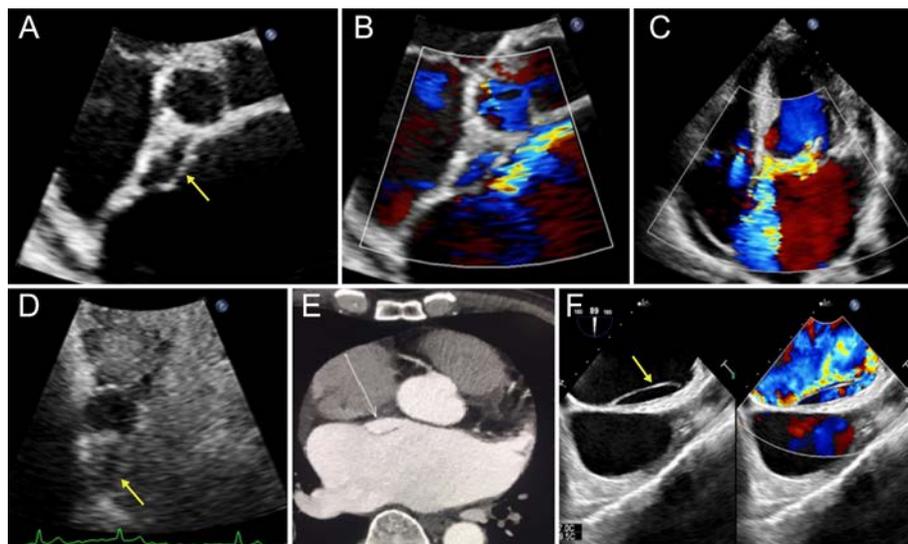


## Visualization of Double Atrial Septum with Persistent Interatrial Space by Three-Dimensional Transesophageal Echocardiography

A 68-year-old man was admitted to our institution with dyspnea on exertion. Chest radiograph showed marked cardiomegaly. Transthoracic echocardiography displayed 2 parallel interatrial septa forming a distinct interatrial chamber, measuring 2.4 cm × 0.8 cm (Figure 1A, Video 1). Color Doppler flow imaging showed a systolic flow into the interatrial chamber (Figure 1B) and severe mitral regurgitation owing to posterior mitral leaflet prolapse was noted (Figure 1C). Contrast echocardiography revealed the microbubbles entering into the interatrial chamber (Figure 1D, Video 2). Computed tomography angiography revealed the presence of a double atrial septum (DAS) with an interatrial accessory chamber (Figure 1E). For a better assessment of the interatrial septum, transesophageal echocardiography (TEE) was performed. Two-dimensional and 3-dimensional TEE demonstrated a double-layer membrane structure of the atrial septum and the distinct interatrial chamber communicating with the left atrium (Figures 1F-2B, Videos 3, 4). TrueVue images clearly exhibited the subtle structure of DAS with persistent interatrial space, making the images more closely resemble the real

### E-PAGE ORIGINAL IMAGE



**Figure 1. Echocardiographic and Computed tomography images. (A) TTE indicating an interatrial chamber. (B and C) CDFI showing a systolic flow coming from the eccentric mitral regurgitation jet into the interatrial chamber and severe mitral regurgitation owing to posterior mitral leaflet prolapse. (D) Contrast echocardiography revealing the microbubbles entering into this interatrial chamber. (E) Computed tomography angiography revealing the DAS and a persistent space between the 2 atria (white arrow). (F) Two-dimensional TEE demonstrating a double-membrane structure and interatrial accessory chamber communicating with the left atrium. DAS, double atrial septum; TTE, transthoracic echocardiography; CDFI, color Doppler flow imaging; TEE, transesophageal echocardiography.**

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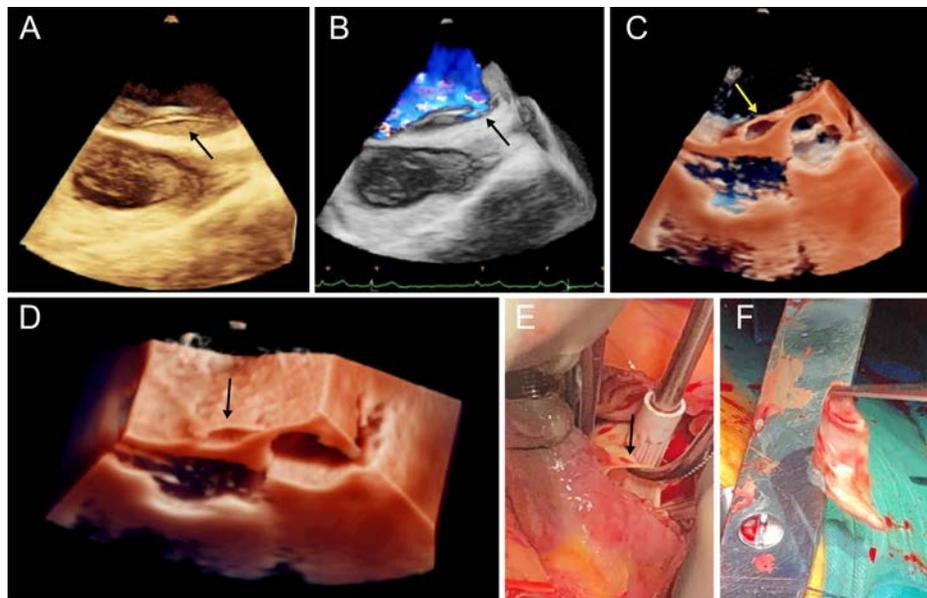
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**Figure 2. Three-dimensional TEE images and intraoperative photographs. (A and B) Three-dimensional TEE indicating the DAS and interatrial chamber communicating with the left atrium. (C and D) TrueVue images clearly displaying a DAS with persistent interatrial space. (E and F) Surgical findings confirming the DAS with persistent interatrial space. DAS, double atrial septum; TEE, transesophageal echocardiography.**

anatomical pathology (Figures 2C, 2D; Videos 5, 6). The patient underwent surgical resection of the accessory septal structure and mitral valvuloplasty. Double atrial septum with persistent interatrial space was confirmed by operation (Figures 2E, 2F).

Double atrial septum is an exceedingly rare congenital atrial septal malformation that features a parallel, fenestrated, double-layered atrial septum and a midline interatrial space in between. To our knowledge, this is the first report of DAS with persistent interatrial space visualized by three-dimensional TEE. Our report highlights the utility of three-dimensional TEE for an eloquent description of these findings.

**Informed Consent:** Informed consent was signed and given by the patient.

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**Video 1:** Transthoracic echocardiogram showing an interatrial chamber.

**Video 2:** Contrast echocardiography revealing the microbubbles entering into this chamber.

**Video 3:** Two-dimensional transesophageal echocardiography indicating a double-layer membrane structure of the atrial septum and the distinct interatrial chamber communicating with the left atrium.

**Video 4:** Three-dimensional transesophageal echocardiography showing the double atrial septum.

**Video 5:** TrueVue images clearly indicating a subtle structure of DAS with persistent interatrial space. DAS, double atrial septum.

**Video 6:** TrueVue images displaying the interatrial chamber filled during the systole and collapsed during the diastole.