

ASD device closure: Long term follow up

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Our experience

- 1998 to 2011
- 1566 patients
- 912 patients > 4 years FU
- Exclusive with ASO
- Clinical, electrocardiographic and echocardiographic
- 6 weeks, 6 months, once a year thereafter

Long term FU

- Safety
- Efficacy

Safety Parameters

- *Cardiac erosion*
- *Thrombus formation*
- *Atrial arrhythmias*
- *Heart block*
- Device embolization
- Infective endocarditis

Safety Issues

- AV valve dysfunction
- Obstruction to systemic and pulmonary veins
- Device integrity and profile
- Nickel toxicity
- Headache
- Aspirin related side effects
- Ventricular dysfunction

Efficacy Parameters

- *Symptoms*
- *Effort tolerance*
- *Mechanical remodeling*
- *Electrical remodeling*
- Residual shunts
- Pulmonary hypertension

Cardiac Erosions

- Amin Z et al: Erosion of Amplatzer septal occluder device after closure of secundum ASDs: review of registry of complications and recommendations to minimize future risks. Cathet Cardiovasc Interv 2004;63:496-502
- Divekar A et al: Cardiac perforation after device closure of ASD with ASO. JACC 2005;45:1213-1218

Cardiac erosions

- Most worrisome complication
- Timing: 1.5 hours to 3 years (20% early, 66% late)
- Site of erosion
- Small and large devices were represented
- Hemopericardium with CP, Fistula formation, hemopericardium alone.
- Outcome: Variable

Cardiac Erosion

- 0.1-0.2%
- Far reaching implication
- Oversized device
- Deficient aortic and superior rims
- **OVERSIMPLIFICATION**
- Way we deploy devices

MI:0.8 S3 FALGUNI GLENMARK CARDIAC
11 MAY 11 17:11:16 21Y/F CENTRE
2/0/D/F3 17CM Adult
GAIN 58 COMP 70 58HZ 0:00:00



MI:0.8 S3
11 MAY 11 17:14:02
2/0/D/F3
GLENMARK CARDIAC CENTRE
Adult FALGUNI 21Y/F
DR SOLANKI
0:00:00
GAIN 58
COMP 70

17CM
58HZ



MI:0.8 S3
11 MAY 11 17:12:58
2/0/D/F3
GLENMARK CARDIAC CENTRE
Adult FALGUNI 21Y/F
DR SOLANKI
0:00:00
GAIN 58
COMP 70

17CM
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GLENMARK CARDIAC CENTRE
Adult FALGUNI 21Y/F
DR SOLANKI
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GAIN 58
COMP 70

17CM
58HZ



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19:23:12.90
13 IMA 0
MPR

H CHITRA SCAN & IMAGING CENTRE
Ref.: BHARAT DALVI
Definition AS+
CT 2010B



P +65 %
HR 79 bpm
RAO/LAO -90°
CRAN/CAUD 0°
M 256x256
CR 1
SL 1.0

W 942
C 191

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A CHITRA SCAN & IMAGING CENTRE
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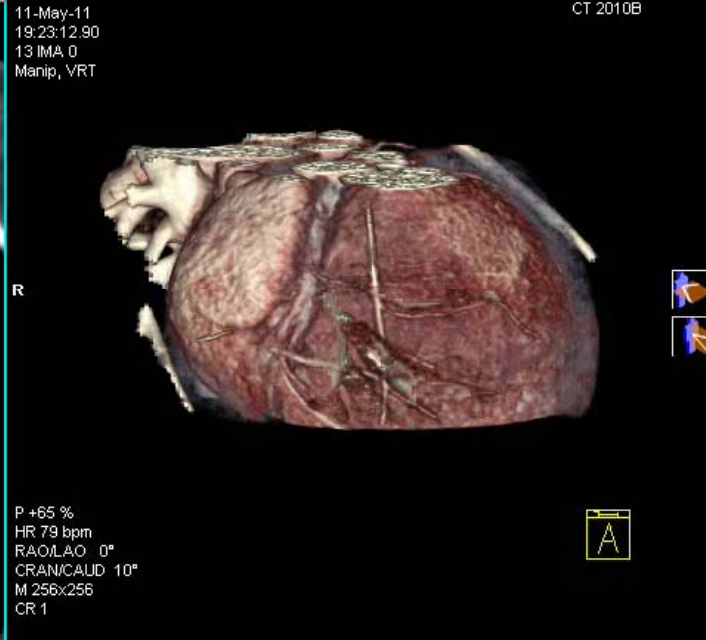


