



New concepts of segment elevation myocardial infarction

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Abstract

The WHO NCD (Non-Communicable Disease Alliance) Warns South Asian Countries including Bangladesh about the 'aggressive' spread of the diseases such as heart problems and diabetes affecting people mostly in younger age. "They should be earning money for the family but they are impacted by diabetes and cardiovascular diseases." Cardiovascular disease (CVD) is a class of diseases that involve the heart or blood vessels. Cardiovascular disease includes coronary artery diseases (CAD) such as angina and myocardial infarction (commonly known as a heart attack). Other CVDs include stroke, heart failure, hypertensive heart disease, rheumatic heart disease, cardiomyopathy, heart arrhythmia, congenital heart disease, valvular heart disease, carditis, aortic aneurysms, peripheral artery disease, thromboembolic disease, and venous thrombosis. CVDs are the number 1 cause of death globally: more people die annually from CVDs than from any other cause. An estimated 17.7 million people died from CVDs in 2015, representing 31% of all global deaths. Of these deaths, an estimated 7.4 million were due to coronary heart disease and 6.7 million were due to stroke. Over three-quarters of CVD deaths take place in low- and middle-income countries. Out of the 17 million premature deaths (under the age of 70) due to non-communicable diseases in 2015, 82% are in low- and middle-income countries, and 37% are caused by CVDs. Most cardiovascular diseases can be prevented by addressing behavioral risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity and harmful use of alcohol using population-wide strategies. People with cardiovascular disease or who are at high cardiovascular risk (due to the presence of one or more risk factors such as hypertension, diabetes, hyperlipidemia or already established disease) need early detection and management using counselling and medicines, as appropriate. (WHO Media Center, May 2017). According to the latest WHO data published in May 2014, Coronary Heart Disease Deaths in Bangladesh reached 50,708 or 6.96% of total deaths. The age adjusted Death Rate is 53.53 per 100,000 of population ranks Bangladesh #150 in the world. Cardiovascular Diseases in Bangladesh Statistics on Overall Impact and Specific Effect on Demographic groups. Annual mortality rate (per 100,000 people) = 213.0; annual years of healthy life lost (per 100,000 people) 4634.0; change in annual years of healthy life lost (since 1990). The percent change in annual years of healthy life lost per 100,000 people between 1990 and 2013. Years of healthy life lost, also called Disability-Adjusted Life Years (DALYs), is the sum of years of life lost to premature death and years lived with disability (adjusted for the severity of a condition). This accounts for population change and does not standardize on age differences. Cardiovascular Diseases in Bangladesh 100.8%. Range across all Global Disease Burden - Minute - 100%, Average 94.34%, Max 1.62 MILLION, percentage of years of healthy life lost attributed to risk factors 87.9%, These risk factors contributed to, and were thought to be responsible for, an estimated 89.2% of the total deaths caused by cardiovascular diseases in Bangladesh during 2013.

Keywords: introduction, symptoms, diagnosis, treatment, conclusion

Introduction

ST-segment elevation myocardial infarction (STEMI) is the term cardiologists use to describe a classic heart attack. It is one type of myocardial infarction in which a part of the heart muscle (myocardium) has died due to the obstruction of blood supply to the area. The ST segment refers to the flat section of an electrocardiogram (ECG) reading and represents the interval between jagged heartbeats. When a person has a heart attack, this segment will no longer be flat but will appear abnormally elevated.

Types and severity

STEMI is one of three types of acute coronary syndrome (ACS). ACS occurs when a plaque ruptures from within a coronary artery, causing the partial or complete obstruction of that artery. The obstruction itself is caused when blood clots form around the area of the rupture.

When obstructed, the portion of the heart muscle serviced by that artery will quickly suffer from a lack of oxygen, called ischemia. Chest pains (angina) are often the first

signs of this. If the obstruction is extensive enough, some of the heart muscle will begin to die, resulting in myocardial infarction.

We categorize ACS by the level of obstruction and the resulting damage to the heart muscle:

If the complete obstruction of a coronary artery occurs, resulting in the death of heart muscle tissue, we refer to that as STEMI, the worst form of ACS.

However, in some cases, the clots will form, dissolve, and re-form during a period of hours or days without causing a fixed obstruction. When this happens, the person may experience on-again-off-again angina even when resting. This type of ACS is called unstable angina.

In between STEMI and unstable angina is a condition some refer to as a "partial heart attack." This occurs when the obstruction doesn't completely stop the blood flow. While some cell death will occur, other parts of the muscle will survive. The medical term for this is a non-ST-segment elevation myocardial infarction (NSTEMI).

Regardless of how an ACS event is classified, it is still

considered a medical emergency since unstable angina and NSTEMI are often early warning signs of a major heart attack.

Symptoms

STEMI will typically result in intense pain or pressure in or around the chest, often radiating to the neck, jaw, shoulder, or arm. Profuse sweating, breathlessness, and a profound sense of impending doom are also common. At times, the signs may be far less obvious, manifesting with nonspecific or generalized symptoms such as:

Pain around the shoulder blades, arm, chest, jaw, left arm, or upper abdomen

A painful sensation described as having a "clenched fist in the chest"

Discomfort or tightness in the neck or arm

Indigestion or heartburn

Nausea and vomiting

Fatigue or sudden exhaustion

Shortness of breath

Dizziness or lightheadedness

Increased or irregular heart rate

Clammy skin

As a general rule of thumb, anyone at significant risk of a heart attack should pay close attention to any unusual symptom arising from above the waist.

