ED Pitfalls Series

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Preface

- The duty and specialty of emergency physicians are correct and immediate diagnosis.
- Physiological approach for non-traumatic patients and Anatomical approach for traumatic ones
- Logics: comparable with chief complaints.
- To err is human who includes the patients.

Preface: Sources of Errors

- Atypical presentations
  - Typical is sometimes minor whereas atypical is major.
- Missing the key points
  - What causes him (she) visit the ED? (What is the true chief complaint?)
- Incorrect exclusion
- Finding one abnormality is sometimes not enough. (Tip of the Iceberg)
- The first minute is not the same as the last minute.
- Consultation does not mean resolution.

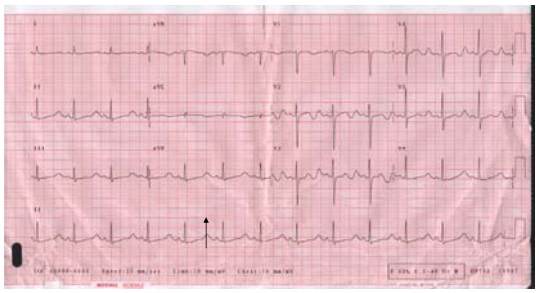
Preface: Major Principles

- Revisiting means Complete Study.
- Always keep clinical suspicion.
- Keep flexible attitude.
- Always re-evaluate from the very beginning.
- Review carefully the old charts or records.
- Keep what should be maintained.
- Learn from READ triage.

Case 1

- A 32 y/o female was brought to our ED due to vomiting, conscious change, and unsteady gait. Drug overdose was suspected by her family. Vital signs were stable (BP 128/68, PR 88, RR 20, BT 36.5'C and SpO2 97% at room air). PMH included bipolar disease under possible lithium treatment.
- What should ECG show?

Case 1



Li 3.1 mEq/L

Case 1

- Lithium intoxication
  - Therapeutic level: 0.7-1.2 mEq/L
  - 1.2-2.0 mEq/L: vomiting and diarrhea
  - 2.0-2.5 mEq/L: blurred vision, muscle weakness / fasciculations, dizziness, vertigo, ataxia, confusion, slurred speech, increased DTRs, transient scotomas
  - 2.5-3.0 mEq/L: myiclonic twitches, choreoatheloid movements, incontinence, stupor, ECG: flat/inverted T's U waves, SA/AV block, prolonged QT
  - 3.0-4.0 mEq/L: seizures, cardiac arrhythmias (VT, PVCs, VF)
  - ≥4.0 mEq/L: hypotension, peripheral vascular collapse

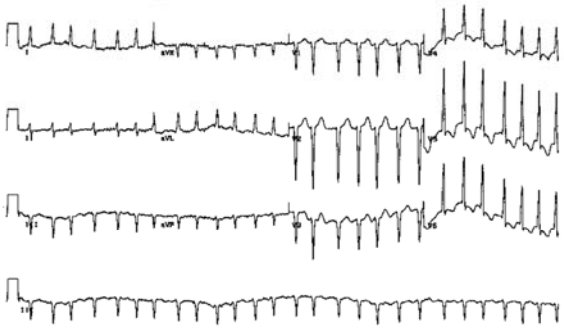
Case 1

- A 45-year-old female presented with diarrhea for several days. Vital signs were BP 142/98, PR 147 bpm, RR 20 /min, BT 38'C, SaO2 97%. Breathing sound was clear. Heart sounds revealed irregular-irregular heart beats. Your colleague told you that this is a case of infectious diarrhea.
- What do you think about her?

Case 2

- Irregular Rhythm (Pulse)
  - Regular-irregular
  - Irregular-irregular: TWO Big
    - Atrial fibrillation (AF) → Cardiac problem (CHF)
    - Multifocal Atrial Tachycardia (MAT) → Lung problem (COPD)

Case 2



Case 2

Case 2

- Chronic AF
  - Always cardiomegaly
- Paroxysmal AF
  - Usually small heart
  - Look for underlying causes before idiopathic AF is diagnosed.

