Women's Heart Disease

Data From Chest Pain in KoRean wOmen'S rEgistry (KoROSE) Study

Seong-Mi Park, M.D.

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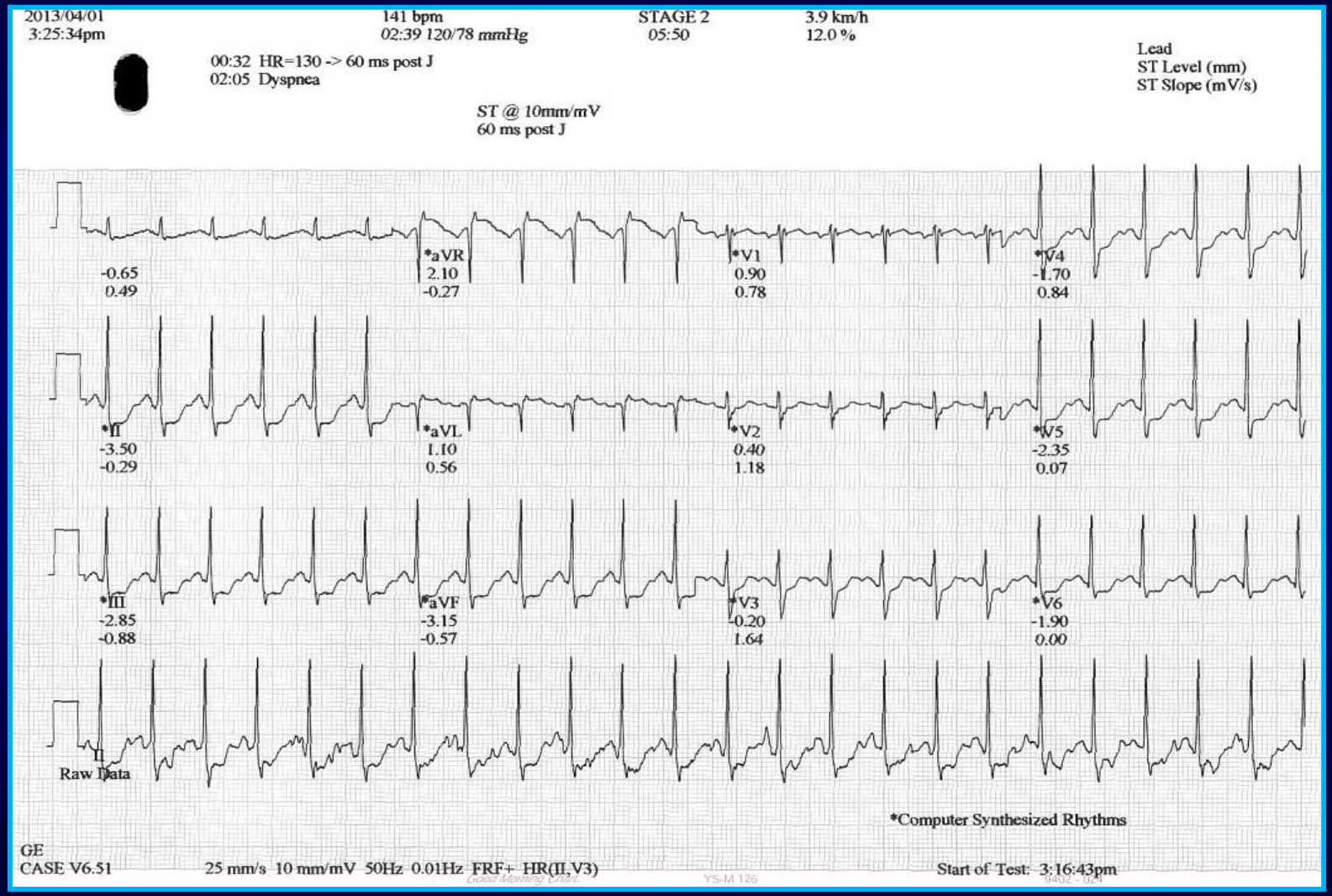
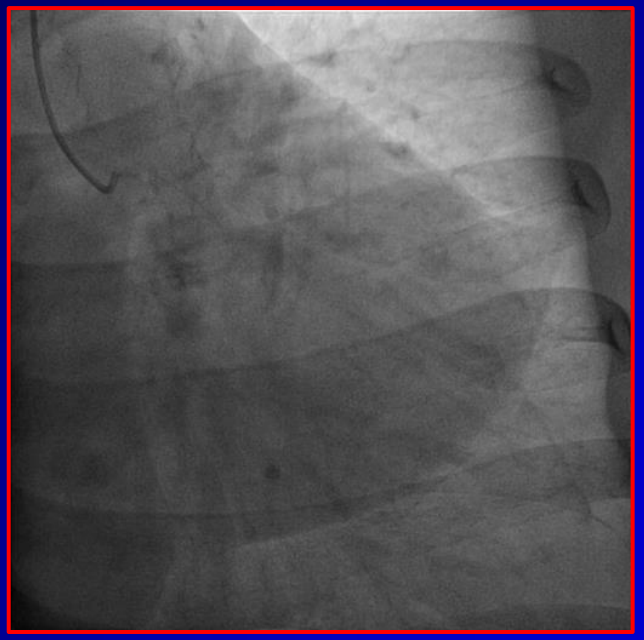
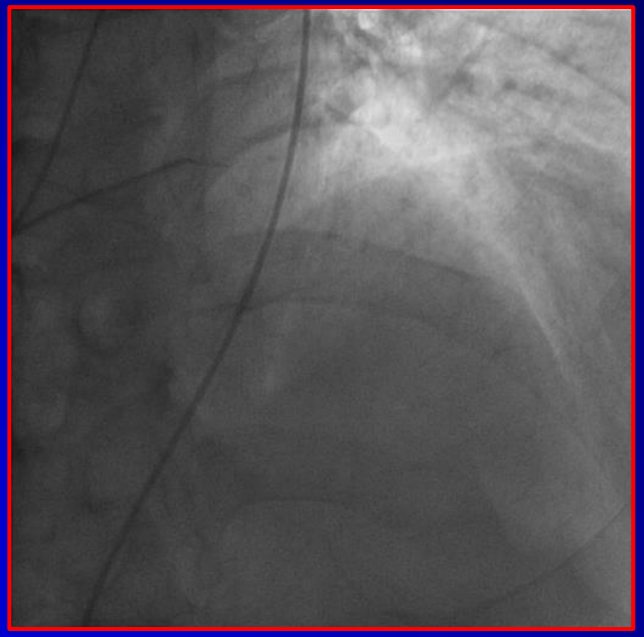
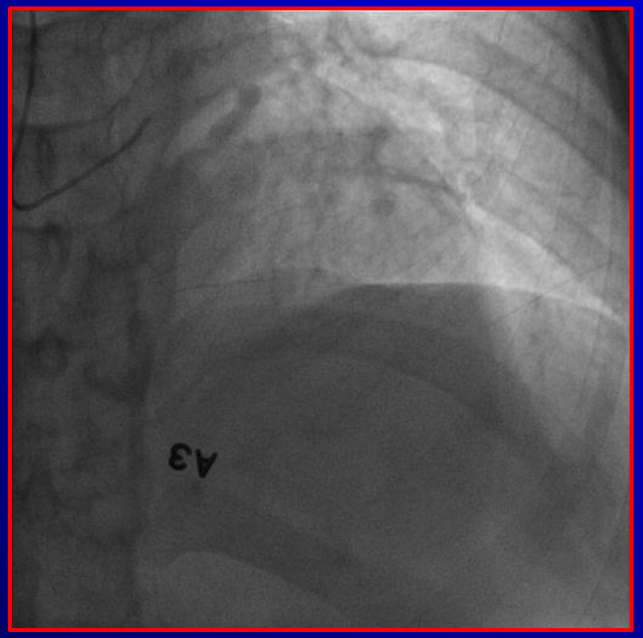
Korea University College of Medicine

