

Mitral Paravalvular Leak

Description and Assessment of a Novel Anatomical Method of Localization

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PERCUTANEOUS CLOSURE OF MITRAL PARAVALVULAR LEAKS (PVL) has been demonstrated to be a safe and effective alternative to open surgical repair in selected patients with mitral paravalvular regurgitation (1,2).

Successful PVL closure depends on accurate localization of the site of regurgitation and efficient communication between the echocardiographer and interventionalist. The aim of this study was to develop a simple-to-use nomenclature based on fixed anatomic reference points, regardless of cardiac rotation, to facilitate localization of mitral PVL based on 2-dimensional (2D) and 3-dimensional (3D) transesophageal echocardiography (TEE) and to test this method against traditional PVL localization by fluoroscopy.

A simple triangulation method based on fixed anatomic relationships of the atrial septum, left atrial appendage, and aortic valve was developed for lesion localization. Anatomically correct terminology (anterior vs. posterior, lateral vs. medial) was used to separate the mitral valve into 8 different quadrants. The nomenclatures of these quadrants are predicated on the understanding that the aortic valve is anterior, the left atrial appendage is anterolateral, and the atrial septum is medial (Figs. 1 and 2). In our study, a particular lesion was determined to “agree” by 2D TEE and fluoroscopy if it was independently identified to be in the same quadrant by blinded reviewers.

Of 119 lesions assessed, 113 (95%) were localized accurately to a specific quadrant. The most common anatomical sites of PVL location were anterolateral (42%), posteromedial (21%), and posterolateral (19%). There was disagreement on lesion location between 2D TEE and fluoroscopy in 6 cases (Table 1). There were no instances of disagreement between 3D TEE and fluoroscopy.

A novel, efficient, and highly reproducible anatomic method of localizing mitral paravalvular leaks is presented (Figs. 3 and 4). This new method facilitates communication in the interventional laboratory and is readily translatable to improve the success of percutaneous closure of mitral prosthetic paravalvular regurgitation.

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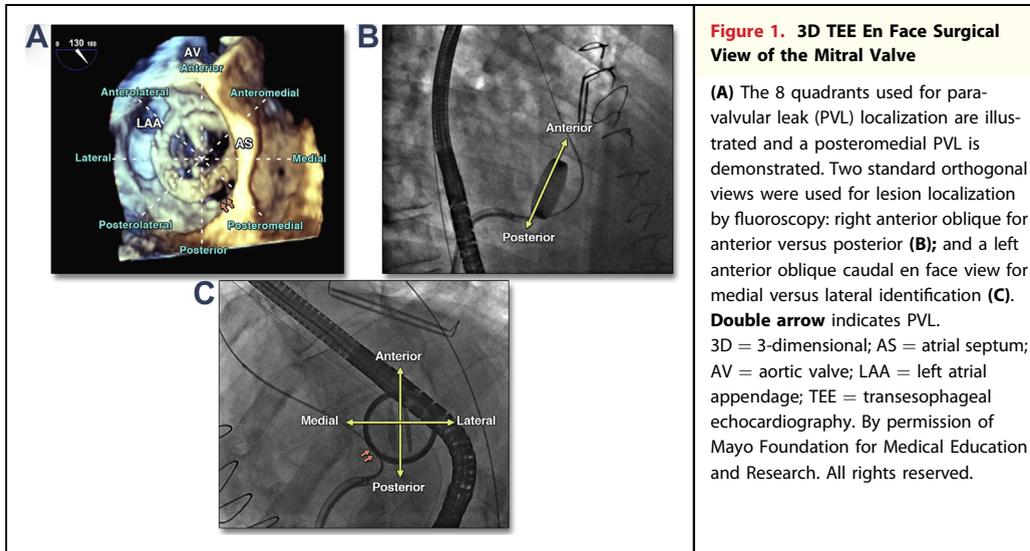


Figure 1. 3D TEE En Face Surgical View of the Mitral Valve
 (A) The 8 quadrants used for paravalvular leak (PVL) localization are illustrated and a posteromedial PVL is demonstrated. Two standard orthogonal views were used for lesion localization by fluoroscopy: right anterior oblique for anterior versus posterior (B); and a left anterior oblique caudal en face view for medial versus lateral identification (C). **Double arrow** indicates PVL. 3D = 3-dimensional; AS = atrial septum; AV = aortic valve; LAA = left atrial appendage; TEE = transesophageal echocardiography. By permission of Mayo Foundation for Medical Education and Research. All rights reserved.

