

즐거로운 1년차 생활

- 성인 심장 -



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자기 소개

- ✓ Date of birth : Nov. 10, 1982 (전주 출생)
- ✓ Workplace : Seoul National University Hospital
- ✓ Specialty : Adult cardiac surgery (aorta, valve)



Contents

✓ 검사 및 환자 평가 – 청진, X-ray, ECG, CAG, CT

✓ 수술

✓ 수술 후 관리

- medication, 발열, 통증, LCOS, I/O, 퇴원 기록

청진

Systolic Murmur

- Aortic stenosis
- Aortic valve sclerosis
- Flow murmur

Diastole

- Aortic regurgitation
- Pulmonic regurgitation

Systole

- Hypertrophic obstructive cardiomyopathy (HOCM)

PDA

Systolic Murmur

- Flow murmur
- Pulmonic stenosis

Systole

- TR
- VSD

Diastole

- TS
- ASD

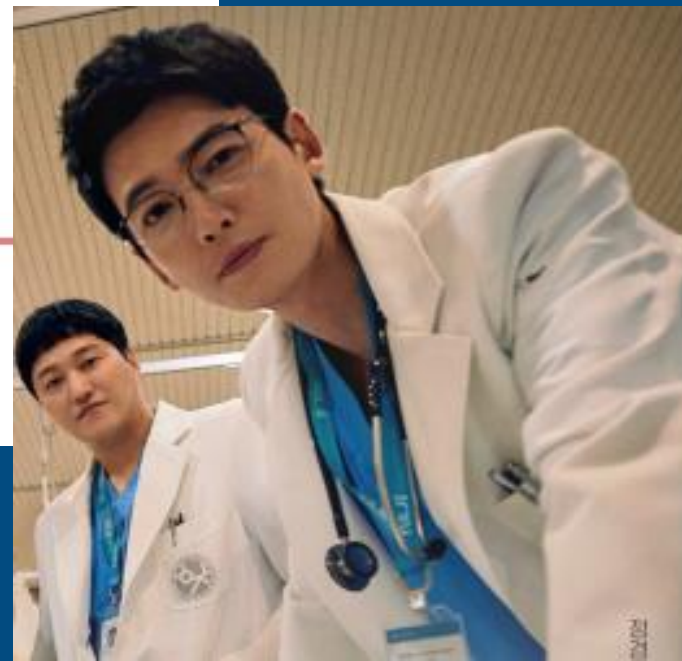
Systole

- MR

Diastole

- MS

A = Aortic P = Pulmonic
T = Tricuspid M = Mitral

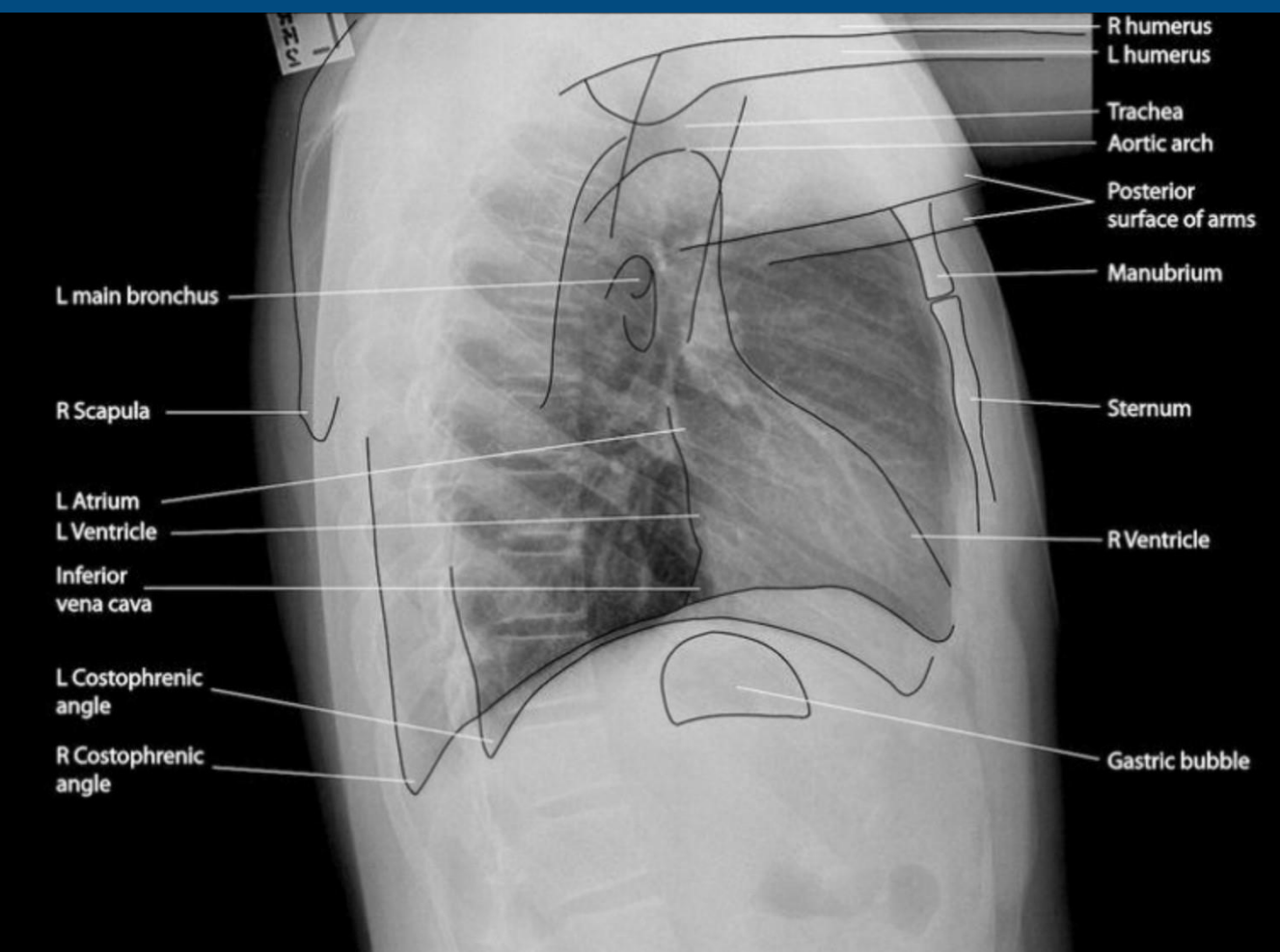
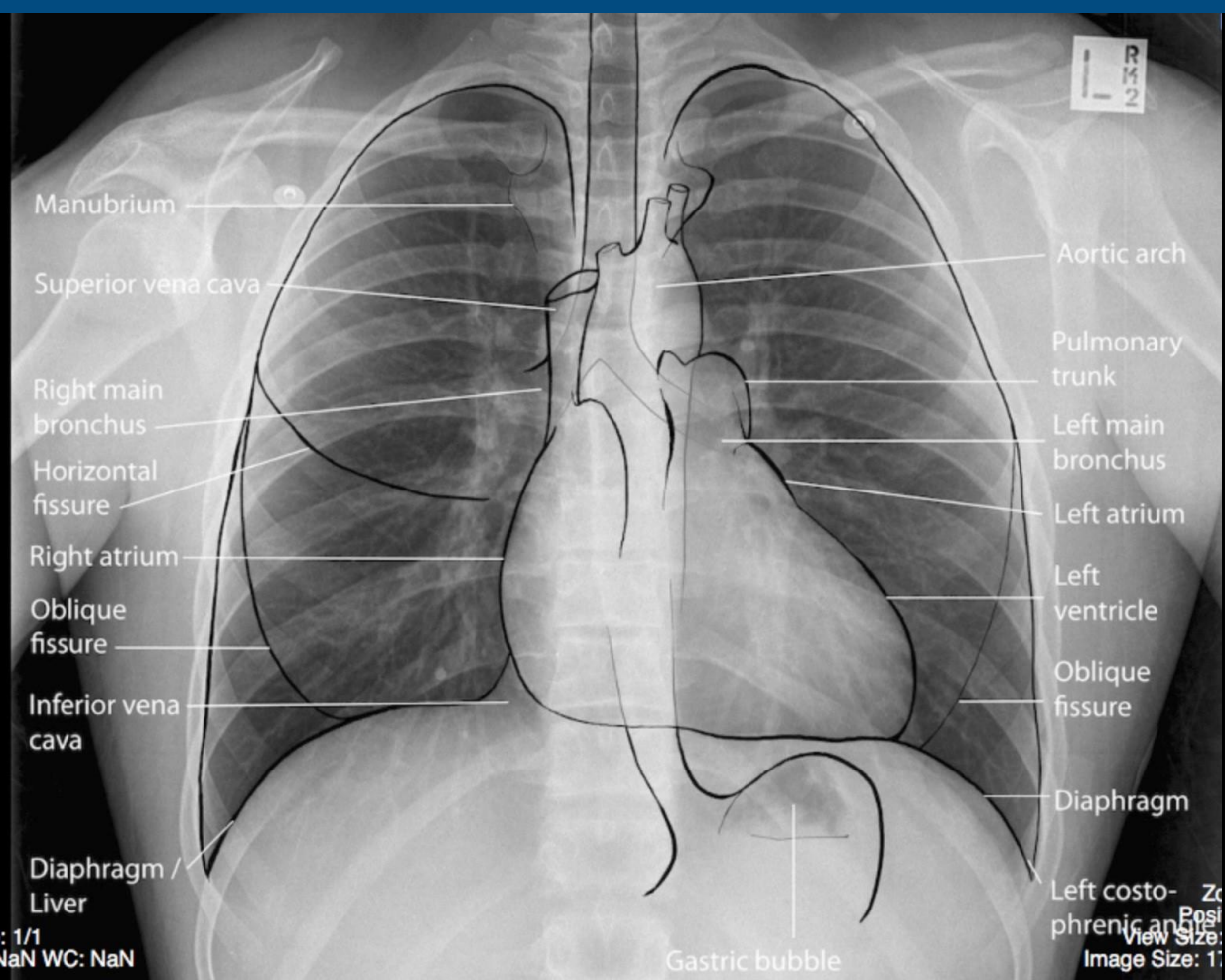