F/60, Chest pain, Mild HTN





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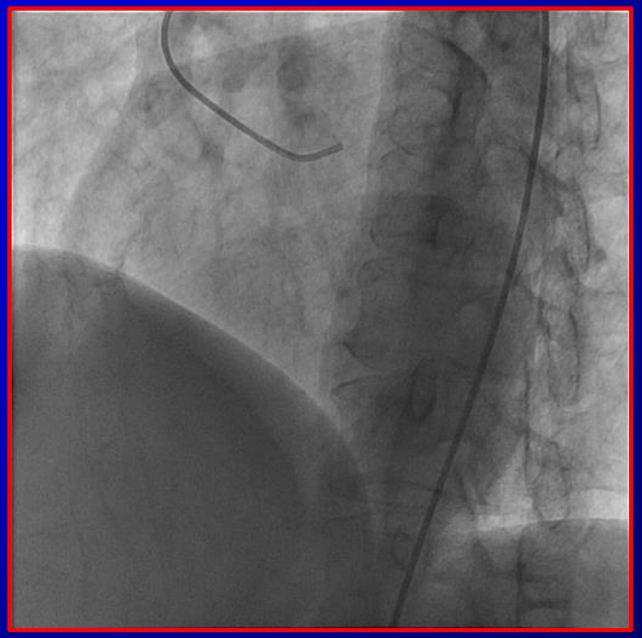
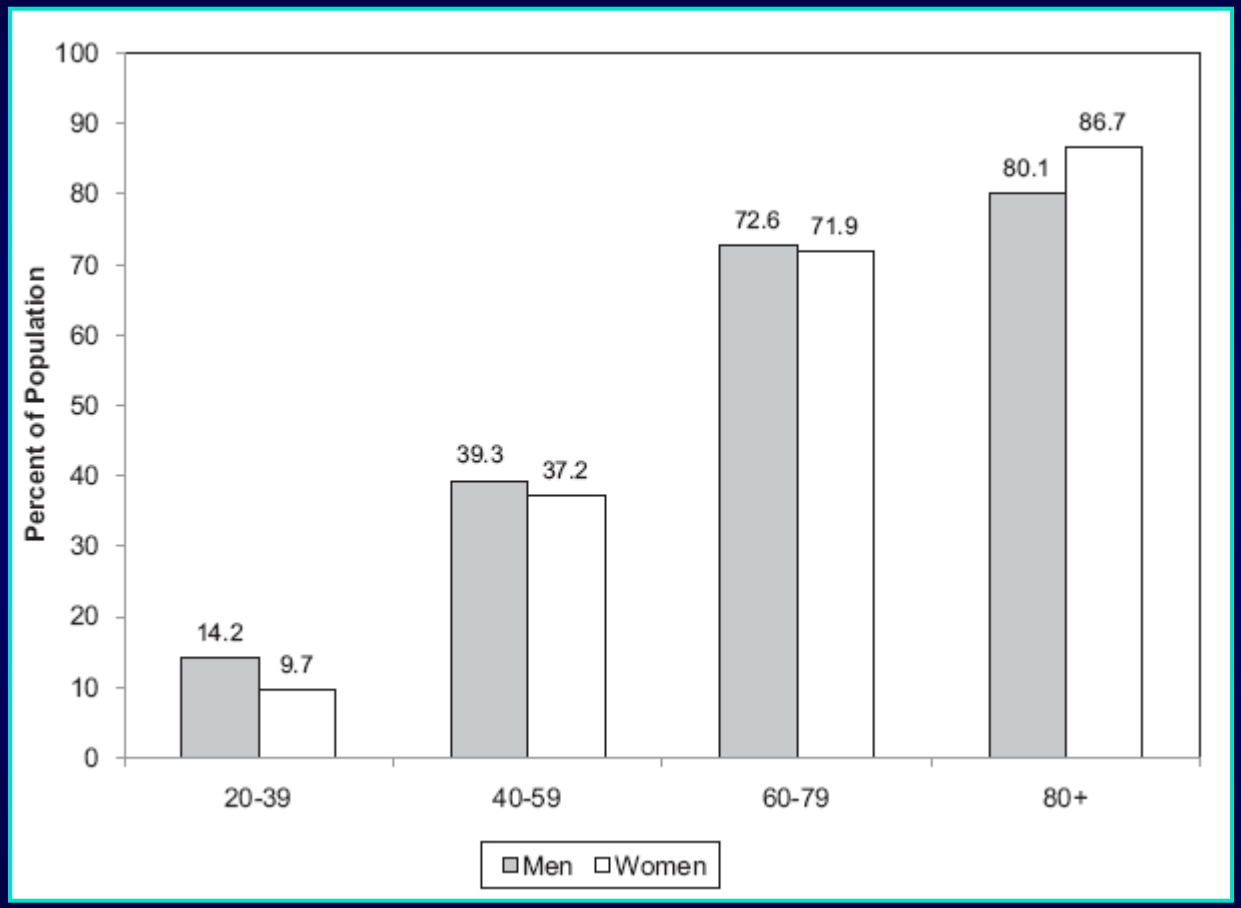
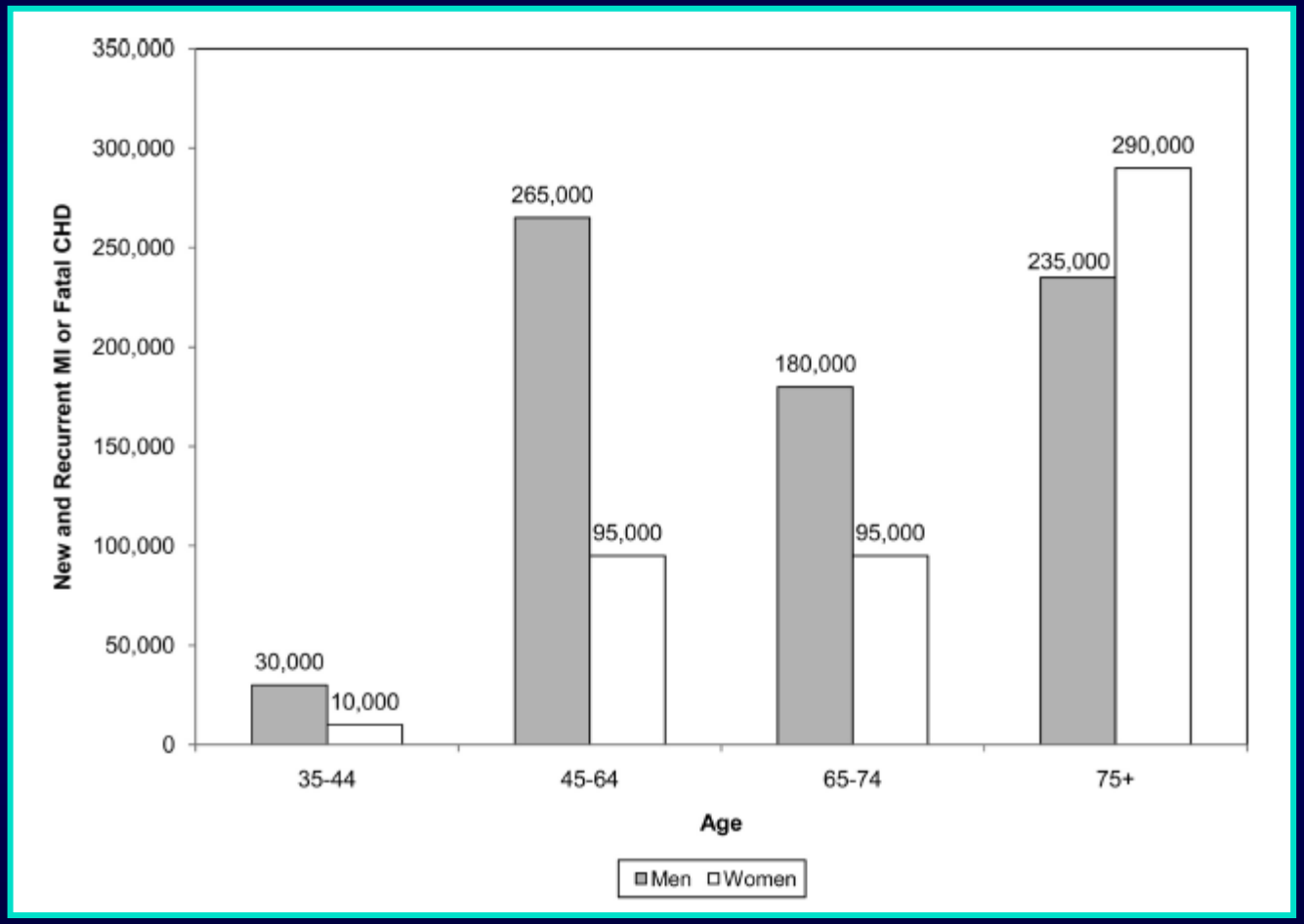


