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Review Article

Be it angioplasty or cabg, heart may stop but hope should not!

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Abstract

Coronary angiography is currently the gold standard anatomic imaging method used to diagnose obstructive epicardial coronary artery disease. Normal coronary artery ratio in coronary angiography is an indirect indicator of patient selection quality for patients with critical coronary stenosis, percutaneous revascularization or Coronary Artery Bypass Graft (CABG) is advised and provided. A recent study reported in American College of Cardiology has inferred that CABG is associated with improved long-term mortality and freedom from major cardiovascular and cerebrovascular events compared with PCI. However, the number of angioplasties stands at a much higher level than CABGs worldwide.

The main difference between coronary artery bypass grafting (CABG) and coronary angioplasty is the invasiveness of the procedure and the recovery time. Angioplasty is a minimally invasive procedure that uses a balloon to widen a coronary artery or in an atherectomy, the plaque is shaved or vaporized away with tiny rotating blades or a laser on the end of a catheter. A small incision is made in the arm, leg, or wrist, the balloon is inflated to widen the artery, and the stent is placed to keep it from narrowing again. The procedure takes about an hour and Patients can often go home the same day or the next day. CABG on the other hand is a major surgery that involves making an 8–10-inch incision in the chest to access the arteries. The procedure takes about 3–6 hours, and patients usually stay in the hospital for 1–2 days. Recovery can take up to 12 weeks. Angioplasty has a lower risk of complications than CABG. Angioplasty is reserved for those with less extensive disease or who are poor candidates for surgery. CABG is generally considered the better option in cases where the patient's arteries are blocked in multiple areas and people with diabetes

Angioplasty is a common medical procedure that is generally safe, but it can have complications depending upon the patient's age, overall health, and whether the procedure was planned or an emergency.

Materials and Methods: This article is an outcome of two cases of angioplasty, one dying during the procedure and another 2 days after the intervention and author's case of CABG in 2005 and Post CABG angioplasty in 2023 and another case about 35 years ago in 1993 of the revival of a case after the heart had stopped pumping the blood during an angioplasty and saved by manual squeezing of the heart from about 15 minutes until heart- lung machine was connected and CABG was done.

Outcome: While both recent angioplasty cases succumbed to complications like bleeding or cardiac arrest, the first case in 1993 and that of the author going strong are the big hope!

Key words: angiograph; angioplasty; pci; percutaneous revascularization; cabg coronary artery bypass graft

Introduction

Cardiovascular disease (CVD) is the leading cause of mortality in India. Nearly a quarter of all mortality is attributable to CVD. Coronary artery disease and stroke are responsible for >80% of CVD deaths. The age-standardized CVD death rate is 272/100,000 in the population in India, much higher than the rate of 235/100,000 in the global population. Premature mortality - years of life lost due to CVD in India has jumped by 59% in the last 20-years. Early onset, rapid progression and a high case fatality rate are the key dimensions of CVD in India are of immense concern. It is estimated that 62 million people in India have some form of CVD compared with 36 million just a decade ago! The relentless growth of CVD in India must be curbed through preventive measures and by an optimal utilization of resources to render care to millions of individuals with CVD beyond cities.

Coronary angiography is currently the gold standard anatomic imaging method used to diagnose obstructive epicardial coronary artery disease. In patients with critical coronary stenosis, surgical or percutaneous revascularization is provided. Normal coronary artery ratio in coronary angiography is an indirect indicator of patient selection quality.

Around 4 million angiograms are performed in the United States and Europe each year. In India, approximately 4.5 lakh angioplasty procedures are performed annually. The number of percutaneous coronary interventions (PCI) in India is increasing at a yearly growth rate of 6%. In 2018, nearly 4,38,351 PCI and around 6 lakh procedures in 2024 were performed in India. Angioplasty is a less expensive treatment option in India than in other countries, making India more affordable option than UK, the US, and the Middle East. The average cost of Angioplasty in India is approximately Rs

1.2 lakh to 1.6 lakh, depending upon the popularity and Star level of the hospitals and cities. Qualified medical professionals and modern facilities for medical care make it a sought-after venue for medical tourism.

