Case Report & Discussion:
A case of Heart Failure with Mitral Valve Regurgitation and Stenosis

Reporter: Intern 葉耀翔
Supervisor: 李源德教授
2018.09.03
Name: 李0純
Age & Gender: 74-year-old female
ID: 10663185
Bed: 28171 (admitted from 8/22 to 8/30)
Height: 149 cm / Weight: 62 kg, BMI=28
Living at elderly apartment
Chief Complaint

• Sudden dyspnea and orthopnea with chest tightness attack and bilateral leg edema since last night (8/21)
Present Illness

Aggravating Factors:
- MYocardial infarction
- Hypertension
- Electrolyte imbalance
- Arrhythmia
- Renal failure
- Thyrotoxicosis
- Fluid overload
- Anemia
- Infection
- Labor, loss of medication
- Stress, shunt

ER at TMU
- 8/21
- 8/22

- O₂ cannula: 6L/min
- Physical examination
- Lab data, ABG
- Chest X ray

Dyspnea
Orthopnea
Chest tightness
Bilateral leg edema

8/22
Medical & Surgical history:

- Coronary artery disease with triple vessel disease
- Invasive mucinous lung adenocarcinoma (pT3pN0M0 Stage IIB), left lower lung
- Severe mitral valve regurgitation
- ESRD under regular HD QW4
- Type 2 DM
- Allergic history: not known allergy
- TOCC history: denied

- **s/p Video-assisted thoracic surgery** with lymph node resection on 2017.06.10
  (adjuvant chemotherapy Navelbine*3 cycles on 106/07/24~106/10/02)

- **s/p Percutaneous coronary intervention with drug-eluting stent over LAD** on 2017.03.06
  (LAD-m 90% stenosis, LAD-d 70% stenosis, RCA-p 70% stenosis)

- **s/p Bio-prosthetic valve replacement** on 2018.07.17
  (27 mm Medtronic Hancock II porcine valve)
PCI on 7/11

LAD middle part s/p DES
LAD first diagonal branch 70~80% stenosis
RCA distal part 40% stenosis
Physical Examination 8/22

General appearance: Acute ill-looking

* GCS: E4 V5 M6, awake, alert, oriented
* Vital sign: BT 36.6 °C
  RR 17/min
  PR 65/min
  BP 162/74 mmHg
  SpO2 93% under O2 cannula

* Abdomen:
  Normo-active bowel sound
  Soft and flat, no tenderness

* Extremities:
  Bilateral leg edema (++)
  Capillary refilling time > 2s
  Dorsalis pedis pulse(+) 
* Skin: lower limbs cold

* HEENT:
  Pale conjunctiva, Anicteric sclera

* Neck:
  Jugular vein engorgement (4cm)
  No lymph node enlargement
  No bruits at carotid artery

* Chest:
  Cough with wheezing sound
  Absent breathing sound over LLL
  Use of respiratory accessory muscle

  Maximal impulse: over 5th ICS at LMCL
  Thrill(-), RV Heave(-)
  Loud S1, Mid diastolic murmur at apex

