopsies and other procedures such as abscess drainages and minimally invasive tumor treatments.plan for and assess the results of surgery, such as organ transplants.stage, plan and properly administer radiation treatments for tumors as well as monitor response to chemotherapy.

**Preparation**

You should wear comfortable, loose-fitting clothing to your exam. You may need to wear a gown during the procedureMetal objects, including jewelry, eyeglasses, dentures and hairpins, may affect the CT images. Leave them at home or remove them prior to your exam. You may also be asked to remove hearing aids and removable dental work. Women will be asked to remove bras containing metal underwire. You may be asked to remove any piercings, if possible.You will be asked not to eat or drink anything for a few hours beforehand, if contrast material will be used in your exam. You should inform your physician of all medications you are taking and if you have any allergies. If you have a known allergy to contrast material, your doctor may prescribe medications (usually a steroid) to reduce the risk of an allergic reaction. To avoid unnecessary delays, contact your doctor before the exact time of your exam.Also inform your doctor of any recent illnesses or other medical conditions and whether you have a history of heart disease, asthma, diabetes, kidney disease or thyroid problems. Any of these conditions may increase the risk of an adverse effect.

**Procedure performed**The technologist begins by positioning you on the CT exam table, usually lying flat on your back. Straps and pillows may be used to help you maintain the correct position and remain still during the exam.Many scanners are fast enough that children can be scanned without sedation. In special cases, sedation may be needed for children who cannot hold still. Motion will cause blurring of the images and degrade the quality of the examination the same way that it affects photographs.If contrast material is used, depending on the type of exam, it will be swallowed, injected through an intravenous line (IV) or, rarely, administered by enema.Next, the table will move quickly through the scanner to determine the correct starting position for the scans. Then, the table will move slowly through the machine as the actual CT scanning is performed. Depending on the type of CT scan, the machine may make several passes.You may be asked to hold your breath during the scanning. Any motion, including breathing and body movements, can lead to artifacts on the images. This loss of image quality can resemble the blurring seen on a photograph taken of a moving object.

### **Risks**

* There is always a slight chance of cancer from excessive exposure to radiation. However, the benefit of an accurate diagnosis far outweighs the risk.
* The effective radiation dose for this procedure varies.
* Women should always tell their doctor and x-ray or CT technologist if there is any chance they are pregnant.
* CT scanning is, in general, not recommended for pregnant women unless medically necessary because of potential risk to the unborn baby.
* The risk of serious allergic reaction to contrast materials that contain iodine is extremely rare, and radiology departments are well-equipped to deal with them.
* IV contrast manufacturers indicate mothers should not breastfeed their babies for 24-48 hours after contrast material is given. However, the most recent American College of Radiology (ACR) Manual.

**Qno5 Write a detail note on Cervical spine.?**

# **Ans Cervical spine**

The neck is part of a long flexible column, known as the [spinal column](http://en.wikipedia.org/wiki/Vertebral_column) or backbone, which extends through most of the body. The [cervical spine](http://en.wikipedia.org/wiki/Cervical_vertebrae) (neck region) consists of seven bones ([C1-C7 vertebrae](http://www.neurospineinstitute.org/procedures/spine-anatomy-physiology/)), which are separated from one another by intervertebral discs. These discs allow the spine to move freely and act as shock absorbers during activity.Attached to the back of each vertebral body is an arch of bone that forms a continuous hollow longitudinal space, which runs the whole length of the back. This space, called the [spinal canal](http://en.wikipedia.org/wiki/Spinal_canal), is the area through which the spinal cord and nerve bundles pass. The spinal cord is bathed in [cerebrospinal fluid](http://en.wikipedia.org/wiki/Cerebrospinal_fluid) (CSF) and surrounded by three protective layers called the [meninges](http://en.wikipedia.org/wiki/Meninges) ([dura](http://en.wikipedia.org/wiki/Dura_mater), [arachnoid](http://en.wikipedia.org/wiki/Arachnoid_mater), and [pia mater](http://en.wikipedia.org/wiki/Pia_mater)).At each vertebral level, a pair of spinal nerves exit through small openings called [**foraminae**](http://en.wikipedia.org/wiki/Intervertebral_foramina) (one to the left and one to the right). These nerves serve the muscles, skin and tissues of the body and thus provide sensation and movement to all parts of the body. The delicate spinal cord and nerves are further supported by strong muscles and ligaments that are attached to the vertebrae.cervical spine is the most superior portion of the vertebral column, lying between the cranium and the thoracic vertebrae.