Prevalence of cardiovascular disease in adults 20 years of age by age and sex (National Health and Nutrition Examination Survey: 2005–2008)



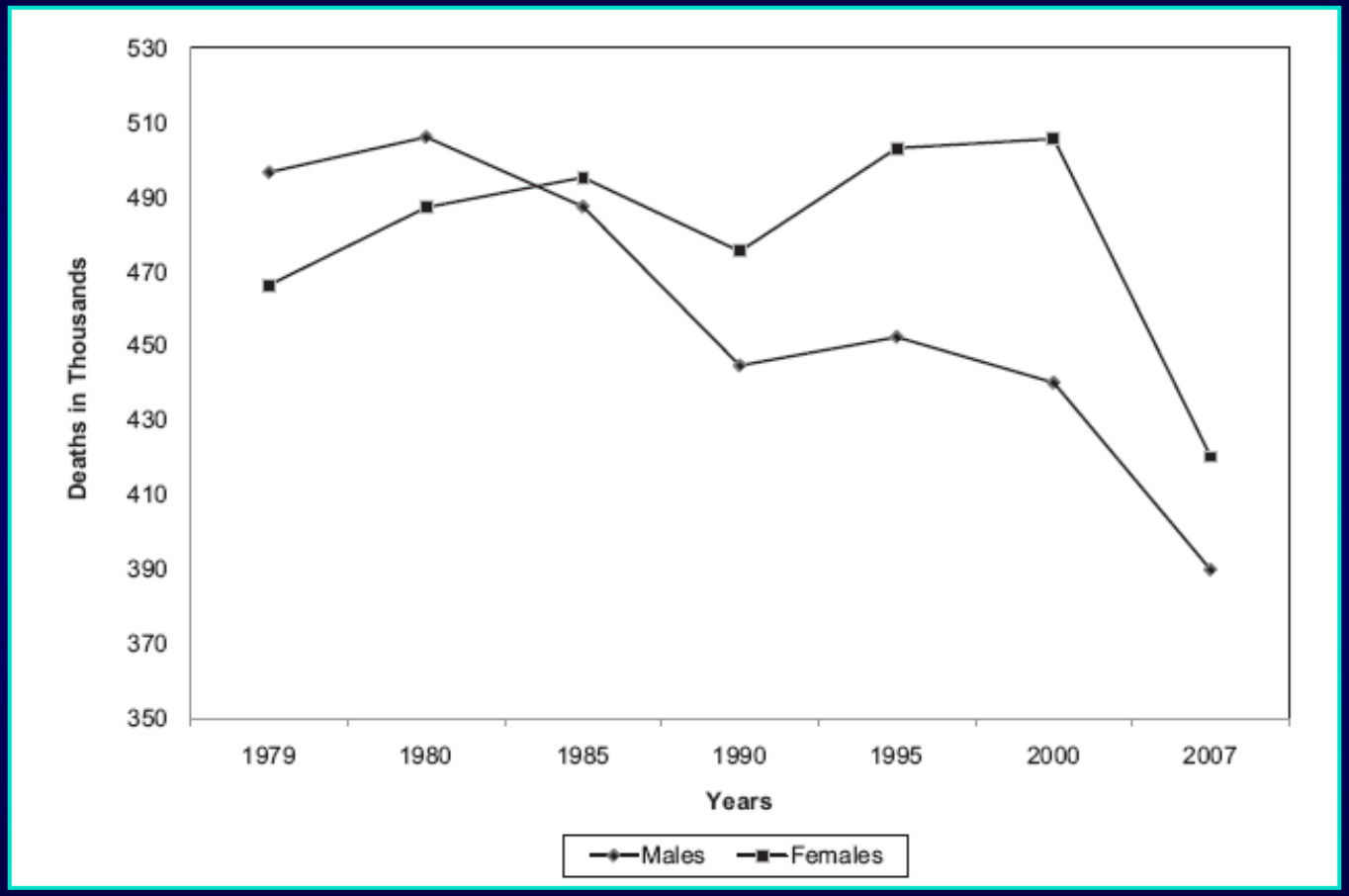
Source: National Center for Health Statistics and National Heart, Lung, and Blood Institute. These data include coronary heart disease, heart failure, stroke, and hypertension.