Case 2

- Secondary AF
  - Also in those with no other risks of heart problem
  - Precipitating factors
    - Hyperthyroidism: beta blocker; anti-thyroid
    - Fever
    - Pain
    - Anxiety
    - Sympathomimetic Agents
    - Vagolytic agents

Treat underlying

Case 2

- Thyroid function revealed that increased T3 and free T4, and significantly low TSH. Hyperthyroidism was diagnosed.
- Propranolol and PTU were then prescribed.

Case 2

- Two days later, the patient felt dyspnea. Bilateral rales were noted. Chest film revealed lung edema.
- What is the treatment modality?

Case 2

- High-Output Heart Failure
  - Profound anemia
  - Thyrotoxicosis
  - Myxedema
  - Paget disease of bone
  - Albright syndrome
  - Multiple myeloma
  - Glomerulonephritis
  - Cor pulmonale
  - Polycythemia vera
  - Obesity
  - Carcinoid syndrome
  - Pregnancy
  - Nutritional deficiencies (eg, thiamine deficiency, beriberi)

Case 2

- Thyroid storm
  - Precipitating factors
    - Infection
    - Surgery
    - Trauma
    - Radioactive iodine treatment
    - Pregnancy
    - Anticholinergic and adrenergic drugs
    - TH ingestion
    - Diabetic ketoacidosis (DKA)

Case 2

- Thyroid storm
  - Treatment
    - (1) ameliorating hyperadrenergic effects of TH on peripheral tissues with use of beta-blockers (eg, propranolol, labetalol);
    - (2) decreasing production of TH with antithyroid medications (eg, propylthiouracil [PTU], methimazole), thereby blocking further synthesis of THs;
    - (3) decreasing hormonal secretion from the thyroid, using iodides; and
    - (4) preventing further TH secretion and peripheral conversion of T4 to T3, using glucocorticoids.

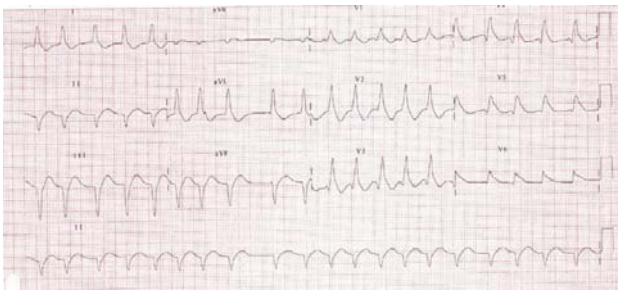
Case 2 (comments)

- Don't believe completely what your colleague tells you because to err is human.
- Re-evaluate every patient and integrate the clinical information again and again.

Case 3

- A 65-year-old female patient consulted our ED due to progressive dyspnea for 3 days. Vital signs were BP 124/76, PR 110 bpm, RR 26 /min, BT 35.8'C, SaO2 87%. Breathing sound was bilateral rales and a pansystolic murmur was also heard.
- What do you think about her?

Case 3



Case 3

Case 3

- Pansystolic murmur
  - Mitral Regurgitation (Valvular, RHD)
  - Ventricular Septal Defect (Rupture)
- Mitral Apparatus
  - Valve itself
  - Annulus
  - Chordae tendinae / papillary muscle
  - Chambers (atria / ventricles)

Characteristics of Ventricular Septal Rupture, Rupture of the Ventricular Free Wall, and Papillary-Muscle Rupture.

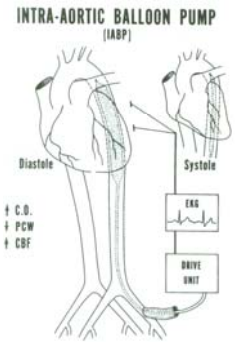
TABLE 1. CHARACTERISTICS OF VENTRICULAR SEPTAL RUPTURE, RUPTURE OF THE VENTRICULAR FREE WALL, AND PAPILLARY-MUSCLE RUPTURE.*