It consists of seven distinct vertebrae, two of which are given unique names:

* The first cervical vertebrae (C1) is known as the atlas.
* The second cervical vertebrae (C2) is known as the axis.
* we shall look at the anatomy of the cervical vertebrae – their characteristic features, articulations and clinical relevance.

**Atlas and Axis**

The atlas and axis have additional features that mark them apart from the other cervical vertebrae.

**Atlas**

The atlas is the first cervical vertebra and articulates with the occiput of the head and the axis (C2).

It differs from the other cervical vertebrae in that it has no vertebral body and no spinous process. Instead, the atlas has lateral masses which are connected by an anterior and posterior arch. Each lateral mass contains a superior articular facet (for articulation with occipital condyles), and an inferior articular facet (for articulation with C2).

The anterior arch contains a facet for articulation with the dens of the axis. This is secured by the transverse ligament of the atlas – which attaches to the lateral masses. The posterior arch has a groove for the vertebral artery and C1 spinal nerve.

**Axis**

The axis (C2) is easily identifiable due to its dens (odontoid process) which extends superiorly from the anterior portion of the vertebra.The dens articulates with the anterior arch of the atlas, in doing so creating the medial atlanto-axial joint. This allows for rotation of the head independently of the torso.The axis also contains superior articular facets, which articulate with the inferior articular facets of the atlas to form the two lateral atlanto-axial joints.

 By [TeachMeSeries Ltd](http://teachmeseries.com/) (2020)



Fig 2 – The bony landmarks of the atlas and ax

**Joints**

The joints of the cervical spine can be divided into two groups – those that are present throughout the vertebral column, and those unique to the cervical spine.

Present throughout Vertebral Column

There are two different joints present throughout the vertebral column:

* Between vertebral bodies – adjacent vertebral bodies are joined by intervertebral discs, made of fibrocartilage. This is a type of cartilaginous joint, known as a symphysis.
* **Between vertebral arches**– formed by the articulation of superior and inferior articular processes from adjacent vertebrae. It is a synovial type joint.

**Unique to Cervical Spine**

There are two joints unique to the cervical spine – the atlanto-axial (x3) and atlanto-occipital joints (x2).

The atlanto-axial joints are formed by the articulation between the atlas and the axis:

* Lateral atlanto-axial joints (x2) – formed by the articulation between the inferior facets of the lateral masses of C1 and the superior facets of C2. These are plane type synovial joints.
* Medial atlanto-axial joint – formed by the articulation of the dens of C2 with the articular facet of C1. This is a pivot type synovial joint.

The atlanto-occipital joints consist of an articulation between the spine and the cranium. They occur between then superior facets of the lateral masses of the atlas and the occipital condyles at the base of the cranium. These are condyloid type synovial joints, and permit flexion at the head i.e. nodding.LigamentsThere are six major ligaments to consider in the cervical spine. The majority of these ligaments are present throughout the entire vertebral column.Present throughout Vertebral ColumnAnterior and posterior longitudinal ligaments – long ligaments that run the length of the vertebral column, covering the vertebral bodies and intervertebral discs .Ligamentum flavum – connects the laminae of adjacent vertebrae.

Interspinous ligament – connects the spinous processes of adjacent vertebrae.

Nuchal ligament – a continuation of the supraspinous ligament. It attaches to the tips of the spinous processes from C1-C7 and provides the proximal attachment for the rhomboids and trapezius.Transverse ligament of the atlas – connects the lateral masses of the atlas, and in doing so anchors the dens in place.



## Anatomical Relationships

The cervical spine has a close relationship with several neurovascular structures in the neck.The transverse foramina of the cervical vertebrae provide a passageway by which the vertebral artery, vein and sympathetic nerves can pass. The only exception to this is C7 – where the vertebral artery passes around the vertebra, instead of through the transverse foramen.