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Review article

Coronary angioplasty: A crucial and updated review

Menka Mishra[1*], Aakash Chavda[2], Sandeep Kumar N.[3], Kamlesh Menaria[4]

Geetanjali College of Nursing, Udaipur, Rajasthan, India

Abstract

In today's world, most deaths are attributable to communicable and non-communicable diseases, 32 million and just over half of these, 16.7 million are as a result of CHD. More than one third of these deaths occur in the middle-aged adults. In developed countries heart disease is the first cause of death for adult men and women. CAD appears to be more prominent among working classes. The incidence of CAD in young adults is increasing mainly due to tobacco consumption, lack of physical activity, sedentary lifestyle and obesity. Traditional coronary angiography and angioplasty are usually performed via femoral approach. Though this route provides an easier vascular access, it is associated with a smaller but potentially serious incidence of vascular complications at the puncture site that may result in significant groin hematoma, blood transfusion or require surgical repair. A useful and safe alternative approach is through the trans-radial access. This route has a very low rate of vascular complications and also allows early mobilization of patients. Though this approach is less commonly used all over the world, recently the usage of this technique has improved.

Currently, we as a team of Heart Care Clinic are performing more than 90 percent of the procedure via the trans-radial route. We have performed thousands of angiographies and angioplasties by this route in past several years. Here we performed an analysis of our experience with trans-radial angiography and angioplasty and demonstrating this to be a safe and effective technique suitable for most of the patients.

Key words: Traditional coronary angiography, angioplasty, trans-radial route

***Corresponding author: Miss. Menka Mishra**, Geetanjali College of Nursing, Udaipur, Rajasthan, India. Email Id: menkamishraajmer@gmail.com

1. Introduction

Coronary angioplasty is the most accurate method (the "gold standard") for evaluating and defining coronary artery disease (CAD). The term "angioplasty" means using a balloon to stretch open a narrowed or blocked artery. However, most modern angioplasty procedures also involve inserting a short wire-mesh tube, called a stent, into the artery during the procedure. The stent is left in place permanently to allow blood to flow more freely. Coronary angioplasty is sometimes known as percutaneous transluminal coronary angioplasty (PTCA). The combination of coronary angioplasty with stenting is usually referred to as percutaneous coronary intervention (PCI) [1]

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Coronary angioplasty has been used as a treatment modality of coronary artery disease in case of 1/3 rd of patients. Primary angioplasty may be the preferred approach in patients with extensive myocardial infarction who have immediate (less than 120 min) access to cardiac catheterization laboratory with experienced personnel. Patients who have been identified to have any contraindication for thrombolytic therapy 2) cardiogenic shock 3) prior to CABG 4) or with the stuttering onset of pain also benefit from primary angioplasty [1]

2. Definition

Angioplasty, also known as percutaneous Tran's luminal angioplasty (PTCA), is a minimally invasive, endovascular procedure to widen narrowed or obstructed arteries or veins, typically to treat arterial atherosclerosis [2]

A deflated balloon attached to a catheter (a balloon catheter) is passed over a guide-wire into the narrowed vessel and then inflated to a fixed size. The balloon forces expansion of the blood vessel and the surrounding muscular wall, allowing an improved blood flow. A stent (Drug-eluting stent) may be inserted at the time of ballooning to ensure the vessel remains open, and the balloon is then deflated and withdrawn. Angioplasty has come to include all manner of vascular interventions that are typically performed percutaneous [3]

3. Types of coronary angioplasty:

3.1 Balloon angioplasty: Balloon angioplasty is performed by passing a thin tube, or catheter, into an artery through a cut in the upper leg or the arm. The catheter is then maneuvered into the clogged artery and a balloon (Drug-eluting balloon) on the tip of the catheter is expanded. The balloon pushes against the plaque in the wall of the artery and flattens it, thus widening the artery [4] [Figure1]

