Cardiac Cath Lab Procedures: An Overview for Nurses

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OBJECTIVES

- Identify indications for cardiac catheterization
- List procedures that may be performed during a cardiac catheterization
- Summarize nursing implications for pre- and post-procedural care for cardiac catheterization

CARDIAC CATHETERIZATION OVERVIEW

- May commonly be called **cardiac cath** or **heart cath**
- Long and flexible tube is placed into an artery in the leg, arm, or neck and threaded to the heart
- Allows physician to investigate and potentially diagnose the cause of chest pain, arrhythmias, or other cardiac symptoms
- Allows physician to determine if patient has ischemic heart disease related to blocked coronary arteries

CARDIAC CATHETERIZATION OVERVIEW

- Can examine heart valves and their function
- May aid in diagnosis of pulmonary hypertension, cardiomyopathy, and heart valve diseases
- Measures oxygen levels and pressures in different heart chambers
- Assesses pumping function of the heart
- Right-sided heart cath evaluates the pressure in the heart and lungs; requires venous access
- Left-sided heart cath requires arterial access

PROCEDURES PERFORMED DURING CARDIAC CATH

- During catheterization, a physician can perform:
- **Coronary angiography-** visualizing coronary arteries by injecting dye through the catheter and visualizing it moving through the arteries using x-ray images
- **Percutaneous coronary intervention (PCI)-** depending on what angiography shows, patient may need PCI. PCI may include balloon angioplasty or stent placement
  - Angioplasty- if it is determined that the patient has narrowed or blocked coronary arteries, a balloon attached to the end of the catheter is inflated, pushing the plaque outward toward the artery walls. Often performed in conjunction with a stent
  - Stent- a small mesh tube inserted in the coronary artery to open a narrowed artery; often coated in a medication that is released into the artery to prevent future narrowing and blockage (drug-eluting stent)
- Stents require blood thinners to be taken post-procedure to prevent stent clotting; drug-eluting stents require longer anticoagulation than bare metal stents

PROCEDURES PERFORMED DURING CARDIAC CATH

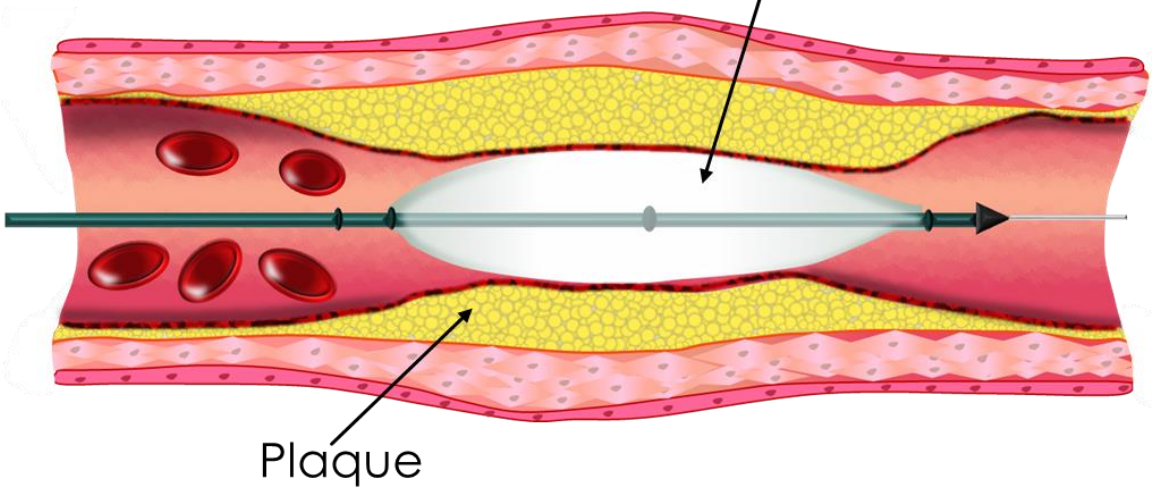
- **Repair or replacement of heart valves**- may be able to repair or replace narrowed or leaking heart valves in certain patients
- **Biopsy-** can be used for genetic testing, myocarditis, or transplant rejection
- **Closure of holes in heart-** congenital defects; atrial-septal defects, patent foramen ovale (PFO)
- **Balloon valvuloplasty-** used to widen narrowed heart valves by inflating balloon

