Post Myocardial Infarction VSD

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Post MI-VSD [ VSR ]

Incidence

• 0.2% in the thrombolytic era [ GUSTO-I ] vs 1-2% in pre-thrombolytic era.
• In the SHOCK Trial Registry, post-infarction VSR was present in 3.9% of patients, with cardiogenic shock complicating AMI
• The time interval from onset of AMI to the manifestation of VSR has a bimodal distribution
  • Higher incidence in the 24h after the onset of infarction
  • Later between the third and fifth day
  • Rarely develops > 2wks after AMI
**Post MI-VSD [ VSR ]**

- VSR is usually associated with a lesion in a SVD [Total occlusion]. A minority of patients presents with MVD
- 60% complicates anterior MI
  - Simple VSD in the apical portion of the septum
- 40% complicates inferior MI
  - VSD in basal septum
  - Complex with extensive intramural rupture with propagation in different directions
  - Associated with significant damage of the right ventricle and MR [PM dysfunction] → worse prognosis

**Post MI-VSD [ VSR ]**
**Mechanism**

- First 24 hours →
  - intramural haematoma dissection or haemorrhage into ischemic myocardial tissue
- 3-5dys →
  - coagulation necrosis of the myocardium with neutrophilic infiltration
- Subsequent retraction of surrounding tissue → enlargement of the defect, followed by a progressive fibrosis and mechanical reinforcement of tissue in the following weeks
Post MI-VSD [ VSR ]
Risk factors

• First MI → absence of collaterals in the coronary circulation
• Old age
• Hypertension
• Female gender

Post MI-VSR

• Acute ischemic insult with loss of structural integrity of IVS.
  • Essential for partitioning and providing mechanical support for both RV and LV.
  • Actively participates in intracardiac conduction system.
Post MI-VSD [ VSR ]

Hemodynamics

• L to R shunt → RV pressure and volume overload + LV volume overload
• Degree of shunt
  • Size of VSR
  • SVR/PVR ratio
• The decrease in COP → compensatory increase in SVR → increased L to R shunt.

Clinical picture

• Severe dyspnea
• Hypotension
• Biventricular failure
• New systolic murmur – thrill
• Loud P2
• AV block
• Cardiogenic shock → multi system failure [shock liver – renal failure.....]
### Independent variables
- ST segment elevation/LBBB.
- Female sex
- Previous stroke
- Positive initial cardiac biomarkers
- Older age
- Higher heart rate

### Protective factors
- Previous MI.
- LMWH.
- B blockers during first 24hrs

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**Post MI - VSD**

- ACC/AHA guidelines:
  - Class I: patients with STEMI complicated by VSR should be considered for urgent surgical repair.
  - If patient hemodynamic status is stable
    - Survival improves significantly if closure is performed after 3 wks [Recession of necrotic ventricular septum is almost complete by 3-4 weeks]
IABP may be used to stabilize patient
Diuretics, vasodilators may be used with caution
No consensus on optimal time for surgery
Early surgery → 20-40% mortality
Delayed surgery → easier but carries the risk of rupture extension and death → early surgery should be performed in all pts with severe HF not responding to aggressive therapy
Trans-catheter closure may soon become an alternative to surgery
• 1957, cooley et al. Performed first surgical repair of PMIVSR.
• In 1988, lock et al. Reported first the transcatheter closure of VSR using cardioseal device.
• Approximately 300 cases of TCC have been reported worldwide in the form of case reports, and small series with success rate of approximately 80–90%.
• The periprocedural use of hemodynamic support like IABP, ECMO, and impela device provides stability.
• Delay in intervention is supported by consensus.
Patient Selection

- All patients with VSR should be assessed in consideration for device closure
- Echocardiography is the mainstay of imaging [site, size, no]
- The VSD must be remote enough to avoid device impingement of the TV, MV and AoV.
- The distance of the defect from the free wall of the ventricles has not been a factor but caution is required

Devices

Amplatzer ASD used on an off-label basis
Technique


Transcatheter Closure of Postinfarction Ventricular Septal Defects Using the New Amplatzer Muscular VSD Occluder: Results of a U.S. Registry

Ralf Holzer,1 MD, David Balzer,2 MD, Zahid Armin,3 MD, Carlos E. Ruiz,4 MD, Jeffrey Feinstein,5 MD, John Bass,2 MD, Michael Vance,7 MD, Qi-Ling Cao,1 MD, and Ziyad M. Hijazi,1+ MD