청진

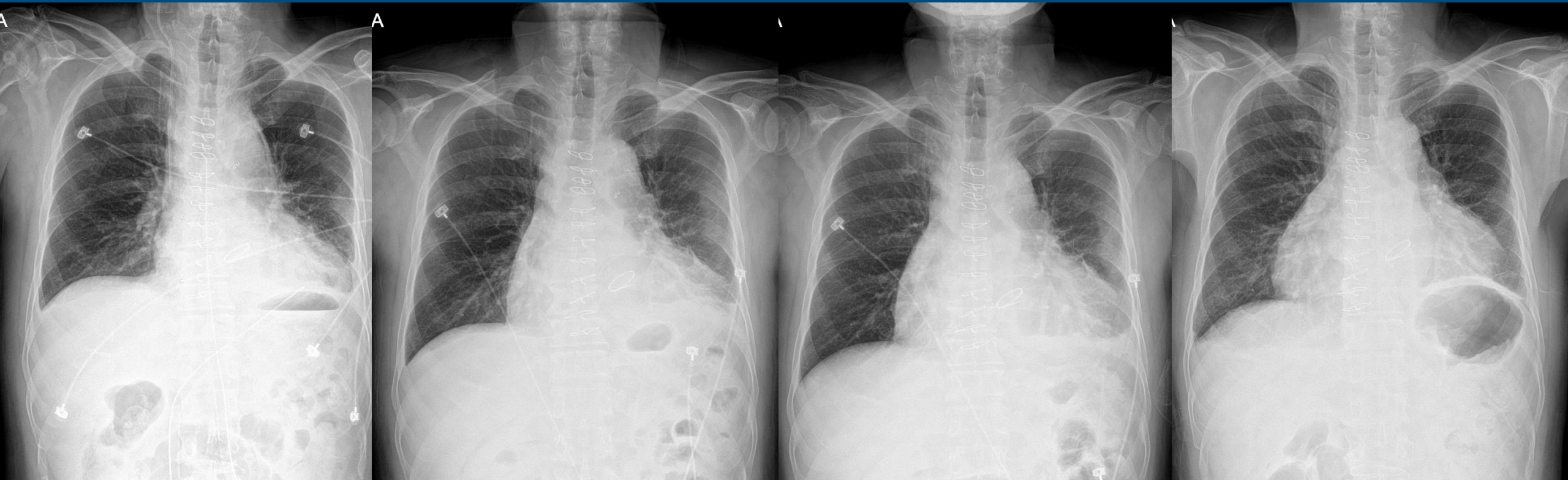
✓ 상행 대동맥류만 있고, echo 소견도 정상인데 청진 해야 되나요?

“많이 해본 자만이 잘할 수 있다.”

Chest X-ray

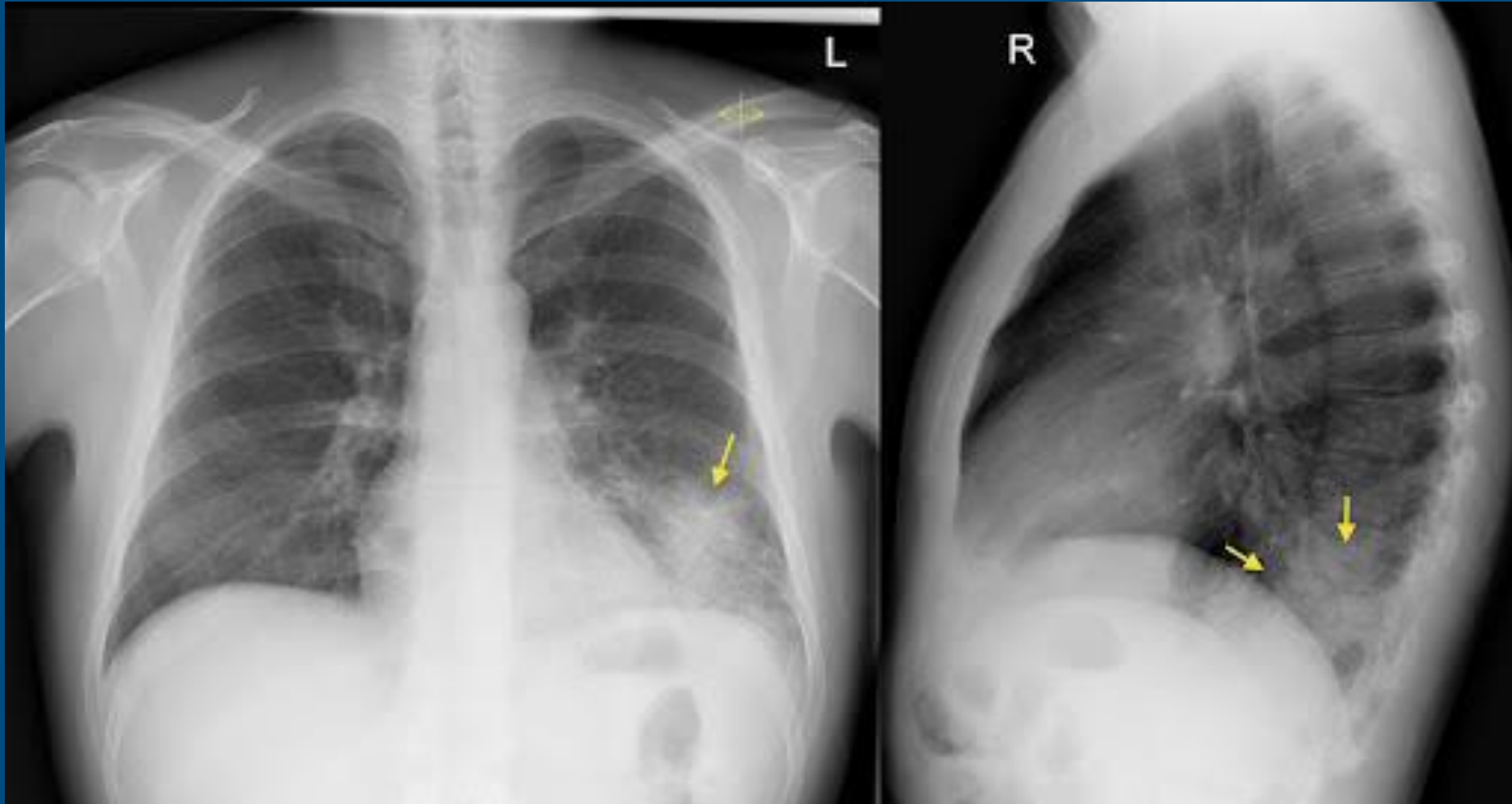


Chest X-ray

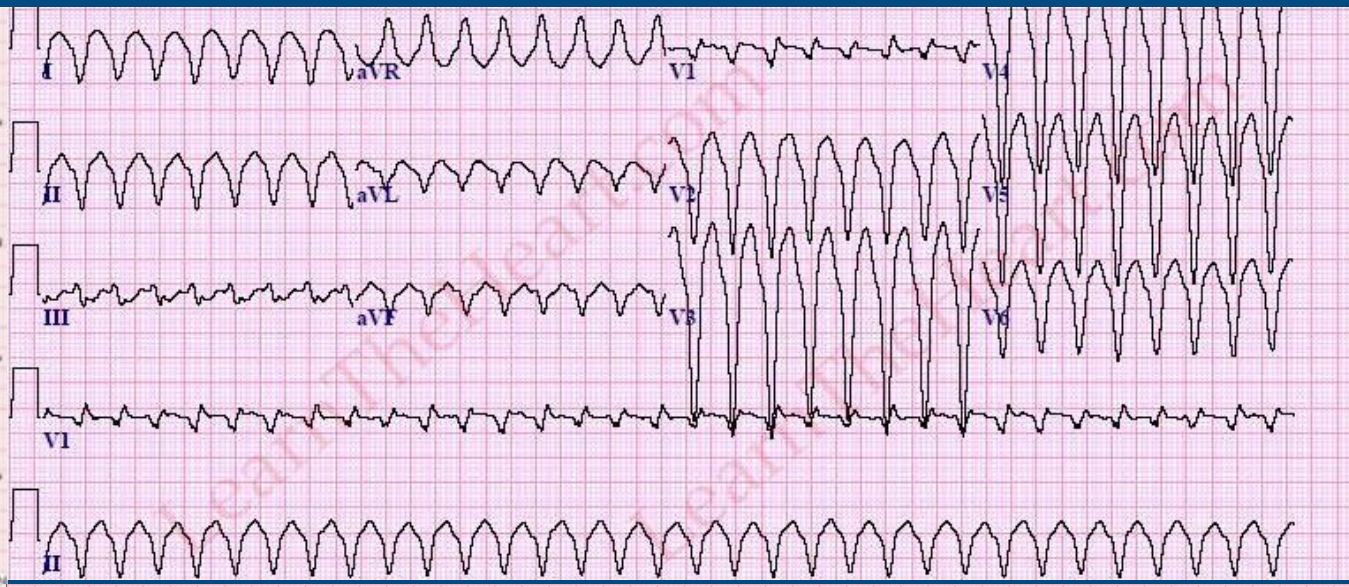
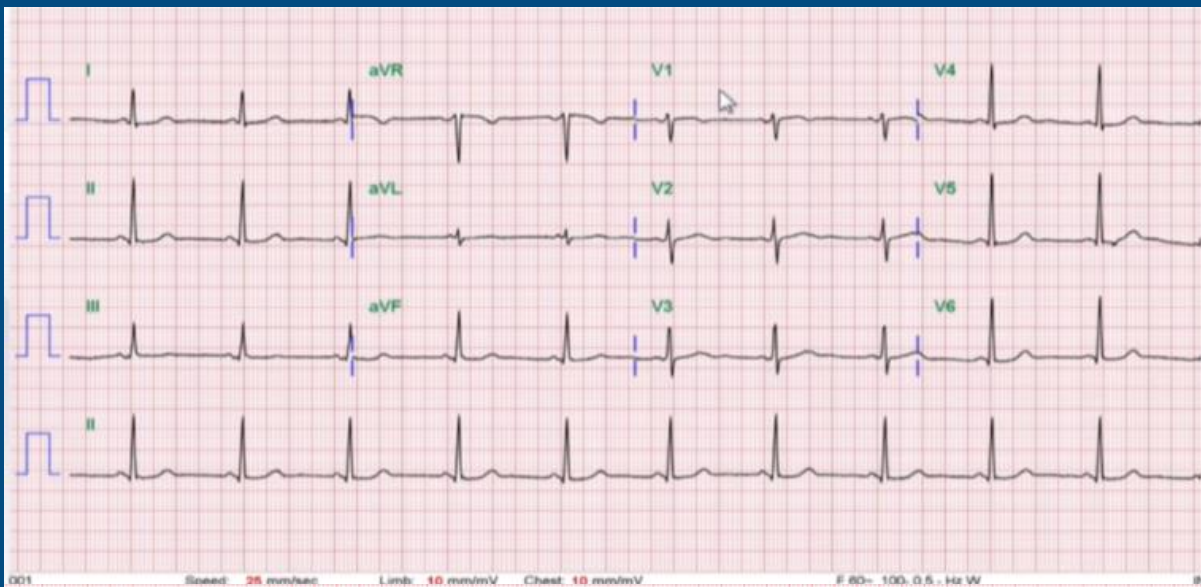


✓ 반드시 여러 장을 같이 놓고 봅니다. !!!

