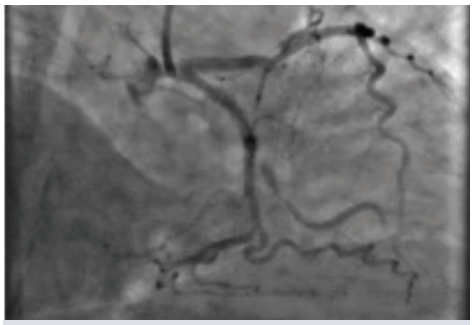
Cath Lab Digest

A product, news & clinical update for the cardiac catheterization laboratory specialist



CASE REPORT

Crossing a Difficult-to-Cross Coronary Lesion: The Utility of the Wire Surfing Technique

Khawaja Afzal Ammar, MD

Abstract

A difficult-to-cross coronary lesion, due to vessel tortuosity and almost complete occlusion, was crossed using the wire surfing technique. This case report captures the details of the case and presents it in the light of fluid hemodynamics, with focus on viscosity and resistance to flow.

Case Report

A 73-year-old female presented to the cardiac catheterization laboratory with chest pain, a half-millimeter ST-segment depression in inferior leads, and rising troponin over the previous 14 hours. Angiography revealed a completely occluded large first obtuse marginal artery (OM1) with an acute angle take-off from a dominant circumflex coronary artery.

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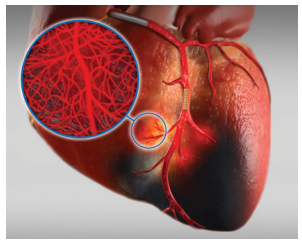
CUTTING-EDGE TECHNOLOGY

Baptist Health's Miami Cardiac & Vascular Institute Experience With SuperSaturated Oxygen (SSO_2) Therapy to Improve Outcomes in STEMI Patients

CLD talks with Marcus St John, MD, and Ramon Quesada, MD.



What have been your observations regarding ST-elevation myocardial infarction (STEMI) treatment outcomes over the past decade?

Marcus St John, MD: STEMI care and outcomes have definitely improved over the years. Much of that improvement has come from two things. One is the advent of percutaneous coronary intervention (PCI), which shepherded us from the thrombolytic era into the percutaneous era of mechanically getting the artery open, first with balloons and then with stents. The other major advent has been reducing door-to-balloon time, getting systems in place so that STEMI patients can get rapid treatment upon presentation.

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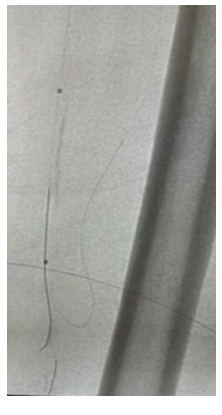
CASE REPORT

Transcollateral Access for SFA Chronic Total Occlusion Recanalization

Zaheed Tai, DO, FACC, FSCAI



Case Report

The patient is a 79-year-old male with a history of chronic atrial fibrillation, peripheral arterial disease with previous iliac stents, venous insufficiency, hypertension, and lifestyle-limiting claudication, with the left leg more symptomatic. He was able to walk 100-200 yards, depending on his activity.

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Baptist Health's Miami Cardiac & Vascular Institute Experience With SuperSaturated Oxygen (SSO_2) Therapy to Improve Outcomes in STEMI Patients

CLD talks with Marcus St John, MD, and Ramon Quesada, MD.

What the data have shown, especially in anterior myocardial infarctions, is that getting the artery open has taken us only so far. There has been a leveling off of additional improvements in long-term outcomes for heart failure and mortality after the short-term benefits that we have seen. The benefits of primary PCI have been sustained, but there has been no further improvement. As a result, leaders in the field have started to think about next steps. Certainly, for example, in the population with cardiogenic shock, one of the next steps was the philosophy of not only opening the artery, but supporting or unloading the ventricle using balloon pumps and other devices. Then, more recently, we have taken the step of treating not just the epicardial vessels, but also treating the microvasculature and addressing no-reflow with SuperSaturated Oxygen (SSO_2) Therapy to reduce infarct size (TherOx SSO_2 Therapy, ZOLL Medical).

Why is it important to you to address the microvasculature in STEMI?

