

Effect of Annuloplasty for Mitral Valve Prolapse Beyond the Annulus and Leaflet

Kikuko Obase, MD; Kiyoshi Yoshida, MD

Mitral valve prolapse (MVP) is the most common cause of primary mitral regurgitation (MR), which represents leaflet or chordae elongation and is frequently accompanied by ruptured chordae. In almost all patients with this entity, annular dilatation is a common lesion. It is well known that the normal annulus has a unique saddle shape,¹ but the saddle is flattened in MVP, and its dynamic characteristics are different from those of the normal annulus.²

See Article by Fukuda et al

In this issue of *Circulation: Cardiovascular Imaging*, a group of experienced investigators led by Dr Fukuda demonstrated basal predominance of left ventricular (LV) dilatation and reduced contraction in MVP using 2-dimensional transthoracic echocardiography and speckle tracking.³ One may have suspected that the posterior leaflet would prolapse superiorly into the left atrium and potentially stretch the basal LV wall, which would then affect basal LV contraction. However, Fukuda et al³ clearly demonstrated that there is no difference in basal wall motion between those with and those without a prolapsed posterior leaflet. They also demonstrated in patients with Barlow's disease with myxomatous leaflets and bileaflet prolapse, no significant difference was shown in the longitudinal strain between the basal anteroseptal wall where is no connection to the leaflets and the wall connected to the leaflets. They demonstrated that the reduction of basal wall motion was proportional to the annular dilatation but not associated with LV ejection fraction or MR volume, suggesting that annular dilatation is associated with basal LV abnormality in MVP.

One of the most interesting speculations from the findings by Fukuda et al³ was that annuloplasty possibly improves the basal LV wall motion. In the presence of severe MR, because of the decreased afterload caused by the low impedance pathway of LV ejection into the left atrium, LV strain remains within normal or higher than normal, despite impairment in LV contractility. It is, therefore, natural that ejection fraction or global LV longitudinal strain may be reduced after

surgery that eliminates the regurgitant volume. Fukuda et al reported that the postoperative reduction of the basal LV strain was attenuated compared with that of the mid and apical LV strain. This suggests that the basal LV wall motion was possibly improved by annuloplasty, or at least annuloplasty did not reduce the basal LV wall motion. This is a good news for surgeons who consider that annuloplasty somehow attenuates the basal LV wall motion, and mitral repair without annuloplasty may jeopardize late results.⁴

Gillinov et al⁵ reported in their study with propensity-matched patients who underwent isolated posterior leaflet repair with 10-year follow-up that mitral repair without prosthetic annuloplasty increased postoperative MR, but did not seem to increase the risk of late reoperation or diminish survival. However, in their study, the majority of patients who did not receive a prosthetic annuloplasty were treated with bovine pericardium annuloplasty or suture annuloplasty. Recently, Dr Alfieri's group reported at 12-years follow-up in degenerative MR patients who underwent an isolated edge-to-edge leaflet suture without any annuloplasty that freedom from reoperation was 57.8% and freedom from recurrence of more than mild MR was 43%. They concluded that the overall long-term results of the surgical edge-to-edge technique without annuloplasty are not satisfactory.⁶

Fukuda et al clearly demonstrated the difference of the LV wall motion pattern between normal subjects and MVP using 2-dimensional speckle tracking technique. Two-dimensional speckle tracking technique has been widely accepted as a tool for the evaluation of LV contraction, providing incremental information in clinical settings. It is essential for speckle tracking technique to acquire an optimal image. The tracking quality becomes suboptimal if the myocardium is poorly visualized. Even if the image is optimal enough, it is sometimes difficult to precisely identify the mitral annulus throughout the cardiac cycle even visually. Through-plane motion is another issue, which may lead to misinterpretation, especially, in apical strain assessment.⁷ Three-dimensional approach may be an alternative to overcome these problems, but 3-dimensional speckle tracking itself still has several issues to be solved, such as stitch artifact or limited temporal and spatial resolution of the 3-dimensional image.

Novel percutaneous approaches for mitral repair, such as Mitral clip or neochord reconstruction techniques, have been produced. Patient selection need to be carefully performed because those procedures do not include annuloplasty. Fukuda et al's results provide us favorable effects of annuloplasty; however, further investigations are encouraged to assess the long-term effects of annuloplasty for LV function and also to prospectively compare patients with and without annuloplasty for mitral repair.

The opinions expressed in this article are not necessarily those of the editors or of the American Heart Association.

From the Department of Cardiovascular Surgery, Nagasaki University Hospital, Japan (K.O.); and Department of Cardiology, Sakakibara Heart Institute of Okayama, Japan (K.Y.).

