EuroIntervention 2019;15:e764-e765 published online jqq April 2019 ■ published online e-edition October 2019

New three-dimensional rendering image of transoesophageal echocardiography for second transseptal puncture for transcatheter mitral valve repair

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This paper also includes supplementary data published online at: https://eurointervention.pcronline.com/doi/10.4244/EIJ-D-19-00049

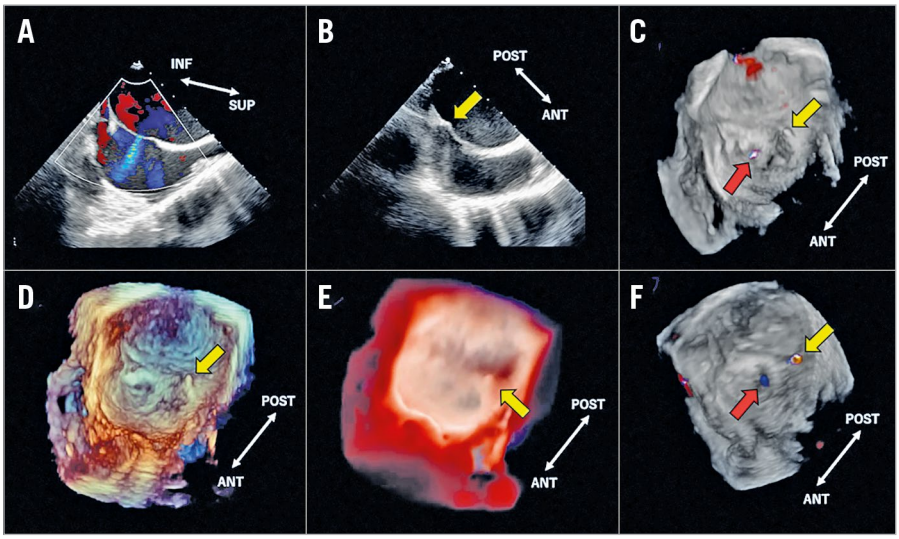

Figure 1. *2D- and 3D-TEE images of the atrial septum during the MitraClip procedure. The red and yellow arrows indicate the previous iASD and tenting point (new iASD), respectively.*

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SUBMITTED ON 11/01/2019 - REVISION RECEIVED ON 1st 27/02/2019 / 2nd 04/04/2019 - ACCEPTED ON 26/04/2019

DOI: 10.4244/EIJ-D-19-00049

A 60-year-old man who had catheter ablation due to atrial fibrillation underwent transcatheter mitral valve repair due to severe secondary mitral regurgitation. The procedure was performed under general anaesthesia with two-dimensional (2D) and three-dimensional (3D) transoesophageal echocardiography (TEE) using the EPIQ CVx/X8-2t ultrasound system (Philips Medical Systems, Andover, MA, USA). During the procedure, 2D-TEE demonstrated the previous iatrogenic atrial septal defect (iASD) at the mid-anterior location of the fossa ovalis **(Figure 1A)**. To obtain sufficient height from the mitral annulus, the tip of a radiofrequency transseptal needle was positioned at the mid-posterior location of the fossa ovalis (**Figure 1B** for the 2D-TEE, **Figure 1C**, **Moving image 1** for the 3D-TEE colour image). Although the 3D-TEE colour and classic 3D-TEE **(Figure 1D, Moving image 2)** images are able to visualise the tenting point, the 3D-TrueVue (Philips Medical Systems) image, which is a new technology that produces virtual light, enabled clarifying the tenting point on the left atrial side by drawing shadows **(Figure 1E, Moving image 3)**. There was sufficient distance (13.6 mm; **Supplementary Figure 1**) between the iASD and the tenting point on the 3D-TrueVue image, which was measured using the combination of the 3D-TrueVue image and the 3D-TEE colour image, and thus puncture was performed. Subsequently, two MitraClip® devices (Abbott Vascular, Santa Clara, CA, USA) were successfully implanted. After removal of the system, the two iASDs (old and new) with left-to-right shunts were confirmed using the 3D-TEE colour image **(Figure 1F, Moving image 4)**.

The puncture point should be at a sufficient distance from the iASD to avoid a merged large iASD that may impact on the stability of the guide catheter of the MitraClip system. In addition, significant iASD after using the MitraClip is associated with worse outcomes[1]. TrueVue is a new 3D realistic rendering image that provides shadowing from the virtual lighting that can improve depth perception within a shallower depth in the 3D images[2]. This new technology may allow a non-echocardiography specialist to visualise the tenting location more clearly than with the classic 3D-TEE imaging, thereby resulting in better communication within the Heart Team during the MitraClip procedure. This is useful in patients with a history of catheter ablation or abnormal anatomy of the atrial septum.

Conflict of interest statement

The authors have no conflicts of interest to declare.