Ramon Quesada, MD: Thrombolysis works well about 60% of the time. With direct PCI, we have been very successful in opening the artery. But there was another element that we didn't take into account initially, which is that while we open the artery and achieve TIMI-3 flow, there is still often sluggish flow at the level of the microcirculation. While you must open the artery, what matters, really, is whether you can achieve flow to the microvasculature to perfuse the myocardium and reduce infarct size. From the beginning, we knew this was a problem. I have participated in several studies, looking at different things such as drugs and thrombectomy to improve the microcirculation. The COOL-MI studies looked at the use of endovascular cooling, but unfortunately, it did not show much benefit. Around the same time, we were also exploring the effects of SSO_2. We found that SSO_2 can achieve reduction of the infarct size, as well as a reduction in readmissions for congestive heart failure and mortality. If we compare thrombolysis to PCI regarding infarct size reduction, PCI offered a 5% absolute median reduction[1] and that made it the therapy of choice. SSO_2 Therapy offers us an additional 6.5% absolute infarct size reduction[2,3], and that is why SSO_2 Therapy was FDA approved. It is approved for use in left anterior descending (LAD) coronary artery STEMI patients treated with PCI within 6 hours of symptom onset. When used earlier the benefit is even greater, as a relative infarct size reduction of 41% was observed for patients treated within ≤3 hours.[2,3] In our institution, I showed the data to my colleagues, and that helped us get 100% buy-in and commitment from the team here at Baptist. As we see younger LAD STEMI patients, keeping them off the heart failure pathway becomes more important.

Dr. St John: Opening the artery is an important, necessary step, but the smaller blood vessels, the ones below the surface — below the tip of the iceberg, as it were — can remain very swollen and edematous, with "sludging" of the blood cells so that the heart muscle downstream from the open artery may still not be getting the oxygen that it needs. It can lead to progression of infarct size and increased heart damage, despite epicardial patency. SSO_2 Therapy raises the dissolved, localized oxygen level high enough that it can diffuse into the myocardium even as the capillaries remain stuck. The process utilizes a circuit that takes arterial blood out of the body, super oxygenates it (up to 1,000 mmHg), and then reinfuses it directly into the left main. Animal studies have shown reductions in capillary edema and microvascular flow restoration.[4,5] That is where we think the benefit and the physiologic underpinnings are regarding the usefulness of this therapy.

How has your team integrated SSO_2 Therapy into your workflows?

Dr. Quesada: It is very easy to use. I think the most difficult initial aspect was to accept the fact that we have to be there for an hour while this therapy is infused. It is a logistical issue in any cath lab, but it can be addressed. It is worth it. We looked at the one-year follow-up in the propensity match study by Chen et al[6] for the patients that received SSO_2. Compared to no SSO_2 Therapy, the SSO_2 patients at one year had incredible outcomes.[6] It goes back to the idea of, why are we here? We are here for the patient. We are here to save muscle and to save lives, and to improve quality of life and long-term outcome of these patients. Like we do with many things in the cath lab for patient care, our doctors put in extra time for this additional procedure to improve outcomes. The team will follow your lead if you transmit your enthusiasm and your excitement. It makes a difference. It's all about the patient; logistics will follow.

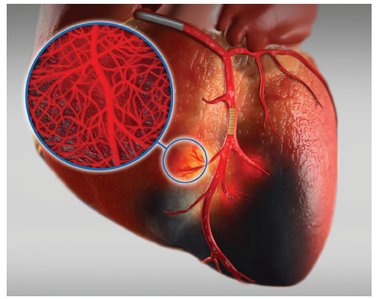

Figure 1. While percutaneous coronary intervention opens the artery and can achieve TIMI-3 flow, there is still often sluggish flow at the level of the microcirculation. SSO_2 Therapy has been shown to treat the downstream myocardium even before capillary flow is restored, leading to reductions in infarct size.[4,5]

Dr. St John: SSO_2 Therapy does require the staff to be present. The physician has to be in the cath lab, but not necessarily scrubbed in the room. That hour is time that we would have been in the hospital anyway, dictating, writing orders, and then speaking to family. While it does add extra time, we are all confident that this therapy is worth it to save muscle. It is important that the physician, nursing, and technologist staff are on board from the beginning. I would credit Dr. Quesada's leadership in presenting this therapy and drawing our attention to the data. The team rallied around it, even though the technologists and the nurses would be the ones staying that extra hour. Now, after seeing young patients with large heart attacks come in and recover with this therapy, they continue to be very supportive. The administration was also quick to say, "Yes, let's put in the capital that we need and let's support this therapy." They have been very supportive of the process in a way that I think sets us apart. We are very lucky and grateful to be in a place where we can have that sort of support.

What outcomes are you seeing with SSO_2 Therapy in your patients?