Angioplasty is a common medical procedure that is generally safe, but it can have complications depending upon the patient's age, overall health, and whether the procedure was planned or an emergency. The risk of complications is higher for patients who are over 65, have kidney disease or diabetes, are women, or have extensive heart disease. Some common complications of angioplasty include: i) Bleeding or bruising at the catheter insertion site, usually in the arm or leg , ii) Restenosis: The artery re-narrows iii) Blood clots formation within the stents iv) A heart attack during or after the procedure v) A stroke during the procedure , vi) Kidney injury due to the contrast dye vii) An abnormal heart rhythm viii) An artery or major blood vessel can tear or be damaged ix) An allergic reaction to the contrast agent.

This article is prompted by the result of two closely associated friends in the month of November 2024 and another case (first ever in author's experience) that was revived from what was considered a dead body by junior doctors in January 1993.

Succumbing a day after Angioplasty: Mr. Bhargavan aged 65 years, a known hypertensive overweight (body mass index: 28 kg/m²) and diabetic for 20 years, had anginal pain in the third week of October 2024. No other atherosclerosis risk factors were present. His angiography had revealed non-critical plaque without severe stenosis for which an angioplasty was done after an angiography on 17th October in a private hospital. He was discharged after observation for 48 hours. His only daughter and son-in-law went to Dubai for vacation after he came home. On the 20th of October 20204 he developed sudden dyspnoea and chest pain for which he was admitted in ICU of the same hospital. His ECG (echocardiography) revealed a right ventricle enlargement. During transfer of the patient for an urgent pulmonary angiography for possible diagnosis of pulmonary embolism, the patient failed to respond to all resuscitative efforts and died. Most probably there was damage to the artery where the sheath was inserted, which might have led to bleeding, or a Cardiac arrest in the hospital itself. Despite all emergency revival efforts failing, he succumbed to the complication on 30th October 2024.

Author's experience of undergoing CABG in 2005 & Post CABG angioplasty in 2023:

This author with complaint of getting tired in the last kilometer of my 4Kms daily morning walk for 2 months consulted the most popular cardiac surgeon that time. As the angiograph showed triple vessels blocks, was advised and underwent CABG within 2 days of the investigation in a very popular private Cardiac hospital in national Capital New Delhi in August 2005. The surgery and post-surgical stay in ICU for 36 hours and the hospital for another 2 days was events free. The only bitter memories were of the hallucinations after recovery for about 12-16 hors due to general anesthesia. I was discharged on day 5 and was able to start my routine walking from day 10 and go to my job after 3 weeks. Next 18 years were un-eventful and in February 2023, I had similar complaint of getting tried in the last KM of my walking that had increased to 6 Kms. An Angiography showed a blockade in one of the old grafts and the plaque was vaporized away with tiny rotating blades on the end of a catheter and stent was placed, completing the post CABG angioplasty. Observing the entire process on a TV screen was a fascinating experience. This time I was discharged the very next day and got on to my routine for day 3 only and doing fine for last 2 years.

A young lady succumbing to Angioplasty: A 31-year-old woman was brought to the emergency room of the Govt. Medical College Hospital with a sudden deterioration of the general condition in January 2021. Electrocardiography was in sinus rhythm and inferolateral derivations revealed ST segment elevation. Soon after transfer to the coronary intensive care unit cardiac arrest was observed and cardiopulmonary resuscitation was performed. However, despite all efforts the patient died. From the history collected from her relatives it was learnt that 20 hrs. before admission to our emergency room the patient underwent a coronary angiography in a private hospital. Her coronary angiography revealed normal vessels, and she had been discharged from the hospital. Her history was unremarkable in terms of coronary risk factors.

Heart Stopped but Hope Didn't almost Dead patient Saved: On January 22 Mr. Bayas, a 51-year-old IAS officer, was admitted in Beach Candy Hospital with Myocardial Infarction and taken up for angioplasty after an angiograph. Angiography and Angioplasty was in nascent stage in India in 1993 and was still evolving, and complications were common. Unfortunately, an unexpected complication (bleeding) led to a sudden heart stop pumping for half an hour, during which efforts 9external cardia massage) made were not helpful in reviving the heart, and the surgeon denies proceeding further. Then a US returned surgeon hoping against hope did the surgery (informing the family bleak chances of revival and taking their consent) despite poor chances of survival and even if survived the damage to brain for want of blood circulation for more than 3-5 minutes. Keeping the heart lung machine ready he opened the chest in 20 minutes, and found the heart inactive, the right side of the heart that pumps blood to lungs was non-functional and the left side of the heart was unable to pump the blood. He then manually squeezed the patient's heart to maintain blood circulation and after about 15 minutes of tireless manual squeezing, heart started beating slowly and the meantime heart lung machine was ready, to which they connected though patient was comatose, and his kidneys and liver were non-function they persevered. In about 40 minutes of the cardiac massage bypass graft was in place to relieve the blockage. The patient recovered in the next 36 hours and was discharged after a week. Mr. Bayas received round the clock care for next 3 months, He recovered fully and served as the Municipal commissioner of Brihanmumbai Municipal Corporation [5].

