

# Circulation

JOURNAL OF THE AMERICAN HEART ASSOCIATION



## Modern Treatment for Heart Attacks: Opening Blocked Arteries Quickly

Amy F. Marple, Elliott M. Antman and Mary M. Hand

*Circulation* 2006;114;578-580

DOI: 10.1161/CIRCULATIONAHA.106.648279

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75214

Copyright © 2006 American Heart Association. All rights reserved. Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://circ.ahajournals.org/cgi/content/full/114/20/e578>

Subscriptions: Information about subscribing to *Circulation* is online at  
<http://circ.ahajournals.org/subscriptions/>

Permissions: Permissions & Rights Desk, Lippincott Williams & Wilkins, a division of Wolters Kluwer Health, 351 West Camden Street, Baltimore, MD 21202-2436. Phone: 410-528-4050. Fax: 410-528-8550. E-mail:  
[journalpermissions@lww.com](mailto:journalpermissions@lww.com)

Reprints: Information about reprints can be found online at  
<http://www.lww.com/reprints>



## Modern Treatment for Heart Attacks

### Opening Blocked Arteries Quickly

Amy F. Marple, MD; Elliott M. Antman, MD; Mary M. Hand, MSPH, RN



**D**uring a heart attack, a clot forms in an artery that supplies blood to the heart and blocks blood flow to the area of heart muscle supplied by that artery. The portion of the heart muscle deprived of blood carrying the needed oxygen begins to become damaged. This is called a “myocardial infarction,” more commonly known as a heart attack. The amount of lasting damage to the heart muscle depends on a number of factors—the size of the clot, the location of the clot, and how long the clot blocks blood flow to the muscle. The longer the heart muscle is without blood and oxygen, the more extensive the damage to the muscle and the greater the size of the heart attack. Learning the warning signs of a heart attack and what steps to take right away can save a life—perhaps your own (Table).<sup>1,2</sup>

#### Fast Action Saves Lives

Calling 9–1–1 is the fastest way to get lifesaving treatment. If you or someone you are with has any symptoms of a heart attack, call 9–1–1 immediately!

If you have a history of chest pain for which your doctor has prescribed nitroglycerin, then take ONE dose right away. If your symptoms are not better 5 minutes after taking one dose, then you should call 9–1–1 immediately. In the past, you may have been told to take up to 3 doses of nitroglycerin before calling 9–1–1. However, the medical guidelines for the use of nitroglycerin have changed to help people who may be having a heart attack get to a hospital more quickly.

By calling 9–1–1 and taking an ambulance you will be seen in the hospital and treated more quickly.<sup>1,2</sup> Sometimes emergency personnel will arrive first in a fire truck or other emergency vehicle, but the ambulance will take you directly to the hospital. Emergency personnel can begin treatment even before you arrive at the hospital. For example, emergency personnel may place electrodes (adhesive patches to which wires are attached) on your chest to obtain an electrocardiogram (an ECG or EKG). An ECG records the electrical activity of the heart and will show abnormal patterns

of electrical activity in the areas of the heart that are damaged or deprived of oxygen if a heart attack is happening.

#### The Good News

There are several life-saving treatments that can open the blocked artery that is causing the heart attack. The blocked artery can be opened by injecting clot-dissolving drugs into a vein (you may hear this process referred to as “fibrinolysis”) and through a procedure called “angioplasty.” Angioplasty is performed in a special part of the hospital called a cardiac catheterization laboratory (“cath lab”). Angioplasty may involve the placement of a small wire device called a “stent,” and the procedure is sometimes called “percutaneous coronary intervention,” or PCI. A stent is shaped somewhat like the spring of a ballpoint pen and may be inserted into the artery to help it remain open after the clot is removed.<sup>3</sup>

#### Treatment

At the hospital, the type of treatment you are given depends on the type of

The information contained in this *Circulation* Cardiology Patient Page is not a substitute for medical advice, and the American Heart Association recommends consultation with your doctor or healthcare professional.

From the Department of Medicine, Brigham and Women’s Hospital, Boston, Mass (A.F.M., E.M.A.), and the Office of Extramural Research, Education, & Priority Populations, Agency for Healthcare Research and Quality, Rockville, Md (M.M.H.).

Correspondence to Mary M. Hand, MSPH, RN, NHLBI Health Information Center, PO Box 30105, Bethesda, MD 20824–0105.

(*Circulation*. 2006;114:e578-e580.)