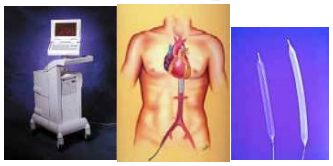
CHARACTERISTIC	VENTRICULAR SEPTAL RUPTURE	RUPTURE OF VENTRICULAR FREE WALL	PAPILLARY-MUSCLE RUPTURE
Incidence	1–3% without reperfusion therapy, 0.2–0.34% with thrombolytic therapy, 3.9% among patients with cardiogenic shock	0.8–6.2%, thrombolytic therapy does not reduce risk; primary PTCA seems to reduce risk	About 1% (posteromedial more frequent than anterolateral papillary muscle)
Time course	3–7 days without reperfusion therapy; median, 24 hr with thrombolysis	1–7 days without reperfusion therapy; mean, 2.7 days with thrombolysis	Median, 1 day (range, 1–14)
Clinical manifestations	Chest pain, shortness of breath, hypotension	Anginal, pleuritic, or pericardial chest pain, syncope, hypotension, arrhythmia, nausea, restlessness, hypotension, sudden death	Abrupt onset of shortness of breath and pulmonary edema; hypotension
Physical findings	Harsh holosystolic murmur, thrill (+), S_3, accentuated 2nd heart sound, pulmonary edema, RV and LV failure, cardiogenic shock	Jugulovenous distention (29% of patients), pulsus paradoxus (47%), electromechanical dissociation, cardiogenic shock	A soft murmur in some cases, no thrill, variable signs of RV overload, severe pulmonary edema, cardiogenic shock
Echocardiographic findings	Ventricular septal rupture, left-to-right shunt on color flow Doppler echocardiography through the ventricular septum, pattern of RV overload	>5 mm pericardial effusion not visualized in all cases, layered, high-acoustic echoes within the pericardium (blood clot), direct visualization of tear, signs of tamponade	Hypercontractile LV, torn papillary muscle or chordae tendinae, flail leaflet, severe mitral regurgitation on color flow Doppler echocardiography
Right-heart catheterization	Increase in oxygen saturation from the RA to RV, large V waves	Ventriculography insensitive, classic signs of tamponade not always present (equalization of diastolic pressures among the cardiac chambers)	No increase in oxygen saturation from the RA to RV, large V waves, very high pulmonary-capillary wedge pressures

*PTCA denotes percutaneous transluminal coronary angioplasty, RA right atrium, RV right ventricle, and LV left ventricle.

Birnbaum Y et al. N Engl J Med 2002;347:1426-1432.

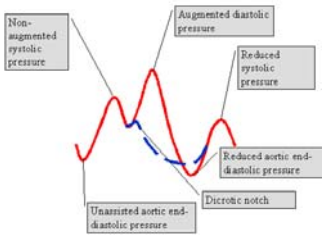
IntraAortic Balloon Pump





- Settings: catheter-mounted, balloon volume 30-50 ml, central lumen, helium, synchronization.
- Net effect: myocardial oxygen supply/demand ratio with a small increase in systemic perfusion (≦0.5L/min)
- Timing: Pre-,Peri-,Post-op

IABP Waveforms



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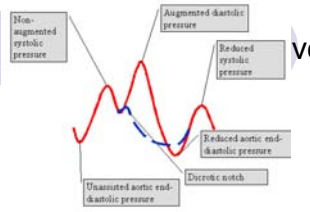
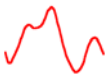
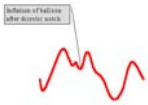
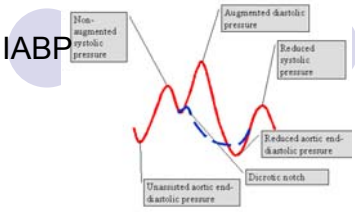


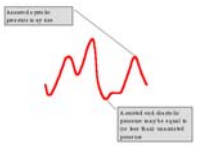


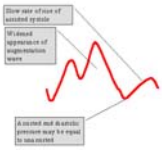


Early Inflation Late Inflation

IABP Waveforms







Early Deflation Late Deflation

Indications

- Cardiogenic shock
- Mechanical complication of AMI
- In association with CABG
- In association with nonsurgical revascularization
- Stabilization of cardiac transplant recipient before insertion of ventricular assist device
- Postinfarction angina
- Ventricular arrhythmias related to ischemia

Contraindications

- Absolute Contraindications
  - Aortic valve insufficiency; Aortic dissection
- Relative Contraindications
  - Femoral arterial insertion: Abdominal aortic aneurysm; Severe calcific aortoiliac or femoral arterial disease
  - Percutaneous insertion: Recent ipsilateral groin incision; Morbid obesity

Complications

- Complication rate: 5-47%
- Limb ischemia; aortic dissection; aortoiliac laceration; perforation; deep wound infection
- Bleeding at insertion site; superficial wound infections; asymptomatic loss of peripheral pulse; lymphocele