Discussions:

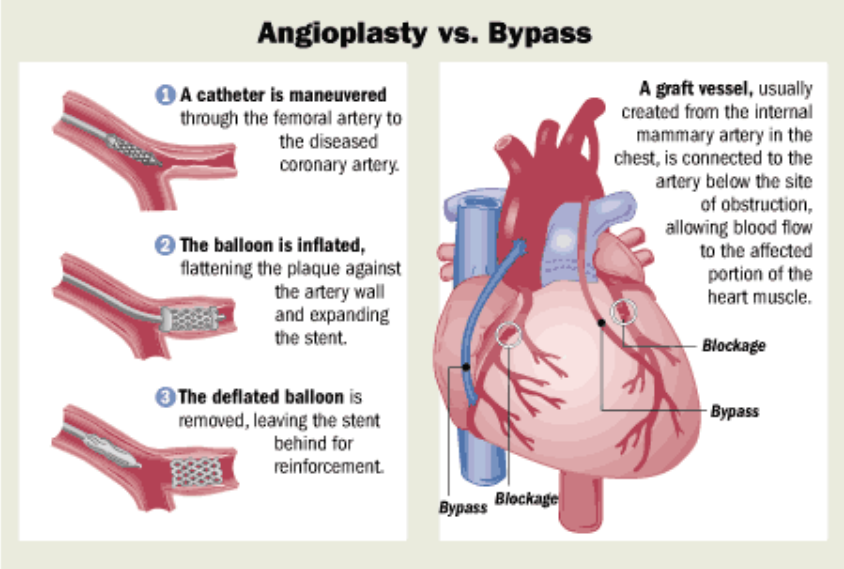
Dr. B C Roy had led formation of the Cardiological Society of India (CSI) on 4th April 1948. The first ever percutaneous transluminal coronary angioplasty (PTCA) was done in 1984 on right coronary artery (RCA) of a post-MI patient with DJ balloon with J-tipped wire by Prof. SC Manchanda at AIIMS, New Delhi [1]. Conventional diagnostic angiography, a technique born in 1924 and substantially refined to present-day technique with the introduction of the Seldinger guidewire in 1953 [2]. Combined with steady improvements in injectors, film changers, and fluoroscopic, radiographic, and subtraction techniques, direct arteriography evolved as the reference standard for the diagnosis and characterization of all manner of vascular disease [3].

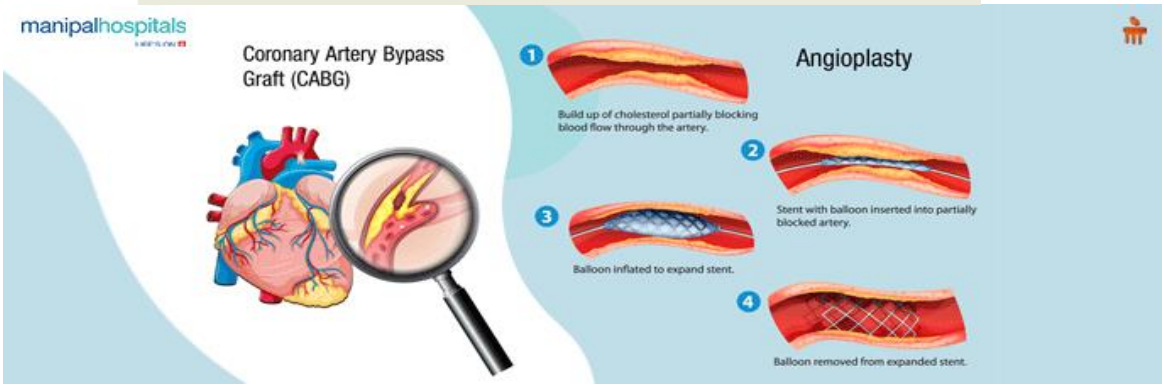
In India, approximately 4.5 lakh angioplasty procedures were performed in 2018. The number of percutaneous coronary interventions (PCI) is increasing at a yearly growth rate of 6%. It is estimated that in 2024, 6 lakh procedures were performed. The major indication for PCI is post myocardial infarction (30%) followed by unstable angina/non-ST elevation MI (24%) chronic stable angina (19%) and Primary PCI (19%). The number of primary PCI for STEMI is 14% of cases. & Rescue PCI was performed in 5%. The PCI done in cardiogenic shock was reported in 3% [5].

