cardioverter defibrillator placement, in the postoperative period, 11 patients from the group of surgical ventricular restoration (SVR) without endocardectomy received automatic implantable cardioverter defibrillators because of spontaneous VT (5 cases) or EPS-induced stable VT (7 cases). Only 1 patient in the group of SVR with endocardectomy had indications for and received an automatic implantable cardioverter defibrillator because of EPS-induced VT in the postoperative period. The EPS protocol was as follows: right ventricular stimulation was performed from the apical and septal positions; programed stimulation continued until frequency reached 220 to 230 impulses per minute; and the programed stimulation protocol included single, double, and triple right ventricular extrastimuli, burst stimulation with 10 stimuli with decremental decrease by 10 ms, and ramp pacing (cardiac pacing in which stimuli are delivered at a rapid but continually altering rate) with 5 to 10 stimuli. The result of EPS were considered as positive when the stimulation resulted in induction of at least 2 events of VT consisting of at least 10 monomorphic ventricular extrasystoles. We diagnosed stable EPS-induced VT when the electrical stimulation resulted in VT lasting for at least 30 seconds.

Vadim E. Babokin, MD
Roman Batalov, MD
Research Institute of Cardiology
Tomsk, Russia

References

1. Dor V, Sabatier M, Montiglio F, Rossi P, Toso A, Di Donato M. Results of nonguided subtotal endocardectomy associated with left ventricular reconstruction in patients with ischemic ventricular arrhythmias. *J Thorac Cardiovasc Surg*. 1994; 107:1301-7; discussion 1307-8.
2. Rastegar H, Link MS, Foote CB, Wang PJ, Manolis AS, Estes NA 3rd. Perioperative and long-term results with mapping-guided subendocardial resection and left ventricular endoaneurysmorrhaphy. *Circulation*. 1996;94:1041-8.

<http://dx.doi.org/10.1016/j.jtcvs.2012.12.036>

PARADOXICAL STITCHES AIM TO DISCIPLINE THE ANTERIOR LEAFLET TO AVOID POSTPLASTY SYSTOLIC ANTERIOR MOTION

To the Editor:

I read with interest the article by Varghese and colleagues.¹ The systolic anterior motion (SAM) associated with

mitral valve repair is related to many factors, both anatomic and technical. The latter could be eliminated, or at least reduced, by a good repair technique. The anatomic factors are considered a hard challenge. The techniques for the treatment or prevention of SAM can be divided into 2 main strategies: resect versus respect rather

FIGURE 1. A, Illustration represents intraoperative transesophageal echocardiographic imaging in the longitudinal axis: *a-b* line indicates the level between the anterior annulus and the tip of the papillary muscle during the late diastole; *c-d* is the distance between the highest point of the interventricular septum and the previous level. The position of the papillary muscle determines the distance *c-d*. B, Illustration represents the A2 of the anterior leaflet. The risk triangle (*abd*) is determined by the borders of A2 on the margin of anterior leaflet and its tip. An increase in the height of this triangle (*cd*) causes an increase in the risk of postoperative systolic anterior motion. The presence of myxomatous tissue in the *abd* triangle is an additional risk factor for systolic anterior motion.

FIGURE 2. Illustration represents the concept of the paradoxical artificial chords to prevent systolic anterior motion. Two artificial chords are diagonally implanted at 5 and 7 o'clock locations between the posterior annulus and the anterior leaflet. During the end diastole, the paradoxical chords ensure the avoidance of contact between the tip of the anterior leaflet and the bulging septum.

than resect. All the previously described techniques that aim to reduce the height of posterior leaflet of the mitral valve by resecting it (so as to migrate the leaflet closure line toward the posterior annulus) are resect strategies. Also, the resection of the anterior leaflet aiming to reduce the amount of excessive leaflet tissue is among the resect strategies. The choice of a suitable dimension for the annuloplasty ring represents a fundamental part of the concept of the mitral valve reconstruction. The papillary muscle–anterior annulus stitches technique² is a nonresect strategy to prevent SAM, and the aim of that method is not to reduce the redundant leaflet tissue or to migrate the leaflet closure line toward the posterior annulus. The concept at the

base of this method is to create a barrier at the same level of the posterior wall of the left ventricular outflow tract to support the edge of the anterior leaflet and to prevent its dropping into the left ventricular outflow tract during the early systolic phase.

The anatomic features are normally assessed by intraoperative transesophageal echocardiography. In our experience, the routine evaluation of the mitral valve in the longitudinal axis leads to evaluation of the level between the anterior annulus and the tip of the papillary muscle during the late diastole. Furthermore, the distance between the papillary muscle and anterior annulus and the highest point of the interventricular septum is indeed assessed (Figure 1, A). This distance

is related to the position of the papillary muscle between the apex of left ventricle and the posterior annulus (Figure 1, A). We believe that the shorter that distance, the higher the risk of postoperative SAM. The movement of the distal part of A2 is then evaluated, and an excessive movement related to the rest of the A2 adds an additional risk factor. Before the repair is begun, the anterior leaflet is analyzed with the help of 2 nerve hooks. The borders of A2 on the margin of the anterior leaflet and its tip determine a triangle that is the first part of the leaflet that drops in the outflow tract (Figure 1, B). An increase in the height of this triangle causes an increase in the risk of postoperative SAM. The presence of myxomatous tissue in the previously mentioned triangle is considered an additional risk factor for SAM. I personally, and my colleagues as well, take into consideration all these factors before deciding to apply the papillary muscle–anterior annulus stitches² as an adjunct to mitral valve repair. When the anterior annulus is not well exposed, we subsequently implant 2 artificial chords diagonally at 5 and 7 o'clock locations between the posterior annulus and the anterior leaflet (Figure 2).³

In the important work of Varghese and colleagues,¹ it is noted that in most the cases requiring repeated repair for SAMs the initial repair techniques had reduced the height of the posterior leaflet, and the size of the implanted ring was not small. This led to me to think that to prevent SAM the surgery should not always aim to reduce the height of the posterior leaflet but also rather should aim to discipline the movement of the anterior mitral valve leaflet.