**Tentative impression:**
Heart failure acute exacerbation
<table>
<thead>
<tr>
<th>8/22</th>
<th>CBC DC</th>
<th>8/22</th>
<th>Electrolyte, liver, renal function</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC</td>
<td>9660/uL [4.00-11.00]</td>
<td>BUN</td>
<td>64.0 mg/dl [6.0-20.0]</td>
</tr>
<tr>
<td>RBC</td>
<td>2.79 10^6/uL [3.80-5.50]</td>
<td>Creatinine</td>
<td>5.5 mg/dl [0.5-0.9]</td>
</tr>
<tr>
<td>HGB</td>
<td>8.5 g/dL [12.0-16.0]</td>
<td>eGFR</td>
<td>8 mL/min/1.73M2</td>
</tr>
<tr>
<td>MCV</td>
<td>87.2 fL [80.0-99.0]</td>
<td>GPT</td>
<td>9 U/L [&lt;41]</td>
</tr>
<tr>
<td>PLT</td>
<td>178000/uL [130-400]</td>
<td>CK</td>
<td>84 IU/L [20-200]</td>
</tr>
<tr>
<td>%NEUT</td>
<td>83.8 % [40.0-74.0]</td>
<td>CKMB</td>
<td>14.0 U/L [&lt;25.0]</td>
</tr>
<tr>
<td>%LYM</td>
<td>7.5 % [19.0-48.0]</td>
<td>Bilirubin T</td>
<td>0.6 mg/dl [0.0-1.2]</td>
</tr>
<tr>
<td>Reticulocyte</td>
<td>2.70 % [0.50-2.50]</td>
<td>CRP</td>
<td>5.20 mg/dl [&lt;0.5]</td>
</tr>
<tr>
<td>APTT</td>
<td>35.1 sec [32.0-45.1]</td>
<td>Albumin</td>
<td>3.5 g/dl [3.5-5.2]</td>
</tr>
<tr>
<td>Troponin T</td>
<td>0.092 ng/ml [0.000-0.014]</td>
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<td>0.092 ng/ml [0.000-0.014]</td>
</tr>
<tr>
<td>NT-pro BNP</td>
<td>24036.00 pg/mL [&lt;125.00]</td>
<td>NT-pro BNP</td>
<td>24036.00 pg/mL [&lt;125.00]</td>
</tr>
<tr>
<td>Na</td>
<td>135 mEq/L [136-145]</td>
<td>Na</td>
<td>135 mEq/L [136-145]</td>
</tr>
<tr>
<td>K</td>
<td>3.4 mEq/L [3.5-5.1]</td>
<td>K</td>
<td>3.4 mEq/L [3.5-5.1]</td>
</tr>
<tr>
<td>Ca</td>
<td>6.8 mg/dl [8.6-10.2]</td>
<td>Ca</td>
<td>6.8 mg/dl [8.6-10.2]</td>
</tr>
</tbody>
</table>
### Lab Data

#### 8/22

<table>
<thead>
<tr>
<th>Blood gas pH</th>
<th>7.431 [7.350-7.450]</th>
</tr>
</thead>
<tbody>
<tr>
<td>pCO2</td>
<td>31.2 mmHg [35.0-45.0]</td>
</tr>
<tr>
<td>pO2</td>
<td>100.5 mmHg [75.0-100.0]</td>
</tr>
<tr>
<td>sO2</td>
<td>97.9 % [&gt;95.0]</td>
</tr>
<tr>
<td>HCO3</td>
<td>20.3 mmol/L [20.0-26.0]</td>
</tr>
<tr>
<td>tCO2(P)c</td>
<td>17.5 mmol/L [23.0-29.0]</td>
</tr>
<tr>
<td>ABEc</td>
<td>-2.4 mmol/L</td>
</tr>
<tr>
<td>SBEc</td>
<td>-2.9 mmol/L</td>
</tr>
<tr>
<td>cHCO3st</td>
<td>22.0 mmol/L</td>
</tr>
<tr>
<td>BEecf</td>
<td>-4.0 mmol/L</td>
</tr>
</tbody>
</table>

#### 8/23

<table>
<thead>
<tr>
<th>Endocrine</th>
<th></th>
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<tbody>
<tr>
<td>Free T4</td>
<td>2.14 ng/dl [0.6-2.3]</td>
</tr>
<tr>
<td>TSH</td>
<td>1.41 uIU/m [0.4-5.0]</td>
</tr>
</tbody>
</table>
- Enlarged heart size
- Increased streaky linear densities involving bilateral hemilungs with blurring of vascular shadows
- s/p Left lower lobe excision
- s/p Mitral valve replacement
- s/p sternotomy with metallic wire fixation
- s/p double lumen catheter

Impression: Pulmonary Edema
Heart Echo 8/23

Four Chamber View
Diastolic phase

Long Axis View
Diastolic phase
Heart Echo 8/23

- Severe LA enlargement
- Mildly diluted LV with eccentric LVH; preserved LV systolic function (LVEF 55-60%)
- Bio-prosthetic mitral valve with elevated trans-MV pressure gradient
  - MV peak PG: 20 mmHg
  - MV mean PG: 6 mmHg
  - MV area: 1.75 cm²
  - Pulmonary artery systolic pressure: 36 mmHg

