Covered stents: A 25-year odyssey

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Key Points
- The concept of the PTFE-covered stent was introduced 25 years ago in the treatment of an aneurysmal vein graft.
- The study by Pavani et al. represents the largest cohort of patients treated with covered stents for Ellis type 3 perforations.
- Covered stents are effective in treating coronary perforations and remain an invaluable tool in the cardiac catheterization lab.

In this issue of Catheter and Cardiovascular Interventions, Pavani et al. report the in-hospital and long-term outcomes of patients undergoing percutaneous coronary intervention complicated by Ellis type 3 perforation treated with covered stents. We congratulate the authors on their excellent study, which represents the largest cohort to-date of patients treated with covered stents for type 3 coronary perforations.

We first introduced the concept of the polytetrafluoroethylene (PTFE)-covered stent in Phoenix 25 years ago. In 1993, we successfully treated a complex aneurysmal lesion in a saphenous vein graft, which was causing ischemic symptoms, by creating a mechanical barrier to seal the aneurysm by preparing the stent graft with commercially available PTFE, and a commercially available Palmaz stent. Dr. Christodoulos Stefanadis also designed the application of a biological covered stent in which the metallic surface was covered by an autologous venous graft. However, this approach required a surgical cut down for harvest of the vein. We subsequently treated six patients with diffuse saphenous vein graft disease, aneurysms, and multiple restenoses. We presented our results and early work in numerous international conferences and were grateful and overwhelmed with requests for use of our device for the treatment of coronary perforations, aneurysms, and saphenous vein disease. This success lead to the development of the Jomed JoStent based upon our original design, which is currently marketed by Abbott Vascular, Inc.

Our team learned early on that with the use of covered coronary stents patients uniformly suffered from distal emboli during the placement of these bulky devices. We mitigated this risk using a technique we previously described called “Suck-U-Surge” where we aspirate from the guide catheter during stent deployment, thereby reversing blood flow and removing potential embolic debris. Perhaps embolic phenomenon is partly responsible for the nearly 40% of patients in the study that had a final coronary flow less than TIMI 3.

While early investigations with PTFE-covered stents showed favorable results, randomized controlled trials showed no benefit of covered stents in treating in-stent restenosis and saphenous vein disease compared to bare-metal stents. Covered stents still remain essential for the treatment of coronary artery perforations. In addition to PTFE and autologous vein tissue, other materials used for covered stents include polyurethane and pericardium. PTFE covered stents are the most commonly available covered stents in interventional laboratories, and hence as in this study, most of the performance results we have are with PTFE covered stents. Only six patients in this study were treated with equine pericardium covered stents.

More recently, two newer generation stents graft are available: the BeGraft (Bentley Innomed) that has a PTFE membrane, and PK Papyrus (Biotronik) which has a polyurethane membrane. Both of these have a low-profile and are compatible with 5-French guidecatheters. One study retrospectively compared the Jostent Graftmaster (Abbott Vascular, Santa Clara, CA) PTFE covered stent with PK Papyrus stent (BIOTRONIK, Berlin, Germany) in the treatment of coronary artery perforation and found that the newer PK Papyrus stent had shorter time to delivery and resulted in a lower rate of pericardial effusion and cardiac arrest. However, there was no difference in procedural success and 1-year follow-up MACE.

Covered stents are successful in sealing Ellis type 3 coronary perforations. Despite the high rate of clinical events, both acutely and long-term, covered stents have a definitive role in the cardiac catheterization laboratory and are indispensable for interventional cardiologists.

CONFLICT OF INTEREST
Nothing to report.

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