

Improving Patient Outcomes After PCI Without Long-Term, Dual-Antiplatelet Therapy

Advancing the value of stent system technology.

Poor poststent vessel healing, late stent thrombosis, and the risks associated with long-term, dual-antiplatelet therapy concern physicians, their patients, and now, the general public.¹ A new class of stent—a biomimetic stent—offers evidence that these problems can be resolved with a fresh approach. The CATANIA™ Stent System with NanoThin Polyzene®-F (CeloNova BioSciences, Inc., Newnan, GA) is anti-inflammatory, antithrombogenic, and bacterial-resistant (Figure 1). A 40-nm surface treatment essentially hides the stent so that the body does not react to the device as a foreign object, unlike bare-metal stents (BMS) or drug-eluting stents (DES) as soon as the drugs are released. This in turn promotes the healing process so that the stent is incorporated into the body more naturally, preventing thrombus onset and late stent thrombosis.

A clinical investigation of *The CAT™*, as the stent is called, is nearing the 1-year follow-up period and has generated impressive preliminary findings. “The preliminary data from the Assessment of The LATEST NonThrombotic Angioplasty (ATLANTA) study show no thrombosis, low restenosis, and good clinical results, suggesting that this nanothin polymer-coated stent promotes vessel healing within 30 days. With a DES, the blood vessel healing takes many months, if it ever happens,” said Corrado Tamburino, MD, PhD, Principal Investigator of the study and Chief of the Cardiovascular Department at Ferrarotto Hospital at the University of Catania in Catania, Italy. “Our preliminary research suggests that this nanothin polymer-coated stent is a very promising solution to restenosis and effective management of thrombosis.”

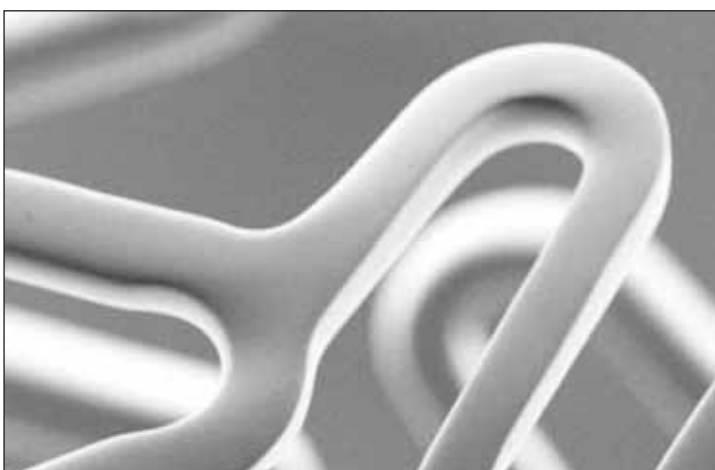


Figure 1. The biomimetic CATANIA™ Stent.

POOR VESSEL HEALING

Although DES reduce rates of restenosis and late lumen loss compared to BMS, one of the negative effects of cytostatic and cytotoxic drugs on cardiac vessels is delayed neointimal healing. Thus, the clinical trade-off for a reduction in symptoms such as angina is the late regrowth of the protective endothelial sheath and the added risk that fibrin and other thrombotic components in the lumen will dislodge or erupt and form a thrombus.

THROMBOSIS

Although it is statistically infrequent, late stent thrombosis is a grave complication that, more often than not, leads to sudden death or myocardial infarction.² Subacute and acute thrombosis occur in 1% to 4% of percutaneous coronary interventions (PCIs).³ After PCI with stent implantation, the best possible protection from thrombosis is a healthy endothelial neointima layer

that seals the stent lipid core and other thrombogenic components inside the lumen. Animal and human pathology studies indicate that DES impair arterial healing when compared to BMS. DES prevent complete re-endothelialization and cause fibrin to persist in the vessel. At autopsy, this delayed healing is considered the underlying cause of late DES thrombosis.⁴

DUAL-ANTIPLATELET THERAPY

Joint Guidelines for PCI from the American College of Cardiology, the American Heart Association, and

the Society for Cardiovascular Angiography and Interventions state that at least 1 year of clopidogrel therapy is required (and a longer administration may be considered) in patients undergoing DES placement. Members of the writing group emphasized that patients are actively involved in the decision because their participation is necessary for successful treatment. Yet, patient compliance can be problematic. Therefore, the risk of thrombosis is compounded when the noncompliant patient discontinues dual-antiplatelet therapy.⁵

New Class of Stent: Biomimetic

Experts discuss the preliminary results of the ATLANTA study with the CATANIA™ Stent.

Corrado Tamburino, MD, PhD, FESC, FSCAI, FSICI-GISE

Dr. Tamburino is Director of the Postgraduate School of Cardiology; Chief of the Cardiovascular Department at Ferrarotto Hospital, Catania University, Italy; and President of the Italian Society of Invasive Cardiology.

Francesco Prati, MD

Dr. Prati is Director of the prestigious core lab, Rome Heart Research, and an acknowledged expert in the use of optical coherence tomography to demonstrate vessel healing.