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KANANI FALGUNI
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HP CHITRA SCAN & IMAGING CENTRE
Ref.: BHARAT DALVI
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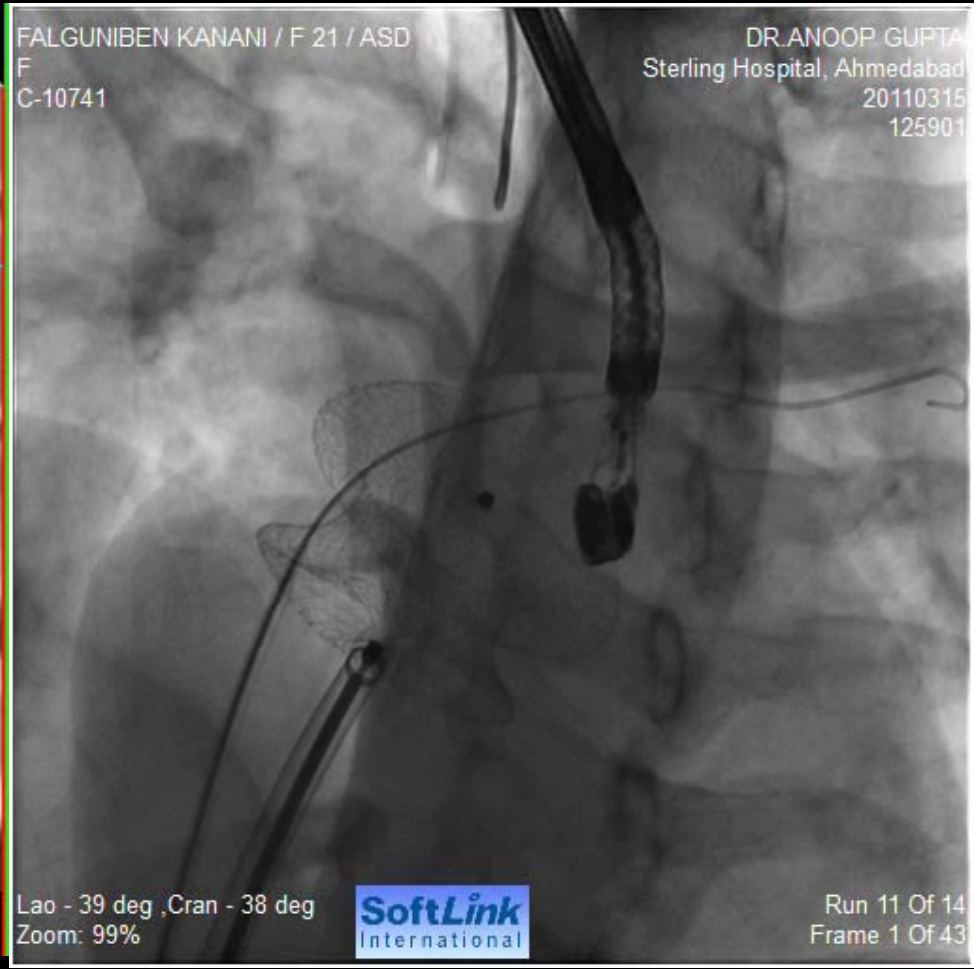


P +65 %
HR 79 bpm
RAO/LAO 0°
CRAN/CAUD 10°
M 256x256
CR 1

W 942
C 191



Phase 45%



FALGUNIBEN KANANI / F 21 / ASD
F
C-10741

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Sterling Hospital, Ahmedabad
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Lao - 39 deg ,Cran - 38 deg
Zoom: 99%

SoftLink
International

Run 11 Of 14
Frame 1 Of 43

Cardiac erosions: Our experience

- Nil
- Large numbers are done with BAT
- Atraumatic delivery
- 1 or 2 attempts
- Proper attention at recapturing technique
- LUCK

Thrombus Formation

- Krumsdorf et al. Incidence and clinical course of thrombus formation on ASD and PFO closure devices in 1000 consecutive patients. JACC 2004; 43:302-9
- Sherman et al. Thrombosis after septal closure device placement. Cathet Cardiovasc Interv 2004; 63: 486-89

Thrombus Formation

- 54 patients
- Reported in 8 different types of devices
- All devices had at least 1 case
- LA side, RA Side or both
- Mean age 44.2 ± 9.8 years
- Mean FU of 5 months
- 12 had normal and 5 abnormal coagulation
- 26-A + C, 15-A, 8-W, 2-H, 1-A+W

Thrombus Formation

- 35 resolved with Warfarin
- 2 successful lytic therapy
- 1 with heparin
- 16 had surgical explantation

Thrombus Formation

- No device is immune
- Early (≤ 3 months) echo surveillance
- Incremental risk factors
 - Age
 - Type of device
 - Prothrombotic state
 - Post procedural atrial fibrillation
 - Persistent atrial septal aneurysm