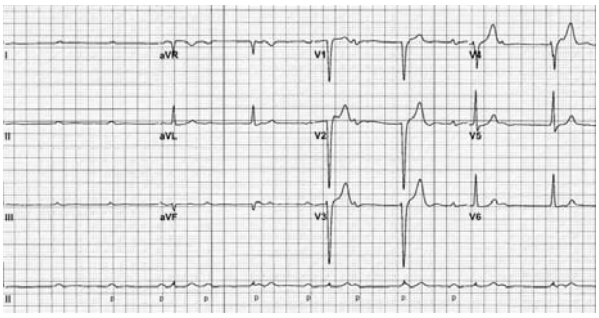
Case 4

- A 68-year-old male patient consulted our ED due to fever for 2 days. Vital signs were BP 122/64, PR 57 bpm, RR 22 /min, BT 39'C, SaO2 95%. Breathing sound was coarse with right rhonchi.
- What do you think about him?

Case 4

- Laboratory findings were leukocytosis (WBC 18,200, band 5%, seg 81%), Hb 12.3, platelet 68K. In addition, BUN 59, Cre 2.4, Na 138, K 5.8, Cl 94 and ABG revealing metabolic acidosis with partial respiratory compensation. CRP was 4.5. CXR revealed RLL pneumonia.
- What else examination should be ordered?

Case 4



Class I（立即處理）

- 意識程度下降
- 生命現象：
  - 收縮壓：≤80mmHg或≥220mmHg
  - 心跳：≥150bpm或≤50bpm
  - 呼吸：≥30rpm或≤8rpm
  - 體溫：≥41℃或≤32℃
- 內科：異物阻塞;已插氣管內管或胸管者;呼吸窘迫;發紺;心因性胸痛;正在抽搐;內出血併生命現象不穩定者
- 外科：外傷出血無法控制者;大於5cm的開放性傷口;疑呼吸道(顏面)灼傷;電灼傷;化學性灼傷;三度TBSA>10% ;二度TBSA>15% ;骨盆或股骨骨折;開放性骨折;疑頸椎骨折;頭部嚴重畸形;腦組織外露;內臟外露;皮下氣腫;胸腹開放性傷口;毒蛇;虎頭蜂咬傷;槍傷或穿刺傷
- 婦產科：急產;性侵害
- 精神科：攻擊性行為

Class II（十分鐘內處理）

- 生命現象：
  - 收縮壓：180-220mmHg
  - 呼吸：20-30rpm
  - 體溫：39-41℃或32-35℃
- 內科：呼吸喘;呼吸困難;胸痛原因不明者;疼痛併嚴重症狀者(劇痛、臉色蒼白);暈眩(Vertigo);突發性神經症狀;內出血併HR>100bpm;吐血;嘔吐、腹瀉、脫水致HR>100bpm
- 外科：小於5cm的開放性傷口;疑有骨折;關節腫脹;疑頭骨骨折;其他昆蟲、動物咬傷;急性尿滯留(≥6小時)
- 精神科：自殺行為或傾向
- 眼科：眼內異物
- 耳鼻喉科：耳鼻喉道內異物

Class III（三十分鐘內處理）

- 生命現象：
  - 體溫：38-39℃
- 內科：抽搐已停止者;疼痛但無嚴重症狀者;頭暈(dizziness);血便、黑便、咳血但生命徵象穩定者;嘔吐、腹瀉但生命徵象穩定者;疑似或輕微中風
- 外科：無傷口之軟組織傷害;動物抓傷;血尿;尿路結石;解尿困難
- 精神科：失眠

Class IV（可延後處理）

- 不符合急診以上條例，如：
  - 頭痛、喉痛、咳嗽、流鼻水等感冒症狀。
  - 中風後遺症。
  - 中風已數日，在別處已處理過，來本院等住院者。
  - 已知癌症的病患，其主訴顯然與癌症有關者，且生命徵象正常。
  - 自門診轉來做常規檢查的治療者。
  - 自門診轉來等住院者，但生命徵象正常者。
  - 主訴某種症狀已有相當時日，但生命徵象正常者。

Case 4 (comments)

- Triage should be made by integration of all available parameters instead of judgment one by one.
- In this case, relative bradycardia in consideration of the presence of fever may be the most important clue!
- Other examples: Case A-M

5-Tier READ Triage

- TTAS by Triage Nurses
  - Can modify according to clinical judgment
- Re-triage by Emergency Physicians
  - Register in HIS system
  - 1st re-triage should NOT be lower than TTAS
- Dynamic Triage: (color codes as internationally designed)
  - **Triage I: Red**
  - **Triage II: Orange**
  - **Triage III: Yellow**
  - **Triage IV: Green**
  - **Triage V: Blue**
  - Changing Triage should be treated as an Order!