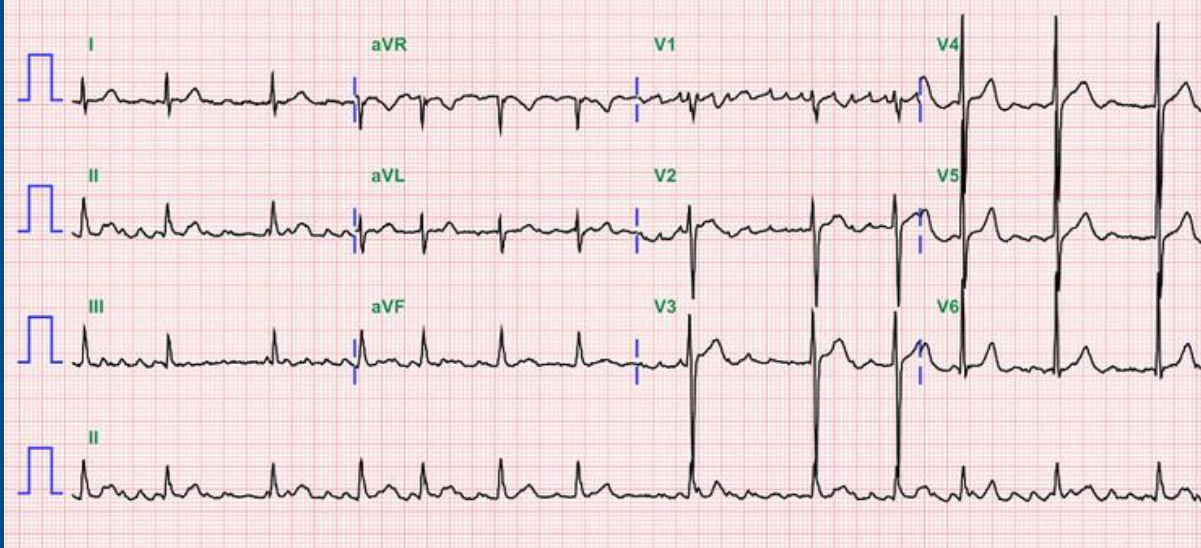
Chest X-ray



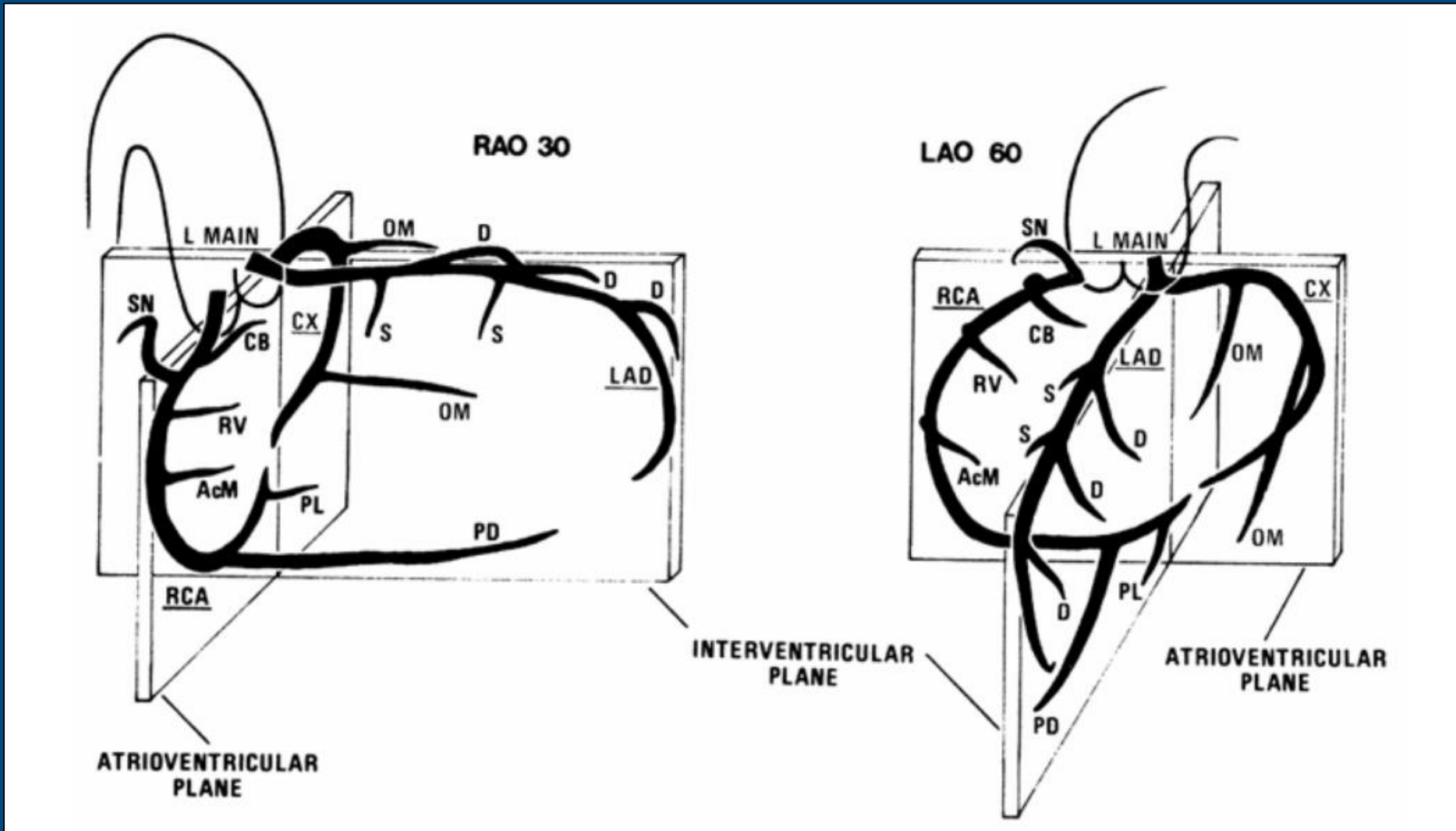
ECG



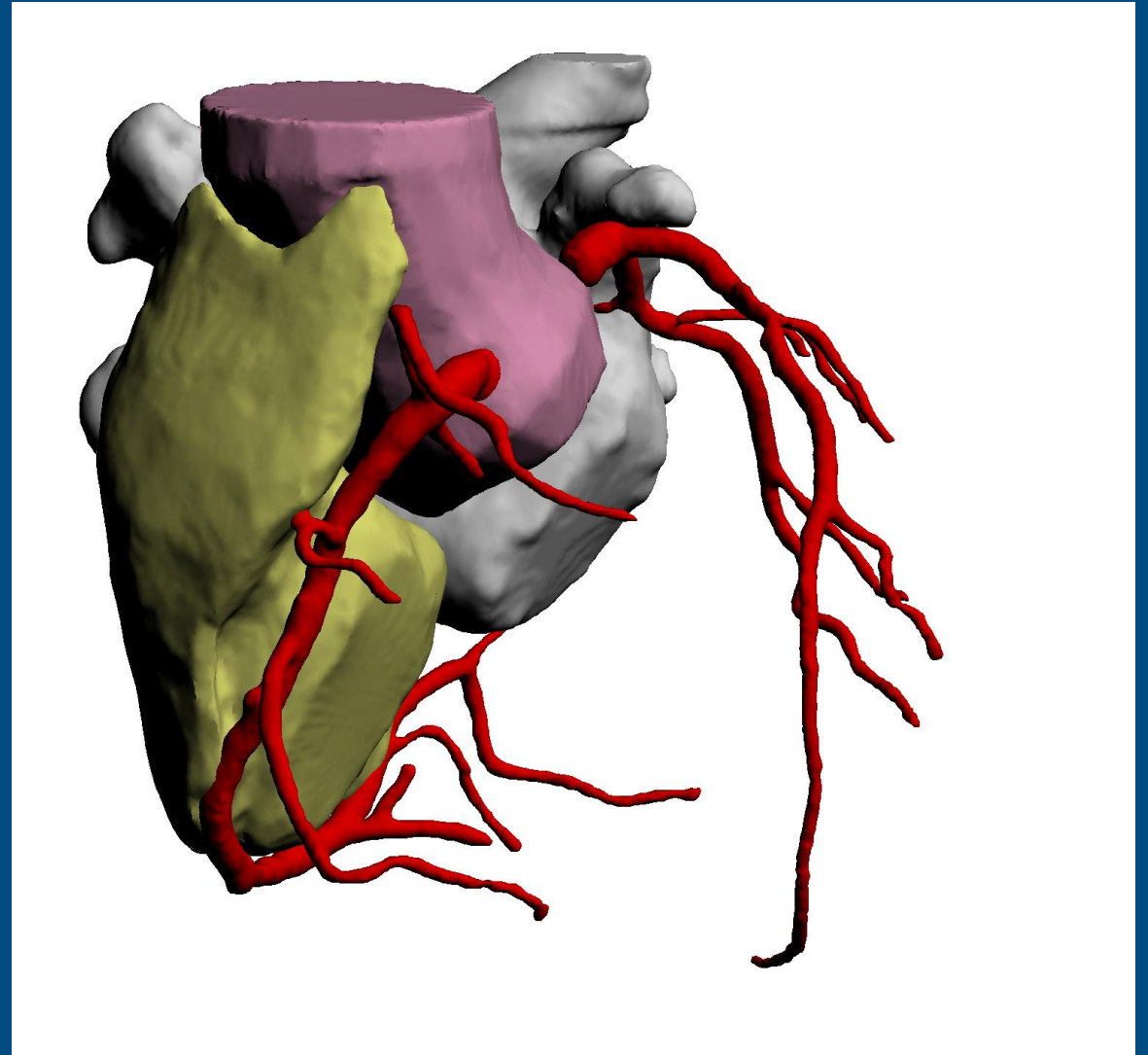
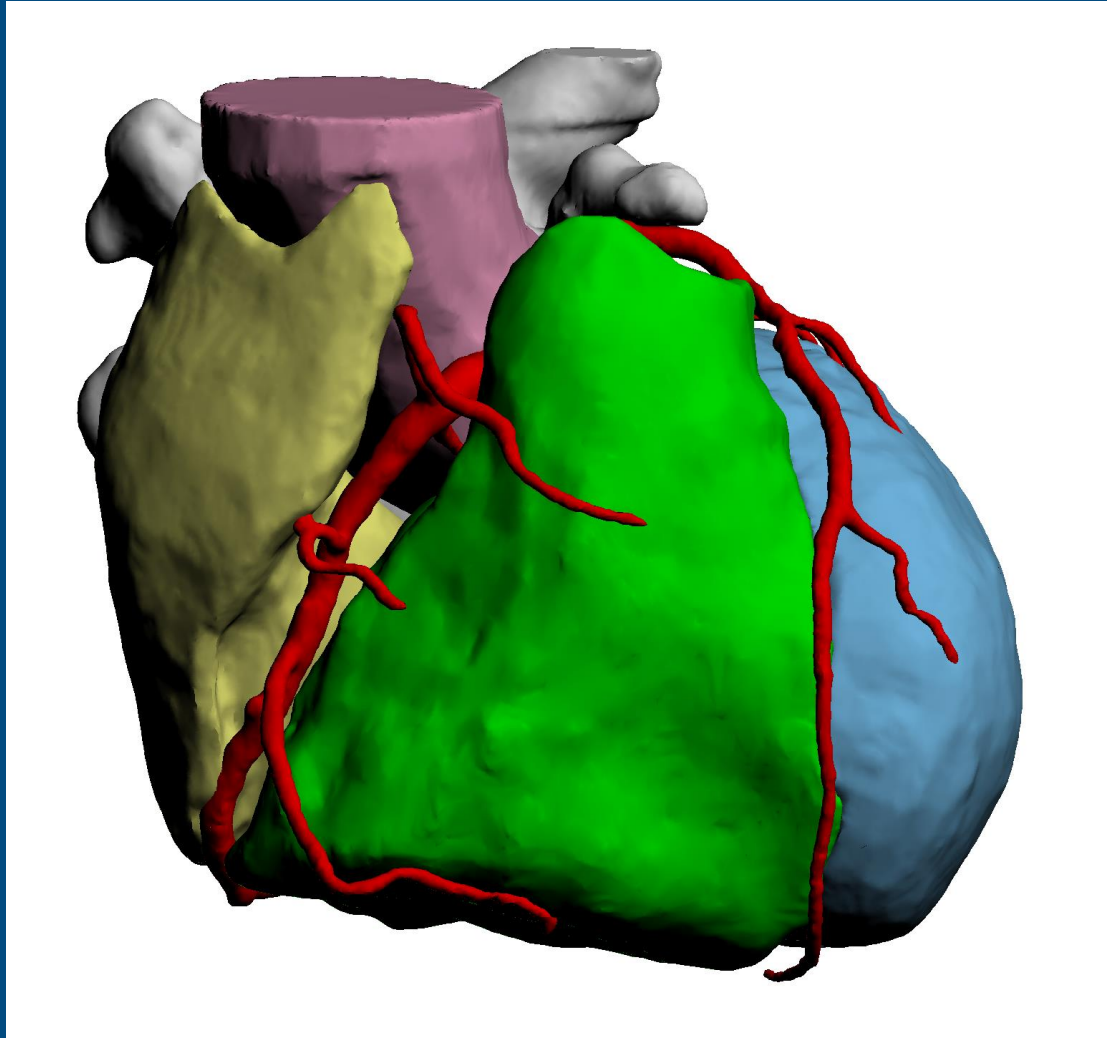
Courtesy of Jason E. Roediger, CCT, CRAT

