

## Improving Outcomes in Congestive Heart Failure

Congestive heart failure (CHF) is a fairly common condition, developing most often in the aftermath of ischemic injury to the heart, or heart attack. The failure in "congestive heart failure" refers to the pumping action of the heart, and specifically, the left ventricle. The left ventricle contracts powerfully, and sends oxygenated blood to all the cells of the body. A heart attack occurs when blood supply to some portion of the left ventricle is cut off due to a blood clot, and that portion of the heart muscle dies. As a result, there is less muscle to pump, and the efficiency of the heart declines. This efficiency is measured as the "ejection fraction" or "left ventricular ejection fraction." Simply, this is the fraction, or proportion, of blood that fills the ventricle that gets pumped out when the ventricle contracts. A normal ventricle will pump out approximately 60% of the blood volume that fills it.

After some of the heart muscle has died, the ejection fraction, or "EF," may fall to 40%, or 30%, or lower. Here's where the "congestive" comes into the picture. Since the ventricle isn't emptying well, when blood is sent into it to fill it up again, it is already partially filled. So it fills to overloading, and this gets worse over time. So blood "backs up." Because blood comes to the left ventricle from the left atrium, and to

the left atrium from the blood vessels in the lungs, the blood backs up into the lungs. As pressure builds up in the pulmonary vessels, fluid begins to leak out into the air spaces. This is referred to as pulmonary edema, and is responsible for the shortness of breath that characterizes CHF.

Because the heart is not pumping efficiently, the organs of the body are getting less blood than they need. The kidneys are designed to respond to a decrease in blood flow by releasing hormones that raise blood pressure, and cause retention of salt and water. This response makes perfect sense when the cause of decreased blood flow is blood loss due to trauma. Probably, this response developed due to the effect of such trauma on our ancestors' survival during the eons of evolution. Our ancestors did not live long enough to develop heart disease or CHF.

In CHF, however, the body's responses are, for the most part, all wrong. The rise in blood pressure puts an additional strain on an already straining left ventricle. This causes it to pump even less well. The retention of salt and water causes even more "congestion" in the lungs. Without treatment, this sequence produces a degenerating spiral that can cause constant shortness of breath, and lead to death.



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Fortunately, treatment of heart failure continues to advance. Diuretics remove excess fluid. Digoxin helps the heart pump better. Medications called ACE inhibitors reduce blood pressure, unburden the heart, and improve survival. A drug called aldactone prevents salt retention by the kidney. Beta blockers reduce stress to the heart, and also improve survival. These interventions, together with a healthy, low-salt diet and close medical follow-up, can lead to very good outcomes in CHF.

But even despite optimal medical care, CHF may progress, and often leads to functional limitations. There is interest in finding ways to prevent the functional impairment CHF causes, and at the Prevention Research Center, we're doing our part. We will soon be starting a study using counseling and gentle exercise to try and improve function and quality of life in heart failure. If you or someone you

know has this condition and would like more information, call 732-1265.

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*Preventive Medicine Column*

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