Annual number of adults having diagnosed heart attack or fatal coronary heart disease



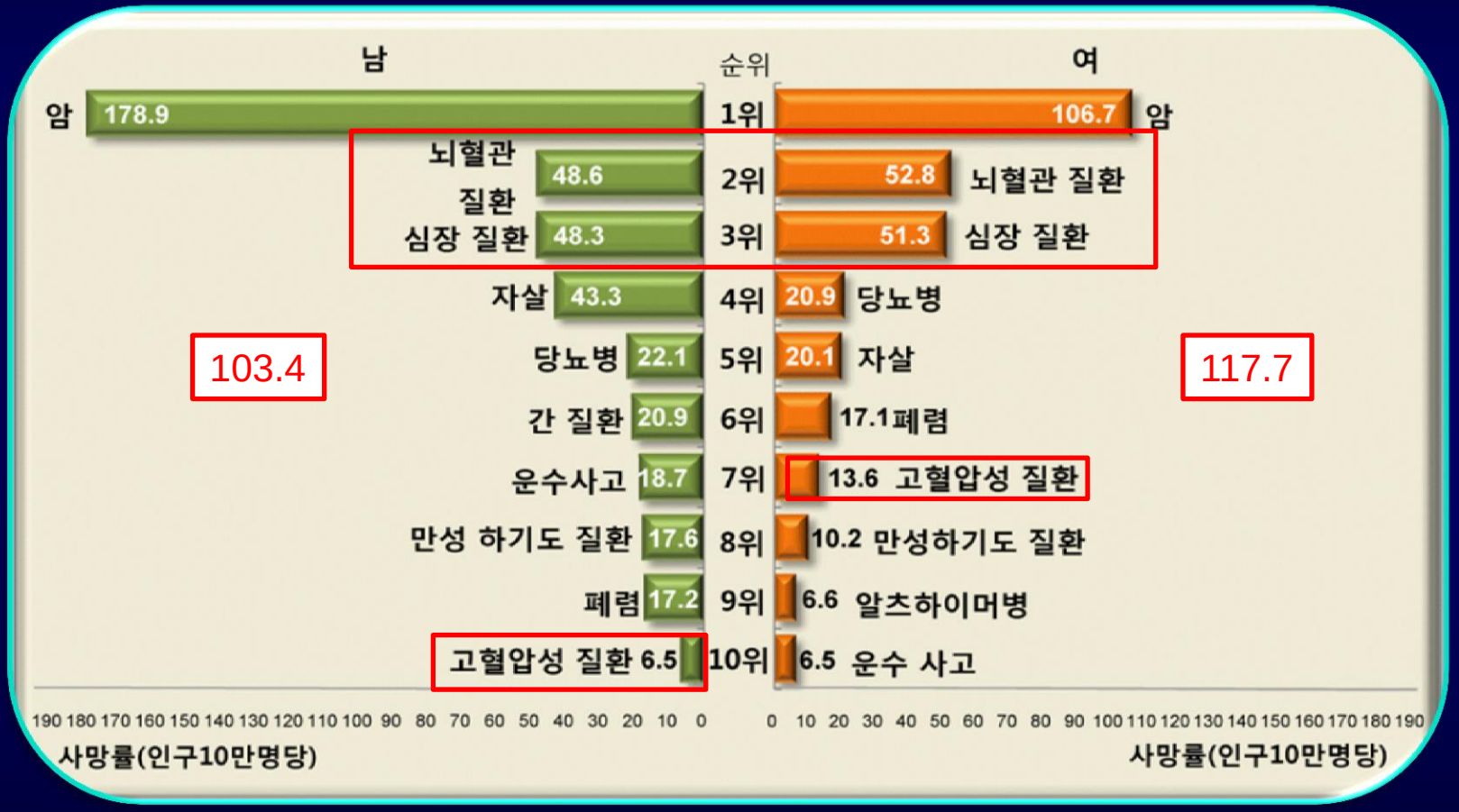
(Atherosclerosis Risk in Communities Surveillance: 1987–2004 and Cardiovascular Health Study: 1989–2004)

Cardiovascular disease mortality trends for males and females, United States: 1979-2007



American Heart Association. Heart and Stroke Statistics 2011

2011 Korean Statistics



순환기계통 질환의 성별 사망률 추이, 2000-2010

(단위: 인구 10만명당, %)

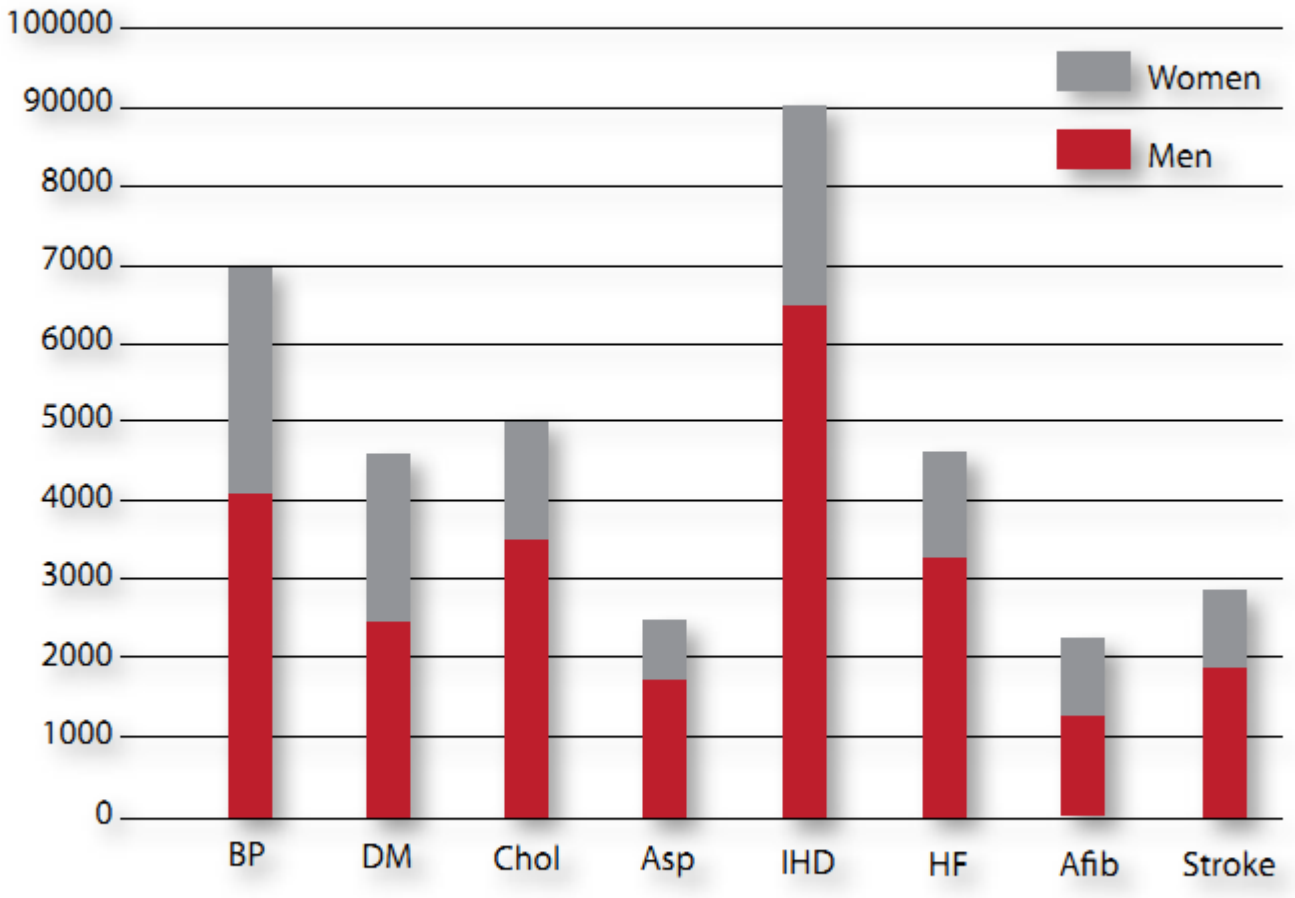
		순환기계통 질환	고혈압성 질환	심장 질환	허혈성[1] 심장 질환	기타[2] 심장 질환	뇌혈관 질환
남녀 전체	2000	122.7	8.9	38.2	21.4	16.8	73.1
	2009	109.3	9.6	45.0	26.0	19.0	52.0
	2010	112.5	9.6	46.9	26.7	20.2	53.2
	09년 대비 증감	3.3	0.0	1.9	0.8	1.2	1.1
	09년 대비 증감률	3.0	0.5	4.3	3.0	6.0	2.2
남	2000	118.4	6.6	39.8	23.8	16.0	69.3
	2009	105.0	6.1	45.2	28.2	17.0	50.8
	2010	107.1	6.1	46.4	28.3	18.1	51.5
	09년 대비 증감	2.0	0.0	1.3	0.1	1.1	0.7
	09년 대비 증감률	1.9	0.0	2.8	0.5	6.6	1.3
여	2000	127.0	11.1	36.6	18.9	17.7	77.0
	2009	113.5	13.0	44.8	23.8	21.1	53.2
	2010	118.0	13.1	47.4	25.2	22.3	54.8
	09년 대비 증감	4.5	0.1	2.6	1.4	1.2	1.6
	09년 대비 증감률	3.9	0.7	5.8	6.0	5.6	3.0
사망률 성비 (남/여)	2000	0.93	0.59	1.09	1.26	0.90	0.90
	2009	0.93	0.47	1.01	1.19	0.81	0.96
	2010	0.91	0.47	0.98	1.12	0.82	0.94