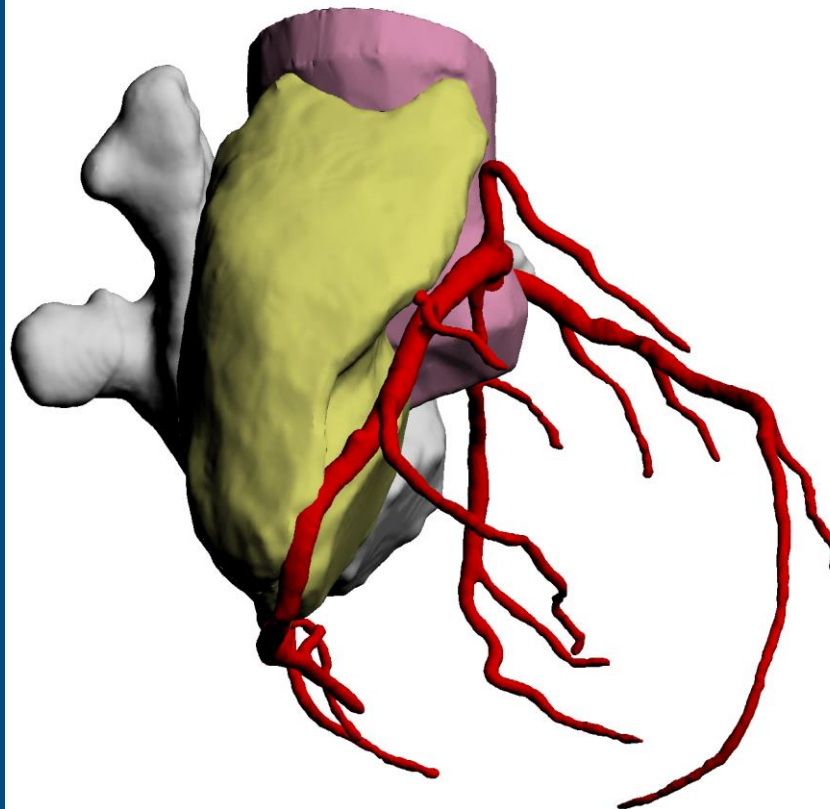
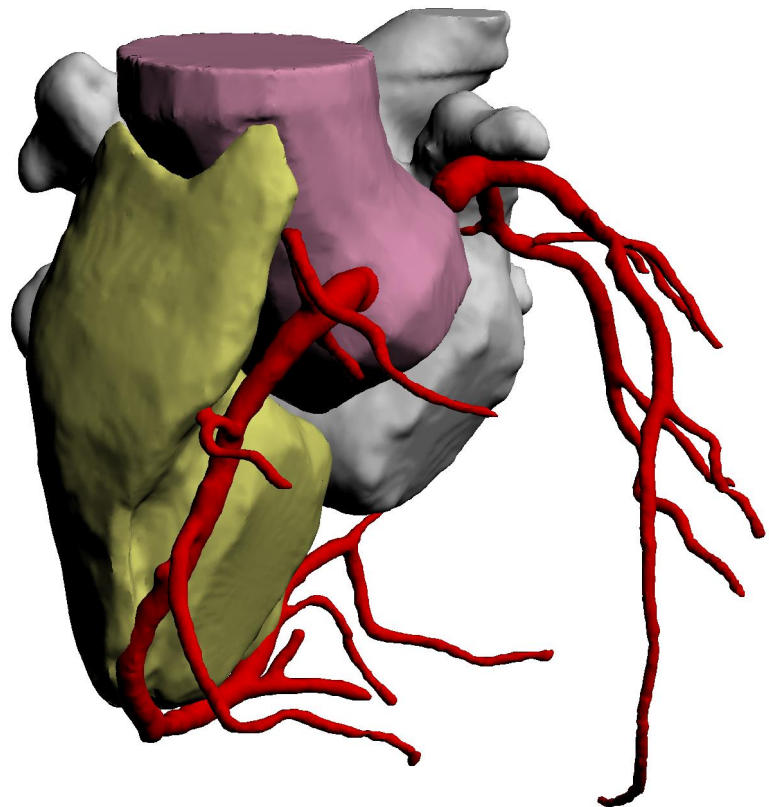


CAG

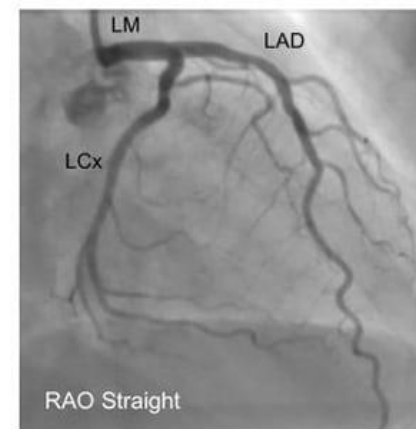


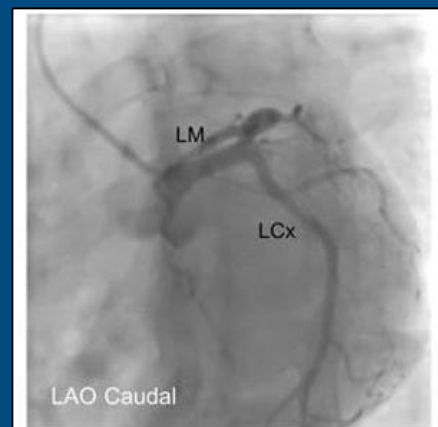
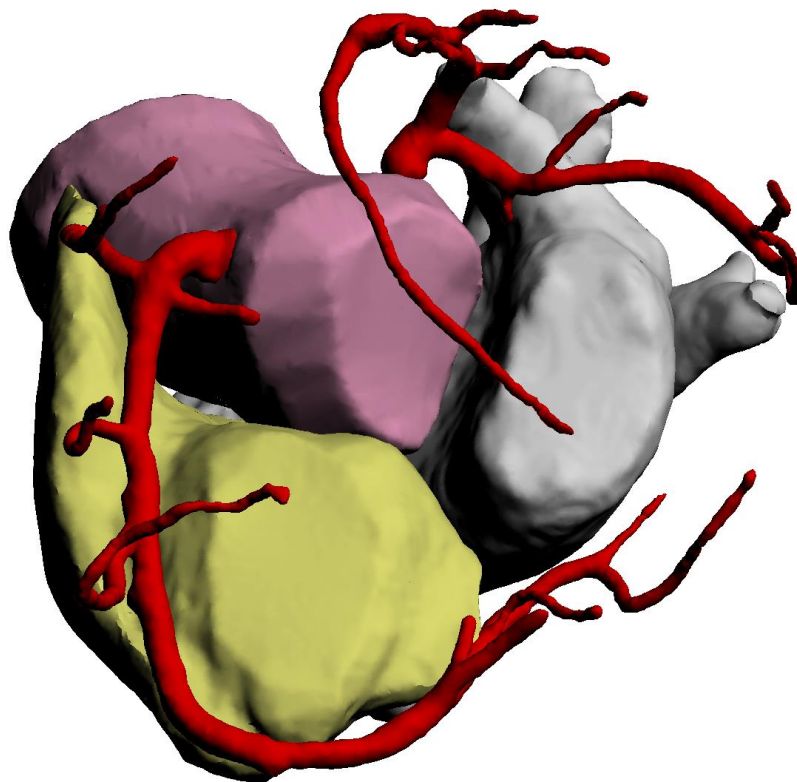
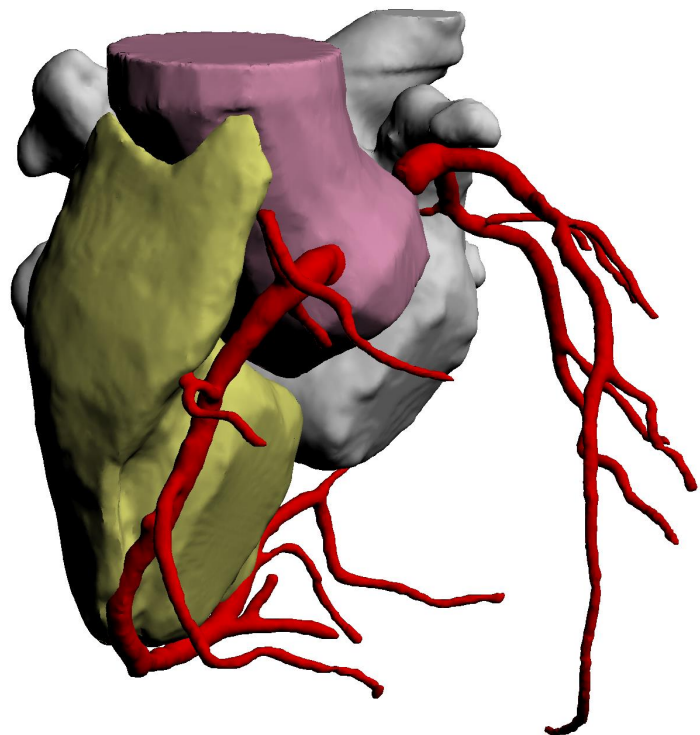
✓ 대부분의 혈관은 LV쪽으로 나온다.



