

S42 The Use of Imaging in Diagnosing and Treating Myocardial Infarction

Objective One

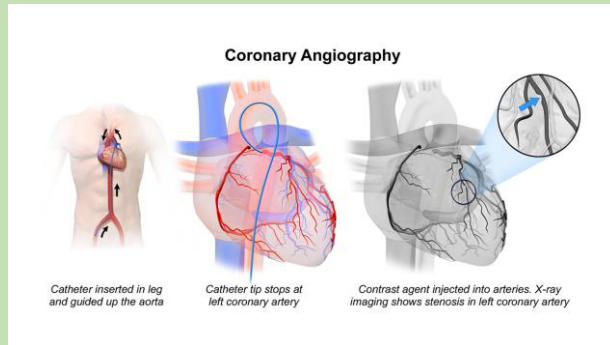
Describe what a myocardial infarction is and how imaging can be used to diagnose a myocardial infarction

Objective Two

Describe how imaging can be used to treat a myocardial infarction

What is a myocardial infarction?

A myocardial infarction is also known as a heart attack. During a heart attack an area of the heart muscle is not receiving oxygen. This lack of oxygen is from the coronary arteries having a blockage. The blockage in the artery is because plaque built up in the artery and caused a blood clot (thrombus) to form. If the heart muscle lacks oxygen the tissue begins to die, this is why it is important to intervene quickly. Through the guidance of imaging, intervention and diagnosis can be completed in one exam.



The image above demonstrates the path a diagnostic catheter would take to reach the coronary arteries. Also demonstrated on the far right is how the arteries would appear after being injected with contrast.

The image to the right shows the typical table and C-arm orientation in a cardiac catheterization lab. The C-arm is mounted to a track on the ceiling allowing some mobility around the patient.



Diagnosing a Myocardial Infarction with Imaging

When a patient is suspected to be having a heart attack, they will first receive an electrocardiogram (ECG) to look at their heart rhythms. An irregular ECG is a clinical indication of a heart attack, and the patient will be transferred to the cardiac cath lab. The cardiac cath lab is a department that performs coronary angiograms, angioplasties, and more.

To obtain images of the coronary arteries the cath lab rooms are equipped with mounted C-arms. These C-arms are capable of moving in various angles to spread the coronary arteries out so they can be visualized completely. Arteries alone are not visible on fluoroscopic images so they must be injected with contrast to become radiopaque.

A coronary angiogram is a minimally invasive sterile procedure where a physician creates access through the femoral or radial arteries. A catheter is placed in the artery. The catheter is then advanced to the coronary arteries, this enables the physicians to inject contrast directly to the coronaries. A registered radiologic technologist operates the C-arm to follow the catheters and contrast in the arteries, so the physician can visualize what they are doing.

The physician is able to immediately review the images while remaining sterile. The physician looks at the arteries for narrowing and blockages. If the patient has had a previous coronary angiogram those images can be brought up and compared to the new images. If narrowing or blockages are present the physician can diagnose a myocardial infarction and state where specifically it is occurring.

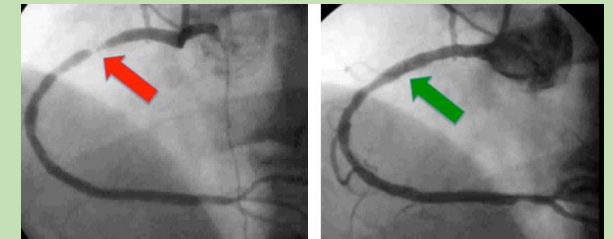
Treatment of a Myocardial Infarction with Imaging

If the physician determines the patient is having a heart attack, they can begin intervention immediately utilizing the same access point. Intervention is also guided using fluoroscopy.

The most common intervention is an angioplasty. Angioplasty involves dilating a stenosis with a balloon on the end of a catheter or placing a stent with a balloon catheter. The balloon portions vary in sizes to match the length of the stenosis and diameter of the coronary artery. The balloon is mostly radiolucent so to visual it on fluoroscopy the balloon inflation device is filled with contrast. This allows the physician to be sure the balloon is located where they would like it to be expanded. When expanding a balloon for a stent, some fluoroscopic equipment has a setting called stent boost. Stent boost allows the radiopaque stent to be visualized in finer detail for greater ability to ensure correct placement.

After completing an intervention, the physician and radiologic technologist work together to obtain more images. Contrast will once again be injected to show the newly opened coronary arteries. After this the exam is complete.

The images below show the right coronary artery injected with contrast before and after intervention. The left image shows the occlusion of the artery (stenosis). The right image shows the same artery open after an intervention.



Conclusion

Imaging has been shown to play a vital role in a patient's care during a heart attack. Fluoroscopic imaging is an excellent tool to diagnose and treat myocardial infarction. Without imaging this process would require vascular surgery that is much more invasive and time consuming for the patient.