PROCEDURES PERFORMED DURING CARDIAC CATH

- **Closure of part of the heart-** may close off the top part of the upper chamber, called the left atrial appendage, which is an area prone to develop blood clots; may be closed off as an alternative to taking blood thinners
- **Alcohol septal ablation**- in patients with hypertrophic obstructive cardiomyopathy, alcohol can be injected into the muscle, causing it to decrease in size

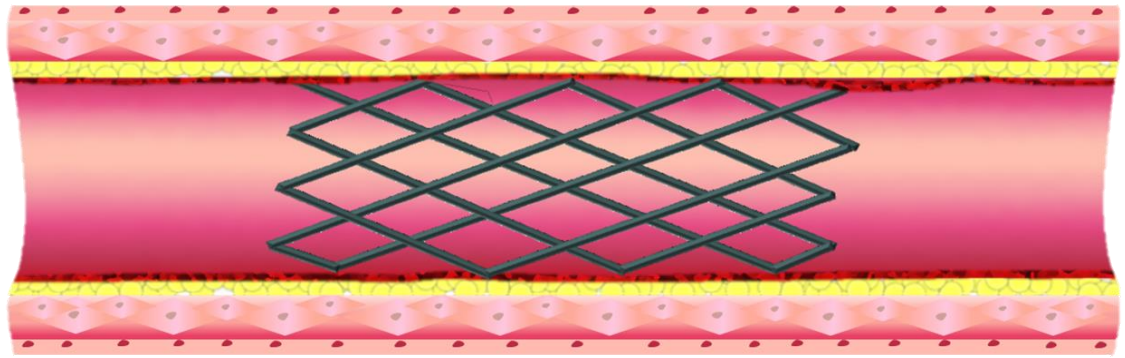
ANGIOPLASTY AND STENT

Catheter with inflated balloon



Inflated balloon compresses the plaque

Stent



Stent widens artery to improve blood flow

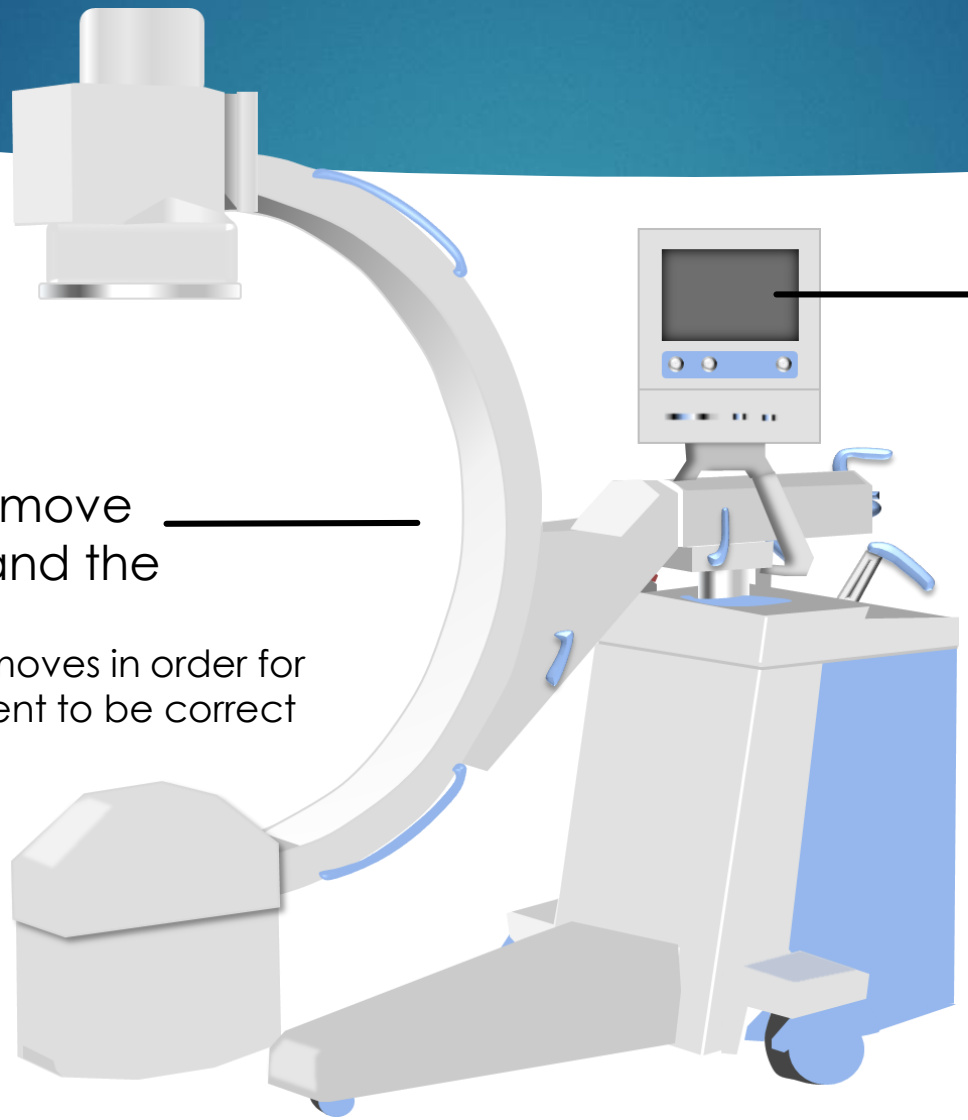
OVERVIEW OF PROCEDURE

- Patient taken to cardiac cath lab and transferred to flat table that is able to move horizontally and laterally
- Cardiac monitor, BP cuff, and pulse oximetry applied
- Access site is cleansed and patient is covered with sterile drapes
- Patient is usually given light sedation during procedure; general anesthesia may be used under certain circumstances
- Physician injects local anesthesia into access site. Physician then inserts a needle into the artery in the access site and inserts a guidewire into the needle
- Needle is removed, and small tube called a sheath is inserted over the guidewire; sheath size depends on the procedure being performed during the cath
- Guidewire is removed, and the catheter is inserted through the sheath

OVERVIEW OF PROCEDURE

- Once catheter is in place, physician performs the appropriate testing and/or treatment (angiography, stent placement, biopsy etc.)
- If/when contrast dye is injected, patient may feel hot flushing and/or nausea
- An x-ray machine called a C-arm (shaped like a large "C") is able to move around the patient and the table; the table also moves in order for the C-arm placement to be correct