1) 허혈성 심장 질환에는 심근경색증, 협심증 등이 있음

2) 기타 심장 질환에는 심부전, 심내막염 등이 있음

Female to male ratio of prevalence of cardiovascular disease

Figure 1 - Participants in clinical trials by gender



Red Alert on Women's Hearts,2009,ESC

BP: blood pressure; DM: diabetes mellitus; Chol: cholesterol; Asp: aspirin; IHD: ischemic heart disease; HF: heart failure; Afib: atrial fibrillation.

Gender Gap in Ischemic Heart Disease

- Differences in cardiovascular risk factors
- Difference in symptom presentation
- Female specific pathophysiology
- Low diagnostic accuracy of tests
- Less referral
- Less aggressive management
- Menopause
- Longer survival in female

Needs for Women's Heart Disease Studies in Korea

대한심장학회
The Korean Society of Cardiology

여성심장질환연구회
Women's Heart Disease Research Working Group

여성심장질환연구회

Women's Heart Disease Research Working Group

- 2012. 5.24 심장학회 이사회에서 여성심장질환연구회 설립 승인됨

- **목적**

  : 본 회는 여성심장질환과 관련된 학술 연구의 발전과 질환의 예방 및 회원 상호간의 친목 도모를 목적으로 한다.

- **사업**

  1) 연수강좌, 집담회 및 강연회 개최,

