The HEARTSTRING Proximal Seal System is a Possible Source of Atheroembolism

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It is necessary to use side clamps to construct proximal anastomoses in off-pump coronary artery bypass, and this can be related to neurologic complications. Recently a new device, the HEARTSTRING device, was developed. We present a 78-year-old man who underwent emergent bypass surgery using the HEARTSTRING device to avoid a side clamp. We found atherosclerotic debris from the punched hole and, unfortunately, a postoperative neurological complication resulted. We strongly suggest that it is most important that potential candidates for the HEARTSTRING device be carefully selected to reduce possible neurologic complications. We report that while this new device is useful, there is a potential pitfall in using it; that is a possible source of atheroembolism.

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Off-pump coronary artery bypass (OPCAB) obviates the need for aortic cannulation and cross clamping. Nevertheless, the use of partial aortic clamps to construct proximal anastomoses is still necessary in OPCAB. Several devices to perform clampless proximal bypass anastomoses have been developed. One of the main goals sought is the reduction of manipulation of the ascending aorta, perhaps the most important factor in reducing neurologic complications. Recently a new device, the HEARTSTRING proximal seal system (Guidant Corporation, Santa Clara, CA, USA), was developed to perform proximal anastomoses without the use of side clamping. However, we report a potential pitfall in using this new device; that it is a possible source of atheroembolism, which is an identified cause of cerebral infarction.

Case Report

A 78-year-old man presented at our hospital with unstable angina. A coronary angiography revealed normal right coronary artery and severe left coronary artery disease (#5: 90%, #6: 90%, #11: 90%). An emergent OPCAB surgery was performed. Two bypasses were implanted including the left internal thoracic artery (LITA) connected to the left anterior descending and a saphenous vein graft (SVG) for the circumflex coronary artery. Preoperatively, thoracic CT proved that the proximal anastomosis had been reliably and easy to handle.

The HEARTSTRING Proximal Seal System (Scanlan, Saint Paul, MN, USA), round the anastomosis compressed the bilateral carotid arteries when we released the HEARTSTRING to avoid debris going into the brain circulation. We placed a graft marker, A/C LOCATOR (Scanlan, Saint Paul, MN, USA), around the anastomosis hole. The SVG flow was 70 ml/min. Postoperatively the patient was hemodynamically stable, but as the patient did not wake up, a cerebral CT was immediately performed. This revealed a new hypodense right frontal area in the region of the anterior cerebral artery (Fig 1B). Postoperative thoracic CT proved that the proximal anastomosis had avoided the calcified position in the ascending aorta (Fig 1B). No perioperative ischemic events occurred; however, there was a postoperative neurological complication because of the atherosclerotic emboli.

Discussion

The use of proximal anastomotic devices seems to be the most appropriate approach to minimize manipulation of the ascending aorta and therefore reduce the risk for neurologic complications. Several automatic proximal anastomosis devices have been designed; although drawbacks have recently been reported. Compared to other devices, the HEARTSTRING device is substantially less invasive. Conventional handsewn anastomoses can be completed with no foreign material (eg, stent) remaining. In our initial clinical experience using the HEARTSTRING device, we found it was reliable and easy to handle.

The patient here had a severely diseased aorta, and unfortunately suffered a neurologic complication after OPCAB surgery. In such a situation, if the decision is to avoid manipulation of the aorta, few alternative options are available. One alternative would be to partially revascular-
ize the heart in such a way that would avoid manipulation of the aorta altogether. Another option would be to perform a complete arterial revascularization using multiple in situ arterial conduits without manipulation of the aorta. A third option would be to attach free arterial conduits to the LITA as Y or T grafts, or a vein graft to another artery but not the aorta (eg, innominate artery). Except for partial revascularization, the other options are more complex and depend on extensive use of arterial grafts. In high-risk patients like the one in this case report, a surgeon will sometimes prefer to perform a simpler and faster option. In such cases, placing proximal anastomoses on the aorta is advantageous.

Clinical experiences reported show that the HEARTSTRING device offers a safe, easy, quick and reproducible option to connect saphenous veins and radial arteries to the aorta without aortic side clamping, as well as an excellent early patency rate. Nollert et al reported a possible source of gas emboli related to the use of the HEARTSTRING in combination with a blower mister, and they strongly discourage this combined use. There are no reports of an embolic complication related to the use of the HEARTSTRING device, like that in our patient; however, our report does suggest a pitfall associated with using the HEARTSTRING device.

We simultaneously used the HEARTSTRING device with a blower mister; however, we do not know whether the emboli complication in our patient was related to the seal delivery, the blower mister or because of the removal of the seal. Preoperatively, a thoracic CT showed an atherosclerotic lesion in the left anterolateral ascending aorta. We also confirmed it by intraoperative palpation of the ascending aorta. Therefore, we performed proximal anastomosis in the right anterolateral ascending aorta to avoid the diseased part. If the use of this device in selected high-risk patients decreases postoperative neurologic complications, which will definitely increase the length of hospitalization and the complexity of treatment, it will probably prove to be markedly cost-effective. A pre-operative thoracic CT and epiaortic ultrasonography will identify the ascending aorta, but cannot absolutely prevent the possibility of cerebral embolic complications. We strongly suggest that in order to reduce neurologic complications, candidates for the HEARTSTRING device are very carefully selected for off-pump coronary artery revascularization. However, even given this possible drawback, this device appears to constitute an important tool to improve neurological outcomes in high-risk patients.

References


