

Prosthetic Valve Quiz:

1) Which one of the following valves is most likely to experience life-threatening obstruction due to clot?

- A. Bjork Shiley**
- B. St. Jude
- C. Carpentier Edwards
- D. Homograft

The Bjork valve is no longer implanted in the US however, a large number were previously used and patients with this valve may be encountered. It is a tilting disk type with a major and minor orifice. Discontinuing anticoagulation for even a short time could have serious results like an acute valve obstruction with clot, especially in the mitral position.

2) A St. Jude Mitral Valve has a pressure half time of 90 msec so it is likely to have valve dysfunction?

- A. True
- B. False**

If there was significant obstruction to the valve, the pressure half time would be significantly prolonged and usually greater than 200 msec. So this valve is unlikely to be obstructed.

3) A #19 St. Jude Aortic Valve has a peak gradient of 40 mm Hg and must be stenotic?

- A. True
- B. False**

The gradient across prosthetic valve is flow and size dependent. The #19 is a small size which should generally be avoided especially in larger persons since it can be associated with valve patient mismatch. Late heart failure may result. High gradients can be seen across such valves and this does not necessarily indicate dysfunction. At times a fluoroscopic assessment of the valve may clarify the issue noninvasively if both leaflets are seen to open normally. TEE unfortunately does not reliably give good visualization of mechanical prosthetic aortic leaflet opening.

4) A TEE is more likely to correctly identify prosthetic aortic or mitral pathology?

- A. Aortic
- B. Mitral**

As mentioned in previous question prosthetic mitral leaflets are seen more clearly and reliably than aortic.

5) Endocarditis can occur on which of these valves?

- A. St. Jude
- B. Carpentier Edwards
- C. Homograft
- D. All of above**

All artificial valves are more likely than native valves to develop endocarditis. Even the homograft can develop infection although less likely than the others.

6) Which is most accurate in identifying valve dysfunction in a patient with a prosthetic aortic valve and heart failure?

- A. Peak gradient
- B. Mean gradient
- C. V1/V2 ratio: Dimensionless index (subaortic /transaortic velocity)**
- D. Calculated cardiac output by Doppler

The dimensionless index eliminates the issue of cardiac output effect on gradient and therefore is highly useful in indicating prosthetic dysfunction. It is also useful in native aortic stenosis. Values less than .20-.25 are typically associated with prosthetic stenosis.

7) Which valve has three leaflets?

- A. Medtronic Hall
- B. Starr Edwards
- C. Homograft**
- D. None of them

The homograft is a human aortic valve explanted from a cadaver along with a portion of the aortic root. It has three leaflets.

8) A peak gradient of 20 mm Hg indicates a mitral prosthetic valve is likely to have dysfunction?

- A. True
- B. False**

The early opening gradient is often high due to the diastolic suction effect of the LV chamber. It cannot be relied on to accurately reflect the degree of stenosis. The mean gradient is much more reliable in this regard. In general a mean gradient of greater than 10 mm Hg. suggests possible mitral dysfunction.

9) A St. Jude Valve has several jets of regurgitation around the rim of the valve extending 1 cm into the atrium. There are also two small central jets noted. The patient likely has normal prosthetic valve function?

- A. True**
- B. False

The St. Jude valve has 'physiological' jets of regurgitation which help wash the valve structure preventing platelets and fibrin from adhering.

Physiological jets are as described above, around the rim and central orifice not displaced far into the LA.

10) A baseline post-op echo study to compare gradients when there is a question about valve dysfunction 2 years later is:

- A. Not helpful
- B. Somewhat helpful
- C. Very helpful**
- D. Always necessary to diagnose valve dysfunction

A baseline echo fingerprint is a good idea and recommended for prosthetic valve patients. Because anemia, fever and the healing process can cause a higher output altering valve gradients the echo 'fingerprint' should not be taken immediately post-op. Rather, at least a month should pass and the patient be in stable condition before the images and gradients are obtained. This baseline exam can be highly useful for comparison later on if issues regarding prosthetic valve dysfunction arise

11) The EOA of a #23 mitral valve is $\pi \times 23\text{mm}/2$ squared?

- A. True
- B. **False**

The EOA, effective orifice area, refers to the actual orifice size which more closely related to the internal diameter at the valve ring. The #23 refers to the external diameter of the ring being . The manufacturer publishes the EOA for each model valve obtained in vitro. In the human we calculate this by using the continuity equation across the valve. It should be fairly close to the published valve unless there is error in calculation or prosthetic dysfunction.

The outside diameter should not be used in calculation of the EOA.

12) A current generation bioprosthetic valve in the aortic position has a 10% failure rate requiring replacement at:

- A. 5 years
- C. 10 years
- D. 15 years
- E. **20 years**

The present bioprosthetic valves have improved technology to the preservation of biological leaflets. Present techniques result in a lower rate of calcification and hence late failure due to stenosis or regurgitation. Failure rates are about 10% in the aortic position at 20 years and 15 years in the mitral position. Because of continuing improvements the failure rate may be even better with the newest model bioprosthetic valves, but only time will tell.