- The images that are taken are able to be viewed during procedure via monitors
- When procedure is complete, catheter, sheath, and guidewire are removed. Pressure dressing or closure device is applied
- Procedure may take from 30 minutes to a couple of hours depending on what the physician is performing
- Patient is transferred to a recovery room where monitored by nurses until discharged home or to hospital room (discussed later)

C-ARM XRAY



The images that are taken are able to be viewed during procedure via monitors

The C-arm is able to move around the patient and the table

The table also moves in order for C-arm placement to be correct

RISKS ASSOCIATED WITH CARDIAC CATH

- Usually a relatively safe procedure
- May develop hematoma at catheter insertion site
- Contrast dye may cause nausea, itchiness, hives
- Allergic reaction
- Arrhythmias
- Bleeding
- Infection

RISKS ASSOCIATED WITH CARDIAC CATH

- Side effects from sedation or anesthesia
- Stroke
- Kidney damage
- Pseudo-aneurysm at insertion site
- If performed repeatedly, may have repeated radiation exposure that may increase the risk of cancer or leukemia, skin damage, and cataracts in later life

POTENTIAL CONTRAINDICATIONS

May include:

- Electrolyte abnormalities
- Acute GI bleed
- Kidney failure or severe renal disease
- Acute stroke
- Blood that is too thin
- Severe allergic reaction to dye used during procedure
- Infection

PRE-PROCEDURE TESTING

May include:

- Electrocardiogram (EKG)
- Chest x-ray
- Echocardiogram
- Stress test
- Cardiac CT
- Cardiac MRI
- Blood tests
  - Complete blood count (CBC)
  - Electrolytes
  - Prothrombin time (PT)/partial thromboplastin time (PTT))