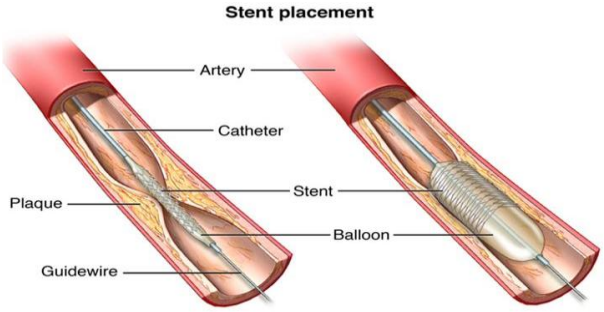

Figure no 1: Balloon angioplasty

3.2 Laser angioplasty: Laser angioplasty is similar to balloon angioplasty, but instead of a balloon-tipped catheter, one with a laser at the tip is used. The laser is guided to the blockage and then used to destroy the plaque, layer by layer, by vaporizing it into gaseous particles. [4] [Figure2]

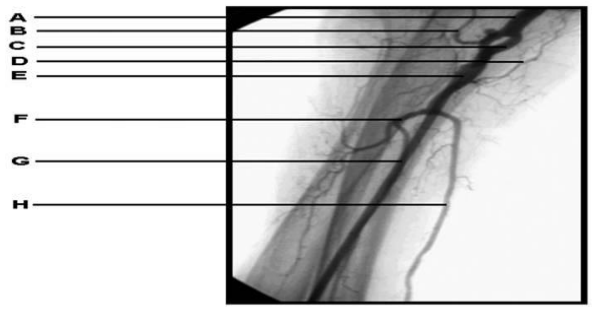

Figure 1 legend:

A: Brachial artery
B: Small Recurrent Radial
C: Ulnar
D: Small Recurrent Ulnar
E: Radial and Ulnar arteries overlayed
F: Common Interosseous
G: Radial
H: Small Ulnar

Figure no 2: Laser angioplasty

3.3 Coronary atherectomy: This procedure is begun similar to angioplasty. But instead of a balloon pressing against the fatty deposits in the walls of the arteries, special instruments are used which cut away the plaque. This technique is proving very useful in treating blockages that may be too calcified (hardened) or inaccessible for balloon angioplasty. [4] [Figure3]

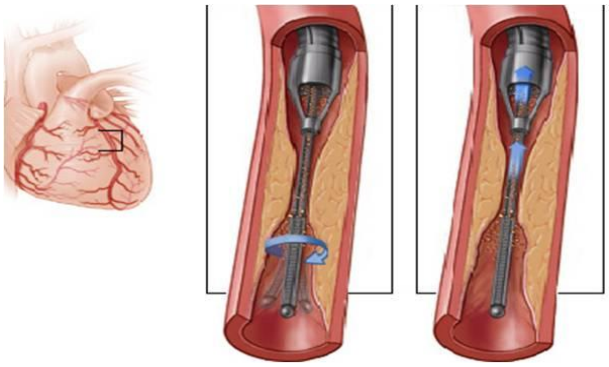

Figure no 3: Coronary atherectomy

The devices that can be used are;

3.3.1 Extraction Atherectomy - This procedure uses a tiny rotating blade that works in much the same fashion as the cutter on a food processor to whisk away blockages inside the artery wall at a rate of up to 1,200 revolutions per minute.

3.3.2 Rotational atherectomy - This procedure uses a high-speed, diamond-tipped drill to penetrate fatty deposits and is particularly useful on hard, Calcified plaque.

3.3.3 Directional atherectomy - This procedure uses a device that is a combination of a balloon and a shaving blade. The cutting device, usually located on the side, is run back and forth and shaves the deposits away [4] [Figure 4]