© 2006 American Heart Association, Inc.

*Circulation* is available at <http://www.circulationaha.org>

DOI: 10.1161/CIRCULATIONAHA.106.648279

## Heart Attack Warning Signs

### Signs of a Heart Attack

- Chest discomfort. Discomfort generally occurs in the center of the chest and can feel like pressure, squeezing, fullness, or pain.
- Discomfort in other areas of the upper body. Pain or discomfort can occur in one or both of the arms, the back, neck, jaw, or stomach.\*
- Shortness of breath.
- Cold sweat, nausea, vomiting, and lightheadedness.\*

\*Women and elderly patients are somewhat more likely than men to experience other symptoms such as nausea, vomiting, and jaw or back pain.

Adapted from *The Act in Time to Heart Attack Signs* campaign.<sup>2</sup>

heart attack you are having and how quickly you can be treated. Only certain hospitals are equipped to perform 24-hour emergency PCI. If you are located too far away from one of these hospitals, clot-dissolving drugs may be the best choice for treatment to reopen clogged arteries. Clot-dissolving medicine may not be recommended for some patients, depending on their medical history. The doctor who treats you will ask you or your family if you have a history of a major trauma or have had major surgery in the past 6 weeks; vomiting blood or bleeding from the rectum in the past 6 weeks; or any bleeding or neurological disorders; and whether you are (or might currently be) pregnant. If the answer to any of these questions is yes, it will be factored into the decision of which heart attack treatment is best.

Emergency PCI is performed only at certain hospitals that are equipped with special x-ray rooms called cath labs where the procedures are performed. Some hospitals have cath labs that are staffed only during daytime hours. The ambulance may not bring you to the closest community hospital with a cath lab unless the hospital is able to perform cardiac catheterization procedures 24 hours a day on an emergency basis. If you or a loved one is considered at high risk for a heart attack, it is good to know which hospitals perform

## Cath Lab



**Figure 1.** Hospital cardiac catheterization laboratory. Reprinted with permission from the American Heart Association.

24-hour angioplasty in your city or state. This way you will know in advance the hospitals where you or your loved ones may be taken in the event of a heart attack.

If your doctor decides you need an angioplasty for your heart attack, you will be taken to the cath lab. The cath lab is a room equipped with x-ray equipment where an angiogram (x-ray image of your arteries) will be done to see the blockages in the heart's arteries (Figure 1). The actual PCI procedure will then be performed to open the blocked artery. In the cath lab, the healthcare team will work together to help you feel comfortable and to assist the cardiologist in the procedure. You will remain awake during the procedure so that you can respond to directions from the cardiologist. A nurse will be present to administer light sedation and anti-anxiety medication to keep you as comfortable as possible during the procedure. A medicine to numb the skin will be given into the groin area. Sometimes another location, such as the wrist, is used in the angioplasty, and the numbing medicine is given in that area. The cardiologist will then insert a needle into the numbed skin and thread a soft-tipped guide wire and catheter through the needle into the aorta, which is the main artery of the body, and then into the heart. The cardiologist will watch the progress on a video screen while the catheter tip is advanced into the opening of the arteries that bring blood to

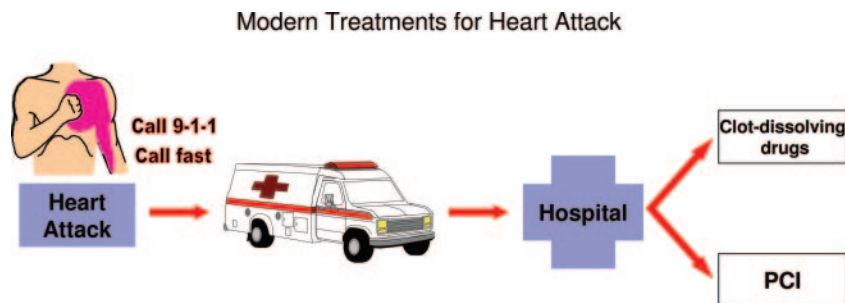
the heart. (The opening of these arteries is located where the aorta joins the heart.) Once the cardiologist has the tip of the catheter in place, a special contrast dye will be injected into the heart vessels to look for blockages. The dye makes it possible for the cardiologist to see the arteries with x-rays. You may feel a warm sensation when the dye is injected.