Thomas A. Gordy

Mr. Gordy is President and Chief Executive Officer of CeloNova BioSciences, Inc., developer of the CATANIA™ Stent System with NanoThin Polyzene®-F.

What is the CATANIA™ stent, and how is it different?

Mr. Gordy: The CATANIA™ Stent System with NanoThin Polyzene®-F is not a BMS and not a DES. It is something new, different, and better. It is a well-designed cobalt-chromium alloy stent with thin struts, and most importantly, it has a 40-nm surface treatment of Polyzene®-F, CeloNova's proprietary surface technology. The Polyzene®-F "hides" the stent. Therefore, the body does not initiate a foreign body reaction to the stent, which contributes to the low restenosis rates with CATANIA™. After the procedure, the vessel begins to heal immediately. Polyzene®-F encourages healthy endothelial cell growth. Because the stent has no drug/polymer matrix, the vessel has no barrier to early and complete healing. In fact, in preclinical and clinical trials to date,

there has never been a stent thrombosis in a patient with a Polyzene®-F treated stent. That alone is a remarkable statistic.

What is Polyzene®-F?

Mr. Gordy: Polyzene®-F is an ultrapure, inorganic polymer that bestows biocompatibility, bacterial-resistance, and anti-inflammatory properties to any device or substrate it coats. The body simply does not detect Polyzene®-F. Furthermore, it resists bacterial infiltration. Although PCI-related infections are rare, they are usually fatal. Because it is an inorganic substance, Polyzene®-F does not release carbon radicals known to invite inflammatory response. Unlike polymers currently used to elute drugs from stents, Polyzene®-F is applied thinly and will not degrade or crack and expose or produce harmful

components. It seems to solicit a positive biological response so that the stent is accepted as a part of the vessel. As a result, patients with *The CAT™* have excellent procedural outcomes and can be free from the substantial medical risks, complications, and financial burden associated with indefinite antiplatelet therapy.

What is the ATLANTA Study?

Dr. Tamburino: The ATLANTA study is a first-in-man clinical investigation of the CATANIA™ stent from CeloNova BioSciences. I am the Principal Investigator for the study. I perform many angioplasties in a single day, and I am totally impressed by the performance of this stent in a very complex patient population: no thrombosis, low binary restenosis, and no myocardial infarctions. This may be an answer to the problems we are facing with other stent systems. Ours is the first clinical study to have an arm of patients with baseline and follow-up optical coherence tomography (OCT) to demonstrate vessel healing. Dr. Prati performed the OCT studies as the core lab for the study.

How did you design the ATLANTA clinical investigation?

Dr. Tamburino: We intended to have a “real-world” patient population for the study. We treated fairly complex patients with *The CAT™*. The ATLANTA patient population was complex: 20% had class C lesions, 34% had diabetes, 63% had unstable angina, and many had small vessels. Despite this, the results show no deaths, no heart attacks, no thromboses, low binary restenosis, and low late loss.

Dr. Prati: In our study, we stopped ticlopidine after 30 days with no ill effects. Although antiplatelet therapy delays the problem of thrombosis in DES, when the therapy stops, the problem returns. However, continuing on antiplatelet therapy indefinitely is problematic too, because it increases the risk of bleeding and may complicate needed future surgeries.

What are the results of the ATLANTA study?

Mr. Gordy: Many of the patients are approaching the 1-year mark, and we have not had a single thrombosis. The data suggest that CATANIA™ may be the safest stent ever made. The highly biocompatible and unique properties of Polyzene®-F do not activate platelets, evoke macrophages, or trigger the inflammatory cascade. Early and homogeneous vessel healing seen from strut to strut prevents the risk of late in-stent thrombosis.

“ . . . no patient in studies with a Polyzene®-F coated stent has ever experienced a subacute, acute, or long-term thrombosis.”

—Thomas A. Gordy

Dr. Tamburino: True. My patients are also my friends; I know each one personally. They have high risk factors for thrombosis—diabetes, small vessels—yet there has not been even one thrombosis. We have placed the CATANIA™ stent in some very small vessels; several were smaller than 2 mm. Even so, the outcomes are very good.

Dr. Prati: To understand the efficacy of the present stent for reduction of restenosis, we can safely say that CATANIA™ outperforms all BMS, some commercial DES, and compares very well against other DES. The key difference is that patients who use this stent do not have to take clopidogrel or ticlopidine for more than 30 days, and no patient in this clinical trial has ever had a thrombosis. Additionally, the preliminary results, as we approach 1 year, show low restenosis and a good late loss score. For me, the most remarkable finding with this stent is the vessel healing at follow-up verified by OCT. From strut to strut, it is possible to observe complete vessel healing. Vessel healing after stenting occurs when a layer of neointima, and eventually endothelial cells, covers the struts. This tissue layer plays a pivotal role in preventing thrombosis.