Samer Kassem, MD, PhD
Department of Cardiovascular

Surgery
Centro Cardilogico Monziano IRCCS
Unit II
Milan, Italy

References

1. Varghese R, Anyanwu AC, Itagaki S, Milla F, Castillo J, Adams DH. Management of systolic anterior motion after mitral valve repair: an algorithm. *J Thorac Cardiovasc Surg.* 2012;143(4 Suppl): S2-7.
2. Kassem S, Jamil H. Papillary muscle-to-anterior annulus stitches: another technique to prevent systolic anterior motion after mitral valve repair. *J Thorac Cardiovasc Surg.* 2011;142:1278-81.
3. Kassem S, Othman M, Polvani G. Paradoxical artificial chords: new technique to prevent systolic anterior motion post mitral valve reconstructions. *J Clin Exp Cardiol.* 2011. S3:002. doi:10.4172/2155-9880.S3-002.

<http://dx.doi.org/10.1016/j.jtcvs.2012.11.088>

Reply to the Editor:

Kassem and Jamil¹ describe 2 approaches for addressing systolic anterior motion (SAM) after mitral valve repair (MVRr). In the first approach they describe an artificial chord from a papillary muscle to the anterior annulus on the ventricular side of the anterior leaflet. The chord serves to stop the migration of excess anterior leaflet into the outflow tract.

The second technique involves placing a diagonal artificial chord from the posterior annulus (anchored into the annuloplasty ring) around the A2 segment of the anterior leaflet between the 5 and 7 o'clock positions. Again this presumably restricts migration of the anterior leaflet into the outflow tract.

My aim in addressing postrepair SAM is to provide a relatively quick, safe, and effective option without affecting coaptation depth and hence long-term repair durability. If significant SAM persists after discontinuation of cardiopulmonary bypass, when possible the treatment should be a relatively quick option to minimize the duration of the additional myocardial ischemic time.²

In theory the methods described by Kassem and Jamil¹ intuitively make sense. However, I have a few concerns:

1. Aside from personal experience, the authors do not provide objective evidence that the measure-

ments they advocate for assessing SAM risk are indeed risk factors for SAM.

2. Placement of the papillary muscle to the anterior annulus artificial chord is often difficult and unlikely to be routinely possible. Furthermore, the difficulty in placing this suture may lead to inadvertent crossing of the artificial chord over normal native chordae, hence affecting chord function. The authors explain that in cases when this is not possible, the diagonal artificial chord option should be considered.
3. The diagonal chord is held in place under the anterior leaflet and may come in contact with native chordae. I would be concerned for constant friction between the artificial chord and well-functioning native primary and secondary chordae and the possible risk for rupture this presents over the long term. I have observed chord rupture with friction between 2 artificial chordae.
4. It is theoretically possible that an excessively short diagonal chord may lead to valve restriction during diastole.

Clear evidence exists that a short coaptation-septal distance and posterior leaflet height greater than 15 mm indeed increases the risk for SAM. Hence, my preference for effectively shortening the posterior leaflet with 1 artificial chord rather quickly addresses both of these risk factors without affecting coaptation depth. I applaud the authors for their novel techniques in addressing SAM and providing additional options to the surgeon.

Robin Varghese, MD, MS, FRCSC
Department of Cardiothoracic Surgery
Mount Sinai Medical Center
New York, NY

References

1. Kassem S, Jamil H. Papillary muscle-to-anterior annulus stitches: another technique to preventing systolic anterior motion after mitral valve repair. *J Thorac Cardiovasc Surg.* 2011;142:1278-81.

2. Varghese R, Anyanwu AC, Itagaki S, Milla F, Castillo J, Adams DH. Management of systolic anterior motion after mitral valve repair: an algorithm. *J Thorac Cardiovasc Surg.* 2012;143(Suppl):S2-7.

<http://dx.doi.org/10.1016/j.jtcvs.2012.12.044>

MORE INFORMATION ABOUT THE PATTERN OF LYMPHATIC SPREAD COULD IMPROVE THE EFFECTIVENESS OF SURGERY FOR ESOPHAGEAL CANCER To the Editor:

We read with interest the article by Li and colleagues¹ recently published in the *Journal*. They investigated the distribution of lymph node metastasis in thoracic esophageal squamous cell carcinoma. This is an important topic because several articles have shown the relation between nodal involvement and worse prognosis of these patients.^{2,3}

To achieve a homogeneous sample, the authors included in the analysis only patients who underwent R0 resection without neoadjuvant therapy, which could modify nodal metastasis pattern.⁴

The authors found paratracheal lymph nodes as the most frequently involved (15.9%), followed by middle paraesophageal (14%), paracardial (11.2%), and lower paraesophageal (11%) lymph nodes.

In our previously published article,⁴ we found paraesophageal lymph nodes as the most frequently involved (31.9%) in a similar subsample (patients who underwent R0 resection for thoracic esophageal squamous cell carcinoma without neoadjuvant therapy), followed by paracardial (19.8%), perigastric (16.4%), and subcarinal (11.2%) lymph nodes.

Despite small differences in percentages (perhaps due to more superficial esophageal cancer presented by Li and colleagues), the results of both articles^{1,4} suggest that a map of the distribution of nodal metastasis might provide useful information to plan the operative technique and adequate