Thrombus Formation: Our experience

- No thrombus - 3 strokes
- Younger population
- Atrial fibrillation – 6 patients
- ASO which is least thrombogenic
- Underestimation. No FU TEE

Heart Block

- Suda K et al. Reversible AV block associated with closure of ASD using Amplatzer device. JACC 2004;43:1677-82
- Al-Anani SJ et al. AV block after transcatheter ASD closure using ASO. Risk Factors and recommendations. Cathet Cardiovasc Intervent 2010;75:767-772

Heart Block

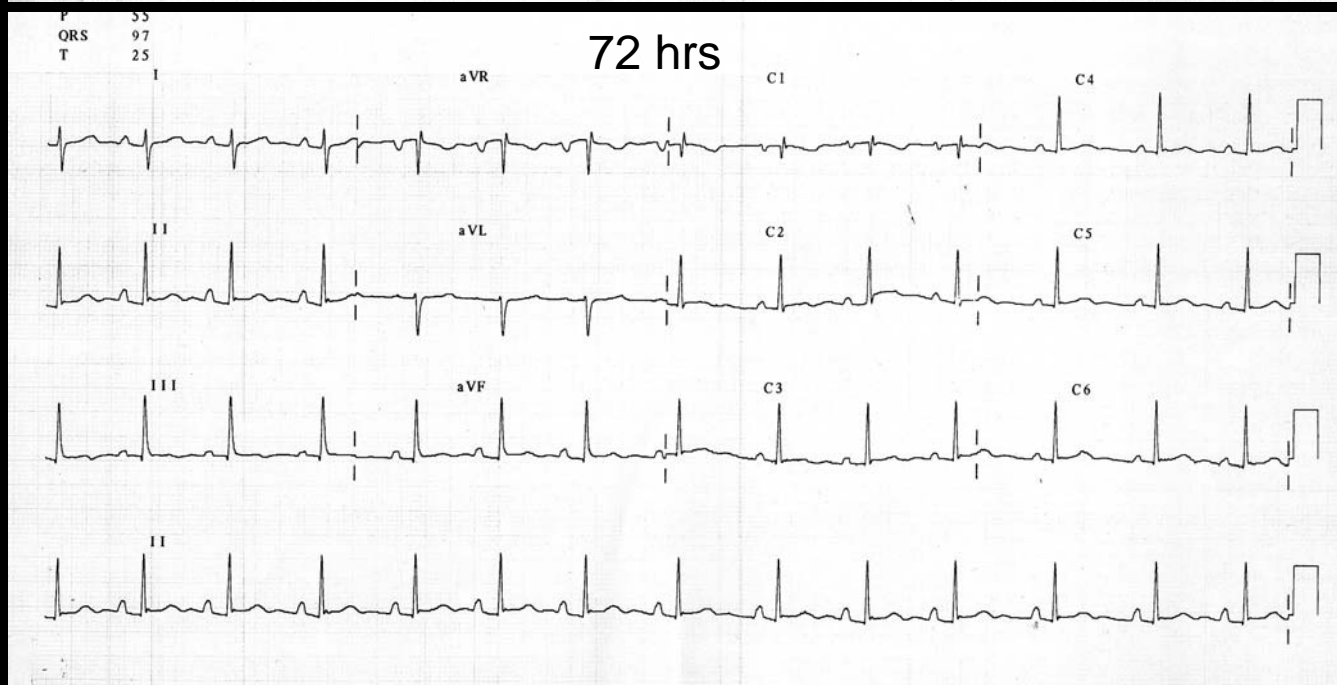
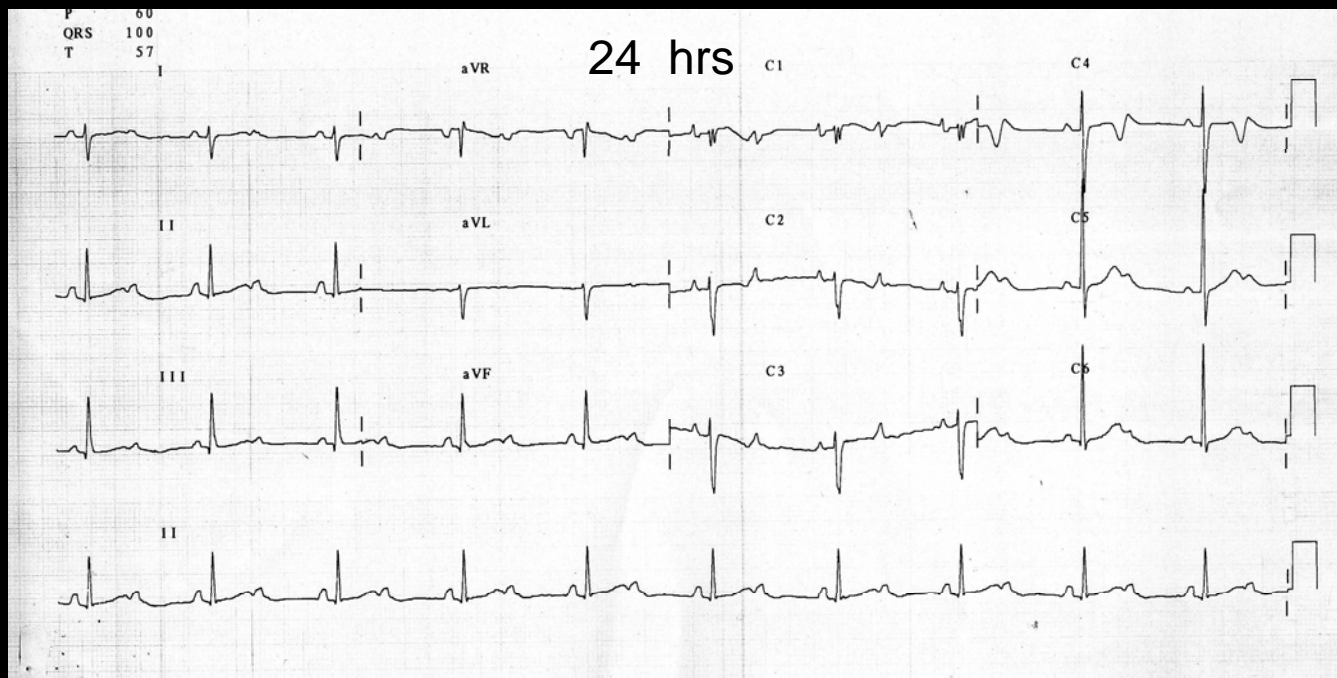
- First degree to CHB
- On table to upto one week
- Delayed AV blocks have not been reported
- Incremental RF: Large ASDs with deficient P1 rim, use of large devices, preceding conduction disturbances
- Close ECG monitoring in high risk group
- Recovery is the rule

