Geometrical correction of the left ventricular with bovine pericardium semi-rigid prosthesis

INTRODUCTION

The ventricular aneurysms are in general consequence of myocardial infarctions with important clinical complications (cardiac insufficiency, thromboembolism, angina pectoris and arrhythmias), and they are responsible for a great deal of mortality of infarction patients. Since the first ventricular aneurysm resection and suture performed by Cooley *et al*. in 1958[4], the surgical ventricular reconstruction has been done by different techniques.

Jatene's[7] encouraging results with the geometrical reconstruction in 1985 have broadened the indications and improved prognostics for wide AM orifice aneurysms. Once the aneurysm was resected the orifice aneurysms (aneurysms mouth - AM), through wich aneurysm communicates with the left ventricular cavity, was larger than the original size of the injured - area. The ventriculotomy was proceeded with enough extension. The present paper reports the use of bovine pericardium semi rigid prosthesis (Braile Biomédica - São José do Rio Preto) in 11 patients with antero-apical ventricular aneurysm of wide AM undergoing geometrical reconstruction.

PATIENTS AND METHOD

A new prosthesis for left ventricular geometrical reconstruction, made of bovine pericardium and preserved in glutaraldehyde is introduced. It is assembled on a Delrin® stent, which has a stainless steel rim coated by Dacron. The prostheses are available in diameters from 19 to 27 mm and are supplied with their respective sizers. From 16 procedures 11 were compared to each other in the pre and postoperative. The ejection fraction was evaluated by

Dodgel Kennedy's method and the segmental contractility by the definition of 100 shortening chordae.

SURGICAL TECHNIQUE

The surgery was performed under normothermia with continuous normothermic anterograde and/or retrograde blood cardioplegia. Whenever there was indication for myocardial revascularization, it was done before ventricular approach.

The ventriculotomy was proceeded with enough extension to enable the exposure of the AM aneurysm and the inclusion of the prosthesis. While observing the perfusion area and the fibromuscular transition, the AM, from which the ventricular wall dilated, was delimited. Careful evaluation of the AM is fundamental for the ventricular function and cavity volume preservation. Polyester 2.0 threads anchored on teflon or bovine pericardium pledgets were stitched separately in "U" shape on the ventricular - aneurysmatic edge (Figure 1). Prosthesis diameter was carefully selected by employed a special sizer, observing the residual cavity volume (Figure 2). Afterwards the stitches were passed on the prosthesis (Figure 3) and then it was positioned and secured on the AM, thus forming the ventricular new wall (Figure 4).

The bovine pericardium flap was then sutured with continuous polyester 2.0 thread suture, in order to support the fixation and to provide hemostasy. The aneurysmatic portion of the left ventricular was not resected but sutured on the prosthesis (Figure 5).

RESULTS

The pre-operative evaluation of the ejection fraction showed average of 0.37 increasing to 0.53 in the postoperative (Figure 6), with segment contractility improvement (Figure 7). The patients had a good postoperative evolution with no significant variation occurrences.

DISCUSSION

Since ventricular aneurysm complications are common in myocardial infarctions with important clinical consequences, plication, excision and suture, imbrication and interposition of patch have been proposed[2].

An easy surgical solution to wide AM was not yet available by 1985 when Jatene[7] presented the geometrical reconstruction technique of the left ventricular, thus eliminating unfavourable factors to the correction, such as the important non reduction of ventricular volume, the septal discinetic area suppression and the left ventricle elliptic conformation.

The efficacy of this type of reconstruction prompted similar patterns, using rigid or semi-rigid prostheses to reconstruct the geometry, especially when the ventricular aneurysm was within surgical indication.

Branco *et al.*[1] , in 1982, described a teflon and dacron prosthesis with wide flaps, which resembled the one we designed. The prosthesis rigidity and the use of large diameters have led to the discontinuity of its use.

The biological material prosthesis (bovine pericardium) preserved in glutaraldehyde, reported in the present paper, has physical properties (tension, elasticity and resistance) indispensable for its use. Since the prosthesis is assembled on a semi-rigid stent it enables the diastolic ventricular volume maintenance and the absence of distortion in the systole. The presence of a steel ring on the base of the Delrin stent enables its postoperative non invasive evaluation through simple chest radiography. The prosthesis described here is non thrombogenic and even so the platelet agregation is attenuated and even more by the routine use of salicilic acetil acid (100 mg/day orally).

Recently, Cooley [2,3] presented the endoaneurysmmorraphy in accordance with the technique for us developed. However, a few differences are remarkable between both procedures:

1) the delimitation of AM is done with separate polyester “U” stitches with teflon or pericardium pledgets;

2) the reduction evaluation to be performed in the AM to return the ventricular geometry is done through standardized approach with the use of sizers, which provides a prediction of the result and can easily be reproduced by any surgeon;

3) the double bovine pericardium which coats the stent is absolutely impermeable to the blood;
4) the suture between the bovine pericardium and the fibrotic tissue provides a completion to the hemostasy;
5) the “jacket” suture of the aneurysmatic tissues on the prosthesis allows for its coverage with no alteration of the ventricular geometry;
6) the biological tissue used is non thrombogenic.

We have chosen to perform all possible myocardial revascularizations, because of the better myocardial protection with continuous cardioplegia. The artery responsible for the aneurysm has often been revascularized, due to the fact that through this technique we do no resect the aneurysmatic tissue, thus enabling the maintenance of the nutritions artery in the area. The continuous myocardial protection during this procedure keeps the myocardium protected and makes possible to visualize the perfunded areas (viable myocardium) or schemiac fibrosis, aiding the transition delimitation of the ventricular aneurysmatic. On the contrary, Jatene[7] recommends that the AM should be defined though ventricular contractility observation with the heart beating.

The possibility to exclude the aneurysmatic septal portion (Figure 1) improves the contractile efficacy, corrects the ventricular geometry and avoids thrombus formation.

The results gained with the geometrical reconstruction have been considered similar to the simplest techniques, such as plicature. It is important, however to note that the surgical indication has reserved the geometrical reconstruction technique to more severe aneurysms and with wide AM [5,6], which otherwise would lead to operative mortality increase and to unsastifactory surgical results.

In conclusion, the left ventricular geometrical reconstruction technique, with the use of bovine pericardium semi-rigid prosthesis Braile Biomédica, proved to be simple and reproductive the patients undergoing this technique presented a significant increase in the ejection fraction with an improvement in the segment contractility and a good hemodynamic and clinical evolutions. The results that we have observed ensure its use as a routine for severe aneurysm surgery of wide AM.

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