Mitral Valve Leaflet Aneurysm- Dynamic CT and Echocardiographic Appearances

Paul Heyworth¹, John Bou-Samra², Ryan Shulman^{1,3}

¹Gold Coast Hospital and Health Service, Gold Coast, Australia

²Gold Coast Private Hospital Cardiology Department, Gold Coast, Australia

³Queensland X-ray, Gold Coast Private Hospital, Gold Coast, Australia

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Corresponding author

Paul Heyworth, MBBS
Gold Coast Hospital and Health Service,
1 Hospital Blvd, Southport Qld 4215,
Gold Coast, Australia
Tel: 61-7-56870000
Fax: 61-7-56874697
E-mail: heyworth.paul@gmail.com

Mitral valve leaflet aneurysm (MVLA) is a rarely encountered pathology with the risk of developing serious complications. We present its imaging appearances in two cases: an 89-year-old female with an incidental finding of both mitral valve leaflet and membranous septal aneurysms during workup for transcatheter aortic valve implantation, and a 48-year-old woman with MVLA secondary to infective endocarditis. As imaging techniques other than echocardiography are being more frequently utilized in the diagnosis of cardiac pathology, this entity may be encountered more often with different modalities. Early diagnosis and intervention are critical to treat this rare and potentially fatal pathology.

Key words Aneurysm · Mitral valve · Heart diseases · Echocardiography · Tomography.

INTRODUCTION

A mitral valve leaflet aneurysm (MVLA) is a rarely encountered pathology with an estimated incidence of 0.03% and is most commonly seen as a complication of infective endocarditis [1-3]. Other causes include connective tissue disorders, rheumatic heart disease and aortic regurgitation [4-6]. Typically, an MVLA is diagnosed via echocardiography, however as technology evolves this entity may be encountered with other imaging modalities. We present two cases of mitral valve aneurysm: the first detected on dynamic cardiac CT; and the second on echocardiogram. The purpose of this case report is to review the CT and echocardiographic appearances of this rare entity, thereby improving awareness within the cardiovascular imaging community.

CASE REPORT

Case 1

An 89-year-old female, notably without any past medical history, presented with progressively worsening dyspnoea on exertion. Her clinical examination was normal apart from an ejection systolic murmur on auscultation. She was considered a

candidate for transcatheter aortic valve implantation (TAVI) and underwent work-up with an echocardiogram, CT angiography, as well as multiphase acquisitions of the heart through all phases of the cardiac cycle.

Her echocardiogram reportedly demonstrated mitral valve prolapse (this was unavailable for review). The cardiac CT demonstrated normal cardiac function with an ejection fraction of 52%. Apart from a benign basal septal bulge, no significant myocardial hypertrophy was demonstrated. A focal outpouching of the anterior mitral leaflet extending into the left atrium, filling in systole and collapsing in diastole, was present (Fig. 1, Supplementary Video 1 and 2 in the online-only Data Supplement). No evidence of leaflet vegetations or nodules was demonstrated. Coaptation of the mitral leaflets appeared satisfactory. A membranous septal aneurysm was also present which extended into the right ventricle—this was considered a relative contraindication to the TAVI procedure. The patient was subsequently lost to follow-up and so further investigation of the cause of this aneurysm was unable to be conducted.

Case 2

A 48-year-old woman presented to her local emergency department complaining of fevers, myalgia/arthritis, right shoulder pain and headache. This was believed to represent a viral illness and she was discharged with general practitioner (GP) follow-up. Her GP referred her back to the hospital due to wors-

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Fig. 1. Key CT slices of MVLA in both diastole and systole. (A) Three chamber view in diastole with collapse of the mitral leaflet aneurysmal sac (arrow). (B) Three chamber view in systole, showing the mitral leaflet aneurysm ballooning back into the left atrium (arrow). (C) Vertical long-axis view in diastole with billowing of the aneurysmal sac (arrow). (D) Vertical long-axis view in systole with ballooning into the left atrium (arrow).

ening symptoms over the course of a week. She had no clinical signs of endocarditis or embolic findings. Blood cultures were positive for *Staphylococcus aureus* and CT showed discitis/osteomyelitis as well as pulmonary emboli. A trans-oesophageal echocardiogram showed a large vegetation arising from the anterior mitral valve leaflet with perforation and possible tricuspid valve vegetation (Fig. 2). Dynamic CT was not considered in this patient due to age and required radiation exposure.