The angiogram shows the cardiologist where the artery blockages are located. The cardiologist can inflate the tiny balloon at the tip of the catheter one or more times to open the blocked artery. Today, it is common for cardiologists to then insert a stent that remains permanently in place after the procedure into the area where the blockage was located before the angioplasty. The stent serves as permanent scaffolding for the newly opened artery. Some stents, called drug-eluting stents, are coated with a medication that is slowly released over time. This medication prevents the growth of scar tissue and clot formation at the site. If the angiogram shows that many of the arteries supplying your heart are clogged, you may not be a good candidate for angioplasty. It has been proven in research studies that patients with more than 3 blocked arteries do better with coronary artery bypass grafting (also called CABG).<sup>4</sup>

After the cardiologist opens the blocked arteries, you will most likely be transferred to the coronary care unit (CCU). This is the intensive care unit

for patients receiving care after heart procedures. The CCU has a specially trained team of nurses and doctors to take care of patients recovering from heart attacks. Your loved ones will be able to visit you after you are transferred to the CCU. Patients are required to lie flat for up to 12 hours after PCI to ensure that the puncture wound at the procedure entry site can heal properly. Patients are monitored with ECGs, blood tests, and routine checks 24 hours a day. The cardiologist may also order an “echocardiogram” within the first few days after your heart attack. This is an ultrasound picture of the heart that shows how the heart is functioning, including the motion and strength of the walls and valves of the heart, and assesses damage after the heart attack. It is a non-invasive test and can be performed at the bedside.

For patients who have a stent placed in one of the heart’s arteries, special medications will be given to prevent clot formation in the stent. These anti-clotting (or antiplatelet) medications, such as clopidogrel, are important in preventing clot formation in the newly placed stents. Patients must take these medications for at least 12 months after the PCI procedure and often longer as directed by their cardiologist. A patient who stops taking the anti-clotting medicine too soon is at risk for development of a clot that completely blocks blood flow through the stent (called “stent thrombosis”) and that may cause another heart attack. It is important to take your prescribed medications every day and to call your doctor if you have any questions or



**Figure 2.** Modern treatments for heart attack. Reprinted with permission from Antman et al, ACC/AHA Guidelines for the management of patients with ST-elevation myocardial infarction. *Circulation*. 2004;110:e82–e292. Copyright American Heart Association, 2004.

concerns regarding future surgical procedures that require you to stop taking aspirin and other antiplatelet medications prescribed for you by your doctor. The cardiologist will also likely prescribe other medications such as a beta-blocker, an aspirin, and a statin (a cholesterol-lowering drug) to help prevent future heart attacks.

Patients who do not have complications can generally be discharged with their new medications within 5 days. Many hospitals and health centers offer cardiac rehabilitation for patients who have suffered a heart attack. Cardiac rehabilitation can help you to develop a safe exercise plan, healthy eating habits, a weight loss plan, and a plan for quitting smoking or reducing alcohol intake.

Make a plan now for what you would do if a heart attack should happen. Doing so will save time and could help prevent extensive injury to your heart muscle. Getting early (“modern”) treatment for a heart attack, as shown in Figure 2, will help to keep your

heart muscle strong and will mean a longer and fuller life for you.

### Disclosures

None.

### References

1. National Heart, Lung, and Blood Institute, National Institutes of Health. Act in time to heart attack signs. Available at: [http://www.nhlbi.nih.gov/health/public/heart/mi/core\\_bk.pdf](http://www.nhlbi.nih.gov/health/public/heart/mi/core_bk.pdf). Accessed September 22, 2006.
2. National Heart, Lung, and Blood Institutes, National Institutes of Health. Act in time to heart attack signs: patient action tablet. Available at: [http://www.nhlbi.nih.gov/health/public/heart/mi/act\\_plan.htm](http://www.nhlbi.nih.gov/health/public/heart/mi/act_plan.htm). Accessed September 22, 2006.
3. Ornato JP, Hand MM. Warning signs of a heart attack. *Circulation*. 2001;103:e124–e125.
4. Shekar PS. On-pump and off-pump coronary artery bypass grafting. *Circulation*. 2006;113:e51–e52.

### Additional Resources

National Heart, Lung, and Blood Institute web site. Available at: <http://www.nhlbi.nih.gov/>. Accessed October 27, 2006.  
 American Heart Association web site. Available at: <http://www.americanheart.org>. Accessed October 27, 2006.  
 US National Library of Medicine. MedlinePlus. Available at: <http://www.nlm.nih.gov/medlineplus>. Accessed October 27, 2006.