How-to-do-it

A single-size band, 50 mm long, for tricuspid annuloplasty

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Abstract

A technique for tricuspid annuloplasty is presented, using a flexible 50 mm long band, where the annular circumference is reduced to a fixed value of 78.5 mm (circumference of #25 mm sizer). From June to February 2007, 15 consecutive patients with tricuspid regurgitation (TR) underwent tricuspid repair using this technique. The first suture is passed at the level of the anteroseptal commissure, the last one in the zone of the septal annulus, 28.5 mm from the first one. The remaining sutures are passed as usual. All the sutures are then adapted to a 50 mm long band. After a mean of 5.4 months from surgery, all patients are alive and asymptomatic. One patient showed residual 2/4 TR, due to enlarged RV with high pulmonary pressure despite a well functioning mitral prosthesis. Mean gradient across the tricuspid valve was 2.5 ± 0.4 mmHg. This technique for tricuspid repair is simple and reliable, providing effective and reproducible results.

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1. Introduction

The simplest and most common technique to correct TR is the De Vega suture annuloplasty [1]. However, it is not clear how to size the final orifice. In 2003, we decided to use a #25 sizer to gauge the tricuspid surface while performing a De Vega annuloplasty. Even if not ideal, this method is effective in reaching a predictable result.

Recently, we began to use a 50 mm long band (SMB50®, Sorin, Saluggia, Italy) in selected cases, applying the same concept. We, herein, describe the surgical technique and mid-term results. The validity of the decision to obtain a single tricuspid orifice independent of the body size was also explored using echocardiographic data from normal volunteers.

2. Materials and patients

2.1. Surgical technique

The first suture is passed in the tricuspid annulus at the level of the anteroseptal commissure. As the circumference of a #25 sizer is 78.5 mm and the length of the band is 50 mm, a second suture is passed in the septal annulus in such a way that the distance between the two stitches is 28.5 mm (Fig. 1, a–b short distance). The remaining U sutures are positioned as usual. All sutures are passed in the 50 mm band, which is secured by tying the sutures. Being the annulus tridimensional, to avoid any stress, the first sutures to be tied are those ones at the level of the septal leaflet, near the posteroseptal commissure, generally two, that are the deepest ones (Fig. 1A). Later on, the suture at the opposite end near the anteroseptal commissure is tied (Fig. 1B). We then prefer to tie the suture in the middle portion of the annulus, then the remaining ones (Fig. 1C). At the end of the procedure, the new perimeter is 78.5 mm (28.5 mm, a–b short distance, +50 mm, a–b long distance) and maintains the non-planar shape of the tricuspid valve (Video 1).

3. Results

From June to December 2007, 15 consecutive patients with TR underwent tricuspid repair using the technique described. Surgical indications were 3+ or 4+ tricuspid regurgitation or any degree of tricuspid regurgitation in the presence of dilated right ventricle (>35 mm at transthoracic echo, TTE) and/or severe annular dilation (>35 mm at TTE, four chambers). All patients had contemporary mitral surgery, nine repair and six replacement.

All patients survived and were discharged in good conditions. The follow-up was 100% complete.

Table 1 shows echocardiographic details, preoperative and at TTE control. After a mean of 5.4 months from surgery, all patients are alive and asymptomatic. Only one patient showed residual 2/4 TR, due to enlarged RV with high
pulmonary pressure despite a well functioning mitral prosthesis. The tethering height remained 7 mm. Very likely, a simple annuloplasty is not the technique of choice in these cases.

To validate the hypothesis that a single final tricuspid orifice could fit every patient, transthoracic echocardiographic data of 20 normal volunteers were evaluated. Tricuspid annular diameter (four chambers) was 24.5 ± 2.0 mm (systole) and 27.4 ± 2.0 mm (diastole). Linear regression showed no correlation with the body size (p = 0.48 and p = 0.36, respectively).

4. Discussion

For a long time it has been thought that functional tricuspid regurgitation was strictly related to left sided lesions and could reverse spontaneously after surgical correction of the left sided pathology. However, dilation of the tricuspid annulus depends on many factors, mainly on right ventricle dilation, that can be totally or partially reversible or cannot reverse at all, being strictly related to the degree of pulmonary pressure. Dreyfus et al. demonstrated that 45% of the patients who underwent isolated mitral valve surgery with no, 1/4 or 2/4 TR, showed an increase in the degree of tricuspid regurgitation of at least two grades after almost 5 years from surgery [2].

Criteria for anatomical correction are not well established, even if based mainly on annular dilation that plays an important role in begetting further tricuspid regurgitation. However, other factors different from annular dilation can be important and difficult to control. Fukuda et al. underlined the importance of tethering height >0.76 cm and tethering area >1.63 cm² in early failure after TR [3].

The most common technique for correction of tricuspid regurgitation is the De Vega suture annuloplasty. Its long-term results remain suboptimal [4—6]. Return of TR not only is an important problem, reflecting complexity of mechanisms that cause TR, but also frequently happens a few days after surgery. Early TR recurrence (within the 1st postoperative month) can vary from 15% to 25% [5,7,8], independently from supported or unsupported techniques. We are then justified to look for different strategies that could bring different results.

The concept of using a #25 sizer to remodel the tricuspid annulus is attractive as the final orifice shows a low gradient and competency of the tricuspid valve. However, we are aware that higher degrees of TR and severe annular dilation are risk factors for the return of TR and we decided to use the same concept using a band.

The 50 mm band has some advantages; it is flexible, follows the 3D shape of the tricuspid valve, and has a single size. The concept of single tricuspid orifice for every patient is supported by the lack of correlation between tricuspid dimensions and body size.

The results are constant, and the gradients are low (2.5 ± 0.4 mmHg). Early results are satisfying. TR was reduced from 3.0 ± 0.9 to 0.3 ± 0.8, and only a patient had residual 2/4 TR, witnessing the importance of other factors other than the simple annular dilation as cause of TR.

The technique we describe is a simple and reliable method that provides effective and reproducible results. Longer follow-up and larger sample size are needed to evaluate the stability of these early results.

References


Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.ejcts.2008.05.057.