ATRIAL SEPTAL CLOSURE AND LEFT ATRIAL APPENDAGE OCCLUSION: INDICATIONS AND GUIDANCE

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ECHOCARDIOGRAPHY IN INTERVENTIONAL CARDIOLOGY

Mobile
  ➢ Anywhere

Real Time
  ➢ Actual Images

Identifying Patient Suitability
Intra Procedural Guidance and Monitoring
Post Procedure Assessment and Follow up

agmz2018
ATRIAL SEPTAL DEFECT

- Ostium secundum ASD is the most common defect encountered

- Echocardiography is commonly used for imaging guidance during percutaneous transcatheter closure of ASD
ACC/AHA 2008 GUIDELINES FOR THE MANAGEMENT OF ADULTS WITH CONGENITAL HEART DISEASE

2.5.2 Recommendations for Interventional and Surgical Therapy

**CLASS 1**

1. Closure of an ASD **either percutaneously or surgically** is indicated for right atrial and RV enlargement with or without symptoms. (Level of Evidence: B)

2. A sinus venous, coronary sinus or primum ASD should be repaired surgically rather than by percutaneous closure. (Level of Evidence: B)

3. Surgeons with training and expertise in CHD should perform operations for various ASD closures. (Level of Evidence: C)

ROLE OF ECHOCARDIOGRAPHY

Before ASD Closure
- Appropriateness criteria for ASD closure
- ASD details relevant to percutaneous ASD closure

During ASD Closure
- Visualization of guide catheters and ASD closure device as it is being deployed

After ASD Closure
- Assessment of device seatedness and residual shunt

Perez, G. Ruiz et al., Current Cardiovascular Imaging Report 2009;2:363-374
ASD RIMS CAN BE DEFINED AS FOLLOWS:

THE RELATION BETWEEN ATRIAL SEPTAL DEFECT AREA, DIAMETER AND SHAPE USING BALLOON SIZING AND THREE-DIMENSIONAL TRANSSESOPHAGEAL ECHOCARDIOGRAPHY DURING PERCUTANEOUS CLOSURE USING OCCLUTECH DEVICE

Efficacy of 3D transoesophageal echocardiography for transcatheter device closure of atrial septal defect without balloon sizing
**ASD SIZING**
Using the MAXIMAL and MINIMAL diameters using 3D-TEE volume and multi-planar reconstruction

**CASE PROFILE**

- 63 year old male
- No known comorbidities
- History of palpitations and easy fatigability

**TTE:**
- ASD, secundum type, with Left to Right shunt, Qp: Qs of 1.5:1
- Dilated Right ventricle and Right atrium
- Referred for TEE
ASD, secundum type
Left to Right shunt w/ Qp:Qs of 1.5:1
Defect size: 1.2-1.5 cm

12mm Apmplatzer Septal occluder was chosen
LEFT ATRIAL APPENDAGE CLOSURE

ALGORITHM OF STROKE PREVENTION IN ATRIAL FIBRILLATION

Non-valvular atrial fibrillation with increased thromboembolic risk

Suitable for OAC
- Higher risk
- Increased bleeding risk not reflected by risk score (e.g., thrombocytopenia, tumor associated bleeding)
- Recurrent bleeding on NOAC
- Need for prolonged anticoagulation treatment (recent coronary stent)

Increased risk of bleeding
- 

Refusal of OAC
- 

Contraindication for NOAC
- 

Thromboembolism with documented failure of VKA
- 

*2012 focused update to the European Society of Cardiology recommendation (8)
*2014 American Heart Association/American College of Cardiology Heart rhythm society recommendation (7)
*European Heart/Rhythm Association/European Association of Percutaneous Cardiovascular Interventions (ESC/PHR/LNE) consensus statement on catheter-based left atrial appendage occlusion (23)
ROLE OF ECHOCARDIGRAPHY IN LAA DEVICE CLOSURE PROCEDURE

Baseline TTE/TEE images are used to:

• Measure the LVEF
• Measure LA dimensions
• Document the presence and size of pericardial effusion
• Determine if the patient meets study inclusion criteria
• Assess LAA anatomy to determine if the patient is suitable for device therapy
• Obtain LAA measurements to determine proper device size

PROTECT AF IMAGING PROTOCOLS

ROLE OF ECHOCARDIGRAPHY IN LAA DEVICE CLOSURE PROCEDURE

Intra-operative TEE images are used to:

• Reconfirm LAA measurement obtained at baseline
• Evaluate device stability, position and seal

Follow-up TEE images are used to:

• Confirm the LAA seal by assessing residual blood flow through and around the device
• Confirm the absence of intracardiac thrombus
• Assess residual interatrial shunt
LAA ANATOMY

All percutaneous LAA occlusion/exclusion procedures would not be possible without two-dimensional (2D) and three dimensional 3D transesophageal echocardiography (TEE).

