

Case Report

Misdeployment of a staple in the PAS-Port proximal anastomosis system : Report of a case.

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We report a case of 74-year-old man who underwent coronary artery bypass grafting utilizing the PAS-Port proximal anastomosis system. Misdeployment of a staple occurred at the proximal anastomosis; one of the nine outer flanges was invaginated in the aortotomy and partially opened. There was no bleeding at the anastomosis site, so a 6-0 polypropylene monofilament interrupted suture was applied to ensure an encircular stitch for reinforcement of the anastomosis. Postoperative angiography showed no adverse findings at the anastomosis. Though we concluded that this misdeployment did not place the patient at additional risk, we need to take notice using new devices and consider rescue methods in situations arising from technical mistakes.

(Key words : coronary artery bypass grafting, PAS-Port proximal anastomosis system, misdeployment, proximal anastomosis)

Introduction

Through advances in technology, aortic connector and proximal anastomosis devices are now available. These tools facilitate attachment of coronary bypass graft construction but also reduce aortic manipulation thereby minimizing the risk of embolization and end organ injury. An ideal device is safe, reliable, efficient, and allows reproducible results, and provides similar or improved quality to currently utilized suture techniques. One such device that has recently become commercially available is the St. Jude Symmetry⁽¹⁾. The case here presents the misdeployment of an aorto-saphenous vein graft anastomosis staple utilizing the PAS-Port proximal anastomosis system ; a rare complication that we believe has not been previously reported.

Case

A 74-year-old male with left main trunk and three vessel coronary artery disease, a with previous inferior myocardial infarction, underwent elective coronary artery bypass grafting

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Fig. 1 Operative findings of aorto-saphenous vein graft anastomosis (arrow). One of the nine outer flanges is invaginated in the aortotomy and partially opened.

(CABG). A preoperative plain chest computed tomogram no calcification of the ascending aorta.

At operation, the site of the anastomosis of the ascending aorta, there was no palpable disease, and investigation by transesophageal echocardiography showed there was no calcification or intimal mural hypertrophy in the thoracic aorta. In this case, we did not use echocardiography from the operative field. From the preoperative evaluation, the patient's data showed moderate pulmonary hypertension, and on-pump beating CABG was indicated. Investigation of saphenous vein graft (SVG) thickness showed a diameter of SVG 5.75mm. To minimize manipulation to the ascending aorta, a PAS-Port proximal anastomosis system was used for the SVG proximal anastomosis. Operative procedures were overseen by the representatives of the device manufacturer, and the PAS-Port for proximal anastomosis was deployed on mean systemic blood pressure of over 90mmHg. When spinning the knob of the delivery tool attached at the site, a staple was misdeployed so that one of the nine outer flanges was invaginated in the aortotomy and thus was partially opened. There was no bleeding at the site, so a 6-0 polypropylene monofilament interrupted suture was applied to ensure an encircular stitch for reinforcement of the anastomosis. Thereafter the procedures for the left internal thoracic artery to the left anterior descending artery and a SVG to the first and second diagonal branches were completed routinely and successfully. Angiography was undertaken for evaluation at 78 days postoperatively and showed no stenosis or staple displacement at the site ; thus it was concluded that the misdeployment did not place the patient at additional risk. (Fig. 2a, b) Investigation of the delivery device revealed no abnormal observations of the condition, other than the implant discard section being detached ; the unsuccessful implant delivery might be have been the result of inadvertent manipulation.

Discussion

Through advances in technology, aortic connector and proximal anastomosis devices are now available. These new devices have been developed to complete anastomosis with simple attachments at the site, but the tools require specific skills to prepare and deploy the system