  2) 여성심장질환 관련도서 발간

  3) 국내외 관련 학술 단체와의 학술 교류,

  4) 여성 심장질환의 예방, 관리 및 홍보에 관한 사업

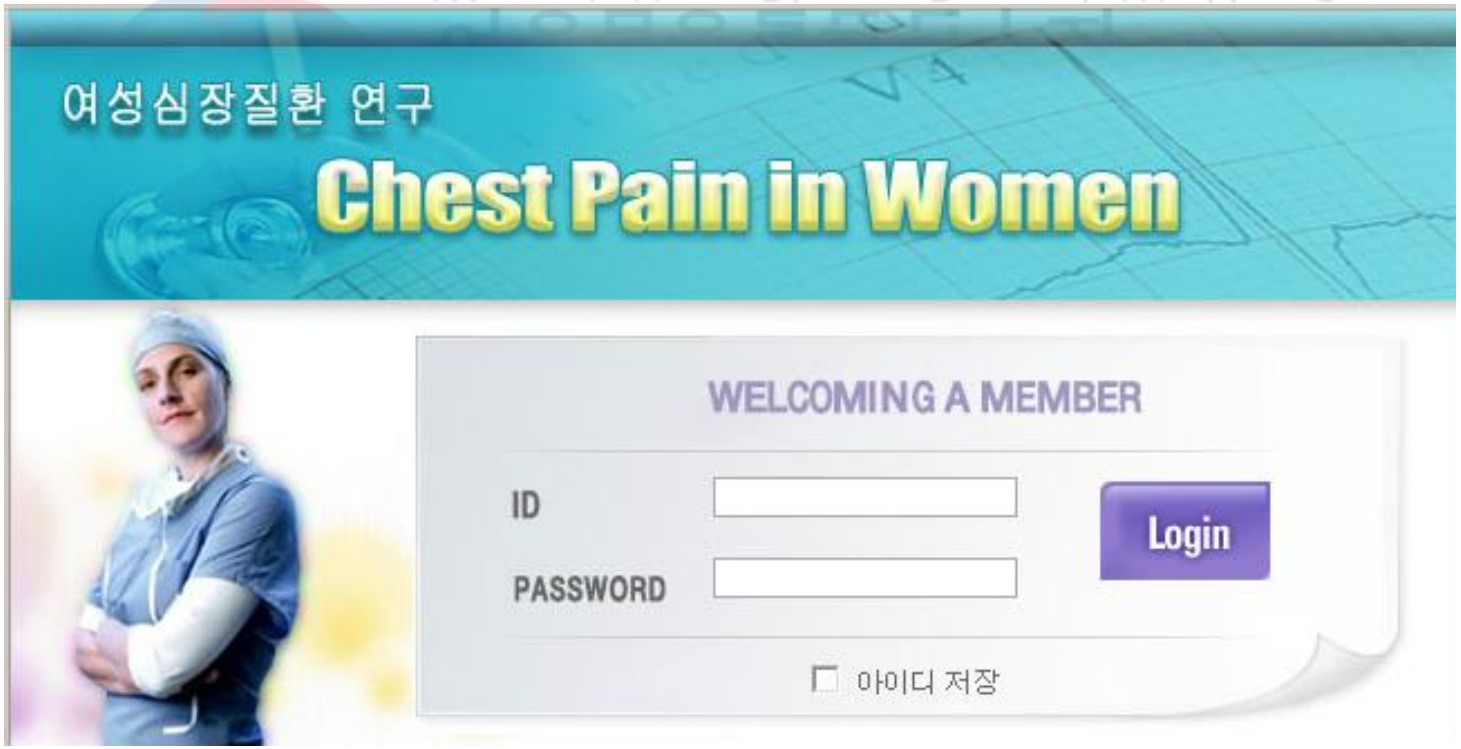
  5) 회원 상호간의 친목과 관련 사업

Chest Pain in KoRean wOmen'S rEgistry

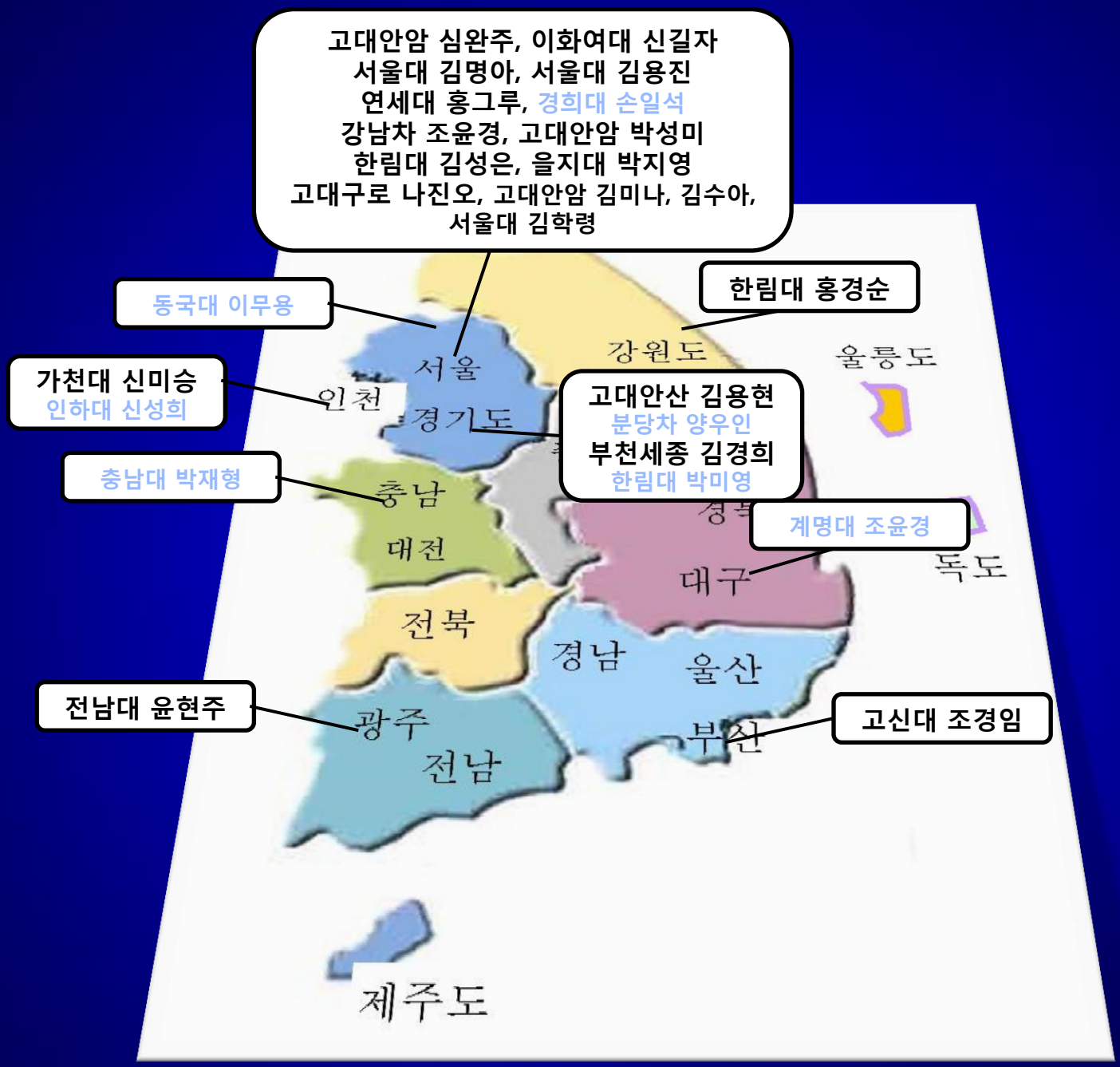
KoROSE study (가칭)

- Multicenter study
- To evaluate Korean women with chest pain suspected ischemic heart disease in outpatient clinic in diagnostic testing, management as well as understanding of the characteristics of patients with and without CAD

여성심장질환연구회
Women's Heart Disease Research Working Group



- 2011년 4월 1일부터 등록 시작
- 2011. 12 추계심장학회에서 심장학회 내 연구사업으로 승인됨


고대안암 심완주, 이화여대 신길자
서울대 김명아, 서울대 김용진
연세대 홍그루, 경희대 손일석
강남차 조윤경, 고대안암 박성미
한림대 김성은, 을지대 박지영
고대구로 나진오, 고대안암 김미나, 김수아,
서울대 김학령
동국대 이무용
한림대 홍경순
가천대 신미승
인하대 신성희
고대안산 김용현
분당차 양우인
부천세종 김경희
한림대 박미영
충남대 박재형
계명대 조윤경
전남대 윤현주
고신대 조경임
서울
인천
경기도
강원도
울릉도
충남
대전
대구
독도
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울산
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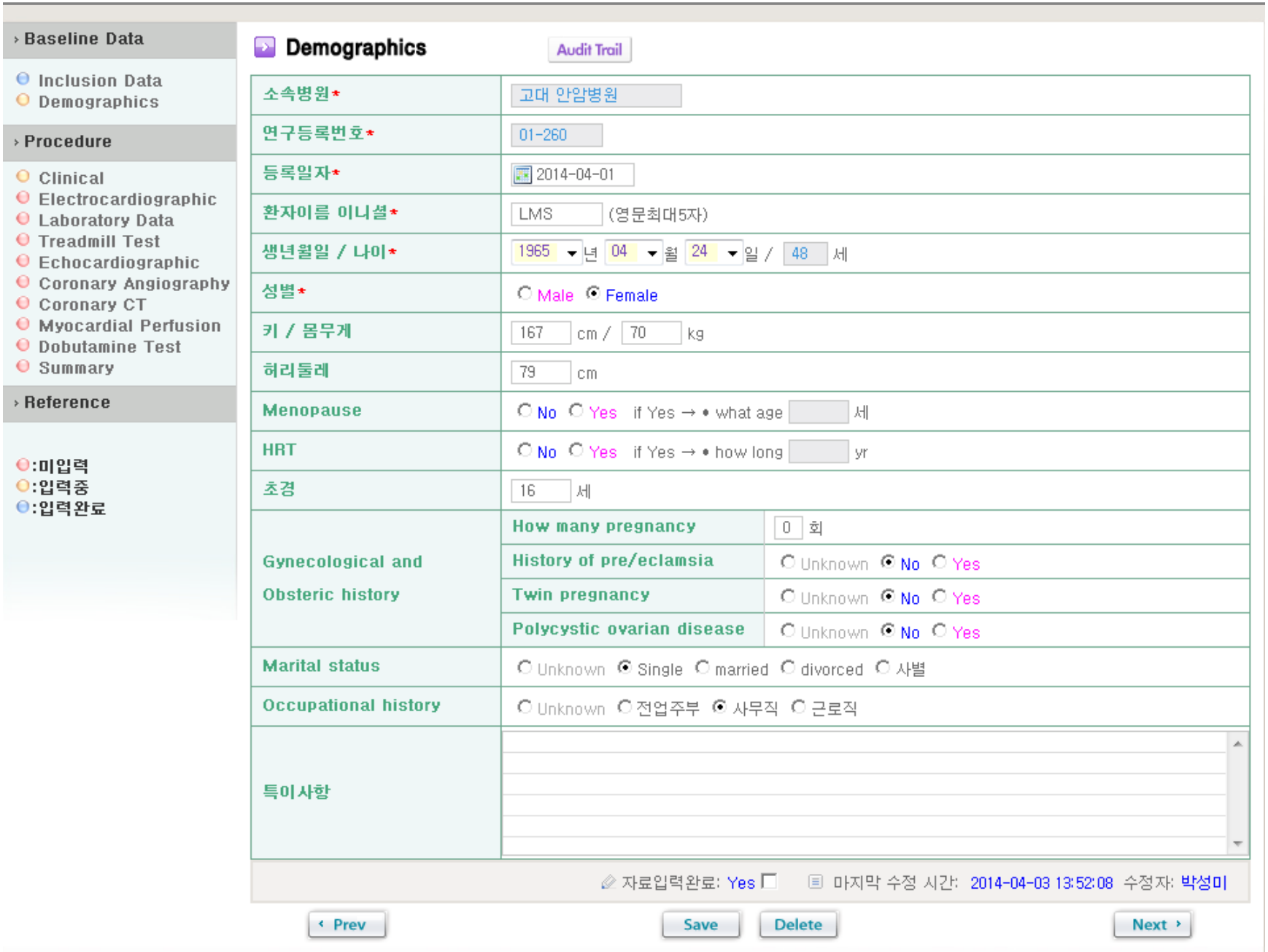
전남
부산
제주도



