Pericardial sewing-cuff: an alternative surgical technique for full-root implantation of aortic allograft and pulmonary autograft

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Abstract

The following is a description of a modified technique for the reinforcement of proximal anastomosis regarding the process of aortic allograft or pulmonary autograft full root implantation. A double width pericardial strip is used to create a pericardial sewing-cuff to be used as a neo-ring. This technique is said to be best suited for decreasing the operative bleeding, reducing anastomotic pitfalls and concomitant repair of the aortic annulus.

Keywords: Allograft; Autograft; Heart valve, allograft; Heart valve, autograft; Aortic valve

1. Introduction

Aortic root replacement (ARR) is accepted as the technique of choice for aortic allograft (ALG) or pulmonary autograft (PAG) implantation [1-4]. However, haemostatic considerations, coupled with desire to prevent the occurrence of secondary graft ring dilatation have prompted the use of reinforcement techniques for the proximal anastomosis [4-8]. This is achieved by incorporating pericardial or fabric strips externally into the proximal suture line [5-7]. Since 2003, we have used a modified reinforcement technique, in which a graft neo-ring is created by means of a double width pericardial strip. We have found this technique useful for a safer graft implantation and anastomotic haemostosis. In addition, an extended flap of pericardial sewing-cuff allows the reconstruction of certain annuloaortic defects. In doing so, the use of any foreign material or allograft subvalvular tissue is avoided.

2. Technique

The procedure is performed using standard cardiopulmonary bypass with moderate hypothermia, myocardial protection with cold blood cardioplegia.

The subvalvular tissue of the graft is trimmed to about 3 mm away from its sinus nadirs. A strip of autogenous pericardium with a width about 1 cm is seized and folded in two to create a double width U-shaped strip. It is then sewn circumferentially to the subvalvular remnant tissue by placing a double armed 5/0 monofilament in a double running suture fashion and biting the stitches close to the graft basal ring, Fig. 1A. When attempting to repair or reconstruct the aortic annulus, the width of pericardial cuff can be adjusted locally to fit the anticipated defect, Fig. 1B. The graft is then inserted by suturing the pericardial sewing-cuff to the aortic annulus using a 4/0 monofilament running suture, Fig. 1C. The implantation is completed as follows: left coronary ostium reimplantation, distal anastomosis, and right coronary ostium reimplantation.

2.1. Clinical results

Since 2003, we have performed this technique on 40 patients (mean age, 61 ± 0.62 years). The pulmonary autograft was used in four patients. Four patients needed concomitant annulus repair, which was achieved with a flap-shaped pericardial sewing-cuff, Table 1. The mean aortic cross-clamp time was 108 min (range of 60-180) and the mean bypass time was 157 min (range of 80-314). There were five hospital deaths (12.5%), two of which occurred in the patients with a preoperative uncontrolled sepsis. No intraoperative or postoperative bleeding occurred in any of the patients. Perioperative transthoracic Doppler-echo-cardiograms were obtained on all patients, which showed a trivial aortic regurgitation in only two patients. One patient suffered a complete atrioventricular block requiring a permanent pace-maker. In the follow-up period (range of 2-19 months), neither increase in the postoperative grades nor new onset of aortic insufficiency has occurred.
graft leaflets and avoid purse stringing the graft base.

It may reduce the likelihood of injury for this modification to be safe, reproducible, and allowing for ALG or PAG) or with anastomotic bleeding. We have found problems with performance of the neo-ring (either with use of this technique with PAG to the situations that require bypass, except when using PAG, thus we have narrowed the typically made before the institution of cardiopulmonary into the proximal suture. The pericardial sewing-cuff is neo-ring instead of externally incorporating the pericardium we used a double width pericardial strip to create a graft is inserted by suturing the pericardial sewing-cuff to the aortic annulus adjusted flap on PAG aimed to fit a defect in the mitral-aortic curtain. (C) The locally adjusted to fit the amount of annular defects. The drawing shows an an image shows the pericardial sewing-cuff with ALG. By suturing the pericardial sewing-cuff close to the graft basal ring, from its inside, the heterogenous subvalvular remnant tissue is nearly excluded from the graft’s inflow and is replaced by a homogenous and smooth inflow.

3. Comments

The reinforcement of proximal suture line in the process of ARR is achieved by incorporating supportive strips into the proximal anastomosis, in an attempt to reduce operative bleeding and provide annular fixation [5–8]. In order to do so, we used a double width pericardial strip to create a graft neo-ring instead of externally incorporating the pericardium into the proximal suture. The pericardial sewing-cuff is typically made before the institution of cardiopulmonary bypass, except when using PAG, thus we have narrowed the use of this technique with PAG to the situations that require concomitant repair of the aortic annulus.

In these early stages, we experienced no technical problems with performance of the neo-ring (either with ALG or PAG) or with anastomotic bleeding. We have found this modification to be safe, reproducible, and allowing for easier insertion. It may reduce the likelihood of injury for graft leaflets and avoid purse stringing the graft base.

In addition, using a flap-shaped pericardial sewing-cuff, we were able to repair the aortic annulus in four patients (annuloaortic disruption or aortic annulus enlargement), which might have otherwise needed fabric, allogenic, or xenogenic patches. Some other possible advantages include maintenance of orthotopic orientation for ALG regardless of the topography of annular defect, augmentation of the thin and limited subvalvular tissue of PAG, and it may alleviate the concern of long-term integrity of allograft subvalvular tissue that is subject to immuno-mediated histological deterioration and shrinkage [5].

In conclusion, the pericardial sewing-cuff can be a useful modification to the standard graft implantation technique. However, a longer-term follow-up period is necessary to determine whether or not this technique will lead to an annular fixation.

References