"Wings of a Butterfly" Technique in Modified Bentall's Procedure

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Abstract

Many surgeons have modified the technique to reduce bleeding from anastomosis line since Bentall and De Bono introduced aortic root replacement using a composite graft. We present a new composite, butterfly wing shaped, valve graft fixated using hand-made double sewing cuff. The "Wings of a butterfly" technique is a method of reinforcement suturing between an added sewing cuff and residual aortic wall at the proximal stump, and helps to reduce bleeding after the modified Bentall's procedure.

Introduction

Since Bentall and De Bono introduced aortic root replacement using a composite graft, many surgeons have modified the technique to reduce bleeding from anastomosis line.[1-5] We describe a new technique involving reinforcement suturing between an added sewing cuff and residual aortic wall at the proximal stump.

Technique

A novel composite valve graft was constructed using the Vascutek Gelweave valsalva graft with an On-X ascending aortic prosthesis (CryoLife, NW, USA). After transecting downward from the distal end of the composite graft, we marked a circular line along the edge of a sewing cuff. The circle was then cut and a ring-shaped PTFE (polyterafluoroethylene) graft was sutured at the upper margin of the sewing cuff using a continuous 4-0 polypropylene suture (Figure 1).

This hand-made composite valve graft has two sewing cuffs, which resemble the "wings of a butterfly", that is, a lower sewing cuff (conventional sewing cuff) for annular suturing and an upper sewing cuff (the added PTFE graft) for reinforcement suturing. After conventional annular suturing, reinforcement suturing was performed between the upper sewing cuff and the residual aortic wall to reduce bleeding at the proximal anastomotic site (Figure 2).

After cardiac arrest under cardiopulmonary bypass, the aorta is completely transected and coronary buttons are excised for transposition, and then interrupted pledgeted sutures are placed on the annulus in an everting mattress fashion for annular suturing (Figure 3A). For reinforcement suturing, a continuous 4-0 polypropylene suture was used to attach the PTFE cuff to the residual aortic wall to wrap the first proximal suture line (Figure 3B).

Comment

Bleeding from the proximal anastomotic line is problematic and impedes aortic root replacement using a composite valve graft. Furthermore, associated increases in operation time lead to reductions in coagulation factors, the need for blood and blood product transfusions, and increase the risk of re-exploration due to bleeding. Several techniques have been introduced since Bentall and De Bono first replaced the aortic root using a composite valve graft.[1-5] Bayfield MS et al. sutured remnant root tissue to a sewn ring or to a Dacron

graft to reduce bleeding.[1] Because a commercial graft can be used, this technique did not increase operation time but bleeding tended to occur at needle holes when reinforcement suturing was performed in the PTFE graft due to an insufficient sewn ring. The method introduced by Chen LW et al. might result in bleeding at needle holes of a modified composite valve graft because the Dacron graft used reinforcement suturing is attached at the lower edge of the composite graft wall.[4] Needle hole bleeding after reinforcement suturing cannot occur when our technique is used, because the main graft is not used for reinforcement suturing. Unlike the pericardial strip technique described by Mohite PN et al., our technique provides savings in operation time as another surgeon can construct the new composite valve graft. Furthermore, suture cannot tear because the PTFE graft is stronger than pericardial strip. [5] The flanged technique by Yakut C. is similar to our technique, but our technique allows the added PTFE graft to be handled more easily and produces a more even suture line than the flanged composite graft.[2]

In conclusion, we present a new composite, butterfly wing shaped, valve graft fixated using a hand-made double sewing cuff that can prevent proximal anastomosis bleeding by providing homogeneous reinforcement suture distribution between the added PTFE sewing cuff and the remaining aortic wall. In addition, the described graft can be handled easily to enable proximal anastomosis suturing and provide reinforcement.

References

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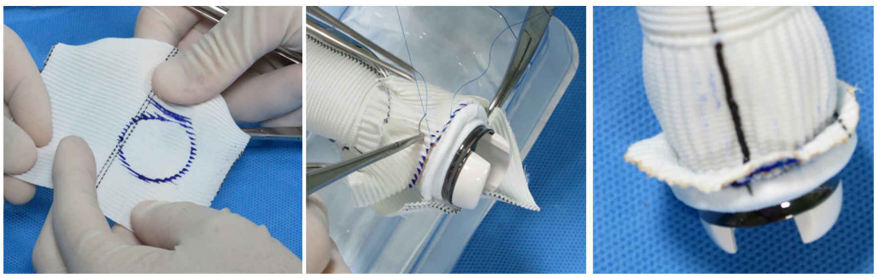
Figure 1. New composite, butterfly wing shaped, valve graft fixated using a hand-made double sewing cuff.

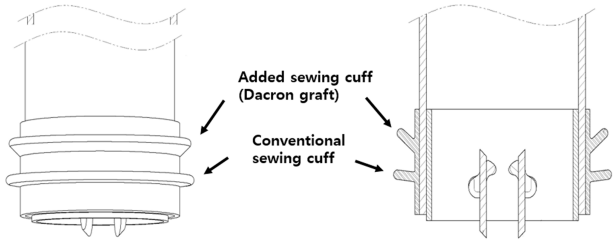
After transecting downward from the distal end of the composite graft, circular line along the edge of a sewing cuff was marked on transected graft. The circle was then cut and a ring-shaped polyterafluoroethylene graft was sutured at the upper margin of the sewing cuff using a continuous 4-0 polypropylene suture. Adding an upper sewing cuff to reinforce suturing using the residual aortic wall.

Figure 2, Schematic views of new composite valve graft and anastomotic procedures

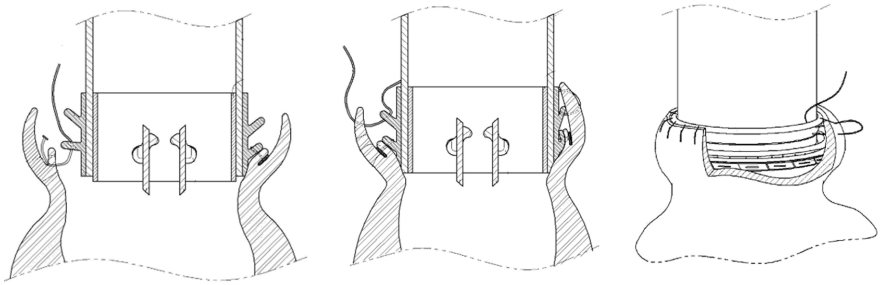
A hand-made composite valve graft has two sewing cuffs, that is, a lower sewing cuff (conventional sewing cuff) for annular suturing and an upper sewing cuff (the added polyterafluoroethylene graft) for reinforcement suturing. After conventional annular suturing, reinforcement suturing was performed between the upper sewing cuff and the residual aortic wall to reduce bleeding at the proximal anastomotic site.

Figure 3. Operation field. A. first annular suturing B. second reinforcement suturing.





An external appearance A cross-sectional view



1st annular suturing 2nd reinforcement suturing Schematic proximal anastomosis