KOREA UNIVERSITY ANAM HOSPITAL

Family Hx of CAD	○ Unknown ○ No ● Yes		
♡ Current medication			
당뇨약	● No ○ Yes	항지질혈증 제제	○ No ● Statin ○ Other
여성호르몬제제	● No ○ Yes	갑상선치료제	● No ○ Yes
위장관계약	● No ○ Yes	aspirin	● No ○ Yes
clopidogrel	● No ○ Yes	cilostazol	● No ○ Yes
warfarin	● No ○ Yes	Calcium channel blocker	● No ○ Yes
beta blocker	● No ○ Yes	ARB	● No ○ Yes
ACEi	● No ○ Yes	diuretics	● No ○ Yes
그 외 다른 약물	● No ○ Yes if Yes → • Drugs:		
♡ Physical activity			
Physical activity	● 일상생활 이외에는 안한다 ○ 운동은 안해도 활동적인 생활 ○ 불규칙적인 운동		
	○ 규칙적인 운동 → ○ Below 2hrs/wk ○ 2-4hrs/wk ○ 4-6hrs/wk ○ 6-10hrs/wk		
♡ Characteristics of chest pain			
character	○ 쑤신다 ○ 조인다 ○ 찌른다 ○ 고추가루 뿌린듯 ● 표현불가능 if 표현불가능 → 양상 : 답답하다		
Location	● 가슴중앙 ○ 왼편가슴 ○ 오른편가슴 ○ 유방아래 ○ 명치		
Duration	● 5분이내 ○ 5-15분 ○ 15-30분 ○ 1시간이상 ○ Other if Other →		
Precipitating factors	● 없음 ○ 운동 ○ 식사 ○ 다양 ○ 심리적부담 ○ 낮은 온도 ○ other if other ↓		
Radiation	● 없음 ○ 왼팔이나 왼쪽어깨 ○ 오른팔이나 오른쪽어깨 ○ 목 ○ 등		
Associated symptoms	☐ Palpitation ☐ dizziness ☐ syncope ☐ dyspnea ☐ headache		

자료입력완료: Yes ☐ 마지막 수정 시간: 2014-04-03 13:53:45 수정자: 박성미

‹ Prev Save Delete Next ›

환자명	LMJ	연구등록번호	01-210	병원명	고대 안암병원
등록일자	2014-02-20	나이	67	키/몸무게	154/72
Dobutamine Study	N	Menopause	Y		

Treadmill Test Findings

☐ Treadmill Test not done Audit Trail

♡ Rest			
Heart rate	60 /min		
SBP	128 mmHg	DBP	90 mmHg
♡ Peak Exercise			
Target heart rate	154 /min		
Maximal heart rate	131 /min (85 % of THR)		
Maximal SBP	178 mmHg	Maximal DBP	83 mmHg
Amount of work	9 METs	Total exercise time	07 min 22 s
♡ ST segment changes			
ST segment change	☐ None ☑ ST depression → • Stage : 0 • Number of leads : II,III,aVF Search • Horizontal : mm • Upsloping : 1 mm • Downsloping : mm ☐ ST elevation → • Stage : • Number of leads :		
The duration of ST segment depression in recovery	00 seconds		
Termination cause	LEG PAIN		
♡ Other			
Other arrhythmia	◉ No ○ Yes if Yes →		
Chest pain with exercise	◉ No ○ Yes if Yes → • Angina score: ○ 0 ○ 1 ○ 2		
Other symptoms	◉ No ○ Yes if Yes →		
Duke treadmill score	03		

자료입력완료: Yes ☑ 마지막 수정 시간: 2014-02-28 10:20:26 수정자: 심완주

여성심장질환 연구

Chest Pain in Women

Coronary Angiography

Home | New Case | Subject List | Statistics

- Baseline Data
  - Inclusion Data
  - Demographics
- Procedure
  - Clinical
  - Electrocardiographic
  - Laboratory Data
  - Treadmill Test
  - Echocardiographic
  - Coronary Angiography
  - Coronary CT
  - Myocardial Perfusion
  - Dobutamine Test
  - Summary
- Reference

:미입력
:입력중
:입력완료

환자명	JSH	연구등록번호	20-051	병원명	전남의대
등록일자	2012-04-05	나이	52	키/몸무게	167/75
Dobutamine Study	N	Menopause	N		

Coronary Angiography

Audit Trail

♡ Coronary Angiographic Findings

Stenosis of Coronary artery disease: ○ Absent ◉ Present if Present →↓ ☑ LAD ☐ LCX ☑ RCA

♡ Lesion Data • Total Number : 2

Number	Location		Severity	Stenosis
1	mRCA	Segment	Moderate	70 %
2	mLAD	Segment	Moderate	60 %

