Transcatheter Septal Closure of Post-Myocardial Infarction Ventricular Septal Rupture in Patient with Inferior Wall Myocardial Infarction and Cardiac Arrest on VA ECMO

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Disclosure

• I, Piyoros Lertsanguansinchai, has no financial conflict of interest related to this discussion
A 75-year-old Thai female, U/D: HT, DLP

- Presented with typical chest pain 3 days PTA to Province hospital

- PE: BP 140/80 mmHg, PR 75 /min, RR 20 /min, murmur??

- Cardiac arrest during waiting for Primary PCI
  → CPR* 3 mins, Adrenaline 1 mg IV x 1 amp
  → ROSC
  → Primary PCI at Province hospital (No Echo)
CAG at Province Hospital

ZES 3.0 x 24 mm
• At Province Hospital after PPCI 2 hours
  - Cardiac arrest * 3 times → EKG-Asystole → ROSC
  - TTE bedside:
    - Good LVEF 65% by visual estimation
    - Ventricular septal rupture size 1.2 cm at basal inferoseptal part with left to right shunt (Qp:Qs = 2.7)
  - Insert IABP via RFA (1:2) Augment 100%
  - Refer KCMH

A 75-year-old Thai female, U/D: HT, DLP
A 75-year-old Thai female, U/D: HT, DLP

- Status before refer to KCMH

- Neuro: E4M6VT, pupil 2 mm RTLBE, no focal neurological deficit
- IABP (1:2) Augment 100%
- Adrenaline 2 mcg/kg/min
- Dopamine 23 mcg/kg/min
- Norepinephrine 0.88 mcg/kg/min
- Bun 28, Cr 1.8, AST/ALT 3102/2202, Lactate 26

BP 90/50 mmHg
Augment 100%
No urine output

AKI
Ischemic hepatitis
High Lactate
A 75-year-old Thai female, U/D: HT, DLP

• At KCMH: First thing to do!!!

- Initiate VA ECMO

Post VA ECMO Day 1

- Neuro: E4M6VT, pupil 2 mm RTLBE, no focal neurological deficit
- Wean off Adrenaline, Dopamine, Norepinephrine

<table>
<thead>
<tr>
<th>WBC cell/mm3</th>
<th>8,400</th>
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</thead>
<tbody>
<tr>
<td>Neutrophils %</td>
<td>84</td>
</tr>
<tr>
<td>Lymphocyte %</td>
<td>9</td>
</tr>
<tr>
<td>Hb g/dL</td>
<td>9.5</td>
</tr>
<tr>
<td>Hct %</td>
<td>27.9</td>
</tr>
<tr>
<td>Platelet cell/mm3</td>
<td>82,000 (150,000)</td>
</tr>
<tr>
<td>INR</td>
<td>6.8 (1.9)</td>
</tr>
</tbody>
</table>

| AST/ALT (U/L)   | 8943/2057 ↑ (3102/2202) |
| ALP(U/L)        | 117                |
| Albumin (mg/dL) | 3.4                |
| TB/DB (mg/dL)   | 5.7/1.2 (0.75/0.43) |
| Ca²⁺ (mg/dL)    | 8.8                |
| PO₄³⁻ (mg/dL)   | 2.2                |
| BUN (mg/dL)     | 11                 |
| Cr (mg/dL)      | 0.77               |

| PH              | 7.457  |
| PaO₂ (mmHg)     | 236    |
| PaCO₂ (mmHg)    | 33.7   |
| SaO₂ %          | 97     |
| Lactate (mmol/L)| 8.8 (26) |
1st Cardio-CVT conference
Post VA ECMO Day 8 (VSR day 9)

- Neuro: E4M6VT, pupil 2 mm RTLBE, no focal neurological deficit
- Complication from VA ECMO
- LGIB suspected Ischemic colitis
- Dobutamine 10 mcg/kg/min, Adrenaline 0.23 mcg/kg/min
- Cardio-CVT conference

<table>
<thead>
<tr>
<th>WBC cell/mm³</th>
<th>12,500</th>
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<tbody>
<tr>
<td>Neutrophils %</td>
<td>85</td>
</tr>
<tr>
<td>Lymphocyte %</td>
<td>7</td>
</tr>
<tr>
<td>Hb g/dL</td>
<td>8.5</td>
</tr>
<tr>
<td>Hct %</td>
<td>24.8</td>
</tr>
<tr>
<td>Platelet cell/mm³</td>
<td>52,000</td>
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<table>
<thead>
<tr>
<th>AST/ALT (U/L)</th>
<th>730/818 ↑</th>
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<tbody>
<tr>
<td>ALP(U/L)</td>
<td>97</td>
</tr>
<tr>
<td>Albumin (mg/dL)</td>
<td>2.9</td>
</tr>
<tr>
<td>TB/DB (mg/dL)</td>
<td>24.7/14.2↑</td>
</tr>
<tr>
<td>Bun (mg/dL)</td>
<td>29</td>
</tr>
<tr>
<td>Cr (mg/dL)</td>
<td>0.64</td>
</tr>
<tr>
<td>Lactate</td>
<td>5 ↑</td>
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2nd Cardio-CVT conference

What would you do next?
Transcatheter septal closure (TSC) may be used as:

- Primary repair
- Bridge to surgery
- Salvage of residual defect following surgical repair

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(a) If deemed suitable for percutaneous repair, transcatheter septal closure (TSC) may be used as primary repair, bridge to surgery, in conjunction with surgery, or as salvage of residual defect following surgical repair.