<table>
<thead>
<tr>
<th>Mitral Stenosis</th>
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<tbody>
<tr>
<td>Mean gradient (mm Hg)*</td>
</tr>
<tr>
<td>Pulmonary artery systolic pressure (mm Hg)</td>
</tr>
<tr>
<td>Valve area (cm²)</td>
</tr>
</tbody>
</table>

Mild to moderate Mitral Stenosis
• Consider **TEE** for prosthetic mitral valve evaluation (elevated trans-mitral pressure gradient)

• Suggest **anticoagulant therapy** (warfarin, keep INR 2.5) for 3-6 months after tissue prosthetic mitral valve replacement

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**Final Diagnosis:**

1. **Heart failure acute exacerbation** (NYHA class III, ACC/AHA stage C) with pulmonary edema, probably due to moderate mitral stenosis

2. **Anemia**, probably due to acute bleeding
Hospital Course

Carvedilol 12.5mg QD / Valsartan 160mg QD / Furosemide 40mg QD / Spironolactone 25mg TID / Amiodarone 200mg BID
Novamin 5mg TID / Minoxidil 5mg QD
Clopidogrel 75mg QD / Warfarin 1mg QD
Trajenta 5mg QD / Toujeo 22U HS SC

Follow CXR

Remove O₂ cannula
Mild dyspnea on exertion
Discharge on 8/30
Chest X Ray 8/28

- Enlarged heart size
- Less streaky linear densities compare with previous image
- Pulmonary congestion improved
Severe Mitral Regurgitation s/p prosthetic valve replacement

1 month

Moderate Mitral Stenosis
Chief Complaint on 7/4

- Dyspnea for 2 days without chest pain or chest tightness
Enlarged heart size

Increased streaky linear densities involving bilateral hemilungs with blurring of vascular shadows

Blunt of left costophrenic angle

s/p Left lower lobe excision

s/p double lumen catheter
Heart Echo 7/16

- Diastolic phase
- Systolic phase

Four Chamber View
Heart Echo 7/16

Diastolic phase

Systolic phase

Long Axis View
Marked left atrium enlargement

Concentric Left Ventricular Hypertrophy with preserved LV systolic function, LVEF=83.58% (LVESD=24.53mm, LVEDD=55.47mm)

Calcified mitral annulus with MVP with moderate to severe Mitral Regurgitation

Moderate Pulmonary hypertension with RVSP 39 mmHg with mild TR

Thickened Aortic Valve with trivial AR
Bio-prosthetic valve replacement

- Operation on 2018.07.17
- Indication: moderate to severe MR and moderate PAH
- Postoperative TEE showed normal function of bio-prosthetic valve
- Medications:
  - Valsartan 160mg QD PO
  - Carvedilol 12.5mg BID PO
  - Amiodarone 200 mg BID PO
  - Isosorbide dinitrate 20mg BID PO
  - Trajenta 5mg QD PO

No Anticoagulant drug (ex: warfarin) after surgery?

Thrombus formation on prosthetic valve → cause mitral stenosis?
Discussion Topics

1. Surgical indication for severe mitral regurgitation
2. Surgical indication for severe mitral stenosis
3. Anticoagulant strategy after bio-prosthetic valve replacement
Surgical indication for MR-1

- According to 2017 AHA/ACC guideline for the management of patients with valvar heart disease
- Surgery is indicated only in selected patients with severe chronic MR
- Definition of severe MR:
  - Vena contracta width (VCW) ≥ 0.7cm
  - R Vol (Regurgitant volume) ≥ 60ml/beat
  - RF (Regurgitant fraction) ≥ 50%
  - EROA (Effective regurgitant orifice area) ≥ 0.40cm²
Surgical indication for MR-2

- Symptomatic patients:
  1. If the LVEF is $\geq 30\%$ and the LV end-systolic dimension is $\leq 55$ mm (Class 1B)
  2. Primary mitral valve disease who have NYHA class III-IV symptoms and severe LV dysfunction (LVEF $\leq 30$ percent) (Class 2A)
Surgical indication for MR-3