Correspondence to Kiyoshi Yoshida, MD, Sakakibara Heart Institute of Okayama, 2-5-1 Nakai-Cho, Kita-Ku, Okayama 700-0804, Japan. E-mail kyoshida@med.kawasaki-m.ac.jp

(*Circ Cardiovasc Imaging*. 2016;9:e005621.

DOI: 10.1161/CIRCIMAGING.116.005621.)

© 2016 American Heart Association, Inc.

Circ Cardiovasc Imaging is available at
<http://circimaging.ahajournals.org>

DOI: 10.1161/CIRCIMAGING.116.005621

Disclosures

None.

References

1. Levine RA, Handschumacher MD, Sanfilippo AJ, Hagege AA, Harrigan P, Marshall JE, Weyman AE. Three-dimensional echocardiographic reconstruction of the mitral valve, with implications for the diagnosis of mitral valve prolapse. *Circulation*. 1989;80:589–598.
2. Grewal J, Suri R, Mankad S, Tanaka A, Mahoney DW, Schaff HV, Miller FA, Enriquez-Sarano M. Mitral annular dynamics in myxomatous valve disease: new insights with real-time 3-dimensional echocardiography. *Circulation*. 2010;121:1423–1431. doi: 10.1161/CIRCULATIONAHA.109.901181.
3. Fukuda S, Song J-K, Mahara K, Kuwaki H, Jang JY, Takeuchi M, Sun BJ, Kim YJ, Miyamoto T, Oginosawa Y, Sonoda S, Eto M, Nishimura Y, Takanashi S, Levine RA, Otsuji Y. Basal left ventricular dilatation and reduced contraction in patients with mitral valve prolapse can be secondary to annular dilatation: preoperative and postoperative speckle-tracking echocardiographic study on left ventricle and mitral valve annulus interaction. *Circ Cardiovasc Imaging*. 2016;9:e005113. doi: 10.1161/CIRCIMAGING.115.005113.
4. Gillinov AM, Cosgrove DM, Blackstone EH, Diaz R, Arnold JH, Lytle BW, Smedira NG, Sabik JF, McCarthy PM, Loop FD. Durability of mitral valve repair for degenerative disease. *J Thorac Cardiovasc Surg*. 1998;116:734–743. doi: 10.1016/S0022-5223(98)00450-4.
5. Gillinov AM, Tantiwongkosri K, Blackstone EH, Houghtaling PL, Nowicki ER, Sabik JF 3rd, Johnston DR, Svensson LG, Mihaljevic T. Is prosthetic anuloplasty necessary for durable mitral valve repair? *Ann Thorac Surg*. 2009;88:76–82. doi: 10.1016/j.athoracsur.2009.03.089.
6. De Bonis M, Lapenna E, Maisano F, Barili F, La Canna G, Buzzatti N, Pappalardo F, Calabrese M, Nisi T, Alfieri O. Long-term results (≤ 18 years) of the edge-to-edge mitral valve repair without annuloplasty in degenerative mitral regurgitation: implications for the percutaneous approach. *Circulation*. 2014;130(11 suppl 1):S19–S24. doi: 10.1161/CIRCULATIONAHA.113.007885.
7. Saito K, Okura H, Watanabe N, Hayashida A, Obase K, Imai K, Maehama T, Kawamoto T, Neishi Y, Yoshida K. Comprehensive evaluation of left ventricular strain using speckle tracking echocardiography in normal adults: comparison of three-dimensional and two-dimensional approaches. *J Am Soc Echocardiogr*. 2009;22:1025–1030. doi: 10.1016/j.echo.2009.05.021.

KEY WORDS: Editorials ■ dilatation ■ echocardiography ■ mitral valve annulus ■ mitral valve regurgitation ■ speckle tracking echocardiography

Effect of Annuloplasty for Mitral Valve Prolapse: Beyond the Annulus and Leaflet
Kikuko Obase and Kiyoshi Yoshida

Circ Cardiovasc Imaging. 2016;9:

doi: 10.1161/CIRCIMAGING.116.005621

Circulation: Cardiovascular Imaging is published by the American Heart Association, 7272 Greenville Avenue,
Dallas, TX 75231

Copyright © 2016 American Heart Association, Inc. All rights reserved.

Print ISSN: 1941-9651. Online ISSN: 1942-0080

The online version of this article, along with updated information and services, is located on the
World Wide Web at:

<http://circimaging.ahajournals.org/content/9/10/e005621>

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in *Circulation: Cardiovascular Imaging* can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the [Permissions and Rights Question and Answer](#) document.

Reprints: Information about reprints can be found online at:
<http://www.lww.com/reprints>

Subscriptions: Information about subscribing to *Circulation: Cardiovascular Imaging* is online at:
<http://circimaging.ahajournals.org/subscriptions/>