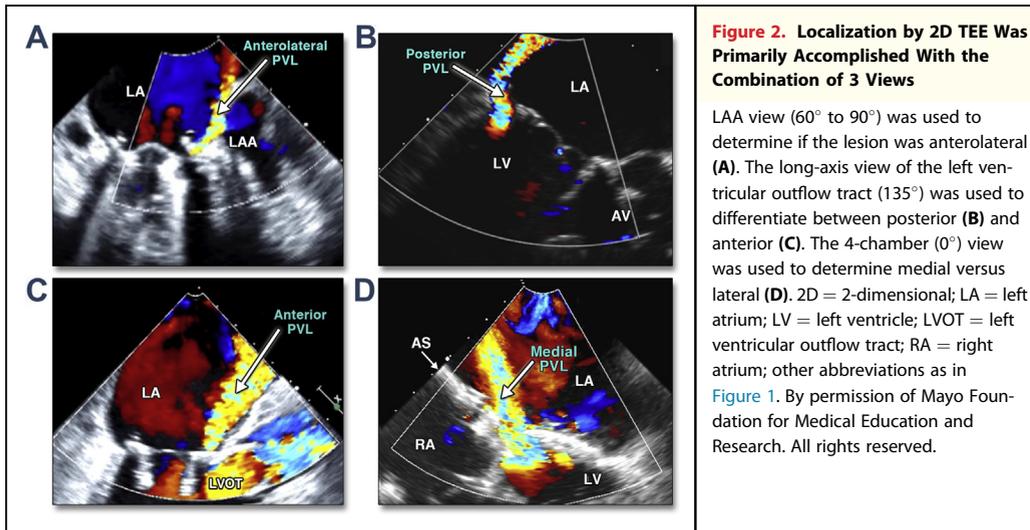


Figure 2. Localization by 2D TEE Was Primarily Accomplished With the Combination of 3 Views
 LAA view (60° to 90°) was used to determine if the lesion was anterolateral (A). The long-axis view of the left ventricular outflow tract (135°) was used to differentiate between posterior (B) and anterior (C). The 4-chamber (0°) view was used to determine medial versus lateral (D). 2D = 2-dimensional; LA = left atrium; LV = left ventricle; LVOT = left ventricular outflow tract; RA = right atrium; other abbreviations as in Figure 1. By permission of Mayo Foundation for Medical Education and Research. All rights reserved.

Table 1. Lesion Location in Patients With Disagreement in Localization

Patient #	2D Echo Localization (Lesion #1)	Fluoroscopic Localization (Lesion #1)	2D Echo Localization (Lesion #2)	Fluoroscopic Localization (Lesion #2)
1	Posterior	Posterolateral	—	—
2	Anterolateral	Posterolateral	—	—
3	Anterolateral	Anterolateral	Posteromedial	Posterolateral
4	Anteromedial	Anterior	—	—
5	Anterior	Posterolateral	—	—
6	Posteromedial	Posterior	—	—

Data demonstrates the lesion localization by 2D TEE and fluoroscopy in the patients who had disagreement in the localization between the 2 methods (n = 6). In 3 cases, the fluoroscopic PVL was located in the quadrant immediately adjacent to the 2D TEE localization, and in the other 3, it was separated by >1 quadrant.
 2D = 2-dimensional; PVL = paravalvular leak; TEE = transesophageal echocardiography.

