The main function of any valve is to maintain the **Unidirectional** flow of blood.
RIGHT ATRIOVENTRICULAR VALVE

The TRICUSPID valve so-named because it usually consists of **three cusps or leaflets**

- Its orifice is best seen from the atrial aspect and measures on average **11.4 cm**
- The fibrous ring keeps the caliber of the orifice constant (large enough to admit the tips of three fingers)
- It is almost **VERTICAL!!!!!!!**, but at 45° to the sagittal plane
- The atrial surface of the AV valve is rather smooth.
- The ventricular surface is irregular because of the insertion of the chordae tendineae

**annulus fibrosus**
Heart in diastole:
viewed from base with atria removed
The atrioventricular valvular complex

Consists of:

1- The orifice and its associated anulus
2- The cusps, the supporting chordae tendineae of various types and the papillary muscles
**The Tricuspid Valve** consists of three cusps:

- **Anterior cusp** lies anteriorly.
- **Septal cusp** lies against the ventricular septum.
- **Inferior (posterior) cusp** lies inferiorly.
The bases of the cusps are attached to the fibrous ring of the skeleton of the heart whereas their free edges and ventricular surfaces are attached to the chordae tendineae. The chordae tendineae connect the cusps to the papillary muscles.
The Tricuspid Valve

The cusps

The chordae tendineae.

papillary muscles
Histology
Valves **Cusps** are composed of connective tissue with over-lying endocardium.

Each valve is composed of three layers

**The spongiosa** is loose connective tissue located on the **atrial or blood vessel side (aortic and pulmonary)** of each valve.

**The fibrosa** forms the core of the valve and contains **fibrous extensions from the dense irregular connective tissue of the skeletal rings** of the heart.

**The ventricularis** is immediately adjacent to the ventricular surface of each valve and is covered with **endothelium**.

It contains dense connective tissue with many layers of elastic fibers.

In the AV valves, the ventricularis continues into **the chordae tendineae**
Valve cusps are normally avascular
Small blood vessels and smooth muscle can be found only in the base of the cusp. The surfaces of the valve are exposed to blood, and the cusps are thin enough to allow nutrients and oxygen to diffuse from the blood.(valvulitis).

- Rheumatic fever causes inflammation of the heart valves (valvulitis)
- Inflammation induces **angiogenesis in the valve and vascularization** in the normally avascular layers of the valve.
  - These changes most commonly affect the **mitral valve (65% to 70%)** and aortic valve (20% to 25%).
- This inflammation can lead to **progressive replacement of elastic tissue by irregular masses of collagen fibers**, causing the valve **to thicken**.
  - The valves become rigid and inflexible, which **affects their ability to open and close**
The extreme edges of the cusps are thin and delicate with a sawtooth appearance from the insertion of chordae.

Away from the edge, the atrial surface of the cusps is finely nodular, the nodule particularly in small children. These nodules are called The noduli Albini.

The noduli Albini: minute fibrous nodules on the margins of the mitral and tricuspid valves of the heart.
When the ventricle contracts, **the papillary muscles contract** and *prevent the cusps* from being forced into the atrium and turning inside out as the intraventricular pressure rises.

To assist in this process, the chordae tendineae of one papillary muscle are connected to the **adjacent parts of two cusps**.

On closure of an AV valve, the narrow border between the **row of Albini nodules** and the free edge of each cusp presses against that of the next, resulting in a secure, **watertight closure**.
Chordae tendineae (tendinous cords) are fibrous collagenous structures supporting the cusps of the atrioventricular valves.

Tendinous cords attach to the free edges and ventricular surfaces of the anterior, posterior, and septal cusps, much like the cords attaching to a parachute.

The tendinous cords arise from the apices of papillary muscles.
Papillary muscles begin to contract before contraction of the right ventricle, tightening the tendinous cords and drawing the cusps together. Because the cords are *attached to adjacent sides of two cusps*, they prevent separation of the cusps and prevented from prolapsing (being driven into the right atrium) as ventricular pressure rises. Thus, *regurgitation of blood* (backward flow of blood) from the right ventricle back into the right atrium is blocked during ventricular systole by the valve cusp.

Do papillary muscles close valve or do they open it?

**Papillary muscles insure Competence of the valve**
The mitral valve

- guards the left atrioventricular orifice
- It consists of two cusps.
The anterior cusp of the mitral valve

THE SUBAORTIC CURTAIN

Subjected to blood flow from two sides
- The bloodstream undergoes two right angle turns, which together result in a 180° change in direction. This reversal of flow takes place around the **anterior cusp of the mitral valve**

The left atrioventricular orifice admits atrial blood during diastole, flow being towards the cardiac apex.
- After closure of the mitral cusps, and throughout the ejection phase of systole, blood is expelled from the apex through the aortic orifice.
The aortic valve guards the aortic orifice.

Each consists of three pocketlike cusps of approximately equal size

There is no distinct, circular ring of fibrous tissue at the base of the arteries from which these and the valve cusps arise

The arterial wall expands into three dilated pouches, the sinuses of Valsalva

The pulmonary valve guards the pulmonary orifice and
The cusps of the arterial semilunar valve are largely smooth and thin. At the center of the free margin of each cusp is a small fibrous nodule called

**The nodulus Arantii**

On each side of the nodules of Arantius, along the entire free edge of the cusp, there is a thin, halfmoon–shaped area called the **lunula** that has fine striations parallel to the edge.
The aortic valve consists of three semilunar cusps:

- **Posterior** (non-coronary) cusp
- Right
- Left

Just superior to right and left cusps in the Sinus of **Valsalva** are the openings of the right and left coronary arteries, respectively.
Pulmonary valve

At the apex of the infundibulum, the outflow tract of the right ventricle, the opening into the pulmonary trunk is closed by the **pulmonary valve**

consists of three **semilunar cusps** with free edges projecting upward into the lumen of the pulmonary trunk

3 semilunar cusps
- Anterior
- Right
- Left

Opening of the pulmonary valve

During diastole, the pulmonary valve is closed and all three cusps of the valve are tightly apposed. The pulmonary valve opens passively during ventricular systole and then closes rapidly at the end of systole