Autologous Adventitial Overlay Method Reinforces Anastomoses in Aortic Surgery

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In this study, we present an inexpensive and effective method for providing a secure and hemostatic anastomosis using autologous adventitia obtained from a dissected or aneurysmal wall. The resected aortic wall is separated between the adventitia and media, and a soft, 2 × 10-cm adventitial strip is overlaid to cover the anastomotic margin. A graft is sutured to the aortic stump. This autologous adventitial overlay method can inexpensively and strongly reinforce the anastomosis during aortic surgery for dissection or aneurysm and will contribute to anastomotic hemostasis and long-term stability. (Ann Thorac Surg 2014;97:1814–5) © 2014 by The Society of Thoracic Surgeons

Suture line bleeding and late suture line disruption have been the primary problems of aortic surgery with prolonged cardiopulmonary bypass, particularly in patients with an acute aortic dissection. Many techniques have been reported to reinforce anastomoses, prevent anastomotic bleeding, and prevent the formation of a new intimal tear [1-5]. Fleck and colleagues [6] reported an effective method to reinforce the anastomosis by wrapping over the aortic wall using bovine glutaraldehyde-fixed pericardium. In this study, we present an inexpensive and effective technique for providing a secure and hemostatic anastomosis using autologous adventitia obtained from a resected aortic wall (aneurysm or dissection).

Technique

In cases of a graft replacement for an acute aortic dissection or a true aortic aneurysm, the aortic wall (aneurysmal wall or dissected aortic wall) is circumferentially or longitudinally resected about 2 cm in width and 10 cm in length during aortic clamping or under hypothermic circulatory arrest. The resected aortic wall is easily separated into adventitia and media by an assistant surgeon, and a thin and soft 2 × 10-cm adventitial strip is used as the anastomotic reinforcement (Fig 1). In patients with acute aortic dissection, the dissected adventitia can be used by trimming the adventitial strip. The anastomotic aortic stump is adequately trimmed, and the adventitial strip is overlaid with its smooth surface upward to cover the aortic margin, namely, one sleeve hanging down the inside and another sleeve hanging down the outside (Fig 2A). In addition, a felt strip can also be placed at the outermost layer of the anastomosis. The strips are fixed with four to five stitches of 4-0 polypropylene horizontal mattress sutures with or without a felt strip on the outside (Fig 2B). If the inner sleeve of the adventitial strip reaches and obstructs the coronary ostia or valve leaflets, the surplus adventitial sleeve should be carefully trimmed with care, not to injure any neighboring structures such as the aortic valve leaflets or coronary ostia. If the sleeve is not large enough, the remnant adventitia or a small piece of autologous pericardium can be used to cover the inner or outer surface of the aortic stump. After this adventitial overlay reinforcement, the graft is sutured to the aortic stump with 4-0 polypropylene continuous sutures, and the graft is inserted within the aorta.

Comment

The concept of this technique is to reinforce the aortic anastomotic stump by overlaying some soft tissue over the margin of the aortic wall from inside to outside. The soft tissue can be bovine pericardium [6], autologous pericardium, or autologous aortic/aneurysmal adventitia obtained from the resected aortic wall described here. We first used autologous adventitia to reinforce the anastomotic margin in patients with aortic dissection or aneurysm, and we found it was effective in preventing suture line bleeding. We have used this technique in 20 cases of acute aortic dissection, 12 cases of chronic aortic dissection, and 10 cases of a true aortic aneurysm.
bovine pericardium, which was effective to reduce bleeding from the suture line; however, it was too expensive. Autologous pericardium was also effective and easier to handle because of its flexibility; however, a large pericardial defect should be covered with another pericardial sheet. Further, we focused on the adventitia obtained from the aneurysmal or dissected aortic wall, which would usually be offered for pathology examination or be discarded.

The anastomosis consists of four layers from inside to outside, namely, the adventitial strip, aorta, adventitial strip, and a felt strip, if used (Fig 2A). The anastomosis can be strongly reinforced using these four layers, with a better fit between the graft and aortic wall. The adventitial overlay method produces less bleeding from the anastomotic gap and needle holes, and less string tension is produced against the aortic wall owing to the soft tissue between, which may lead to long-term stability without the formation of an anastomotic pseudoaneurysm or a new intimal tear [7]. An anastomotic stenosis caused by the thick felt strip sandwich method in patients with a small aortic diameter [8] can be prevented by this thinner adventitial overlay method.

This method can be effectively used for proximal and distal anastomoses in patients with an acute aortic dissection or a true aneurysm. We have used this method in 10 patients (true aneurysm in 8 and acute dissection in 2) since 2012. One patient who was undergoing a total arch replacement redo died after surgery of intestinal necrosis caused by a late atheroembolism. However, no anastomotic bleeding was observed in any patient using this adventitial overlay method. A close follow-up is required to confirm the long-term stability of the anastomosis.

References