Shoulder Point Fitting Method as a New Universal Tricuspid Annuloplasty

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Abstract

Approximately half of all tricuspid valves consist of four or more leaflets; however, no studies discuss how to implant an annuloplasty ring in these multi-leaflet valves. We define the shoulder point of the tricuspid annulus and the annuloplasty ring, and advocate a simple and universal fitting method to avoid deforming the tricuspid valve after ring implantation.

(word count: 56 words)

Tricuspid valve repair has received recent attention. The term, "tricuspid" suggests that the tricuspid valve, the right-sided atrioventricular valve, has three leaflets. However, pathological examinations have shown that approximately half of all tricuspid valves consist of three leaflets, and the remaining half have four or more leaflets [1-3]. The septal leaflet is easily identified, and the anterior leaflet is identified as a superior mural leaflet. The posterior leaflet, an inferior mural leaflet, is located between the septal leaflet and the anterior leaflet, and the number of posterior leaflets varies greatly (Fig. 1). A commissural leaflet is sometimes observed between leaflets, which makes it difficult to identify the number of posterior leaflets.

In tricuspid valves consisting of four or more leaflets, the anterior leaflet is relatively smaller than that in three-leaflet tricuspid valves. Therefore, leaflet proportion differs between three-leaflet and multiple-leaflet valves. When using a tricuspid annuloplasty ring, the sizing method and implantation technique must be tailored to individual valve morphology; however, papers describing placement of a tricuspid annuloplasty ring do not discuss how to implant the ring in multi-leaflet tricuspid valves [4,5].

Technique

We advocate the "shoulder point" as a mark both on the tricuspid annulus and on the annuloplasty ring as a universal landmark in tricuspid annuloplasty. The location of the shoulder point is roughly defined as the annular point on a diagonal line from the commissure between the anterior leaflet and the septal leaflet (Fig. 2a). The shoulder point is located at approximately two o'clock on the tricuspid valve in a surgeon's field of view because the tricuspid annulus appears larger in this direction [6].

In a typical tricuspid valve with three leaflets, the shoulder point almost equals the commissural area between the anterior leaflet and the posterior leaflet. In multi-leaflet tricuspid valves, the anterior leaflet is usually small, and the shoulder point does not equal the commissure area between the anterior and posterior leaflets; in these valves, the shoulder point is located on the annulus of the posterior leaflet (Fig. 1).

There are many commercially available tricuspid annuloplasty rings, with each ring developed specific to the annuloplasty technique (Fig. 2). In general, there are two marked lines on the right side of the annuloplasty ring that is to be fit to the commissure area. The bottom marker fits at the commissure between the septal leaflet and the posterior leaflet. The second marker should be fit to the commissure between the

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anterior leaflet and the posterior leaflet. The location of the second mark is different on each annuloplasty ring. We defined the shoulder point of the annuloplasty ring as shown in Figure 2, with marks located at the two o'clock position to determine the shoulder point on the tricuspid annulus.

The bottom marker of the annuloplasty ring is fit to the commissure between the septal leaflet and the posterior leaflet. The shoulder point of the tricuspid annulus and the annuloplasty ring are fit together (shoulder point fitting method; Fig. 2c). The anchoring suture for these two points is essential in this technique to properly fit the ring to the annulus. Using this technique, we can decrease the size of the tricuspid annulus while maintaining a similar configuration without deforming the tricuspid valve. This method can be applied to any tricuspid valve morphology.

Tricuspid annuloplaty has been performed with this concept to 49 patients during 22 months: 30 patients with Tri-Ad Adams annuloplasty ring (Medtronic, Minneapolis, MN), 19 patients with Carpentier-Edwards Physio Tricuspid annuloplasty ring (Edwards Lifesciences, Irvine, CA). The median age was 73 years old and ranged from 36 to 90 years old. Postoperative echocardiography showed that residual TR of mild or less range was in 94% (trivial or none regurgitation was in 43%). Only 3 patients had moderate TR after tricuspid annuloplasty (One in Tri-Ad ring, two in Physio Tricuspid ring). So I think that the early result was good, but we have no data in mid-term.

This is a simple and universal fitting method to avoid deforming the tricuspid valve after ring implantation.

Comment

Surgeons have traditionally considered that tricuspid annuloplasty involves simply using a small ring, and have accepted a certain degree of residual regurgitation after tricuspid annuloplasty. However, residual regurgitation worsens patient morbidity [7]; therefore, complete tricuspid repair without regurgitation is required.

Disorientation of the marker on the annuloplasty ring and the commissure of the tricuspid valve lead to distortion of the tricuspid valve after ring implantation, which causes residual regurgitation. Considering anatomical variations in both the tricuspid valve and the annuloplasty ring, the traditional method of fitting the ring marker to the commissure of the tricuspid valve is not ideal in every case.

The shoulder point is an important landmark for implanting a tricuspid annuloplasty

ring to avoid deforming the configuration of the tricuspid valve, and this fitting method can be applied to any type of tricuspid annuloplasty ring. Using this method, surgeons must not identify anatomical variations in the valve such as leaflet morphology and the commissural point between the leaflets because the markings must lie on the diagonal line along which the tricuspid valve is enlarged.

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Figure legends

Figure 1: Tricuspid valve with two posterior leaflets. The star indicates the "shoulder point". ANT: anterior leaflet, P: posterior leaflet, SEP: septal leaflet.



Figure 2: Tricuspid annuloplasty rings. The star indicates the shoulder point of the annuloplasty ring.



Figure 3: Shoulder point fitting method. The red arrow indicates the direction of enlargement of the tricuspid annulus (a). The star indicates the shoulder point on the tricuspid annulus and annuloplasty ring. The annuloplasty suture at the shoulder point should be fit to that on the annuloplasty ring to avoid deforming tricuspid configuration (c).





(C)

References

1: Tretter JT, Sarwark AE, Anderson RH, Spicer ED. Assessment of the anatomical variation to be found in the normal tricuspid valve. Clinical Anatomy 2016;29:399-407

2: Skwarek M, Grzybiak M, Kosinski A, Hreczecha J. Notes on the morphology of the tricuspid valve in the adult human heart. Folia Morphol 2004;63:319-24

3: Silver MD, Lam JHC, Ranganathan N, Wigle ED. Morphology of the human tricuspid valve. Circulation 1971;43:333-48

4: Ratschiller T, Guenther T, Guenzinger R, and et. al. Early Experience with a new three-dimensional annuloplasty ring for the treatment of functional tricuspid regurgitation. Ann Thorac Surg 2014;98-2039-45

5: Milla F, Castillo JG, Varghese R, Chikwe J, Anyanwu AC, Adams DH. Rationale and initial experience with the Tri-Ad Adams tricuspid annuloplasty ring. J Thorac Cardiovasc Surg 2012;143:S71-3

6: Dreyfus GD, Corbi PJ, Han KMJ, Bahrami T. Secondary tricuspid regurgitation or dilatation: which should be the criteria for surgical repair? Ann Thorac Surg 2005;79:127-32

7: Bernal JM, Morales D, Tevuelta C, Llorca J, Gutierrez-Morlote J, Revuielta JM. Reoprations after tricuspid valve repair. J Thorac Cardiovasc Surg 2005;130:498-503