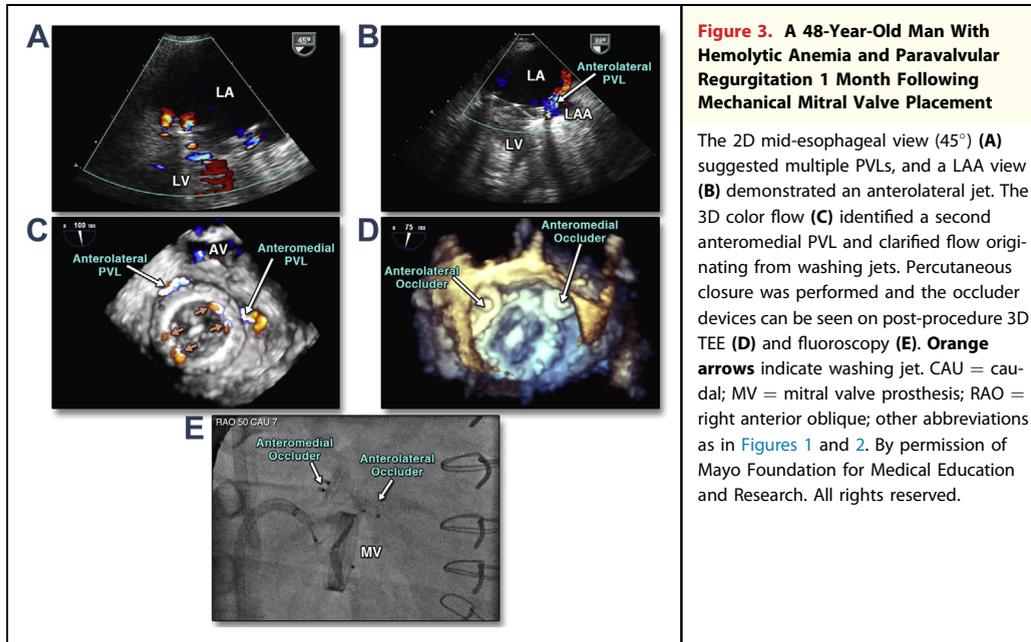


Figure 3. A 48-Year-Old Man With Hemolytic Anemia and Paravalvular Regurgitation 1 Month Following Mechanical Mitral Valve Placement

The 2D mid-esophageal view (45°) (A) suggested multiple PVLs, and a LAA view (B) demonstrated an anterolateral jet. The 3D color flow (C) identified a second anteromedial PVL and clarified flow originating from washing jets. Percutaneous closure was performed and the occluder devices can be seen on post-procedure 3D TEE (D) and fluoroscopy (E). **Orange arrows** indicate washing jet. CAU = caudal; MV = mitral valve prosthesis; RAO = right anterior oblique; other abbreviations as in Figures 1 and 2. By permission of Mayo Foundation for Medical Education and Research. All rights reserved.

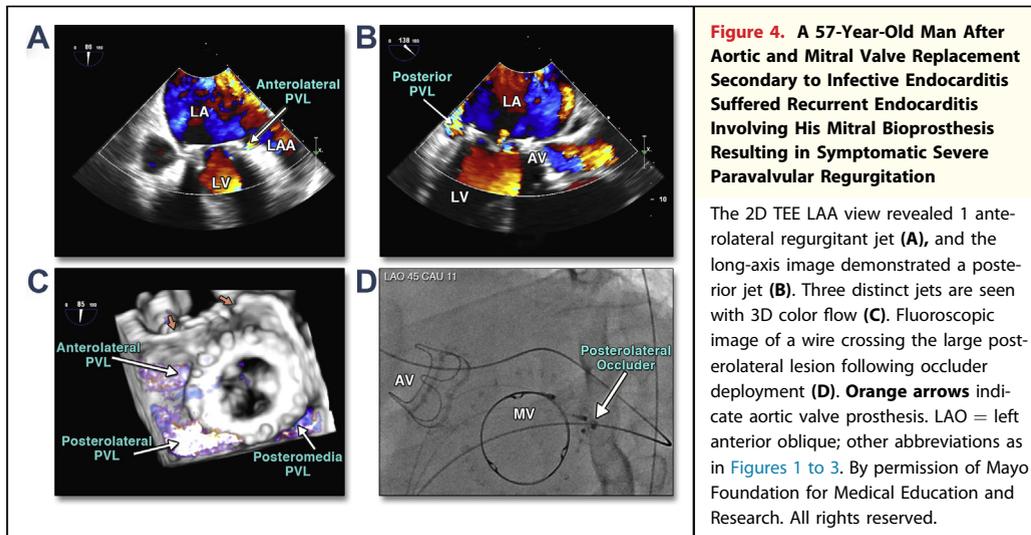


Figure 4. A 57-Year-Old Man After Aortic and Mitral Valve Replacement Secondary to Infective Endocarditis Suffered Recurrent Endocarditis Involving His Mitral Bioprosthesis Resulting in Symptomatic Severe Paravalvular Regurgitation

The 2D TEE LAA view revealed 1 anterolateral regurgitant jet (A), and the long-axis image demonstrated a posterior jet (B). Three distinct jets are seen with 3D color flow (C). Fluoroscopic image of a wire crossing the large posterolateral lesion following occluder deployment (D). **Orange arrows** indicate aortic valve prosthesis. LAO = left anterior oblique; other abbreviations as in Figures 1 to 3. By permission of Mayo Foundation for Medical Education and Research. All rights reserved.

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