TRANSCATHETER DEVICE CLOSURE OF MULTI-FENESTRATED OSTIUM SECUNDUM ATRIAL SEPTAL DEFECTS BY SINGLE DEVICE: EXPERIENCE FROM TERTIARY CARE HOSPITAL FROM INDIA AND PROPOSING A NOVEL TECHNIQUE

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Background:

Nearly 10% atrial septal defects are multi-fenestrated. Till today most of those defects are closed surgically.

However, successful device closure of multi-fenestrated defects is described in literature.

In some occasion, using single device is sufficient to cover nearby small additional defect/s. In other occasions, more than one device is used to close multiple defects with stout intervening tissue, which can hold two devices.

When inter-atrial septum is sieve like (multiple small/ medium size defects), The AMPLATZER™ Cribriform Multifenestrated Septal Occluder which is specially designed for such defect can be of help.

Whereas few isolated case reports are available regarding device closure of ASDs where two/ more large defects are separated by thin intervening membrane like septal tissue associated with or without septal aneurysm. That thin membrane (< 5mm) cannot hold two separate devices. In such circumstances that membrane is first ruptured by balloon (atrial-septostomy) or blade (blade-septostomy) to create a single large defect followed by placement of single device.

Here, first time in the world we are proposing a novel technique of trans-catheter closure of multi-fenestrated ASD with thin membrane like septation, not stout (< 5mm) enough to hold two devices, closed by single device. To create single defect, we are not doing prior uncontrolled balloon or blade septostomy procedure.

We are taking an appropriate size device (including two defects and intervening tissue) and deploying LA disc inside LA cavity then pulling the device across the defect and opening the waist of the device slowly such a way that waist of the device can push / rupture intervening

thin membrane and accommodate across the defect followed by deploying RA disc as routine. By choosing appropriate size device and using this novel technique multiple atrial septal defects separated by thin membrane can be closed successfully with single ASD device without any major complication and without lengthening fluoroscopic time or extra cost of 2nd device.

Material and method:

This is a single centre, retrospective, observational study, Form August 2016 to September 2021 over last 5 years, all ASD device closure reports were analysed and found out that 408 atrial septal defects were successfully closed by device in this time period in our institution (NH- Rabindra Nath Tagore international institute of cardiac sciences Kolkata). In 298 cases Amplatzer septal Occluder (ASO) (AGA Medical Corporation, Plymouth, Minnesota, United States of America) devices have been used, 2 cases are closed by Amplatzer cribriform devices, Another 108 cases LifeTech (LifeTech Scientific Shenzen Co Ltd) devices have been used.
In 17 cases multiple ASDs were successfully closed by trans-catheter device placement in this time period. Retrospectively this study has analysed 17 patient's medical records, echocardiography reports, images and transcatheter device closure reports, procedure (fluoroscopy) recording. Informed written consent was available for each patient prior to device closure. As this is a retrospective study ethical committee approval was not mandatory.

Inclusion criteria:

1. Presence of ≥2 holes of secundum ASD detected by transthoracic or trans-oesophageal echocardiography.
2. ASD successfully closed in catheterization laboratory by single ASD device (ASO or cribriform device).
3. Any age (pediatric and adult).

Exclusion criteria:

1. Echocardiography detected single ASD.
2. Failed transcatheter closure by single device and ultimately surgical closure done.

17 patients with multi-fenestrated ASD were classified into following group according to anatomy of the defect and choice of device.

Group A- one major defect was closed by waist of the single ASD device and nearby defect/s was covered by retention disk (LA and RA disc) of same device.

Group B – patients where multiple small fenestrations across atrial septum (sieve like septum, larger one <15 mm) was closed by Amplatzer cribriform device. Multiple holes were covered by retention disk of the device.

Group C - patients who had two large holes with intervening thin membrane like interatrial tissue with or without aneurysm formation. Those defects were closed by single ASD device. Thin intervening membrane/ aneurysm is pushed aside or ruptured by waist of the device, where waist of the device itself act as atrial septostomy balloon.

Results:

This present study documented that among 408 successful ASD device closure over 5 years' time period in our institute only 4.1% cases were multi-fenestrated atrial septal defect. All such defects were closed with single ASD device (100%), more than one device in a same patient was not used (0%) in this study. 17 patients were subdivided according to anatomy of defect and choice of septal Occluder (Amplatzer septal Occluder /Lifetech Cera ASD device or Amplatzer cribriform device).

Group A- had 8 patients (47%) where one major defect was closed by waist of the ASD device and nearby defect/s was covered by retention disk (LA and RA) of the same device.

Group B - had 2 patients (11.7%) where multiple small fenestrations across atrial septum (sieve like septum, larger one <15 mm) was closed by single Amplatzer cribriform device. Multiple holes were covered by two large, equal sized retention disks (LA and RA) of the device not by the thin (3mm) waist device.

Group C- had 7 patients (41.17%) who had two large fenestrations with intervening thin membrane like interatrial tissue, closed by single ASD device. Thin intervening membrane/ aneurysm is pushed aside or ruptured by waist of the ASD device, where waist of the device itself act as atrial septostomy balloon.

Conclusions:

Transcatheter device closure of fenestrated ASD is a feasible option with high success rate. By using specially designed Amplatzer cribriform device, defect with multiple small holes can be closed. On the other hand, by doing device guided pushing and breaking of intervening thin atrial septal tissue(<5mm). Two major ASDs separated by thin membrane like inter atrial septal tissue with or without aneurysm formation can be closed by single device without any complication. By this method we can avoid cumbersome, uncontrolled balloon or blade septostomy and successfully closed multi-fenestrated ASD by single device.