Diagnosis

In most cases, the diagnosis of STEMI can be made quickly once the person is under medical care. A review of symptoms, accompanied by the evaluation of the ST segment on the ECG, is usually enough for a doctor to begin treatment. A review of cardiac enzymes may also help but usually arrives well after acute treatment is started.

It is important to stabilize the person as quickly as possible. In addition to pain and distress, STEMI can cause sudden death due to ventricular fibrillation (a serious disturbance of the heart rhythm) or acute heart failure (when the heart cannot pump enough blood to properly supply the body).

After a heart attack has run its course, the muscle itself may be left with substantial permanent damage. Chronic heart failure is a common consequence of this, as is the increased risk of dangerous cardiac arrhythmias (irregular heartbeats).

Treatment

Treatment must be started the moment STEMI is diagnosed. In addition to administering drugs to stabilize the heart muscle (including morphine, beta-blockers, and statin medications), efforts will be made to immediately reopen the blocked artery.

This requires speed. Unless the artery is opened within three hours of the blockage, at least some permanent damage can be expected. Generally speaking, much of the damage can be minimized if the artery is unblocked within the first six hours of an attack. Up until 12 hours, some damage may be averted. After that, the longer it takes to unblock the artery, the more damage there will be.

There are several approaches to reopening an arterial obstruction:

Thrombolytic therapy involves the use of clot-busting drugs. Angioplasty is the medical term for the surgical repair/reopening of an artery.

Stenting involves the insertion of a mesh tube to reopen the artery.

Once the acute phase of treatment is over and the blocked artery is reopened, there is still a lot that has to be done to stabilize the heart, and to reduce the odds of another heart attack.

This usually involves an extensive period of recovery, including an exercise-based rehabilitation program, dietary changes, and the use of anticoagulants (blood thinners) and lipid control medications.

Conclusion

ST-segment elevation myocardial infarction (STEMI) is the most acute manifestation of coronary artery disease and is associated with great morbidity and mortality. A complete thrombotic occlusion developing from an atherosclerotic plaque in an epicardial coronary vessel is the cause of STEMI in the majority of cases. Early diagnosis and immediate reperfusion are the most effective ways to limit myocardial ischaemia and infarct size and thereby reduce the risk of post-STEMI complications and heart failure. Primary percutaneous coronary intervention (PCI) has become the preferred reperfusion strategy in patients with STEMI; if PCI cannot be performed within 120 minutes of STEMI diagnosis, fibrinolysis therapy should be administered to dissolve the occluding thrombus. The initiation of networks to provide around-the-clock cardiac catheterization availability and the generation of standard operating procedures within hospital systems have helped to reduce the time to reperfusion therapy. Together with new advances in antithrombotic therapy and preventive measures, these developments have resulted in a decrease in mortality from STEMI. However, a substantial amount of patients still experience recurrent cardiovascular events after STEMI. New insights have been gained regarding the pathophysiology of STEMI and feed into the development of new treatment strategies.

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Conflict of interest

The authors declare no conflict of interest.

References

- 1 Ibanez B. *et al.* ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *Eur. Heart J.* 2017; 39:119-177 (2018). These are the guidelines for the treatment of STEMI by the ESC.
- 2 Joshi P. *et al.* Risk factors for early myocardial infarction in South Asians compared with individuals in other countries. *JAMA*, 2007; 297:286-294.
- 3 Ashikujaman Syed. In-vivo imaging study of distribution of liposoluble fluorescent drugs after epicardium-in-situ administration by ASD. *Int. J. Adv. Res. Biol. Sci.* 2019; 6(6):58-70.
- 4 O'Gara PT. *et al.* ACCF/AHA guideline for the management of ST-elevation myocardial infarction: a

- report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *J. Am. Coll. Cardiol.* 2013; 61:e78-e140 (2013). These are the guidelines for the treatment of STEMI by the American College of Cardiology and the American Heart Association.
- 5 Leone O. *et al.* consensus statement on endomyocardial biopsy from the Association for European Cardiovascular Pathology and the Society for Cardiovascular Pathology. *Cardiovasc. Pathol.* 2011; 21:245-274 (2012).
 - 6 Newby LK. *et al.* Value of serial troponin T measures for early and late risk stratification in patients with acute coronary syndromes. The GUSTO-IIa Investigators. *Circulation.* 1998; 98:1853-1859.
 - 7 Csordas A, Bernhard D. The biology behind the atherothrombotic effects of cigarette smoke. *Nat. Rev. Cardiol.* 2013; 10:219-230.
 - 8 NHS Digital. Health survey for England, 2015. — Adult overweight and obesity. HSCIC.gov.uk <http://healthsurvey.hscic.gov.uk/media/37748/hse2015-adult-obe.pdf> (2016).
 - 9 Grundy SM. *et al.* AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA Guideline on the Management of Blood Cholesterol: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am. Coll. Cardiol.* 2018. <https://doi.org/10.1016/j.jacc.2018.11.002> (2018). This paper presents recently published guidelines on the management of blood cholesterol, one of the most important risk factors of atherosclerosis.
 - 10 Vogel B, Claessen BE, Arnold SV. *et al.* ST-segment elevation myocardial infarction. *Nat Rev Dis Primers.* 2019; 5:39. Doi: 10.1038/s41572-019-0090-3.