Revascularization of Chronic Total Occlusion

Chronic Total Occlusions (CTOs) of coronary arteries represent one of the most challenging problems in contemporary interventional cardiology. A CTO is a complete blockage that has been present for at least three months, although most of these arteries have been occluded for considerably longer. CTOs are very common, occurring in 15-20% of patients with significant coronary artery disease. Most patients with CTOs are treated with medical therapy or CABG surgery. Historically, percutaneous intervention (PCI) has been attempted only in a small percentage of cases, and with suboptimal success rates. CTOs are a major cause of incomplete revascularization with PCI, which has been shown to lead to worse outcomes.

HYBRID CTO APPROACH

During the last few years, new approaches have been developed for treating CTOs, which include dissection-reentry and retrograde techniques. Dissection-reentry involves passing equipment into the subintimal space then reentering the vessel lumen beyond the diseased segment. Retrograde techniques involve using collateral channels that develop around CTOs to access the distal vessel. Dissection-reentry and retrograde techniques, combined with conventional antegrade wiring, constitute the Hybrid CTO Approach. Frequently, these techniques are used in combination to “solve” a single lesion. It is now possible to treat almost all CTOs with virtually no angiographic exclusions. Using this approach, success rates for opening CTOs are close to that of treating non-CTO lesions, with similar complication rates.

Patient Population

CTO intervention should be considered in patients who continue to experience lifestyle-limiting symptoms despite appropriate medical therapy. Other patients who may benefit include those with a severe ischemia or other high-risk findings on non-invasive testing.

Images before (left) and after blood flow was restored to a Chronic Total Occlusion (CTO) of a right coronary artery. A previous attempt by another physician was unsuccessful, partly due to an occlusion length of over 60 mm. The vessel was opened using a combination of retrograde and dissection-reentry techniques, a so-called reverse CART (Controlled Antegrade and Retrograde subintimal Tracking) procedure.

FOR MEDICAL PROFESSIONALS

Patients with successful CTO intervention typically experience immediate and dramatic symptom relief. CTO revascularization has also been shown to improve regional and global wall motion in patients with viable but hibernating myocardium. Patients with successful CTO revascularization have been found to have lower rates of CABG surgery than patients in whom the CTO attempt was unsuccessful. These patients have also been consistently found to have improved survival, although this finding still requires validation in a prospective, randomized trial4.

PROGRAM HISTORY

The Hybrid CTO program at the Oregon Heart & Vascular Institute was begun in 2011 by Dr. Stephen Cook with the assistance of Dr. William Lombardi. Dr. Lombardi, who practices at PeaceHealth St. Joseph Medical Center in Bellingham, Wash., is one of the world’s foremost experts in CTO intervention and a creator of the Hybrid Approach. Sacred Heart Medical Center is the first hospital in Oregon to utilize these techniques and equipment. The success rate to date has been greater than 95%.

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**Case Study**

**History:** A 63-year-old man had experienced fatigue, shortness of breath, and angina for over two years, requiring him to severely restrict his activities.

**Diagnosis:** Angiography showed a chronic total occlusion of the patient’s left anterior descending artery, with the distal vessel filling through collaterals. He continued to be symptomatic despite maximally tolerated anti-anginal therapy.

**Treatment:** Interventional cardiologist Stephen Cook, MD, utilized the Bridgepoint Medical dissection-reentry system, combined with a single drug-eluting stent, to restore blood flow to the distal LAD.

**Outcome:** Even before discharge from the hospital the next day, the patient experienced an immediate improvement in his symptoms. Four months following the procedure he said, “It really made a difference in my life. I was out walking the other day, and I was amazed to be able to walk that far and feel so good.”