- Asymptomatic patients:
  1. LVEF $>$60 % who have new onset AF or pulmonary hypertension (Class 2A)
  2. Preserved LV function (LVEF $>$60 percent and LV end-systolic diameter $<$40 mm), if the likelihood of repair without residual MR is $>$90 percent and surgical risk is low (Class 2A)
  3. LVEF of 30 to 60% and/or an LV end-systolic dimension $\geq$40 mm (Class 1C)
Medical therapy can alleviate symptoms, but valvotomy or valve replacement is required to relieve the obstruction to flow.

Methods of intervention:

1. Percutaneous mitral balloon valvotomy (PMBV)
2. Surgical commissurotomy or mitral valve replacement

Based largely upon valve morphology and estimated procedural risks.

Morphology not suitable for PMBV: valve deformity or calcification, left atrial thrombus, or significant mitral regurgitation.
Definition of severe MS:
- Mean pressure gradient > 10 mmHg
- Pulmonary artery systolic pressure > 50 mmHg
- Valve area < 1.0 cm²

PMBV:
1. For symptomatic patients with severe MS with favorable valve morphology (Class 1)
2. For asymptomatic patients with severe MS with favorable valve morphology, and new onset of AF
Surgical indication for MS-3

- Open commissurotomy:
  - For *severely symptomatic* patients *(NYHA class III/IV)* with severe MS, and not candidates for PMBV
  - For congenital MS
- Mitral valve replacement:
  - For patients not amenable to either PMBV or open commissurotomy
Symptomatic mitral stenosis
NYHA functional class II

History, physical exam, CXR, ECG, 2D echo/Doppler

Mild stenosis
MVA > 1.5 cm²

Exercise

PASP > 60 mmHg
PAWP ≥ 25 mmHg
MVG > 15 mmHg

No
Yes

Yearly follow-up

Valve morphology favorable for PMBV?

Yes

No

Class IIb

6-month follow-up

Consider PMBV
Exclude LA clot, 3+ to 4+ MR

Valve morphology favorable for PMBV?

Yes

No

Class I

Severe PH
PAP > 60 mmHg

Yes

No

Class IIa
6-month follow-up

† Consider commissurotomy or MVR
Anticoagulation Strategies After Bioprosthetic Valve Replacement: What Should We Do?

Dec 19, 2016  |  Paul Cremer, MD; Benico Barzilai, M.D., FACC
Expert Analysis

Discuss both aortic and mitral valve replacement
Anticoagulation in the first few months after surgical valve replacement → Mitigate against thrombotic complications

These events are infrequent → data related to these complications are limited

Recent meta-analysis of 31740 patients:
- Occur in 145 patients (1%) with VKA
- Occur in 262 patients (1.5%) without VKA

Recent retrospective study of 4075 patients:
- Discontinuation of warfarin was associated with increased thromboembolic events and cardiovascular deaths 1-6 months after surgery
- No difference in bleeding events between 3 months and 1 year
Anticoagulation Recommendation

- Universal anticoagulation after bio-prosthetic aortic valve replacement is difficult to justify → Only Class IIB recommendation
- Bio-prosthetic mitral valve seem to be at higher risk for thromboembolic events than aortic valve → Class IIA recommendation
- Specific clinical situations → anticoagulation should be more strongly considered
  - On post-op echocardiography: >50% in mean Doppler gradients/ increased cusp thickness/ abnormal cusp mobility
Conclusions

- Risk factors:
  - Atrial fibrillation
  - History of thromboembolic event
  - Hypercoagulable condition
  - Severely reduced left ventricular systolic function
Post bio-prosthetic mitral valve replacement mitral stenosis

→ Seem to be relative to no anticoagulation medication after surgery

What to do next?

→ Keep anticoagulation of Clopidogrel 75mg QD/ Warfarin 1mg QD
→ Closely follow-up severity of mitral stenosis
→ May consider thrombectomy if progress to severe MS
Thank you!!