

Drug Eluting Stents

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Minimally invasive treatment of coronary artery disease began in the late 1970's with the initial use of balloon angioplasty to dilate blocked heart arteries. While initial success rates were excellent, this procedure was plagued with recurrence of the blockage in up to half of patients. This recurrent blockage process is called *restenosis*. Restenosis is comprised of two components. The muscular wall of the artery, stretched by the balloon, can recoil partially narrowing the artery again. The artery can also develop an exaggerated scarring effect which narrows the artery with scar tissue. The combination of these two processes led to the high rate of recurrent blockage after balloon angioplasty.

In the early 1990's, cardiologists began to use small metal tubes, called *stents*, into the artery after opening it with a balloon angioplasty. The use of stents revolutionized the use of angioplasty for the treatment of coronary heart disease. The stent prevents the elastic recoil of the vessel wall and acts as a scaffold to hold the artery open. Despite the use of stents as a common part of angioplasty, 10% to 30% of patients still had restenosis. Some patients, such as diabetics, and some parts of the heart arteries are more prone to restenosis despite the use of stents. In stented patients, the restenosis is made up primarily of the growth of scar tissue inside of the stent.

Beginning in 2003, a new generation of coronary stent was available for use in the United States. In these stents, called *drug eluting stents*, the stainless steel stent is coated with a medication to prevent the formation of the scar tissue inside the artery. The first such stent, called the Cypher stent, is coated with a medication called sirolimus. This drug was first used in organ transplant patients to prevent rejection. In the heart artery, sirolimus prevents the overgrowth of scar tissue that renarrows the artery after treatment. The second stent, called the Taxus stent, was introduced later the same year. This stent is coated with a drug called paclitaxel. This drug was first used as a chemotherapy agent and also prevents the overgrowth of scar tissue. Both drugs are released locally and do not cause side effects for the patient.

Both of these stents are in common use, and both are extremely effective for the prevention of restenosis. Drug eluting stents reduce the rate of restenosis from up to 30% with bare metal stents to the 4-7% range. The use of these stents has greatly expanded the ability of cardiologists to treat patients with coronary heart disease, and has become part of the standard treatment of most patients who are candidates for angioplasty.