(b) Candidacy for total artificial heart and/or cardiac transplantation should be considered for any unstable patient whether as an alternative to, in addition to, or following failure of repair. (MCS = mechanical circulatory support; OHT = orthotopic heart transplant; TAH = total artificial heart.)
Procedure plan for transcatheter septal closure

✓ Status before TSC
  - RFA : IABP
  - LFA : Arterial cannular VA ECMO
  - LFV : Venous cannular VA ECMO

✓ Access sites
  - RFA (Exchange IABP out)
  - RFV

✓ Technique
  - TEE guided VSR closure
  - Balloon sizing
Multipurpose catheter # 6Fr via RFV
Standard J tip wire # 0.035
Jaw Snare #15 mm
Balloon sizing # 24 mm
Defect 20 mm
VSD Closure Device

Device size = Waist

LV Disc = 20 mm
Waist
RV Disc = 14 mm

VSR defect 20 mm

IVST 10 mm

10 mm

3mm 14 mm 3mm

3mm 8 mm 3mm

3mm
VSD Closure Device

Device size = Waist

LV Disc = 20 mm
Waist
RV Disc = 14 mm

IVST 10 mm

VSR defect 20 mm

VSD Closure Device

10 mm

3mm 14 mm 3mm

3mm 8 mm 3mm
PDA Closure Device

2-3 mm Aortic size = 20 mm, 2-3 mm = 26 mm

Length 7-8 mm

PA size = 18 mm

VSR defect 20 mm

IVST 10 mm
PDA Closure Device

2-3 mm Aortic size = 20 mm
2-3 mm = 26 mm

Length 7-8mm

PA size = 18 mm

VSR defect 20 mm

IVST 10 mm
ASD Closure Device (Cocoon #24)

Device size = Waist

LV Disc = 38 mm
Waist = 24 mm
RV Disc = 34 mm

3-4 mm

6-7 mm

5-6 mm 24 mm 5-6 mm

VSR defect 20 mm

IVST 10 mm
ASD Closure Device (Cocoon #24)

Device size = Waist

- Waist = 24 mm
- LV Disc = 38 mm
- RV Disc = 34 mm
- VSR defect = 20 mm
- IVST = 10 mm
MP catheter
# 6Fr via RFA

Septal occluder sheath
# 12 Fr via RFV
ASD occluder device
Cocoon # 24 mm
ASD occluder device
Cocoon # 24 mm
Pre VSR closure

Qp : Qs = 6.9

Post VSR closure

Qp : Qs = 2.5
Post VSR closure Day 1
Wean off Dobutamine, adrenaline

Post VSR closure Day 2
Off VA ECMO

ECHOCARDIOGRAPHIC
- LVEF 65 %
- LVOT VTI 15 cm/s
- LV lateral S velocities 8 cm/s
After off VA ECMO (4 hours) → BP drop, Lactate↑

Discuss with heart team, patient and family → Balloon atrial septostomy
Balloon atrial septostomy

SL0 Introducer sheath #8
BRK transeptal needle puncture

Confida wire
Armada35 10x40mm, 10 ATM
Balloon atrial septostomy

<table>
<thead>
<tr>
<th></th>
<th>Pre procedure</th>
<th>Post procedure</th>
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<tbody>
<tr>
<td>RA Pressure</td>
<td>24 mmHg</td>
<td>22 mmHg</td>
</tr>
<tr>
<td>LA Pressure</td>
<td>19 mmHg</td>
<td>21 mmHg</td>
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</tbody>
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Hospital course

- Ongoing shock
- Subtemp
- Leukocytosis
- Cardiogenic shock and septic shock
- Multiple organ failure
- Death
Pre VSR closure

\[ \text{Qp} : \text{Qs} = 6.9 \]

Post VSR closure

\[ \text{Qp} : \text{Qs} = 2.5 \]
VSR is a rare but life-threatening mechanical complication of acute myocardial infarction (in-hospital mortality up to 60%)

Periprocedural temporary mechanical support is a useful adjunct for hemodynamic stabilization, improves end-organ failure, and bridging to VSR closure

Percutaneous transcatheter septal closure (TSC) is an emerging option for inoperable patients due to excessive surgical risk

Every number from the procedure (RHC) is important for the patient’s life