THREE MAIN LAA MORPHOLOGIES
LEFT ATRIAL APPENDAGE CLOSURE DEVICE - WATCHMAN DEVICE

Nitinol Frame
- Radially expands to maintain position in LAA
- Available sizes:
  - 21, 24, 27, 30, 33 mm (diameter)
- 10 Active fixation anchors around device perimeter designed to engage LAA tissue for stability and retention
- Contour shape accommodates most LAA anatomies

160 Micron Membrane
- Polyethylene terephthalate (PET) cap
- Designed to block emboli from exiting the LAA
- Intended to promote healing process

LEFT ATRIAL APPENDAGE CLOSURE PROCEDURE

1. To reach the heart, the delivery catheter is inserted into a vein in the groin. The Watchman device is positioned in the Left Atrial Appendage.

2. Once released, the device is permanently implanted. It stops harmful blood clots from entering the bloodstream and causing strokes.
LAA SIZING FOR WATCHMAN DEVICE ON 2D TEE

LAA SIZING FOR WATCHMAN DEVICE ON 3D TEE.
**LAA ANATOMIC EXCLUSION CRITERIA FOR THE WATCHMAN DEVICE**

- LAA orifice diameter that is either too small (<16.8 mm) or too large (>30.4 mm).
- LAA depth that is too shallow.
- The depth of a secondary LAA lobe (if present) cannot be too close to the LAA orifice (must be >1 cm away), which could lead to an uncovered portion of the LAA.

**Other Possible Exclusion Criteria**

- Atrial septal aneurysm excursion distance >15 mm.
- Large interatrial shunt.
- Mobile aortic plaque >4mm in thickness.
- Significant mitral stenosis (mitral valve area < 1.5 cm²).
- PEF with thickness > 2 mm.

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**TRANSSEPTAL PUNCTURE GUIDANCE BY TEE:**

- **A** Short Axis at AV Level
- **B** Bicaval Level
- **C**
- **D**
SUBOPTIMAL WATCHMAN DEVICE DEPLOYMENT.

IMPROPER POSITION

WATCHMAN PARA-DEVICE LEAK
WATCHMAN DEVICE–ASSOCIATED THROMBUS. TWO-DIMENSIONAL (A) AND 3D (B) TEE

CASE PROFILE

- 78 year old, male
- Long standing Atrial Fibrillation on warfarin
- Easy bruisability
- Episodes of fall due to frailty
- Multiple ecchymosis bilateral upper extremeties and petechial lesions back
- Hypertensive
- Diabetic
- Hx of UGIB

**CHAD₂VASC score 4 High risk**

**HAS BLED score 3 High risk**
LAA ANATOMY / ASSESSMENT: OSTIUM SIZE AND SHAPE

LAA ANATOMY / ASSESSMENT
MORPHOLOGY / ABSENCE OF THROMBUS / PROPER DEVICE SIZING

<table>
<thead>
<tr>
<th>Maximum LAA Ostium (mm)</th>
<th>Device Size (mm)</th>
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<tbody>
<tr>
<td>17-19</td>
<td>21</td>
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<td>20-22</td>
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Broccoli:
Transseptal (IAS) Crossing

WATCHMAN™ Device Deployment
DEVICE RELEASE CRITERIA – P.A.S.S

WATCHMAN™ Device

*All criteria must be met prior to device release (PASS)*

**Position** – device is at the ostium of the LAA

**Anchor** – fixation anchors engaged / device is stable

**Size** – device is compressed 8-20% of original size

**Seal** – device spans ostium, all lobes of LAA are covered

Device Release Criteria – Position

The compressed device should be 80-92% of its original size
DEVICE RELEASE CRITERIA – ANCHOR (TUG TEST)

DEVICE RELEASE CRITERIA - SIZE
TEE AFTER 45 DAYS

ECHOCARDIOGRAPHY IN INTERVENTIONAL CARDIOLOGY

- Technical Advances in Percutaneous Procedures
- Echocardiography Parallels progress in Interventional Cardiology
- Future
  - Expanding Indications
  - Smaller and Better Equipment
  - Superimposed Echo Images on Fluoroscopic Screen
  - Incremental Value of RT 3D Echo
ECHOCARDIOGRAPHY IN INTERVENTIONAL CARDIOLOGY

Before .... During ..... After ..... 

Plan ..... Monitor ..... Follow ..... 

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TEE - Trust your Echocardiography to Echocardiographers