N=18, early survival 40%
Results
Amplatzer device
Amin, Walsh and de Giovanni

- Total patients: 77
  - Perventricular: 1
- Successful placement: 72
- Significant residual shunt: 5/72
- 2nd device implantation: 5
- Device embolization: 2
- Cross over to surgery: 2

Results
Amplatzer device
Amin, Walsh and de Giovanni

- Internal Jugular vein: 56
- Femoral vein: 21
- Procedure Time (minutes): 30 – 300 (141)
- Fluoro Time (minutes): 15 – 137 (39)
- Device size: 8 – 24 mm
  - Muscular VSD < 18 mm defects
Results
Amplatzer Device
Amin, Walsh and de Giovanni

- Tricuspid valve damage 3
  - 1 died, 1 surgery, 1 RV failure
- Hemolysis 2
- Mortality 24/77 31%
Immediate primary transcatheter closure of postinfarction ventricular septal defects

Holger Thiele, Carl Kaufersch, Ingo Daehnert, Martin Schoenauer, Ingo Eitel, Michael Borger, and Gerhard Schuler

CLINICAL RESEARCH
Vascular and congenital heart disease

VSD patients
n=29

Cardiogenic shock
n=16

No procedural success
n=2

Additional surgery
n=0

30 day mortality
n=2 (100%)

Long-term mortality
n=2 (100%)

Procedural success
n=14

Additional surgery
n=1

30 day mortality
n=12 (86%)

Long-term mortality
n=13 (93%)

No cardiogenic shock
n=13

No procedural success
n=2

Additional surgery
n=1

30 day mortality
n=1 (50%)

Long-term mortality
n=1 (50%)

Procedural success
n=11

Additional surgery
n=3

30 day mortality
n=4 (36%)

Long-term mortality
n=4 (36%)

Percutaneous Closure of Post-MI Ventricular Septal Defect (VSD)

395-day follow-up of 53 post-MI percutaneous VSD closure attempts at 11 British centers, 1997 to 2011.

- Procedural success was 89%, with more than half of patients (58%) surviving to discharge
- Only 4 additional patients died over 395 days of follow-up
- Prior surgical closure of the VSD, immediate shunt reduction associated with reduced long-term mortality

Implications: Percutaneous closure of VSD is associated with high inhospital mortality, but patients who survive to discharge have generally favorable long-term outcomes.


The Source for Interventional Cardiovascular News and Education
Case 1

- 77 years old male.
- Ex smoker, DM, HTN.
- Presented with Chest pain 7 hours duration.
- ECG: acute anterior STEMI.
- Coronary angio – total occlusion LAD.
- Primary PCI.
• Few hours after PCI developed a systolic murmur.
• Stable at first then rapid deterioration with congestive heart failure
• Echo:- VSR – EF 45% –↑ RVSP.
• Shock liver with marked elevation of SGOT and SGPT
• ↑ BUN and creatinine.
• On support – IAB for 5 days.
• Surgery was considered very risky and trans-catheter closure was planned.

Case 2

• 62 years old male.
• No risk factors.
• Presented to hospital with progressive dyspnoea.
• Had a completed anterior STEMI 14 days earlier.
• Did not receive thrombolytic therapy and was managed at home with medical treatment.
Examination

- Pale, orthopnic.
- BP = 90/60, HR = 110b/min, Resp rate 25/min.
- Congested pulsating neck veins.
- Oedema of lower limbs.
- Normal S1, Loud P2, S4.
- Harsh pan systolic murmur.
- Bilateral sibilant ronchi, scattered coarse crepitations together with fine basal crepitations.

ECG
Lab

• Random blood sugar : 95 mg/dl
• Serum creatinine : 1.8 mg/dl
• SGPT : 750 IU/L
• SGOT : 1050 IU/L
• INR : 1.2
• Albumin: 3.6
• Na: 125   K: 4.1   Ca: 8
• CK total: 42 - CK MB: 18
• WBCs: 15,000  HB: 9.8  Platelets: 142,000

Outcome

• Patient improved and was weaned off support.
• Echo showed good device position and improvement in his LV functions EF=45%.
• One week later he required ventilation for severe chest infection and died
Conclusion

• Device closure of VSD is feasible and offers a good alternative /bridge to surgery.
• Appropriate patient selection improves survival. Early intervention if needed.
• Post procedural ICU
• Ultimate outcome remains dismal
  • Co-morbidities and pre-procedure status of patient directly reflects outcome.
  • Technical success is dependent upon experience and team approach to VSD closure.

CSI Africa 2018
Cairo, Egypt

November 30 – December 1, 2018

For more information please visit the website:
http://www.csi-congress.org/csi-africa.php
Thank You