Karnataka, the home State of the author, is also seeing a rise in the number of people going through angioplasty. Karnataka's renowned Jayadeva Institute of Cardiovascular Research Centre alone has conducted 10,000 angioplasty procedures in the year 2021 and nearly 12,000 annually thereafter util 2024. Mysuru's Jayadeva Hospital had conducted 6,500 angioplasties in 2021, and private hospitals conduct about 600 cases each year. At least 30% of them are people under 40 years of age. Increasing burden of the disease itself due to lifestyles, work stress among young, awareness created around the disease and increase in screening supported by health insurances. Stress has become the new smoking" for the urban population, apart from a few major factors like heredity, lifestyle and uncontrolled diabetes, and pollution contributing to coronary heart disease. For rural areas, along with predisposed heart disease factors like diabetes, use of tobacco, smoking and alcohol intake are the risk factors. Earlier, it was thought to be a disease of the affluent, but that is no longer the case."

Angioplasty Versus Bypass Surgery: The main difference between coronary artery bypass grafting (CABG) and coronary angioplasty is the invasiveness of the procedure and the recovery time. Angioplasty is a

minimally invasive procedure that uses a balloon to widen a coronary artery or in an atherectomy, the plaque is shaved or vaporized away with tiny rotating blades or a laser on the end of a catheter. A small incision is made in the arm, leg, or wrist, the balloon is inflated to widen the artery, and the stent is placed to keep it from narrowing again. The procedure takes about an hour and Patients can often go home the same day or the next day. CABG on the other hand is a major surgery that involves making an 8–10-inch incision in the chest to access the arteries. The procedure takes about 3–6 hours, and patients usually stay in the hospital for 1–2 days. Recovery can take up to 12 weeks. Angioplasty has a lower risk of complications than CABG. Angioplasty is reserved for those with less extensive disease or who are poor candidates for surgery. CABG is generally considered the better option in cases where the patient's arteries are blocked in multiple areas and people with diabetes.





Angioplasty is a common medical procedure that usually has a very low risk of serious complications, but there are some possible complications, including: i) Bleeding or bruising at the catheter insertion site, which is usually in the arm, groin, or wrist ii) A blood clot in the treated blood vessel or damage to the blood vessel from the catheter iii) An infection at the catheter insertion site. More serious complications are less common but include iv) A heart attack, which can occur in 3–5% of people v) A stroke, in less than 1% of people is reported vi) An allergic reaction to the contrast dye used during the procedure vii) Kidney damage caused by the dye used viii) A rupture of the coronary artery, which may require open-heart surgery and CABG as was in our 1993 case. The patient is advised to rest for 3 days after an angiogram, and 1 week following an angioplasty. If the patient had a heart attack, may need 4-6 weeks off from work.

Multiple hospital studies-based mortality rates after angioplasty in India stand at:

In-hospital mortality rate for all primary angioplasty patients at 6% and for after elective angioplasties around 4 % has been reported. Factors like age between 51–60 yrs. Gender: Males were more likely to be affected than females. Individuals with Diabetes and Hypertension are at higher risk.
30-day and 1-year mortality rates -A study of 25,423 angioplasty patients found that the 30-day mortality rate was 3.8% and the 1-year mortality rate was 8.2%.

