3D-TEE added value during percutaneous structural cardiac interventions

Dr. Hani Mahmoud-Elsayed
MBBCH, MSc, FASE
EACVI/HIT Committee member
Associate Consultant, Director of Echocardiography Lab
Aswan Heart Centre, Magdi Yacoub Foundation

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-ostead distance, LAA ostium,...)
Imaging of the IAS

3D-TEE guided Septal Puncture

RATLe-90 maneuver

RATLe-90 maneuver

3D-TEE guided Septal Puncture

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)
ASD device closure
LAA assessment for percutaneous closure
Using 2D-TEE

0 degrees

Assessment of the LAA
Assessment of the LAA

45 degrees

Assessment of the LAA

Image of ultrasound scan with measurements:
Assessment of the LAA

90 degrees
Assessment of the LAA

135 degrees
Assessment of the LAA

3D-TEE
Assessment of the LAA

Circulation: Cardiovascular Imaging

Evaluation of the Left Atrial Appendage With Real-Time 3-Dimensional Transesophageal Echocardiography: Implications for Catheter-Based Left Atrial Appendage Closure

Gaetano Nucifora, Francesco F. Falsetta, François Regoli, Elena Pasotti, Giovanni Pedrazzini, Tiziano Moccetti and Angelo Auricchio

Circ Cardiovasc Imaging. 2011;4:514-523; originally published online July 7, 2011; doi: 10.1161/CIRCIMAGING.111.963892
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.

Nucifora et al RT3DTEE Imaging of LAA Circ Cardiovasc 2011;4:514-523

TAVI
Valve sizing

Annulus dimensions

Annulus dimensions

Annulo-Osteal Distance
LEFT ATRIAL VIEW
WIRE & catheter manipulation

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

Hani Mahmoud*, Mohamed Al-Ghamdi*, Abdullah Ghabashy*, M H. Ezzat*, A. Al-Amin*
*Prince Sultan Cardiac Center, Al-Hassa, Saudi Arabia. **Cardiology Department, Al-Azhar University, Egypt

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-oesophageal 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 <2v). 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 (1.6 ± 0.7 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.
ORIGINAL ARTICLE

The value of three-dimensional color Doppler trans-esophageal echocardiography in predicting the number of MitraClip devices needed during the procedure

Hani M. Mahmoud, Ali M. Al-Ameen, Mohamed H. Hassan, Tarek Badr, Hesham Nieem, Ahmed A. Shaheen, Abdullah E. Ghabashi
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,...)
- Full volumes (cropping & MPR to get measurements in extraordinary axes not possible by 2DTEE e.g. Aortic Annular dimensions, annulo-osteous distance, LAA ostium,...)
- 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.

The EACVI HIT Community

Growing together today,
securing excellence tomorrow!
For only **78 Euros** per year, you get access to a multitude of educational and scientific resources:

- **Webinars**, **Imaging E-learning courses**, **Basic Echo course**, **Imaging Toolboxes**, **Pocket Size Online course (ESCeL)**, **EACVI Imaging Case Gallery**, **EduCAD IHD Clinical Cases**,
- resources from congresses, meetings & courses

Join us at Facebook and LinkedIn
**Young Network of Cardiovascular Imaging**