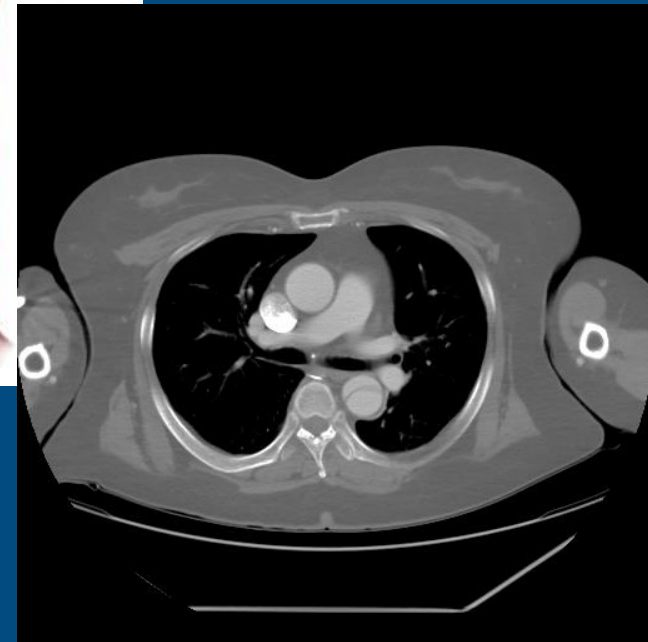
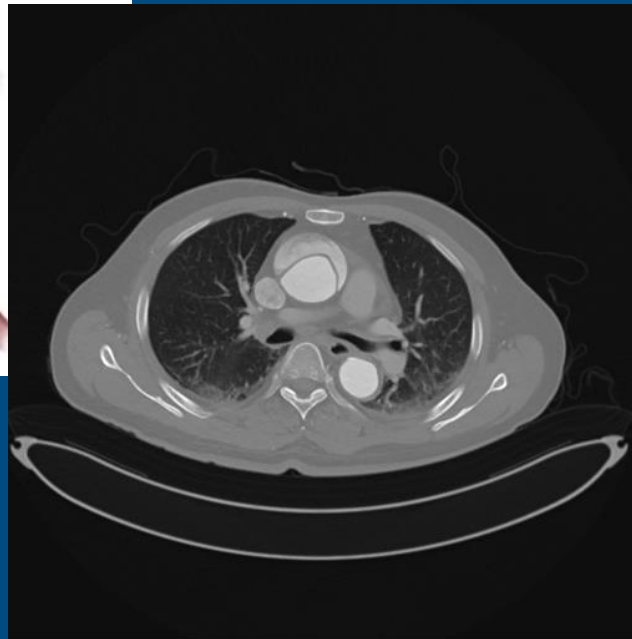
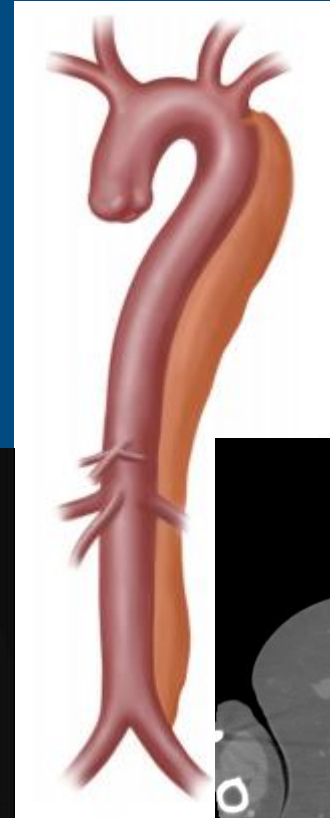
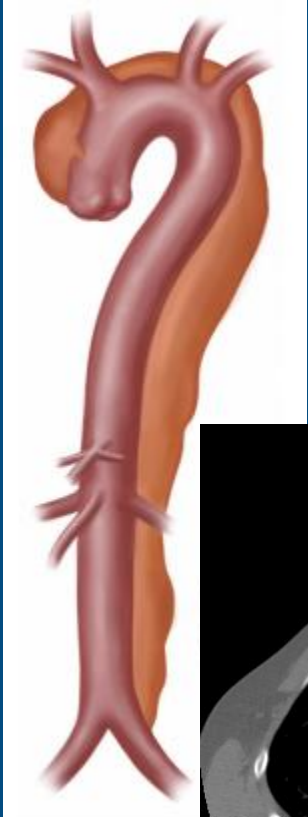


Left Coronary

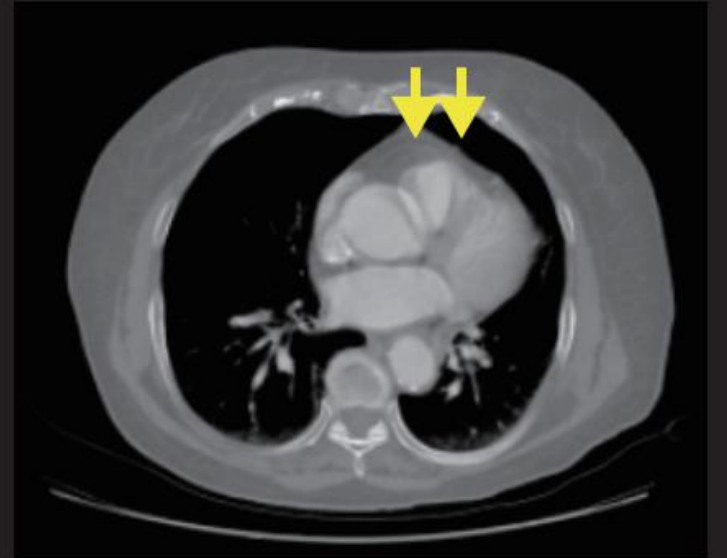
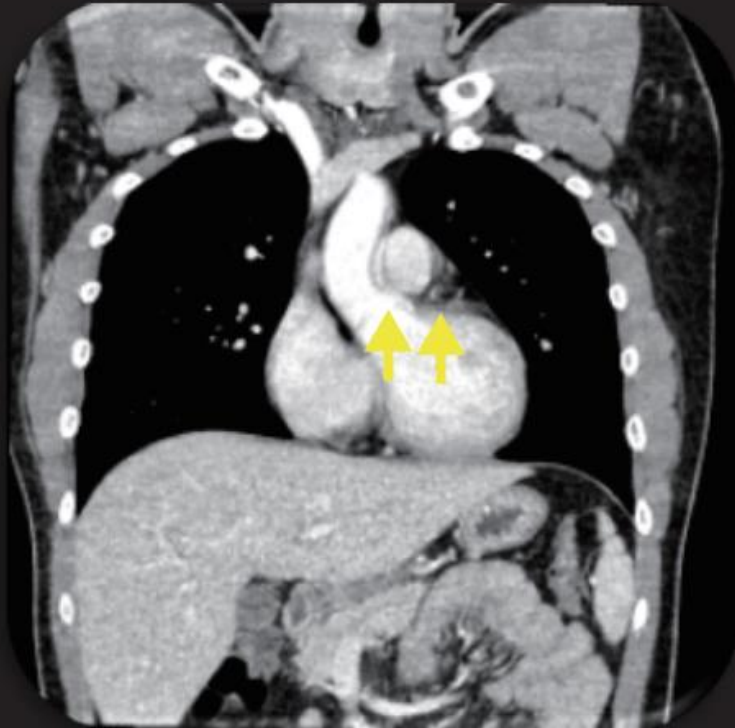
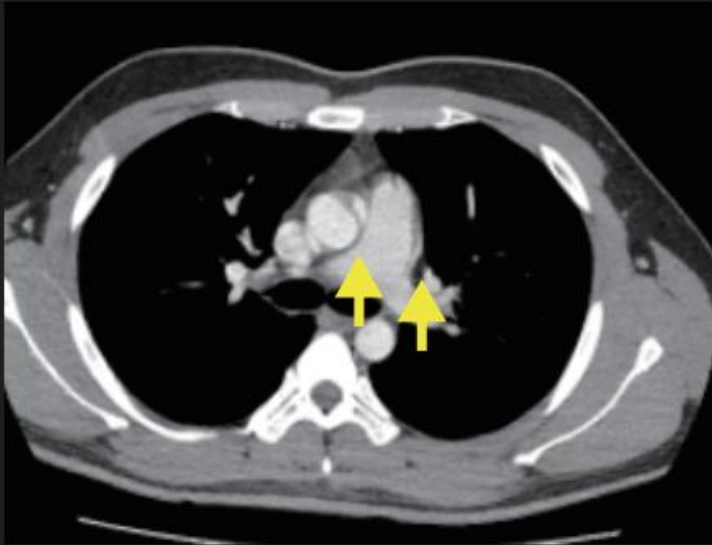




CT



CT (motion artifact)



CT (motion artifact)

CT에서 Motion artifact vs Dissection flap 구별법

구분	Motion artifact	실제 Dissection flap
주로 발생 부위	Ascending aorta (심장 가까운 부위, 박동 심함)	Ascending, arch, descending 모두 가능
형태	흐릿하고 흔들린 모양, 경계 불명확	얇고 선명한 막(fl ap), lumen을 나눔
연속성	특정 단면에서만 보이고 위치 불연속	여러 연속 단면에서 동일하게 관찰됨
해부학적 타당성	lumen을 일관되게 나누지 못하고 설명 어려움	true lumen / false lumen 구분 가능
재구성 영상(MPR, oblique, curved)	다른 각도에서 사라지거나 모양 변화	모든 각도에서 일관되게 flap 확인
주변 소견 동반 여부	없음	대동맥 확장, 혈전, 혈중, pericardial/pleural effusion, branch vessel involvement 가능
감소 방법	ECG-gated CT에서 사라짐	ECG-gated CT에서도 그대로 보임

