3D Echocardiography in the Cath-lab
“Beyond fluoroscopy”

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Nothing to disclose
Introduction

- Within the past decade, we have witnessed the exponential growth of novel percutaneous trans-catheter therapies for the treatment of valvular and congenital heart disorders.

- Consequently, a new field has emerged in the world of adult cardiovascular medicine known as "structural cardiac interventions".

- Percutaneous MitraClip, LAA closure, ASD closure, Mitral annuloplasty, TAVI etc. have become important alternative therapies to conventional surgery in a particular group of patients.

Cubeddu RJ et al. J Invasive Cardiol. 2009 Sep;21(9):478-82

Introduction

- Fluoroscopy with or without two dimensional trans-esophageal echocardiography is the widely used method for guidance during these kind of procedures.

Introduction

Added values of 3D-TEE

- Live/real-time wide sector en-face views (monitoring live events e.g. septal puncture, Mitral Clip positioning, catheter&/ wire motion,...)

- Full volumes (cropping & MPR to get measurements in extraordinary axes not possible by 2DTEE e.g. Aortic Annular dimensions, annulo-ostetal distance, LAA ostium,...)
Imaging of the IAS

3D-TEE guided Septal Puncture

RATLe-90 maneuver

RATLe-90 maneuver

3D-TEE guided CS cannulation
After insertion of the coronary sinus catheter through the right internal jugular vein, multiple trials for coronary sinus cannulation guided by fluoroscopy and two-dimensional trans-esophageal echocardiography were unsuccessful.

Real-time three-dimensional zoom mode was used.

Then, the volume was rotated to have the anatomically oriented enface view of the inter-atrial septum from the right atrial perspective. (RATLe-90 maneuver)
LAA assessment for percutaneous closure

Assessment of the LAA
Assessment of the LAA
Assessment of the LAA

Figure 2. Scatterplots of linear regression analysis for real-time 3D transesophageal echocardiography (RT3DTEE) (A) and 2D transesophageal echocardiography (2DTEE) (B) measurements of the left atrial appendage (LAA) orifice area versus the computed tomography (CT) reference values.

TAVI
Annulus dimensions

3D-TEE
Annulo-Osteal Distance

LEFT ATRIAL VIEW
WIRE & catheter manipulation
PARAVALVULAR LEAKAGE CLOSURE

MitraClip
The predictive value of three-dimensional vena-contracta in determining the number of MitraClip devices needed during the procedure in functional mitral regurgitation

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Purpose

During MitraClip procedure, one or more clips might be needed to effectively reduce the mitral regurgitation. Three-dimensional vena-contracta (3D-VC) assessed by color Doppler three-dimensional trans-esophageal echocardiography (3D-TEE) was proven to be well correlated with MR severity. However, its role in predicting the number of MitraClip devices needed during the procedure was not fully determined. Aim of this study is to assess the predictive value of 3D-VC area & length in determining the number of clips needed during the procedure.

Methods

3D-TEE with color Doppler was performed in 12 patients (age 68 ± 3.2 years; 50% men; with functional MR) who underwent successful MitraClip procedure (reduction of MR to <2+). Manual tracing and measurement of the 3D-VC area (3D-VCA) as well as the 3D-VC length was done. These values were compared between patients who received 1 clip (n=4) and ≥ 2 clips (n=8).

Results

Patients who received ≥ 2 clips had larger 3D-VC area compared to patients who received 1 clip (0.5 ± 0.31 cm² vs. 0.24 ± 0.15 cm²). Patients who received ≥ 2 clips had longer 3D-VC length compared to patients who received 1 clip (1.2 ± 0.37 cm vs. 0.8 ± 0.24 cm).

Conclusions

The 3D-VCA & length using 3D TEE is helpful in determining the number of MitraClip devices needed during the procedure in functional mitral regurgitation.
PMBV
Conclusion

- Three-dimensional TEE has an incremental role during Structural cardiac interventions such as TAVI, LAA closure, PMBV & MitraClip percutaneous therapy.
- It provides live/real-time wide sector images (monitoring live events e.g. septal puncture, Mitral Clip positioning, catheter & wire motion, etc.)
- Full volumes (cropping & MPR to get measurements in extraordinary axes not possible by 2DTEE e.g. Aortic Annular dimensions, annulo-osteal distance, LAA ostium, etc.)
- It can create a common language between the echocardiologist & the interventionist by providing anatomically oriented & en-face views of the cardiac structures.
- It really saves time, can reduce the radiation exposure “fluoroscopy time”.
- It reduces the need to get trans-gastric 2D-TEE views.
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