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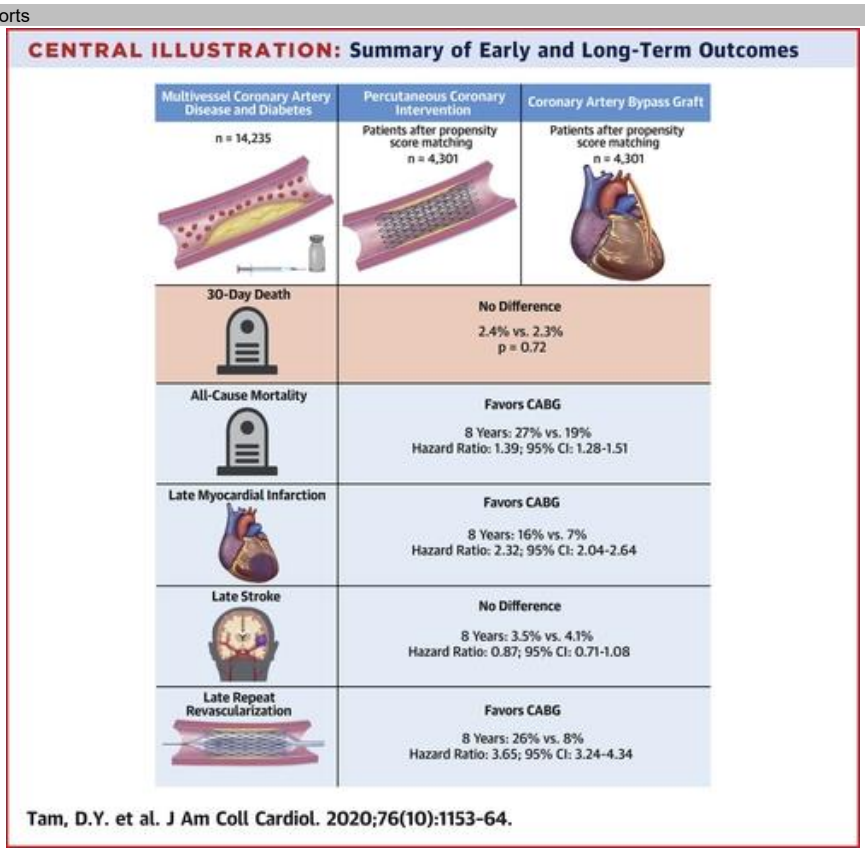
Another study found that the procedural survival rate for angioplasty was 98.9%. and 90% of patients lived five years after angioplasty. A study found that about 10.9% of angioplasty patients had a heart attack within five years.

Another recent study reported In-hospital mortality after PCI at a large safety net hospital is around 3%. Most deaths were due to cardiogenic shock and acute coronary syndrome and were not procedure related. Three independent reviewers adjudicated 85% of death as unpreventable [8]. It has been reported that death after coronary angiography is rare (0.02%). Left main coronary artery lesion, advanced age, multivessel disease, heart failure, aortic stenosis and renal failure are reported as the risk factors causing sudden death after coronary angiography.

The first Coronary Artery Bypass Graft (CABG) surgery was carried out by Dr. K.M. Cherian in 1975 at Chennai, about 13 years after its advent in 1962. By mid-1990, some 10,100 CABG surgeries were being performed annually in India. In 2024 the annual number is about 600,000 according to industry sources. A recent study reported in American College of Cardiology after studying a total of 4,519 and 9,716 patients underwent PCI and CABG, respectively, inferred that CABG was associated with improved long-term mortality and freedom from MACCEs compared with PCI



Patients who underwent CABG were significantly younger (age 65.7 years vs. 68.3 years), were more likely to be men (78% vs. 73%) and had more severe CAD. The propensity score matching based on 23 baseline covariates yielded 4,301 well-balanced pairs. There was no difference in early mortality between PCI and CABG (2.4% vs. 2.3%; p = 0.721) after matching. The median and maximum follow-ups were 5.5 and 11.5 years, respectively. All-cause mortality (hazard ratio [HR]: 1.39; 95% CI: 1.28 to 1.51) and overall All-cause mortality and the composite of myocardial infarction, repeat revascularization, stroke, or death (termed major cardiovascular and cerebrovascular events {MACCEs (HR: 1.99; 95% CI: 1.86 to 2.12)} were significantly higher with PCI compared with CABG. The study inferred those patients with multivessel CAD and diabetes, CABG was associated with improved long-term mortality and freedom from MACCEs compared with PCI [11].

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