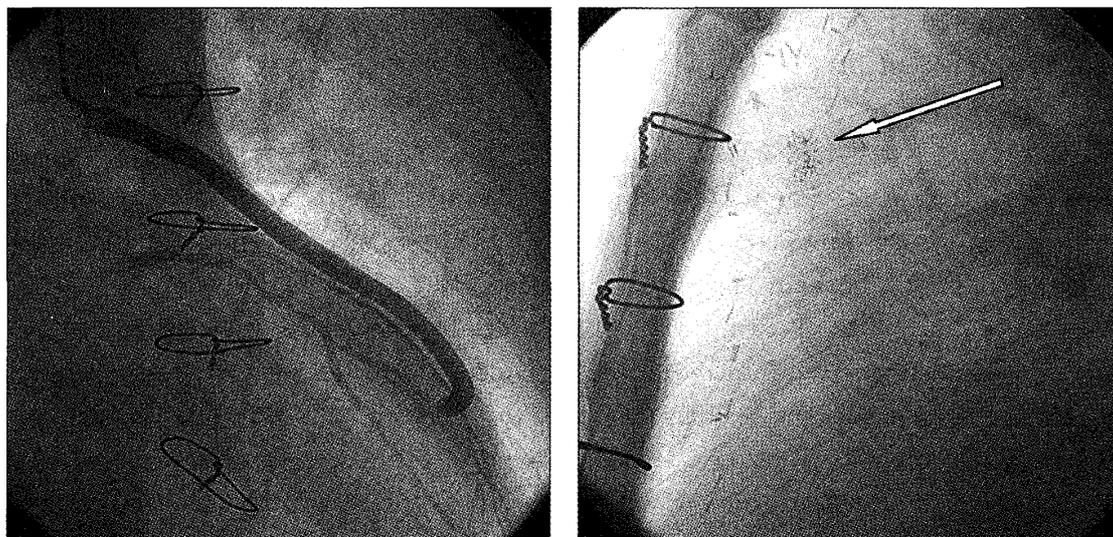


Fig. 2 Angiography at 78 days postoperatively shows no stenosis (a) or staple displacement (b) (arrow) at the site.

in the operating field. Once there has been a misdeployment, a suitable rescue method for the specific situation is required, and any wrong treatment would place additional risk on the patient with possible severe complications.⁽²⁾

Investigations of these new devices are reported, and while rapid, effective and giving reproducible results for eliminating aortic cross clamping, it is questionable whether they decrease embolic debris compared with conventional anastomosis.⁽³⁾

In this case, there were no abnormal observations, other than the implant discard section being detached, concerning the condition of the delivery device that could have contributed to the unsuccessful implant delivery during deployment. The misdeployment was replicated in a most stringent scenario, in which the implant was stressed beyond worse case stress conditions that could be expected to be encountered clinically.

A factor contributing to the paddle detachment is excessive load/strain from an unsuccessful implant deployment ; this strain likely increased the deformation. During testing conducted in regards to the misdeployment, no paddles detached without manipulation ; however it was noted that when a misdeployment took place, detachment could occur with just slight manipulation of the paddle. At this time the reported failure rate, unsuccessful deployments are approximately 0.2%. Medical evaluation of the paddle detachment, spinning the knob of the delivery tool might be a rough procedure for finely stabilizing an attachment on the pulsatile aortic wall.

For safe use of this device, the anastomosis site should have no palpable disease and be of sufficient quality to be considered suitable for hand-sewn anastomosis. Determination may also be based upon echocardiographic demonstration of either mural (e.g. calcification) and/or intimal (e.g. plaque, exudates) disease.

Connecting devices are well indicated for patients who have no space for placing a clamp on the ascending aorta with an absolutely need for a proximal vein graft anastomosis. It is necessary to recognize that the pursuit of convenience with new apparatus can correspond to the future troubles according to the circumstances y. Should this type misdeployment occur, an

encircled interrupted stitch with 6-0 polypropylene monofilament might be useful for rescuing the situation and so not placing the patient at additional risk.

References

- 1) Atona C, Scrofani R, Lemma M et al. Assessment of an aortosaphenous vein graft anastomotic device in coronary surgery : clinical experience and early angiographic results. *Annals of Thoracic Surgery*. 74 : 2101-5, 2002.
- 2) Katariya K, Yassin S, Tehrani HY et al. Initial experience with sutureless proximal anastomoses performed with a mechanical connector leading to clampless off-pump coronary artery bypass surgery. *Annals of Thoracic Surgery*, 77 : 563-7, 2004.
- 3) Martens S, Dietrich M, Herzog C et al. Automatic connector devices for proximal anastomoses do not decrease embolic debris compared with conventional anastomoses in CABG. *European Journal of Cardio-Thoracic Surgery*. 25 : 993-1000, 2004.

冠状動脈バイパス術中に大動脈近位側自動吻合器 (PAS-Port proximal anastomosis system) 不具合の1例

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要 約

症例は74歳の男性, 心筋梗塞後不安定狭心症で冠状動脈バイパス術を施行した。術前より肺高血圧を合併していたため体外循環使用心拍動下手術を行った。術野からのechoは行わなかったが, 術前胸部単純CT検査や術中経食道超音波検査では明らかな大動脈病変を認めなかった。術中, 大動脈近位側自動吻合器(PAS-Port proximal anastomosis system)を使用したところ, 9枚のouter flangeのうちひとつが開放しない状態となった。吻合部位からの出血

は認めなかったが, 吻合部を6-0 polypropylene糸結節にて8針補強した。経過中本件に関連する有害事象は出現しなかった。術後78日目に術後造影検査を行ったが特に吻合部には狭窄などの所見は認められなかった。技術の進歩に伴い自動吻合器などを臨床使用する機会が増加しているが, 不具合が不意に発生した場合, その事態への対応を考慮しておく必要があることを常に認識しておかねばならない。