Mr. Gordy: These results are not surprising to those of us who have worked with Polyzene®-F. During the ATLANTA clinical investigation, ongoing post-ATLANTA clinical studies, and a previous clinical trial of a stent with Polyzene®-F, no patient in studies with a Polyzene®-F coated stent has ever experienced a subacute, acute, or long-term thrombosis.

Have any of the preliminary outcomes surprised you?

Mr. Gordy: Interestingly, results in patients with diabetes were as good as those in patients without diabetes. All patients have passed the 6-month follow-up period, and soon, many will have reached the 12-month follow-up with no presentation of thrombosis, again without long-term, dual-antiplatelet therapies.

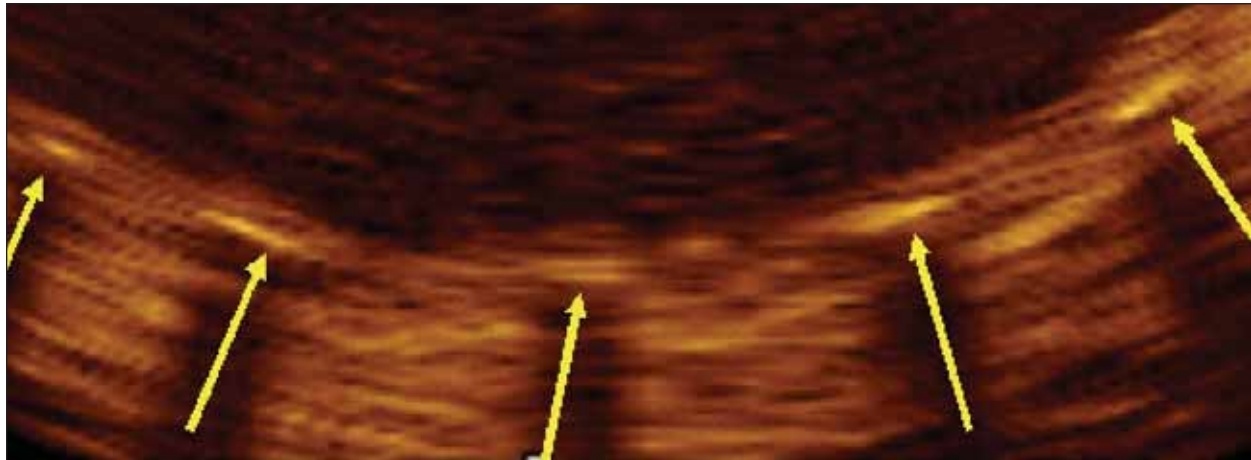


Figure 2. OCT image showing stent struts (arrows) and vessel healing.

Clinical follow-up for patients with diabetes was also outstanding.

Is it too early to draw conclusions with only 6 months of data?

Mr. Gordy: We have no reason to believe that our outcomes will be any different at 12 months or longer. Early, even, and complete vessel healing is so important to long-term outcomes. Unlike with DES, healing is completed early with the CATANIA™ stent, eliminating the risk for late thrombosis. Many physicians who have studied the results tell me that using a BMS should not be considered appropriate with the availability of CATANIA™.

How do you measure healing?

Mr. Gordy: ATLANTA is the first coronary clinical trial to include, in addition to quantitative coronary analysis and intravascular ultrasound, OCT at baseline and follow-up to demonstrate vessel healing and coverage of the stent at the stent strut level (Figure 2). This level of investigation gives irrefutable evidence of vessel healing and could change the behavior of future clinical trials.

Why is OCT so important?

Dr. Prati: Currently, no *in vivo* imaging technique is able to provide reliable information on adequate strut coverage. OCT accurately differentiates stent struts and the vascular tissue surrounding them. After stent implantation, an endothelialized neointima seals the metallic stent, lipid core, and fibrin in the underlying artery from the lumen. This provides protection against stent thrombosis. With OCT, we are able to see that vessels stented with CATANIA™ have fast and complete vessel healing from strut to strut.

Is CATANIA™ currently available?

Mr. Gordy: Yes. The CATANIA™ Coronary Stent System with NanoThin Polyzene®-F has been CE marked and is available in Europe through distributors and direct sales. CATANIA™ is available in 60 sizes with diameters from 2 to 4 mm and lengths from 8 to 38 mm. The CATANIA™ stent is not FDA approved and is not available for sale in the US.

The CATANIA™ Coronary Stent System with NanoThin Polyzene®-F offers protection from thrombosis and freedom from long-term, dual-antiplatelet therapy. A nanothin surface treatment of Polyzene®-F improves maneuverability and handling of the stent, reduces vessel damage during deployment, and prevents the inflammatory cascade leading to thrombosis. Its biomimetic nature ensures quick healing after PCI for excellent long-term outcomes.

CONCLUSION

CATANIA™, a new class of stent, addresses the problems of thrombosis, without the risks associated with dual-antiplatelet therapies while delivering very low restenosis rates and low late loss. Early, homogeneous vessel healing from stent strut to strut provides outstanding patient outcomes without the complications of long-term, dual-antiplatelet therapies. ■

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