Heart Block

- Replacing with a smaller device (if it occurred and persisted on table)
- Anti-inflammatory: NSAIDs or Steroids
- Upto 7 days
- Surgical removal with epicardial pacing wires

Our experience

- 1 case had a 2:1 block which recovered after 48 hours
- 57 cases of 40 mm ASO
- 115 cases of small children with large ASDs



New onset atrial tachyarrhythmias

- New onset atrial flutter or fibrillation – 6.5%
- Trial with pharmacological conversion for 3-6 months
- Electrical cardioversion may be attempted
- RF ablation of AF following ASO: Case reports

Pre-existing atrial fibrillation

- Consider RFA and then close the ASD
- Amiodarone for 4 weeks
- All on Warfarin
- Confirm absence of thrombus
- Close the ASD
- Convert on table with device attached to cable
- If Afib persists, continue Amiodarone.
- DC cardioversion after 6 months

Our experience

- 6 Atrial fibrillation
- Two got converted on table with electroversion
- Two went into NSR after 6 months with a DC cardioversion
- The other 2 in Afib with rate control strategy

Symptoms

- Symptomatic improvement is universal
- Exceptions:
 - Elderly
 - Presence of A fib
 - Those with PHT

Effort Tolerance

- VO₂ max:
 - Improves in all. Majority normalize
 - Preprocedural VO₂ max < 50% : subnormal
 - Some of the “asymptomatic” also show improvement
 - Maximum benefit in Q_p:Q_s > 2
 - Duration of improvement at least upto 3 years
 - Not significantly influenced by age at closure

Mechanical remodeling

- Echo and MRI
- RA and RV volumes
- LA and LV volumes
- RV:LV transverse diameter ratio
- Maximum during first month
- Go for 3 years (may be even beyond)
- Irrespective of age of closure until early adulthood

Mechanical Remodeling

- Delayed in the elderly
- Also in those with severe PHT
- RA area corrected to BSA does not normalize
- Is related to the age of correction
- May not normalize the risk for atrial arrhythmias
- Will need more long term FU

Electrical Remodeling

- 12 lead ECG and Holter monitoring
- P wave duration and dispersion: Initial increase followed by decrease
- PR duration and dispersion: Unchanged
- QT dispersion
- JT dispersion
- Reduced arrhythmogenic potential secondary to electrical remodeling

Conclusions

- Device closure is very safe and highly effective
- Erosion remains one of the contentious issues
- Need further insight into its cause
- Device related thrombosis and arrhythmias need to be identified and addressed
- Subjective improvement is universal
- Objective mechanical and electrical reversed remodeling is a rule

**“ Good is not good enough
when better is expected”**