✓ 증상 확인

✓ 상급자 및 영상 전문

의 상의

수술 – 동의서 받기

'수술동의서' 받았지만 수술내용 없으면...설명의무 '위반'

| 수술동의서에 예상되는 위험성·부작용 등 내용 없어...의료사고 위자료 책정에도 영향 미쳐 주의 요망

수술동의서 서명했어도...法 "충분한 설명 없다면 의무 위반"

수술 전 15분간 동의서 6종 서명...설명의무 위반
"동의서 내용 추상적...병원 측 위자료 배상해야"

설명의무 위반 의사에 4천만원 배상 판결

원고, 의료진은 부정맥만 설명...'방실차단'은 언급없어

수술 직전 뇌졸중 위험 알려준 의사...대법 "설명 의무 위반"

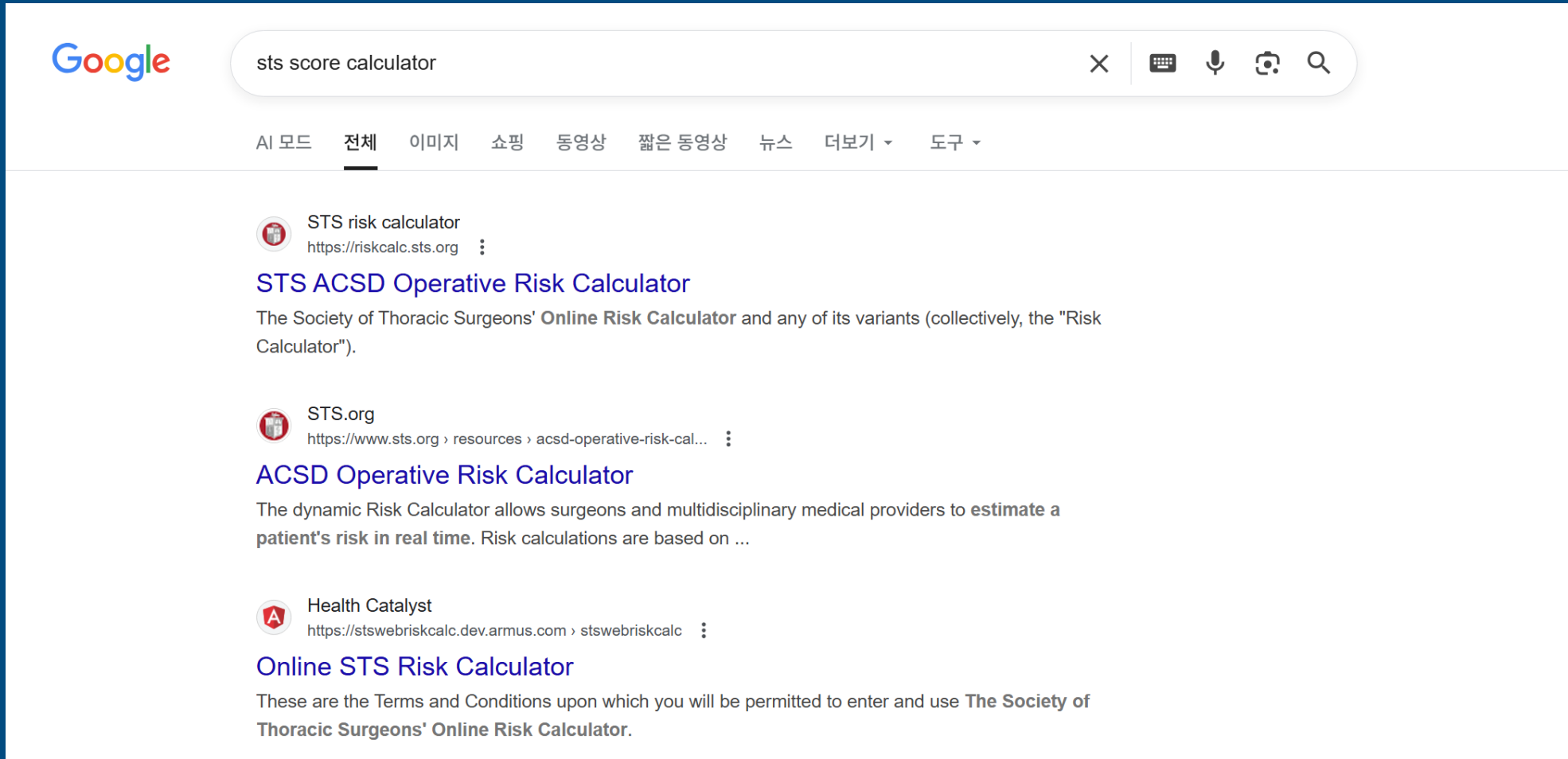
대법 "수술 전 환자 '숙고 시간' 안 준 의사, 설명의무 위반"

수술 – 동의서 받기

- ✓ 수술의 목적, 수술시간, 입원기간, 예후.....
- ✓ 수술의 합병증 설명
- ✓ 공통된 합병증 : bleeding, infection, stroke, pneumonia, AKI, multiorgan failure.....
 - Aorta - paraplegia, hoarseness, esophageal injury
 - CABG - phrenic n palsy, saphenous neuralgia
 - valve - LV rupture (mitral valve replacement), AV block (permanent PM insertion)
 - ECMO – leg ischemia

수술 – 동의서 받기

✓ 예측 사망률



The screenshot shows a Google search interface with the query "sts score calculator". The search results are as follows:

- STS risk calculator**
https://riskcalc.sts.org
STS ACSD Operative Risk Calculator
The Society of Thoracic Surgeons' **Online Risk Calculator** and any of its variants (collectively, the "Risk Calculator").
- STS.org**
https://www.sts.org › resources › acsd-operative-risk-cal...
ACSD Operative Risk Calculator
The dynamic Risk Calculator allows surgeons and multidisciplinary medical providers to **estimate a patient's risk in real time**. Risk calculations are based on ...
- Health Catalyst**
https://stswebriskcalc.dev.armus.com › stswebriskcalc
Online STS Risk Calculator
These are the Terms and Conditions upon which you will be permitted to enter and use **The Society of Thoracic Surgeons' Online Risk Calculator**.



STS Short-term / Operative Risk Calculator

Adult Cardiac Surgery Database - All Procedures

Answer All Questions that Apply for Accurate Estimates

Planned Surgery



Selection Required ▾

Surgery Incidence



Select ▾

Surgical Priority



Select ▾

Demographics

Sex



Select ▾

Age (years)



Height (cm)



Weight (kg)



Race



Select all that apply ▾

Payor / Insurance



Select a maximum of 2 ▾

Laboratory Values

Creatinine (mg/dL)



Hematocrit (%)



WBC Count (10³/μL)



Platelet Count (cells/μL)



Preoperative Medications

☐ ACE Inhibitors/ARBs ≤ 48 hrs

☐ GP IIb/IIIa Inhibitor ≤ 24 hrs

☐ Inotropes ≤ 48 hrs

☐ Steroids ≤ 24 hrs

☐ ADP Inhibitors ≤ 5 days

Risk Factors/Comorbidities

Diabetes



Select ▾

☐ Family Hx of CAD

☐ Hypertension

☐ Liver Disease

☐ Mediastinal Radiation

☐ Unresponsive State

☐ Dialysis

☐ Cancer ≤ 5 yrs

☐ Syncope

☐ Immunocompromised

Endocarditis



Select ▾

Illicit Drug Use



Select ▾

Alcohol Use



Select ▾

Tobacco Use



Select ▾

Pulmonary

Chronic Lung Disease



Select ▾

☐ Recent Pneumonia

☐ Sleep Apnea

☐ Home O₂

Vascular

Cerebrovascular
Disease



Select ▾

☐ Peripheral Artery Disease

☐ Right Carotid Sten. ≥ 80%

☐ Prior Carotid Surgery

☐ Left Carotid Sten. ≥ 80%

Cardiac Status

Heart Failure



Select ▾

NYHA Classification



Select ▾

PreOp Mech Circ Support



Select all that apply ▾

Ejection Fraction (%)



☐ Cardiogenic Shock

☐ Resuscitation ≤ 1hr

Coronary Artery Disease

Prim. Coronary Symptom



Select ▾

Myocardial Infarction-when



Select ▾

No. of Diseased Vessels



Select ▾

Valve Disease

☐ Aortic Stenosis

☐ Aortic Root Abscess

☐ Mitral Stenosis

Aortic Regurgitation



Select ▾

Mitral Regurgitation



Select ▾

Tricuspid Regurgitation



Select ▾

Arrhythmia

Atrial Fibrillation



Select ▾

Atrial Flutter



Select ▾

V. Tach / V. Fib



Select ▾

Sick Sinus Syn.



Select ▾

2nd Degree Block



Select ▾

3rd Degree Block



Select ▾

Previous Cardiac Interventions (Select all that apply)