Dr. Quesada: Left ventricular (LV) function is the most important parameter. We follow these patients with a reassessment of LV function before they go home, a couple of weeks after the event, and then at three months, we also do nuclear imaging to assess, objectively, their improvement. The recovery of the left ventricle in SSO_2 patients definitely improves over time. There is a lot of myocardium that is hibernating or stunned that can be saved, and this is the muscle that you want to salvage with SSO_2.

Dr. St John: We will assess the myocardial blush, which is an angiographic measurement of appearance of perfusion to the heart muscle, before and after our infusion. All patients will leave the hospital with an ultrasound of the heart to evaluate their ejection fraction (EF). Many times, although not always, we will have done an assessment of the EF at the time of the acute MI or right after we have opened the artery in the cath lab, and then we will assess it again before discharge. Looking at that data will be helpful to evaluate if there is a benefit above and beyond what we would normally have seen just with opening the artery. Anecdotally, we are seeing improvement in LV function in patients who present with anterior MI with initially reduced EF and anterior wall motion abnormalities who have significant improvement, and in some cases, normalization of LV function. From my experience, this is more than would just be seen with early PCI, but ultimately will need to be confirmed with larger, adequately powered studies.

Baptist Health's Miami Cardiac & Vascular Institute is well known for its forward-thinking approach to improving cardiovascular care. Can you describe how it differentiates itself from other institutions?

Dr. St John: We try to always be at the forefront, in the context of being a very team-oriented institution. If you look at the physical design of the cath lab, there is a lot of glass and openness, which facilitates interaction between physicians, technologists, and nurses. But we also want to be a place where new and emerging technologies are brought to bear for the benefit of our patients as soon as possible. The team-spirited aspect is manifested in our protocols and processes that using a team approach gets patients from the minute they get to the ER very quickly to the cath lab. As a result, we were very much wanting to be early adopters of this additional next step in the care of the STEMI patient. We have a process where first there needs to be a physician champion. In the case of this therapy, Dr. Quesada presented the concept at some of our initial meetings that included various stakeholders. Then the institution got behind it, as it very often does when there is good clinical evidence and physician support for a process or a product, and we moved forward.

Any final thoughts?

Dr. Quesada: Our hospital is part of a unique STEMI network in Miami where everyone has committed to getting the artery open within 60 minutes. As part of that STEMI network, right now we are the only hospital offering SSO_2 Therapy. Of course, with a STEMI, EMS will go to the closest interventional lab. But if there are two hospitals that are comparable in distance, EMS often decides to take their patient to the site that offers SSO_2 Therapy. It becomes very attractive to hospital administrators after they see the increased numbers of patients.

Dr. St John: I like that SSO_2 Therapy doesn't get in the way of what we know works. The first thing is getting the patient to the lab quickly and safely. It is easy to deploy and improves outcomes for the patient. Anecdotally, we do see improvements in myocardial blush. We might see improvements in one grade of TIMI myocardial blush: eg, 1 to 2, or 2 to 3, pre and post SSO_2 Therapy. Again, this needs to be corroborated by more data. This type of grading in the lab can be subjective. The trials that led to FDA approval were, of course, positive and our early impression of SSO_2 Therapy is very promising. With experience and more data, we will see if the indications can be expanded to include other patient subtypes (NSTEMI patients, for example, or later presentations) and other vessels.

Dr. Quesada: The big eye-opener is the one-year follow-up of these patients in the trials, which shows very low rehospitalization for heart failure and no mortality.[6] The field of microcirculation is the next big thing in STEMI. I definitely think SSO_2 Therapy will benefit those patients who have the worst MIs, and who, despite successful PCI, potentially face the permanent loss of myocardial tissue due to poor microvascular flow and large infarcts. ■

For more information on SSO_2 Therapy, visit zoll.com/therox

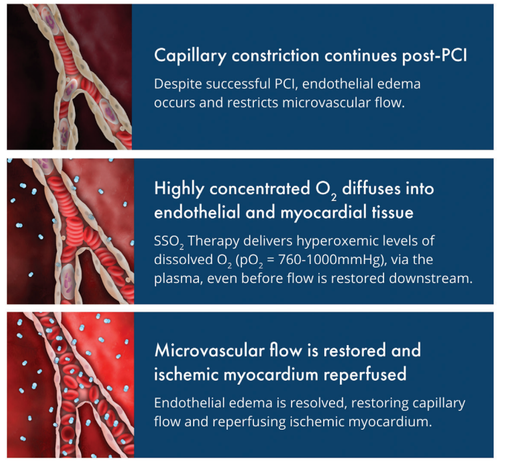

Figure 2. TherOx SSO_2 Therapy, ZOLL Medical.

This article is supported by ZOLL Medical.

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