She was taken to surgery for mitral valve repair and tricus-

pid vegetectomy. The A1 leaflet of the mitral valve had a large overlying vegetation with erosion onto the annulus and the decision was made to replace the valve. The tricuspid valve had a region of abnormal tissue at the base of the septal leaflet and this was removed. She had an unremarkable post-operative course and was discharged to complete 12 weeks of IV antibiotics.

Fig. 2. Transoesophageal echocardiogram displaying the MVLA with associated vegetation and regurgent jet. (A) Very foreshortened mid-oesophageal four-chamber view in systole with atrial ballooning of the mitral leaflet aneurysm (A) and debris within. (B) Aortic valve. (C) Anterior mitral valve leaflet. (D) Right ventricle septal thrombus. (B) Moderately foreshortened mid-oesophageal four-chamber view in diastole with persistent outpouching of the aneurysm (A). (B) Aortic valve. (C) Anterior mitral valve leaflet. (D) Right ventricle septal thrombus. (E) Right ventricle. (F) Left ventricle. (C) Very foreshortened mid-oesophageal four-chamber view doppler in systole demonstrating a focal perforation (A) without complete rupture. (D) Mid-oesophageal two-chamber view in systole, with the large bacterial vegetation (A) attached to the aneurysm (B). (C) Left atrial appendage. (D) Posterior mitral valve leaflet. (E) Anterior mitral valve leaflet.

DISCUSSION

An MVLA is a focal bulge of one of the mitral valve leaflets, with the anterior leaflet most commonly affected. When present, an MVLA balloons into the left atrium during systole and collapses in diastole [3]. MVLA's typically form when an acquired pathology such as infective endocarditis (most common), an iatrogenic injury, Libman-Sacks endocarditis or aortic regurgitation complicates a pre-disposing abnormality such as a connective tissue disorder or congenital anomaly [1-6].

An MVLA is most commonly diagnosed on an echocardiogram and most descriptions in the literature reflect this. As other imaging techniques such as cardiac magnetic resonance (CMR) and cardiac CT play a larger role in the diagnosis of cardiac disease, this entity may be encountered more often in such modalities. To the best of our knowledge, no reported cases of the appearances of an MVLA on dynamic multiphase cardiac CT exist,

with all reported cases demonstrated on echocardiography except one case on CMR [7]. It is important that clinicians recognize this condition and treat it early, since, if left untreated, MVLA's may progressively dilate and ultimately perforate, which can have catastrophic consequences such as stroke and/or torrential mitral regurgitation [2,5].

Supplementary Movie Legends

Video 1. Three chamber dynamic CT.
Video 2. Vertical dynamic CT.

Supplementary Materials

The online-only Data Supplement is available with this article at <https://doi.org/10.22468/cvia.2018.00234>.

Conflicts of Interest

The authors declare that they have no conflict of interest.

REFERENCES

1. Reid CL, Chandraratna AN, Harrison E, Kawanishi DT, Chandrasoma P, Nimalasuriya A, et al. Mitral valve aneurysm: clinical features, echocardiographic-pathologic correlations. *J Am Coll Cardiol* 1983;2:460-464.
2. Amita R. Infective endocarditis. PathologyOutlines.com Web site. <http://www.pathologyoutlines.com/topic/heartnontumorinfecendocarditis.html>. Published March 23, 2014. Accessed February 12, 2018.
3. Tomsic A, Li WW, van Paridon M, Bindraban NR, de Mol BA. Infective endocarditis of the aortic valve with anterior mitral valve leaflet aneurysm. *Tex Heart Inst J* 2016;43:345-349.
4. Takayama T, Teramura M, Sakai H, Tamaki S, Okabayashi T, Kawashima T, et al. Perforated mitral valve aneurysm associated with Libman-Sacks endocarditis. *Intern Med* 2008;47:1605-1608.
5. Edynak G, Rawson A. Ruptured aneurysm of the mitral valve in a Marfan-like syndrome. *Am J Cardiol* 1963;11:674-677.
6. Kathir K, Dunn RF. Congenital obstructive mitral-valve aneurysm. *Intern Med J* 2003;33:541-542.
7. Saghir S, Ivey TD, Kereiakes DJ, Mazur W. Anterior mitral valve leaflet aneurysm due to infective endocarditis detected by cardiac magnetic resonance imaging. *Rev Cardiovasc Med* 2006;7:157-159.