

Percutaneous coronary Intervention versus Coronary Bypass Graft Surgery.

1.0) Acute Coronary Syndromes:

Acute Coronary Syndromes include ST-elevation myocardial infarction, non-ST-elevation myocardial infarction and unstable angina.

Each of these conditions involves erosion and rupture of coronary artery plaques and the formation of platelet rich clots. In non-ST elevation myocardial infarction ischaemia is severe enough to cause myocardial damage and the release of serum markers of myocardial injury (creatinine kinase and troponin) into the blood stream. (1).

2.0) Management of acute coronary syndrome:

Left main coronary artery stenosis occurs in about 3-5% of the patients who have had an angiography for symptoms of acute coronary symptoms (2). Traditionally surgery is used to treat unprotected left main coronary artery disease. This essay compares percutaneous coronary intervention with coronary bypass graft surgery.

2.1) Percutaneous Coronary Intervention (PCI):

Percutaneous coronary intervention (PCI) is also referred to as coronary angioplasty. PCI is a method for opening stenosed coronary arteries and restoring blood flow to the heart muscle non-surgically. (3)

A special catheter is used for this procedure. This catheter is inserted into a blood vessel, moved through the vessel into the area of the blocked coronary artery. The tip of the catheter contains a balloon, this balloon is inflated at the site of the stenosed coronary artery. This procedure pushes the fatty tissue against the walls of the artery and improves blood flow through it. Fluoroscopy is used to help guide the movement of the catheter into the site of stenosis.(3)

Atherectomy can also be performed using this procedure with the use of tiny blades at the tip of the catheter. The blades break the atheromatous plaque down into tiny pieces and open the artery up.(3)

Stents can also be employed to open arteries up using this method. In this procedure a small metal mesh that is expandable is used to open the stenosed artery up and to keep it open. Once a metal stent is inserted into the site of stenosis it opens up, keeps the artery open and cells begin to form on it within days of insertion. If stent is being used, medicine to reduce the risk of blood clot formation are given to the patient.(3)

Stents that have a coating of special medication reduce the risk of excessive tissue growth on the metal stent. These stents are called the drug-eluting stents and they help prevent narrowing of the blood vessels (3)

Stents may become blocked over a period of time therefore it is recommended that the patients be made aware of this problem and advised to seek medical help if chest pains are felt.(3)

Excessive tissue growth can also be prevented by using radiotherapy

The risks of angioplasty include:

- Blood clot formation within blood vessels
- Bleeding at the site of catheter insertion
- The risk of infection
- Abnormal heart rhythm
- Stroke
- Myocardial infarction
- Angina
- Rupture or complete stenosis of the coronary artery requiring immediate surgical intervention
- Allergy to dye

2.2) Coronary Artery Bypass Graft Surgery:

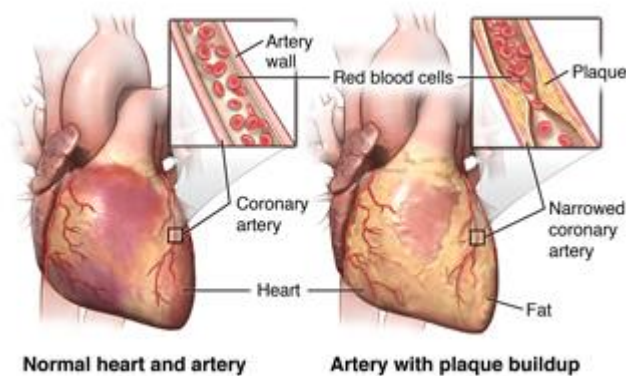


Image 1. taken from (3). Shows a normal artery and an artery affected by an atherosclerotic plaque.

Coronary artery bypass graft surgery is a surgical procedure where blood vessels or grafts are used to bypass the blocked part of the coronary artery. These blood vessels are taken from veins in the legs or the chest arteries. Sometimes an artery from the wrist is used. One end of the graft is attached to where the blockage begins, the other to where the blockage ends and in this way blood bypasses the blockage and flows to the heart muscles through another route (4).