☐ CABG

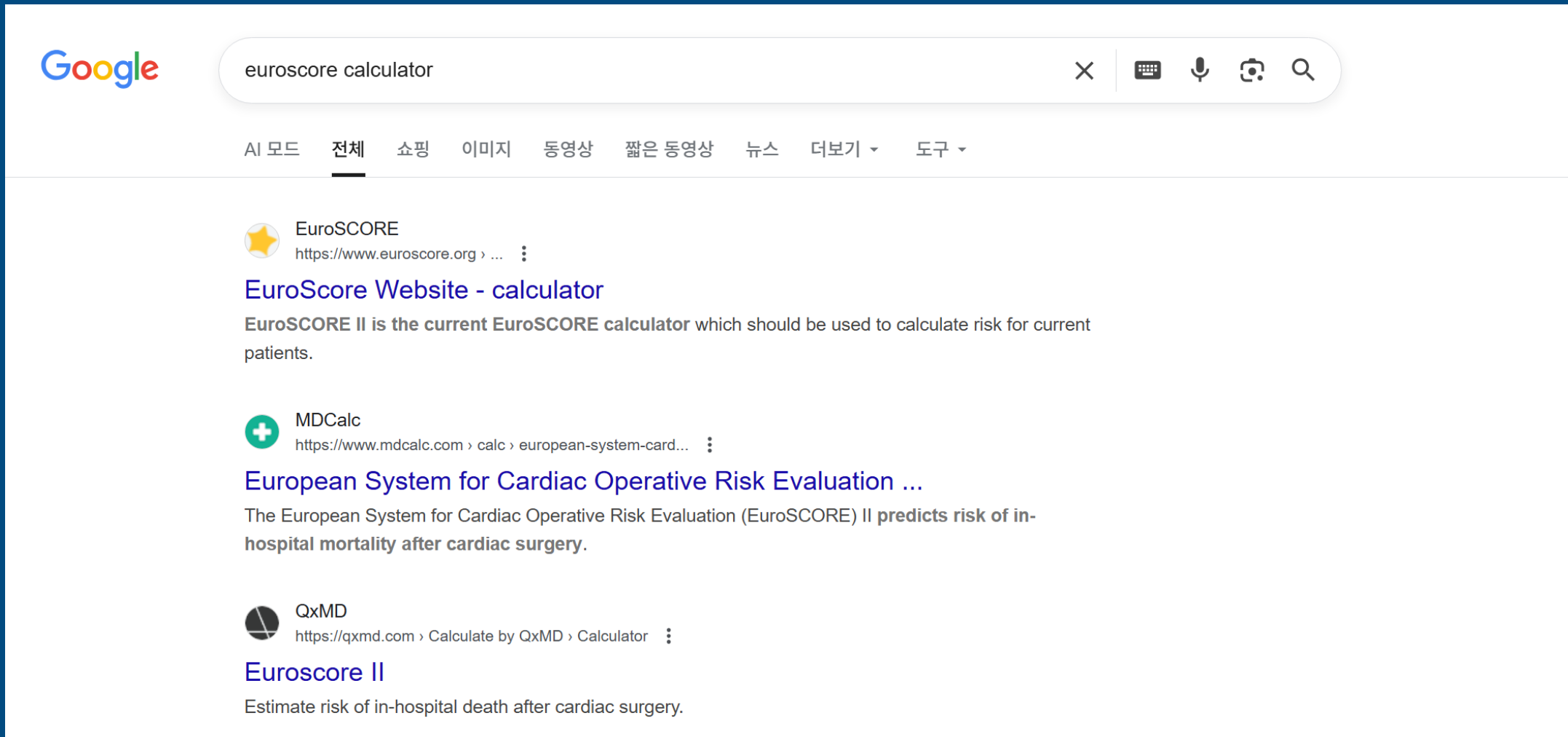
☐ Valve

☐ PCI

☐ Other

수술 – 동의서 받기

✓ 예측 사망률



The screenshot shows a Google search for "euroscore calculator". The search bar is at the top with the text "euroscore calculator" and various icons (X, keyboard, microphone, camera, search). Below the search bar are tabs for "AI 모드", "전체", "쇼핑", "이미지", "동영상", "짧은 동영상", "뉴스", "더보기", and "도구". The "전체" tab is selected. The search results are listed below:

- EuroSCORE**
https://www.euroscore.org > ...
EuroScore Website - calculator
EuroSCORE II is the current EuroSCORE calculator which should be used to calculate risk for current patients.
- MDCalc**
https://www.mdcalc.com > calc > european-system-card...
European System for Cardiac Operative Risk Evaluation ...
The European System for Cardiac Operative Risk Evaluation (EuroSCORE) II predicts risk of in-hospital mortality after cardiac surgery.
- QxMD**
https://qxmd.com > Calculate by QxMD > Calculator
Euroscore II
Estimate risk of in-hospital death after cardiac surgery.

EuroSCORE II calculator

EuroSCORE II

EuroSCORE I (additive) ?

EuroSCORE I (logistic) ?

Important: EuroSCORE II is the current EuroSCORE calculator which should be used to calculate risk for current patients. If you need to calculate the older EuroSCORE I (additive or logistic), please select the appropriate tag above.

Patient-related factors

age ?	
biological sex	Male
chronic lung disease ?	☐ no
extracardiac arteriopathy ?	☐ no
poor mobility ?	☐ no
previous cardiac surgery ?	☐ no
active endocarditis ?	☐ no
critical preoperative state ?	☐ no
renal impairment ?	normal (CC > 85 ml/min)
creatinine clearance	

Cardiac-related factors

CCS angina class 4 ?	☐ no
LV function	good (LVEF > 50%)
recent MI ?	☐ no
pulmonary hypertension ?	No
NYHA class	I

Operation-related factors

surgery on thoracic aorta ?	☐ no
urgency of operation ?	elective
weight of operation ?	isolated CABG

EuroSCORE II

0.00 %

Based on the information you have provided... if 100 people with a similar condition had a similar operation, 0 may be expected to die, whereas 100 would be expected to survive. Your EuroSCORE is 0.00.

reset

수술 – 동의서 받기

✓ 반드시 상급자가 하는 것을 같이 참관 합니다. !!!

百聞不如一見

백

일백

문

들을

불

아니

여

같을

일

한

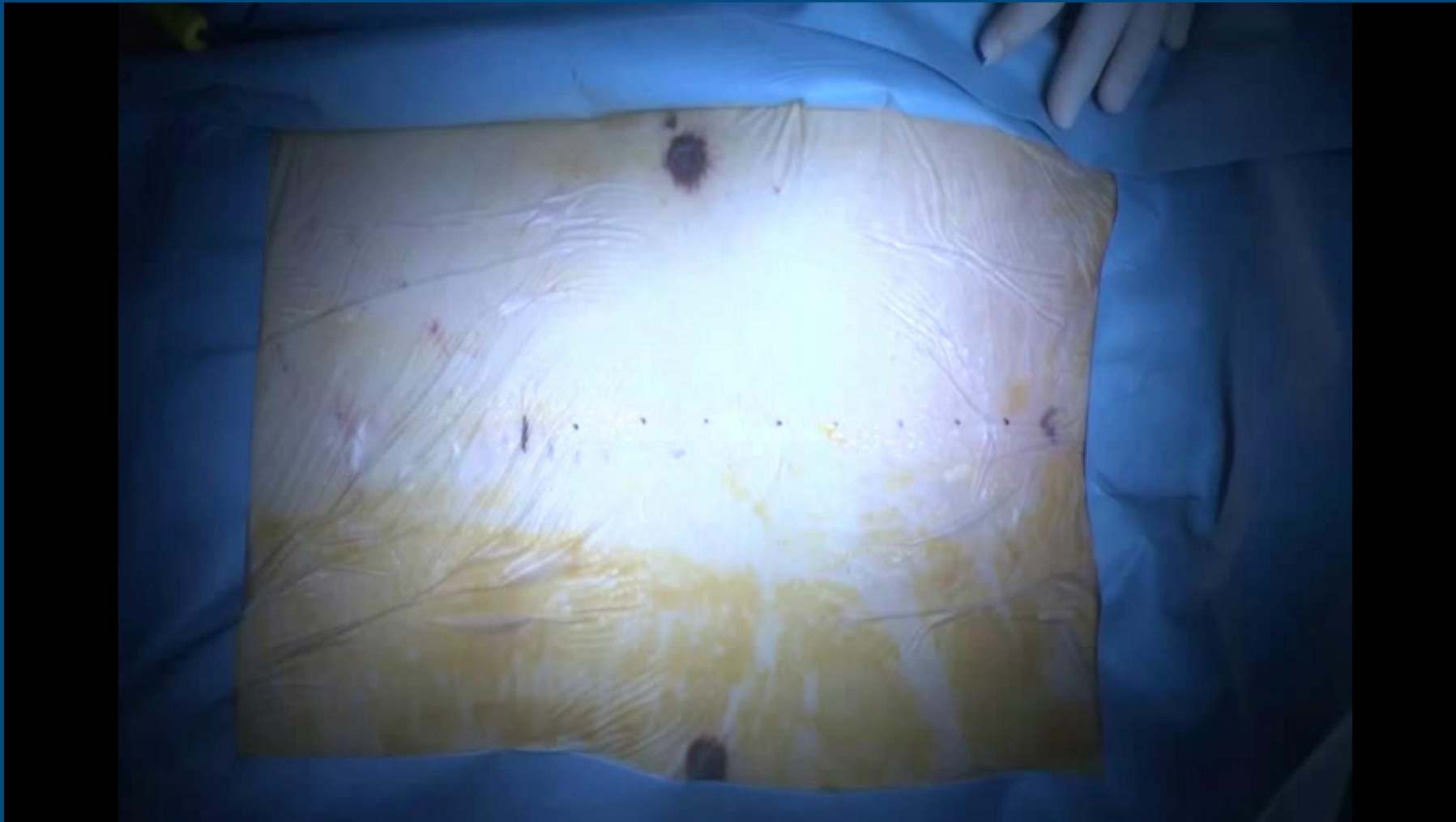
견

볼

백 번 듣는 것이 한 번 보는 것만 못하다는 뜻으로, (1) 무엇이든지 경험(經驗)해 보아야 보다 확실(確實)히 알 수 있다는 말 (2) 간접적(間接的)으로 듣기 만하면 암만 해도 직접(直接) 보는 것보다는 확실(確實)하지 못하다는 말.