NURSING CARE RELATED TO PROCEDURE

Pre-Procedural Care

- Requires informed consent
- NPO for six to eight hours prior to procedure
- Patient will need a patent IV site
- May require access site preparation (shaving); this may also be done in the cath lab area by nursing staff depending on facility protocols
- Certain medications may need to be held pre-procedure, such as blood thinners, NSAIDS

NURSING CARE RELATED TO PROCEDURE

- Remove dentures and jewelry
- Nurse should assess and note strength of pedal pulses, and it may be a good idea to mark them with a marker
  - If patient has diminished pedal pulses post-procedure and are difficult to palpate, the nurse will know where to locate, as well as what the pre-procedure assessment was

NURSING CARE RELATED TO PROCEDURE

Post-procedural care

- Patient will continue to need vital signs taken until fully awake and per facility protocol
- Sheath is normally removed immediately following procedure and either pressure dressing or closure device used
- If anticoagulants used during procedure, sheath removal time will depend on the medication used; may be 90 minutes to four hours post procedure, depending on activated clotting time (ACT) results
- Manual compression of the artery is the "gold standard" for hemostasis after sheath removal; pressure usually held for approximately 15 minutes or longer if patient continues to bleed

NURSING CARE RELATED TO PROCEDURE

- Following sheath removal, nurse must continue to monitor access site for bleeding and/or hematoma formation, as well as circulation assessment
- Have patient notify nurse immediately if they feel a sudden gush or wetness around the access site
- Patient will lie flat with the head of the bed elevated no more than 30 degrees with leg straight for four to six hours post-procedure if femoral artery used (or per facility protocol)
- Patient may be discharged home or stay overnight for observation depending on procedure findings and interventions done

METFORMIN AND IODINATED CONTRAST MEDIA

- Use of iodinated contrast media may lead to acute kidney injury
- Metformin-associated lactic acidosis is a rare but serious concern, as metformin is eliminated via renal excretion; any factor that may cause decreased renal excretion may put the patient at risk for lactic acidosis

According to the American College of Radiology Guidelines:

- In patients who have no evidence of acute kidney injury and with a glomerular filtration rate (GFR) greater than or equal to 30 mL/min, metformin does not need to be discontinued prior to or following IV administration of iodinated contrast media
- In patients who take metformin who are known to have acute kidney injury or severe chronic kidney disease, or are undergoing a procedure that may cause emboli in the renal arteries, metformin should be temporarily discontinued at the time of or prior to the procedure and held for 48 hours post-procedure.
- Metformin may be restarted after renal function has been evaluated and found to be normal

VASCULAR CLOSURE DEVICES (VCDs)

- Developed in the 1990s
- Goal was to limit time, labor, bedrest and patient discomfort
- May not be used routinely in all cath labs
- Multiple different types:
  - Devices that seal the vessel immediately using mechanical means (collagen plug, suture devices)
  - Devices that strap onto the patient that put pressure on the puncture site
  - Hemostatic pads that have materials in them that speed up the clotting process (usually used in conjunction with one of the devices or manual compression)

PATIENT EDUCATION REGARDING DISCHARGE

If catheter was placed in groin

- OK to walk short distances on flat surface
- Limit using stairs for first few days home to twice per day
- No yard work, lifting heavy objects, or playing sports for two days, or until cleared by physician

If catheter was in arm

- No lifting heavier than ten pounds
- No heavy pushing, pulling, or twisting

PATIENT EDUCATION REGARDING DISCHARGE

For any insertion site

- Keep area dry for 24-48 hours
- Avoid sexual activity for two to five days
- No baths or swimming for first week; showers are okay but keep access site dry for first 24-48 hours
- Take blood thinners and all other medications as prescribed by physician

PATIENT EDUCATION REGARDING DISCHARGE

Notify provider if:

- Bleeding at catheter site that will not stop when pressure applied
- Changes in color, temperature, or sensation in arm or leg where catheter was inserted
- Purulent drainage from insertion site
- Experience chest pain/shortness of breath not resolved with rest

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