For the bypass procedure to be performed the heart has to be stopped for sometime. Access to the heart is obtained by cutting the sternum into a half forcing the chest open through this cut. Tubes from a bypass machine are connected to the heart once the heart is exposed, so that the bypass machine pumps the blood around the body whilst the bypass procedure is being performed. (4)

Veins used for this procedure come from the calf and the thigh areas of the legs. In coronary artery bypass graft surgery where arteries are used, the radial artery from the wrists maybe used.

Not everyone is suitable for this type of surgical intervention. Fitness for the procedure depends on other co morbidities. (4)

The risks of coronary artery bypass graft surgery include:

- Bleeding during surgery or after surgery
- Infection
- Pneumonia and breathing problems
- Blood clots leading to MIs, PE or stroke
- Arrhythmias
- Allergy to contrast dyes and latex

3.0) Percutaneous coronary intervention versus coronary bypass graft surgery:

Long term mortality associated with both surgical and percutaneous coronary intervention (PCI) were found to be very similar (5). The rate of repeat revascularisation however was increased in people with percutaneous coronary intervention and the risk of stroke was found to be higher in people who had had surgical intervention (6). The clinical outcome relies heavily on choosing the correct treatment for a particular patient. Guidelines such as the European society of cardiology help decide the correct intervention for people with acute coronary syndrome (7).

Percutaneous coronary intervention is preferred in patients who are haemodynamically unstable and are in cardiogenic shock. Mortality rate is higher in patients who are haemodynamically unstable than in patients who are stable (8,9). In patients who are haemodynamically stable surgery or PCI or both may be used .

Coronary artery bypass surgery is preferred in patients with multiple vessel disease (10).

References

1). Acute Coronary Syndromes In: Kumar P, Clark M (eds.) Clinical medicine. 6th ed. Edinburgh: Elsevier Saunders; 2005. p.241-318.

2) Yusuf S, Zucker D, Peduzzi P, et al. Effect of coronary artery bypass graft surgery on survival: overview of 10-year results from randomised trials by the Coronary Artery Bypass Graft Surgery Trialists Collaboration. Lancet 1994;344:563–70.

3) Coronary angioplasty available at: http://www.hopkinsmedicine.org/healthlibrary/test_procedures/cardiovascular/percutaneous_transluminal_coronary_angioplasty_ptca_and_stent_placement_92,P07981/

4) Coronary artery bypass graft surgery available at http://www.hopkinsmedicine.org/healthlibrary/test_procedures/cardiovascular/coronary_artery_bypass_graft_surgery_cabg_92,P07967/

- 5).** Caracciolo EA, Davis KB, Sopko G, et al. Comparison of surgical and medical group survival in patients with left main equivalent coronary artery disease: longterm CASS experience. *Circulation* 1995;91:2335-44.
- 6).** Taggart DP, Kaul S, Boden WE, et al. Revascularization for unprotected left main stem coronary artery stenosis: stenting or surgery. *J Am Coll Cardiol* 2008;51:885-92.
- 7).** Takaro T, Peduzzi P, Detre KM, et al. Survival in subgroups of patients with left main coronary artery disease: Veterans Administration Cooperative Study of Surgery for Coronary Arterial Occlusive Disease. *Circulation* 1982;66:14 -22.
- 8).** Buszman PE, Kiesz SR, Bochenek A, et al. Acute and late outcomes of unprotected left main stenting in comparison with surgical revascularization. *J Am Coll Cardiol* 2008;51:538-45.
- 9).** Kushner FG, Hand M, Smith SC Jr., et al. 2009 focused updates: ACC/AHA guidelines for the management of patients with STelevation myocardial infarction (updating the 2004 guideline and 2007 focused update) and ACC/AHA/SCAI guidelines on percutaneous coronary intervention (updating the 2005 guideline and 2007 focused update): a report of the American College of Cardiology Foundation/ American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol* 2009;54:2205- 41.
- 10).** Cutlip DE, Windecker S, Mehran R, et al. Clinical end points in coronary stent trials. *Circulation* 2007;115:2344 -51.