Sternotomy

✓ 가장 기본이 되는 approach



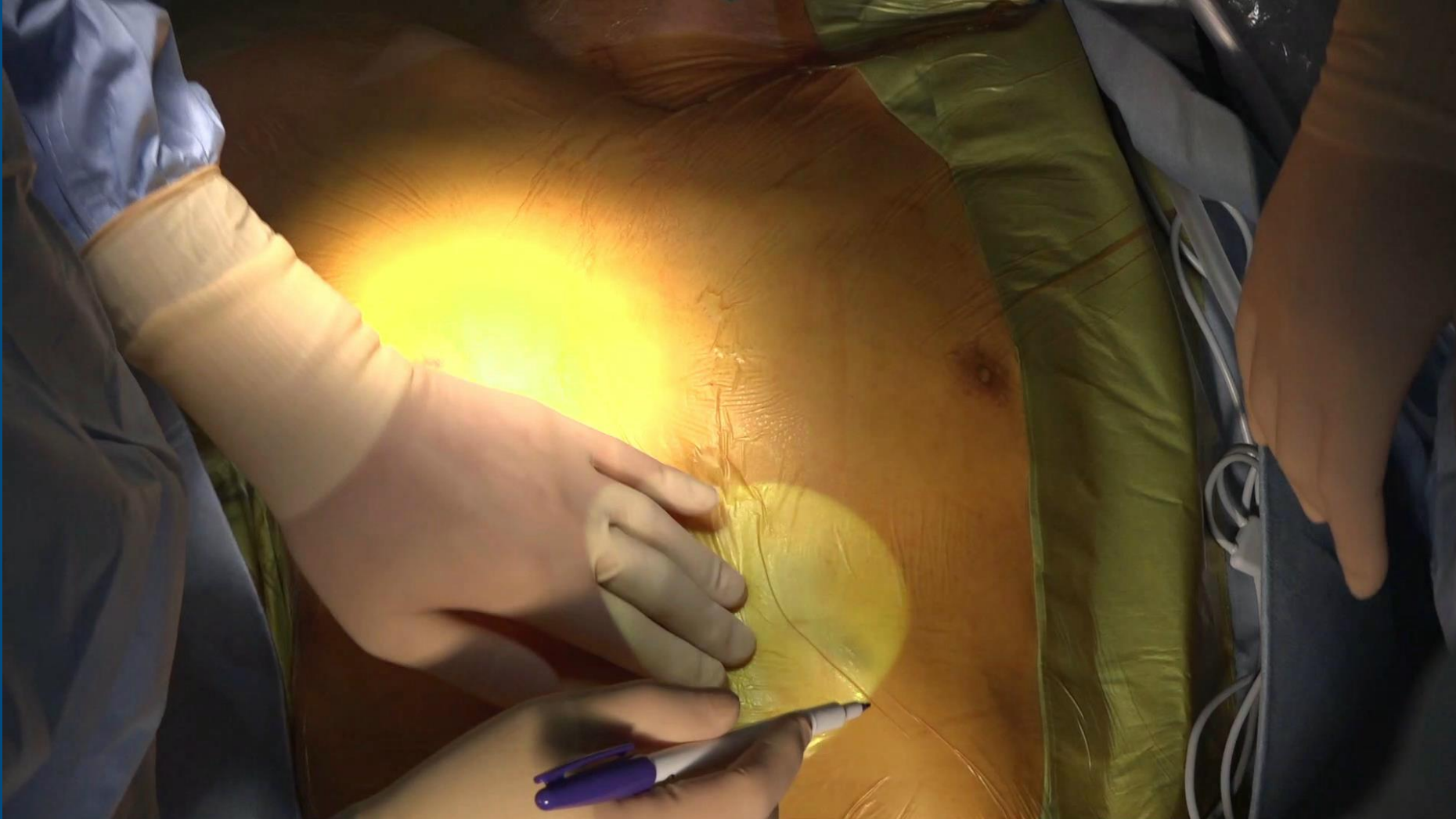
Right Anterior thoracotomy

- ✓ Aortic valve replacement



Lateral thoracotomy

- ✓ Mitral and tricuspid valve



Laparotomy

- ✓ Abdominal aortic aneurysm



수술 후 관리 - medication

약제	특징 및 유의사항
ACE inhibitors : Captopril, Enalapril, Perindopril, Ramipril	- 심부전에 권장 - 신혈관 협착 및 고칼륨혈증 시 주의 - 임신 및 혈관부종에서 금기
Angiotensin receptor blocker (ARB) : Candesartan, Losartan, Valsartan, Irbesartan, Telmisartan, Fimasartan	
Beta blocker : Atenolol, Carvedilol, Bisoprolol, Nebivolol	
Calcium channel blocker : Amlodipine, Diltiazem, Nifedipine	- 협심증, 심근경색 시 권장 - 심한 천식 및 서맥에서 금기
Thiazide : Hydrochlorothiazide, Indapamide	- 수축기 단독 고혈압, 협심증 시 권장
	- 통풍, 저칼륨혈증 시 금기

수술 후 관리 - fever

- “ OOO 환자 체온이 38.9도 입니다”
 - POD # OO..????
 - 적극적인 lung care vs. imaging or B/Cx
 - Wound 확인
 - sternal instability, discharge, redness, heating sense, pain.....
 - CXR 및 청진
 - 가래 양상, breathing sound.....
 - 그 외 fever focus..
 - phlebitis, UTI

슬기로운
의사생활* 매주[목] 밤9시 방송

tvN

15



tvN
DRAMA
구독

수술 후 관리 - 부정맥

- “환자의 맥박 수가 조금 전부터 분당 130회 입니다...”
 - ECG (Afib, PSVT, sinus tachycardia)
- Postoperative Afib
 - Cause: E' imbalance, fever, pain, dehydration, desaturation, inotropics
 - 원인 교정 후 rhythm control vs. rate control...

A fib management

1. Hypovolemia : volume try (I/O 확인)
2. Hypokalemia : Potassium 보충
3. Hypomagnesemia : magnesium 보충
4. Pain control
5. Amiodarone, anticoagulation start – 병원의 protocol에 따라
6. 혈액학적으로 불안정 할 때 : 상급자 noti, cardioversion 고려

수술 후 관리 – 저혈압 (LCOS)

**혈압이 낮고 소변이 안나옵니다.
어지럽고 손발이 차갑습니다.**

01

Low cardiac output symptom

- Low blood pressure
- Confusion
- Clammy skin of hand, foot
- Shortness of breath
- Fatigue and chest pain
- Arrhythmia
- Swelling in leg, feet (edema)

$$\begin{aligned}\text{CO} &= \text{Heart rate} \times \text{Stroke volume} \\ &= \text{Heart rate} \times (\text{EDV} - \text{ESV})\end{aligned}$$



Arrhythmia

Antiarrhythmia drug
Pacemaker



Preload



Afterload
(contractility)

IV volume
Inotropic agent

LCOS management

1. Foley insertion → strict I/O check
2. Medication start : inotropics
3. Lasix try
4. SubICU 또는 ICU로 전동 고려.

- ✓ Noti 가 오기 전에 20-30분 단위로 환자 상태 확인.
- ✓ Foley 에서 소변이 떨어지는 것 확인.
- ✓ 2-3시간 정도 경과 관찰했는데, 호전이 없을 경우 다시 상급자와 상의

수술 후 관리 – I/O

- “ 오늘 하루 I/O negative 1500 되었습니다.”
 - I/O 의 기본 notify는 OOOO/OOOO 로 해주세요....
 - Preoperative B.wt, target B.wt 을 우선 생각해야 한다.
 - 환자의 P/Ex 이 최우선
 - 환자의 volume status 를 우선 평가할 것
 - Axilla, tongue, urine color, thirsty
 - Dehydration status일 때는 volume replacement를 우선시
 - Diuretics 는 신중히 (특히, 저녁에 -> 낙상 위험이 있음)
- ✓기본적으로 -500 에서 +500 정도는 크게 문제 되지 않습니다.
- ✓ AS인 경우 너무 체중이 많이 빠지지 않도록 주의

퇴원 오더 & 기록

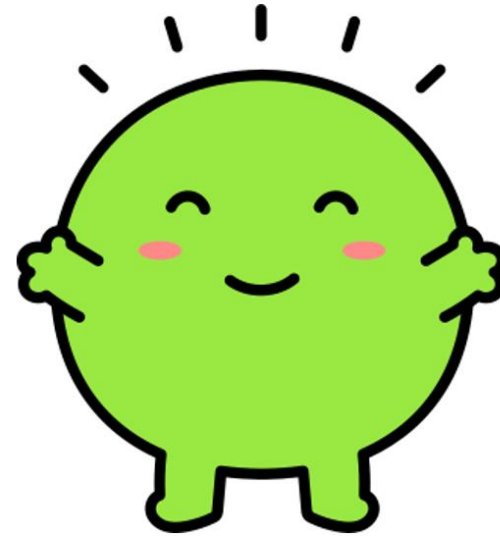
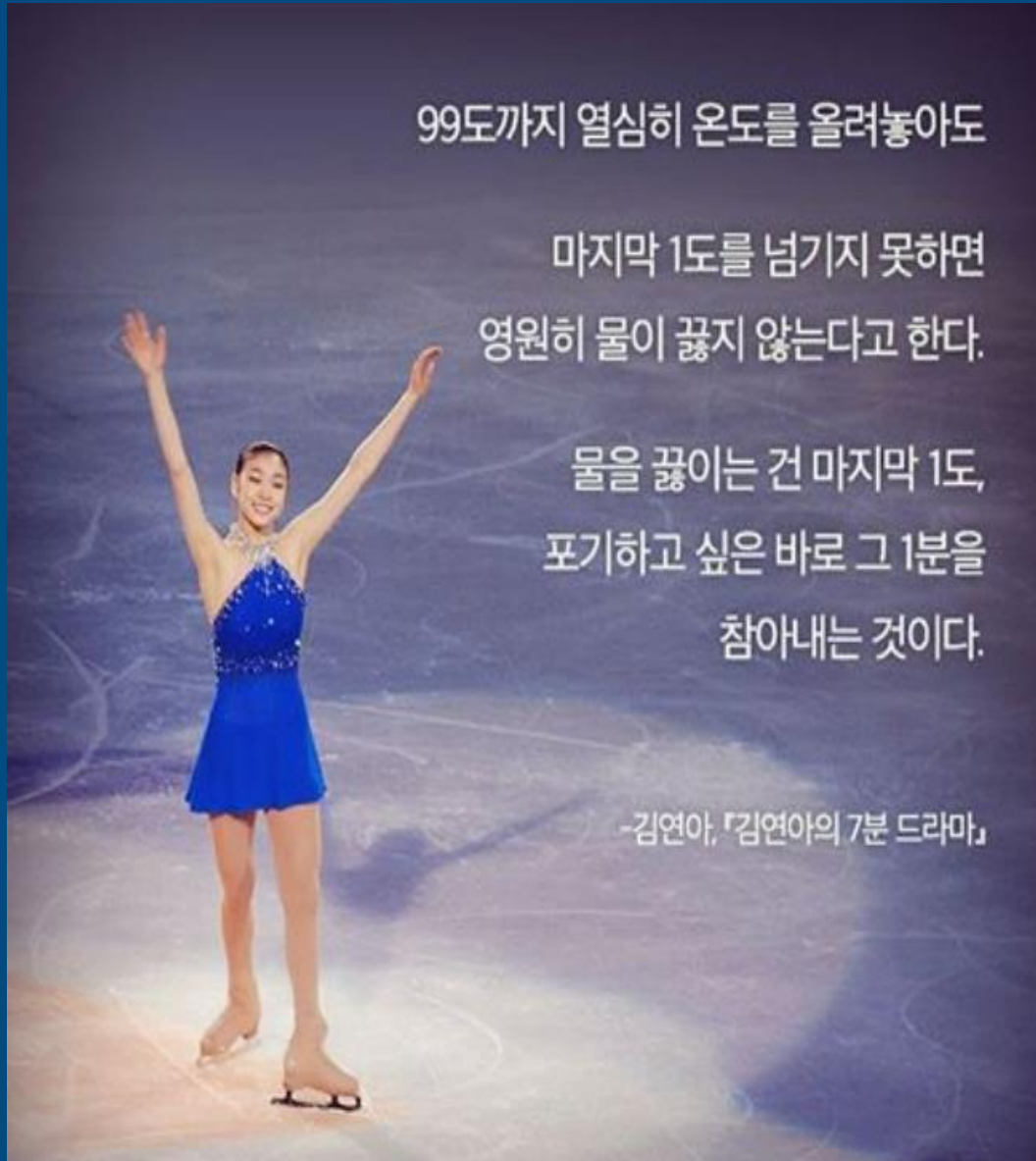
- 약의 종류와 용량 확인
 - Diuretics, antibiotics, NSAIDs...
- 퇴원 기록
 - 입원 치료 시 postop event 기입
 - Routine medication 이외의 처방에 대한 설명
 - 타과 consult 및 예약 확인

슬기로운 성인심장파트 1년차의 마인드는?

“Every day may not be
good, but there’s
something good
in every day.”

-ALICE MORSE EARLE

슬기로운 성인심장파트 1년차의 마인드는?



나는 여기서 머물지 않아!
곧 수술하는 멋진 의사가
될꺼야!

슬기로운 성인심장파트 1년차 돌아가서 당장 해야 할 것은?

미친듯이 매일 연습하기로 해

수술 기초

Two hand Tie

경청해 주셔서 감사합니다.

질문 있으신가요?