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Supplementary data

Supplementary Figure 1. 3D-TEE TrueVue image showing that the distance between the iASD and the tenting image is 13.6 mm.
Moving image 1. 3D-TEE colour moving image.
Moving image 2. Classic 3D-TEE moving image.
Moving image 3. 3D-TEE TrueVue moving image.
Moving image 4. 3D-TEE colour moving image after removal of the MitraClip system.

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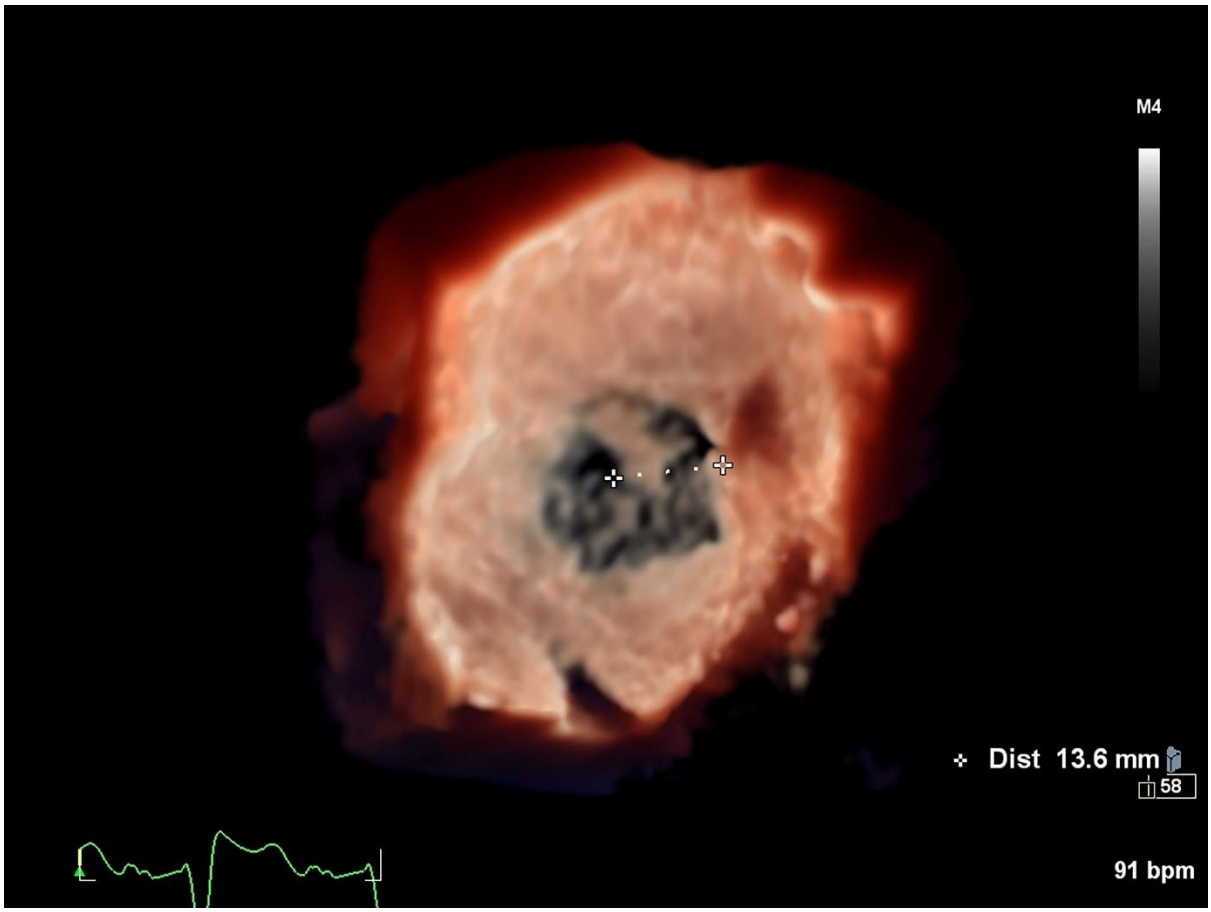
Supplementary data



Supplementary Figure 1. 3D-TEE TrueVue image shows that the distance between the iASD and the tenting image is 13.6 mm.

iASD: iatrogenic atrial septal defect; TEE: transoesophageal echocardiography; 3D: three-dimensional

Moving image legends

Moving image 1. 3D-TEE colour moving image. 3D-TEE colour imaging video from the left atrium shows the iASD and the tenting point on the atrial septal wall.

Moving image 2. Classic 3D-TEE moving image. Classic 3D-TEE image video shows the tenting point.

Moving image 3. 3D-TEE TrueVue moving image. 3D-TEE imaging video using the novel TrueVue technology shows the clear-cut tenting point with the shadow that was drawn by virtual light.

Moving image 4. 3D-TEE colour moving image after removal of the MitraClip system. The two iASDs after removal of the MitraClip system - one is the previous defect and another is the defect created in this procedure.