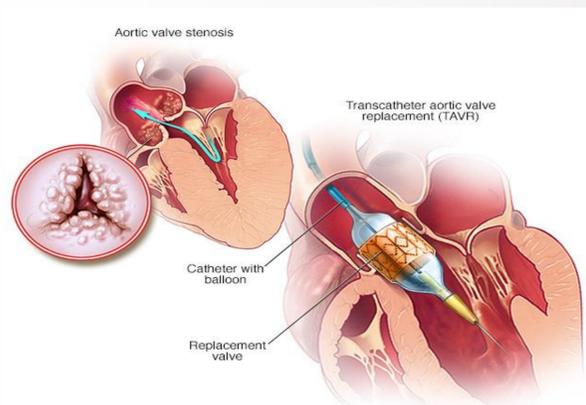


## Introduction

Transcatheter Aortic Valve Replacement (TAVR) is a minimally invasive procedure performed by surgeons in a cardiac catheterization lab. TAVR is when a catheter is fished through a person's artery and into their aortic valve, where a new valve is blown up and put into place over the old one, as seen in Figure 1. Many different forms of medical imaging are used before, during, and after this procedure to insure the safety of the patient and the correct placement of the new valve. Some of the medical imaging used is fluoroscopy, computed tomography (CT), magnetic resonance imaging (MRI), and ultrasound.



**Figure 1.** The proper placement of a balloon-expandable mechanical aortic valve.<sup>1</sup>

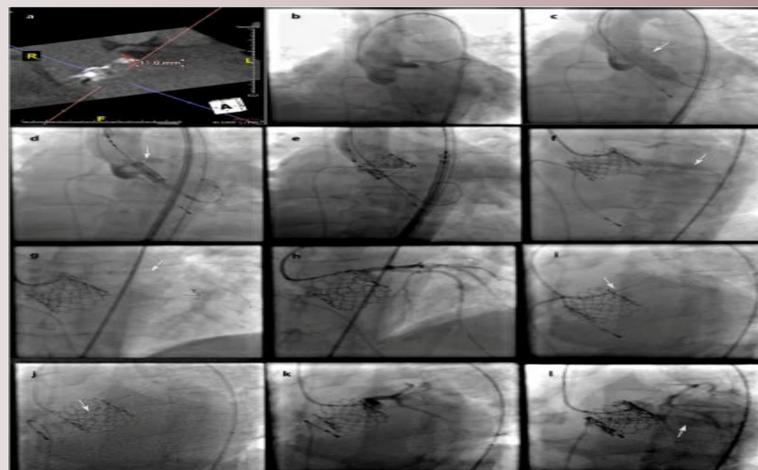
# Medical Imaging in TAVR



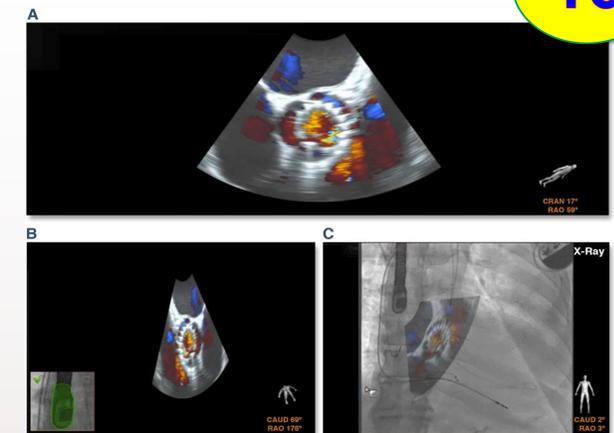
**Figure 2.** A CT exam being used for measurements of the aortic valve for a TAVR procedure.<sup>4</sup>

## Advantages of Fluoroscopy during Surgery

The fluoroscopy-guided approach to surgery has many positive advantages above other forms of medical imaging. The first advantage being that it is a lower dose of radiation for the patient and hospital personnel compared to intraoperative computed tomography scans. The second being the ability for the physician's to measure the distances of the surrounding structures in respect to the valve plane and use areas of calcification within vessels and the valve as land marks while fishing the catheter into the proper position. Finally when using fluoroscopy the patient does not need to be under general anesthesia, where as imaging such as TEE and intraprocedural CT usually require sedation.<sup>5</sup> Figures 3 and 4 are examples of fluoroscopy being used in addition to other medical imaging modalities to create the best possible image for the doctor placing the valve.



**Figure 3.** The combination of CT images and fluoroscopy being used to place a mechanical valve.<sup>6</sup>



**Figure 4.** The echocardiography images are superimposed over a fluoroscopy exam to compare the images in real time. The echocardiogram is pictured in the images A and B, while the overlapping is pictured in image C.<sup>7</sup>

## Conclusion

Transcatheter Aortic Valve Replacements are quickly becoming a safer way to replace an aortic valve in elderly or sick patients. Medical imaging modalities such as fluoroscopy, CT, MRI, and ultrasound are great ways to measure, plan, and perform this surgery while maintaining a minimally invasive environment.

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## Medical Imaging Used

All types of medical imaging are used in the process of completing a Transcatheter Aortic Valve Replacement, including CT, MRI, Fluoroscopy, and ultrasound. Using the 3D medical imaging provided by CT and MRI prior to the start of the procedure, finding the proper size of prosthesis is far more accurate, lowering the likelihood for aortic regurgitation after the new valve is placed.<sup>2</sup> Figure 2 shows the measurements being done on a CT of the heart. The use of transesophageal echocardiography (TEE) with fluoroscopy combined, makes the doctor able to see in real time the comparison between the two images, making finding the exact location of the aortic annulus and other important anatomy more precise.<sup>3</sup>