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SHORT COMMUNICATION

Epicardial hematoma and myocardial ischemia following application of Starfish stabilizer: an uncommon complication of the device

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Abstract The Starfish heart positioning device allows excellent cardiac positioning and hemodynamic stability during off-pump coronary artery bypass graft surgery. Herein, we present a patient in whom the use of this device caused epicardial hematoma as the result of an injured epicardial vein, an uncommon complication of this device. In this patient, regional left ventricular wall motion abnormality on transesophageal echocardiography and a ST-T change on electrocardiogram occurred secondary to the development of the epicardial hematoma. These signs completely disappeared upon removal of the hematoma. These findings suggested that the hematoma resulted in reversible myocardial ischemia.

Keywords Complication · Heart stabilizer · Hematoma · Myocardial ischemia · Off-pump coronary artery bypass surgery

Stabilizer devices have revolutionized off-pump coronary artery bypass surgery (OPCAB). They stabilize the myocardial wall locally and allow the surgeon to accurately place anastomotic sutures without requiring institution of cardiopulmonary bypass and without inducing significant hemodynamic instability. Complications associated with these devices have rarely been reported. Herein, we present a patient in whom the application of a heart positioner caused epicardial hematoma that resulted from an injured epicardial vein and probably resulted in reversible myocardial ischemia.

A 78-year-old, hypertensive, male patient underwent elective OPCAB for unstable angina from triple-vessel disease, using both the Octopus Tissue Stabilizer and Starfish Heart Positioner (Fig. 1) (Medtronic, Minneapolis, MN, USA). The left and right internal thoracic arteries (LITA and RITA) were used to revascularize the second diagonal (D2) and high lateral (HL) branches, respectively. A venous graft was used for sequential grafting to the right ventricular branch (RVB) and the posterior descending artery (4PD). The Starfish was used for adequate positioning of the beating heart during the RITA-HL and venous graft-RVB-4PD anastomoses, respectively. The anastomosis to the 4PD was the last to be performed. Upon the last removal of the Starfish, no hemorrhage or hematoma was observed on the myocardial wall, where suction cups of the Starfish had been applied. After completion of the aorta-to-venous graft anastomosis, protamine was given, and the pericardium was closed. Approximately 10 min after the pericardial closure, however, we noticed hypokinesis of the posterolateral wall of the left ventricle (LV) in the short-axis view of transesophageal echocardiography (TEE) (ALOKA PROSOUND SSD-α10, Tokyo, Japan) and the ST-T segment elevation in lead II of the electrocardiogram (ECG) (Philips IntelliVue MP70, Boeblingen, Germany) (Fig. 2), although we could not detect obvious pericardial fluid retention. Subsequently, a constant output from the pericardial drain occurred. With the pericardium reopened, hematoma was found to have extended over the posterolateral LV wall. After removal of the hematoma, an epicardial vein at the site of application of the Starfish's suction cups was found to be the source of bleeding, which could be successfully controlled with local application of pressure homeostasis using Tachocomb

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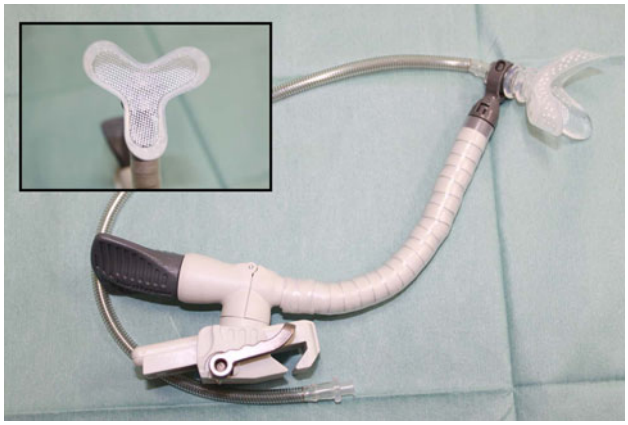

Fig. 1 Starfish heart positioner device. *Inset* Starfish's suction cups

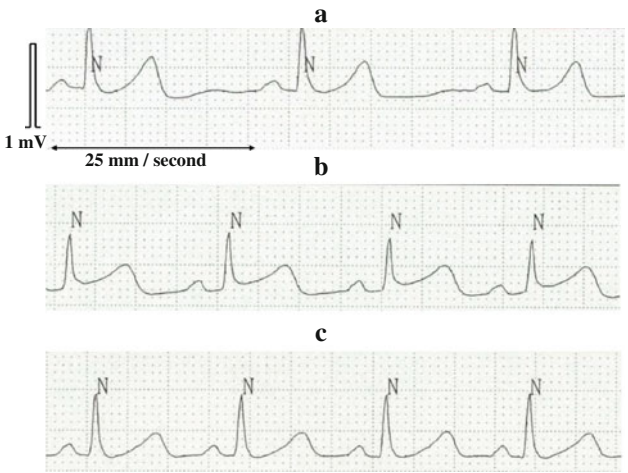

Fig. 2 Change of ST segment during procedure: before anesthetic induction (**a**), before removal of epicardial hematoma (**b**), and after removal of the hematoma (**c**)

(Nycomed, Zurich, Switzerland). Re-pericardiotomy and evacuation of bloody epicardial fluid did not improve the ST-T change and wall motion abnormality. Immediately after removal of the hematoma, however, the ST-T change and regional wall motion abnormality disappeared completely.

Our report presents an uncommon complication of the Starfish, an epicardial hematoma from an injured epicardial vein. The regional hypokinesis of the LV wall might be directly caused by the epicardial hematoma, because cardiac tamponade can be presented as selective compression of the LV or other heart chambers on echocardiography [1]. In our patient, however, the regional hypokinesis and the ST-T segment elevation persisted even after evacuation of the bloody pericardial fluid, and disappeared only after the removal of the epicardial hematoma over the posterolateral LV wall. Therefore, it seemed more likely in our patient that the epicardial hematoma extending to the posterior wall induced myocardial ischemia by obstructing the venous graft.

Although Mandke et al. [2] reported intramyocardial dissecting hematoma caused by the use of the Octopus stabilizer, we found no previous report describing a significant complication associated with the use of the Starfish, and hence this may be the first reported case of epicardial hematoma resulting from the use of this device and possibly resulting in reversible myocardial ischemia during OPCAB. Suction pressures recommended by the manufacturer are similar for these two devices, −200 to −400 mmHg for the Octopus and −200 to −300 mmHg for the Starfish, and hence the Starfish might cause some tissue injury, analogous to the Octopus [2]. Further, epicardial bleeding or hematoma was noticed not immediately after the removal of the Starfish but only after the pericardial closure. This delayed bleeding occurred probably because the source of bleeding was an epicardial vein and not an artery or anastomosis.

In conclusion, we presented a patient in whom the use of the Starfish heart positioner during OPCAB caused epicardial hematoma resulting from epicardial venous injury and probably resulting in reversible myocardial ischemia, an uncommon complication of this device.

References

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