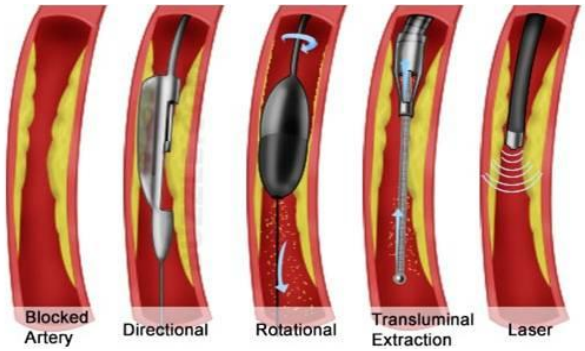

Figure no 4: Extraction, rotational, directional atherectomy

4. Pre-procedure care

Previously provide additional information as needed. Explain to the client that he/she will be awake during the

procedure, which takes 30 -60 minute to complete whole procedure. Before the procedure provide all routine preoperative care as ordered. Although the client remains awake, Signed consent is required, and pre-procedure fasting may be ordered. Administer ordered cardiac medications with a small sip of water unless contraindicated. Assess for hypersensitivity to iodine, radiologic contrast media and other reaction to other things. Record baseline assessment data, including vital signs, height, and weight. Mark the locations of peripheral pulses and instruct to void prior to going to the cardiac catheterization laboratory, to promote comfort [5] [Figure 5]

Figure no 5: Pre-procedure care

5. Angioplasty procedure

A Patient lies on a couch in a catheterization room. An X-ray machine is mounted above the couch. A thin, flexible 'guide' tube (catheter) is inserted through a wide needle or small cut in the skin into a blood vessel in the groin or arm. A local anesthetic is injected into the skin above the blood vessel. So, it should not hurt when the catheter is passed into the blood vessel. [6][Figure 6]

Figure no 6: catheterization room

The doctor gently pushes the catheter up the blood vessel towards the heart. Low-dose X-rays are used to monitor the progress of the catheter tip which is gently manipulated into the correct position. The tip of the catheter is pushed inside a heart (coronary) artery down to where there is a narrowed section caused by the fatty patches, or 'plaques', (atheroma) [6] [Figure 7]

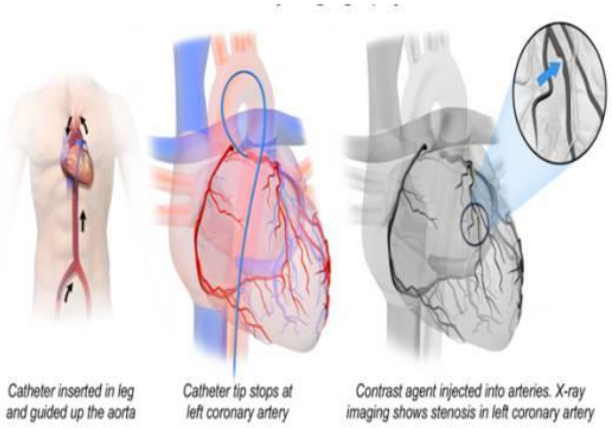

Figure no 7: a catheter is pushed into a heart

A second thinner 'balloon catheter' is then passed down the 'guide' catheter. There is a balloon and a small tube (a stent) at the tip of the balloon catheter. The balloon is blown up for 30-60 seconds. This squashes the atheroma and widens the narrowed artery. When the balloon is blown up it stops the blood flow. Therefore, Patient may have an angina-like pain for a short time. However, this soon goes after the balloon is let down. Usually, a stent is left in the widened section. The stent is like a wire mesh tube which gives support to the artery and helps to keep the artery widened. The 'collapsed' stent covers the balloon and is opened as the balloon is blown up. Some Stents are coated with a chemical that helps to prevent the artery from becoming blocked again. [6] [Figure 8].

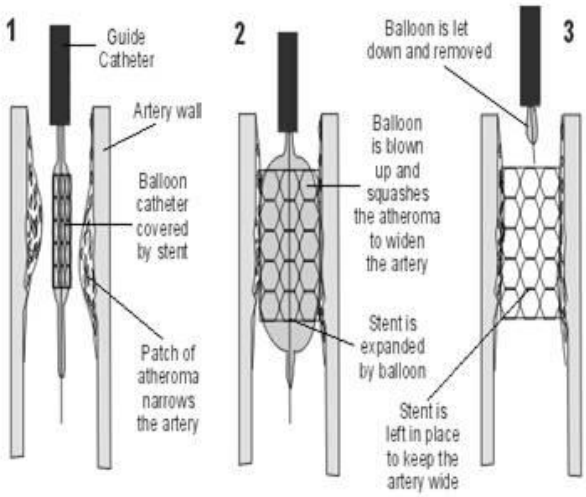

Figure no 8: PTCA Stent

During the procedure heartbeat is monitored by electrodes placed on your chest which provide a tracing on an electrocardiograph (ECG) machine. Sometimes a sedative is given before the test if you are anxious [6] [Figure 9]