TTAS檢傷可能衍生問題

- Under-Triage
  - Esp. for Those without Adequate Compensation Mechanisms
  - Difficulties between Triage I and II
- Negative Impact on Efficiency
  - D2B Time
  - Fibrinolytics for New-Onset Ischemic Stroke

Case A

- A 29 year-old female pregnant (GA 28 wks) was brought to ED after a traffic accident.
- Vital signs: GCS E3M6V4 BP 112/70 mmHg, PR 90 bpm, RR 20/min, BT 37.2ºC, SpO2 95%.
- PMH: G1P1, Nil
- ABG: pH 7.350 PaO2 88 PaCO2 40 HCO3 20.2

Physiologic changes in pregnant woman

- Cardiovascular system

1. Heart:
   move upward, hypertrophy of cardiac muscle
2. Cardiac Output
   increase by 30%, reach to peak at 32nd –34th week
3. Blood pressure
   early or mid pregnancy Bp ↓ . late pregnancy Bp↑ .Supine hypotensive syndrome

Physiologic changes in pregnant woman

- Hematology

1. Blood volume

1) Increase by 30%-45% at 32nd –34th (peak)
2) Relatively diluted

2. Composition

1) Red cells
   Hb:130→110g/L, HCT:38%→ 31%.
2) White cells: slightly increase
3) Coagulating power of blood: ↑
4) Albumin: ↓ , 35 g/L

Physiologic changes in pregnant woman

- The Respiratory system

1. R rate: slightly ↑
2. vital capacity: no change
3. Tidal volume: ↑ 40%
4. Functional residual capacity: ↓
5. O_2 consumption: ↑ 20%

Physiologic changes in pregnant woman

- The urinary system

1. Kidney

1) Renal plasma flow (RFP): ↑ 35%
2) Glomerular filtration rate (GFR): ↑ 50%

2. Ureter
   Dilated (P ↑)
3. Bladder
   Frequent micturation

Physiologic changes in pregnant woman

- Gastrointestinal system

1) Gastric emptying time is prolonged→ nausea.
2) The motility of large bowel is diminished → constipation
3) Liver function: unchanged

Physiologic changes in pregnant woman

- Endocrine

1. Pituitary (hypertrophy)

1) LH/FSH: ↓
2) PRL: ↑
3) TSH and ACTH: ↑

2. Thyroid

1) enlarged (TSH and HCG ↑)
2) thyroxine ↑ and TBG ↑ → free T_3 T_4 unchanged

Case A

- Normal Lab values
  - Hct 32% -42%
  - WBC count 5,000-12,000/L
  - Arterial pH 7.40-7.45
  - Bicarbonate 17-22 mEg/L
  - PaCO2 25-30 mmHg

Case A

- Respiratory alkalosis is normal in late pregnancy, whereas “normal” CO2 partial pressure (a PaCO2 35-40 mmHg) may indicate CO2 retention, even impending respiratory failure.

Case B

- A 70 year-old male complains of general weakness for 1 day.
- Vital signs: BP 112/70 mmHg, PR 61 bpm, RR 22/min, BT 39.9ºC, SpO2 95%. GCS E4M6V5
- PMH: Hypertension with medications

Case B

- Different vital signs should be integrated together instead of reading separately!
- Everyone’s normal range may not be the individual’s “normal range”.
- In case 1, TTAS II → Should be modified as Triage I

Case C

- A 77 year-old female has been noted tarry stool for 1 day.
- Vital signs: BP 106/78 mmHg, PR 69 bpm, RR 24/min, BT 36.2ºC, SpO2 96%. GCS E3M6V3-4
- PMH:
  - Dementia for 5 years
  - some kind of heart problem (according to her Indonesia care-giver)

Case C