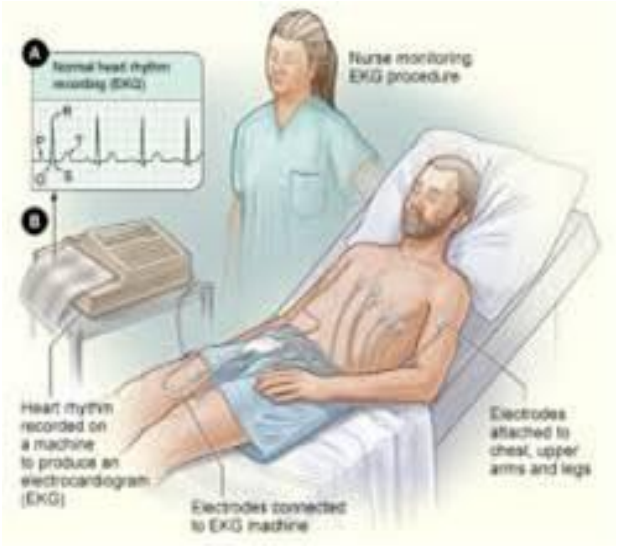

Figure no 9: ECG monitoring

6. Post-procedure care

After coronary angioplasty procedure hemodynamic parameters are monitored and a special band (Trans-Radial band) is used to prevent hematoma which is removing after a few hours of procedure. There is few point should be remember. Firstly keep Patient's leg straight as much as possible. Try not to bend at the site of the incision for 24 to 48 hours and Patient may feel like resting more after the procedure. Slowly start to do more each day. Rest when patient feel it is needed [7] [Figure 10].

Figure no 10: hematoma special band

7. Advantages and disadvantages of coronary angioplasty

7.1 Advantages: Coronary angioplasty itself safest and fastest procedure for the cardiac patient and recovery period is also very shorter and less painful. Which can done under local anaesthesia. The procedure does not leave a noticeable scar. A repeat procedure, if required is easier to perform.[8]

7.2 Disadvantages: Coronary angioplasty has fewer disadvantages mostly it cannot be used in arteries that cannot be reached by the catheter. Sometime it cannot be effective against very hard atherosclerotic plaques. And restenosis may occur, especially if a stent is not placed during the procedure [8]

8. Complication of coronary angioplasty: Coronary angioplasty procedure is relatively safe but some patients have allergic reaction to iodine-based dye range from hives to anaphylactic shock, which can involve hives, rash, edema, vascular collapse, shock, and respiratory distress. Patients with diabetes or pre-existing kidney disease also do not tolerate iodine-based dye and are at risk for kidney damage or failure. Rarely, an inflated angioplasty balloon can tear the vessel wall (dissection). If this occurs, emergency bypass surgery is performed. Anaphylactic shock is life-threatening and requires immediate medical attention, arrhythmias, bleeding at the insertion site, heart attack or stroke during and after the procedure and Infection at the insertion site are common complication of coronary angioplasty [9]

9. Contraindication of coronary angioplasty: coronary angioplasty is contraindicated in all those patients who have allergy to contrast (dye) medium, uncontrolled blood pressure, kidney failure patients, transient ischemic attack (Mini Attack), electrolyte imbalance, active systemic infection and arrhythmias [10]

Conclusion

Angioplasty is one treatment option that may open the narrowed artery and remove fatty build-ups. Angioplasty does not prevent fatty substances from building up on the walls of the coronary artery. However, re-narrowing of the arteries can be prevented by eating right, exercising, quitting smoking, reducing stress, and controlling high blood pressure and cholesterol. Coronary angioplasties are very safe. Risks and complications are very rare. Knowing about them will help you detect them early if they happen**.**

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