Spasm provocation test

Other findings

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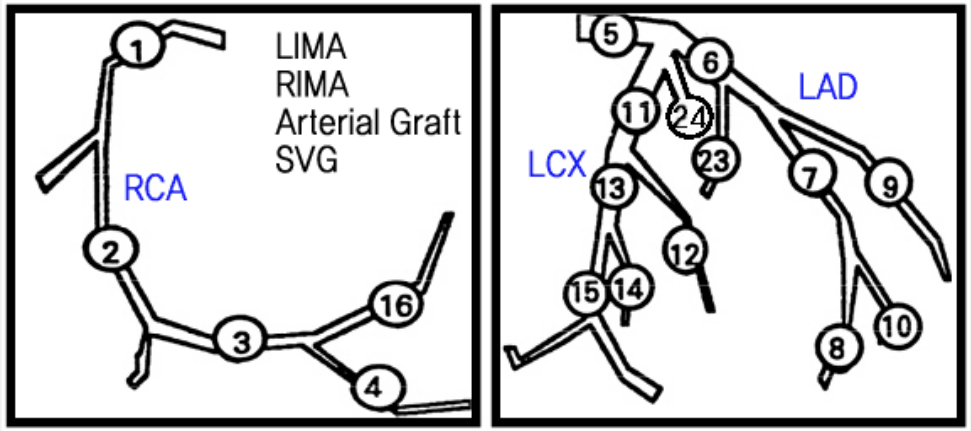
http://www.ecrf.kr/?STYPE=2 - Segment - Windows Internet Explorer

♡ Segment

Close



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in Women
Coronary Angiography
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환자명 JSH
연구등록번호 20-051
병원명 전남의대
등록일자 2012-04-05
나이 52
키/몸무게 167/75
Dobutamine Study N
Menopause N
Coronary Angiography
Audit Trail
Coronary Angiographic Findings
Stenosis of Coronary artery disease
Absent Present if Present →↓ LAD LCX RCA
Lesion Data • Total Number : 선택
Number Location Severity Stenosis
Spasm provocation test
No Yes if Yes → Positive Negative • ergonovine Acetylchoine
Other findings
Calcification
Minimal Mild Moderate
Intracoronary thrombus
No Yes
Myocardial bridging
No Yes
Slow flow ≥ 3beats
No Yes
자료입력완료: Yes
마지막 수정 시간: 2012-10-10 10:26:08 수정자: 윤현주
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환자명	JSH	연구등록번호	20-051	병원명	전남의대
등록일자	2012-04-05	나이	52	키/몸무게	167/75
Dobutamine Study	N	Menopause	N		

Summary Data

Audit Trail

♡ Other associated studies	
Carotid ultrasound	○ No ○ Yes
Coronary angio CT	○ No ○ Yes
SPECT or MIBI scan	○ No ○ Yes
♡ Diagnosis	
Final diagnosis	○ Myocardial infarction ○ Angina pectoris with fixed lesion ○ Microvascular angina ◉ Vasospastic angina ○ GERD or GI disorder ○ Stress induced cardiomyopathy ○ Other musculoskeletal pain ○ Pychological disorder (Hwa-byung, mental or emotional disorder as a result of repressed anger or stress)
♡ Other	
Comment	

한국 우울증 검사(KDS)

표준화 : 이민수 · 이민규

번 호		이 름	(남 · 여)	나 이	만 세
직 업		검사일자		학 력	

아래에 적혀 있는 문항을 잘 읽은 후 **오늘을 포함하여 지난 2주일 동안** 당신이 느끼고 생각한 것을 가장 잘 나타내는 숫자에 V 표하시기 바랍니다. 한 문항도 빠뜨리지 말고 답해 주시기 바랍니다.

	전혀 아니다	아니다	그저 그렇다	그렇다	매우 그렇다
1. 나에게는 희망이 없다고 생각한다.	⓪	①	②	③	④
2. 내 인생은 실패작이라고 생각한다.	⓪	①	②	③	④
3. 나의 삶이 후회스러워 괴롭다.	⓪	①	②	③	④
4. 가족이나 친구가 도와주더라도 울적한 기분을 떨칠 수 없다.	⓪	①	②	③	④
5. 머리가 아프고 무겁다.	⓪	①	②	③	④
6. 하고 있는 일에 마음을 집중하기가 어렵다.	⓪	①	②	③	④
7. 나의 미래는 어둡다.	⓪	①			
8. 나 자신에 대해 무가치하고 창피스럽게 느낀다.	⓪	①			
9. 나는 불안정하고 안절부절 못한다.	⓪	①			
10. 슬픔을 느낀다.	⓪	①			
11. 가슴이 답답하다.	⓪	①			
12. 하는 일마다 힘들게 느껴진다.	⓪				

고려대학교 안암병원

Beck Depression Inventory (BDI)

다음의 각 내용은 모두 네 개의 문항으로 되어 있습니다. 네 개의 문항을 읽어 보시고, 지난 일주일 동안의 자신을 가장 잘 나타낸다고 생각하는 하나의 문항을 선택하여 번호를 ( )안에 기입하여 주십시오.

) 1 0) 나는 슬프지 않다.
1) 나는 슬프다.
2) 나는 언제나 슬픔에 젖어 헤어날 수가 없다.
3) 나는 너무나 슬프고 불행해서 도저히 견딜 수 없다.

) 2 0) 나는 앞날에 대해서 별로 비관적이지 않다.
1) 나는 앞날에 대해서 비관적이다.
2) 나는 앞날에 대한 기대가 아무 것도 없다.
3) 나는 앞날에 아주 절망적이고 나아질 가망도 없다.

3 0) 나는 실패자라고 생각하지 않는다.
1) 나는 다른 사람들보다 더 많이 실패한 것 같다.
2) 내가 살아온 과거를 돌이켜 보면 생각나는 것은 실패뿐이다.
3) 나는 인간으로서 완전히 실패자인 것 같다.

) 4 0) 나는 전과 같이 일상생활에서 만족하고 있다.
1) 나의 일상생활은 전처럼 즐겁지가 않다.

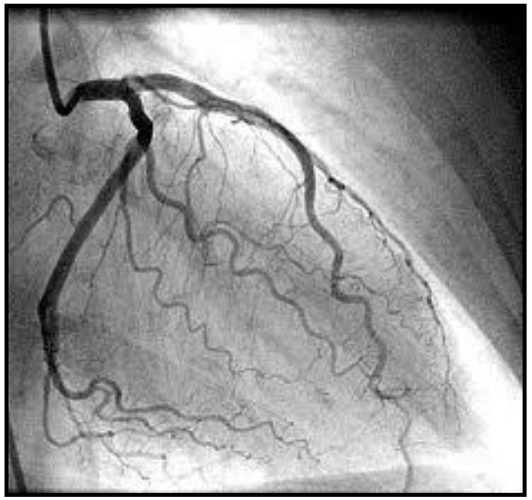
2013 대한심장학회 추계학술대회

1. Women Specific Predictors of Obstructive Coronary Artery Diesease in Symptomatic Women **(서울대 김학령/김명아)**
2. Chest pain in women patients with normal coronary arteriograms **(서울대 김경희/김명아)**
3. Clinical value of treadmill test in Korean women with chest pain **(고려대 김용현/가천대 신미승)**
4. Clinical Significance of Dynamic Left Ventricular Outflow Tract Obstruction during Dobutamine Stress Echocardiography in Women with Chest Pain **(고려대 박성미/심완주)**
5. Diagnostic Accuracy of Dobutamine Stress Echocardiography in Korean Women with Chest Pain **(고려대 박성미/김완주)**
6. Higher frequency of coronary vasospasm and coronary atherosclerosis in depressed women with chest pain **(고신대 조경임/고려대 심완주)**
7. Relationship between depression and QTc interval in female patients with suspected coronary artery disease **(고신대 조경임/한림대 홍경순)**

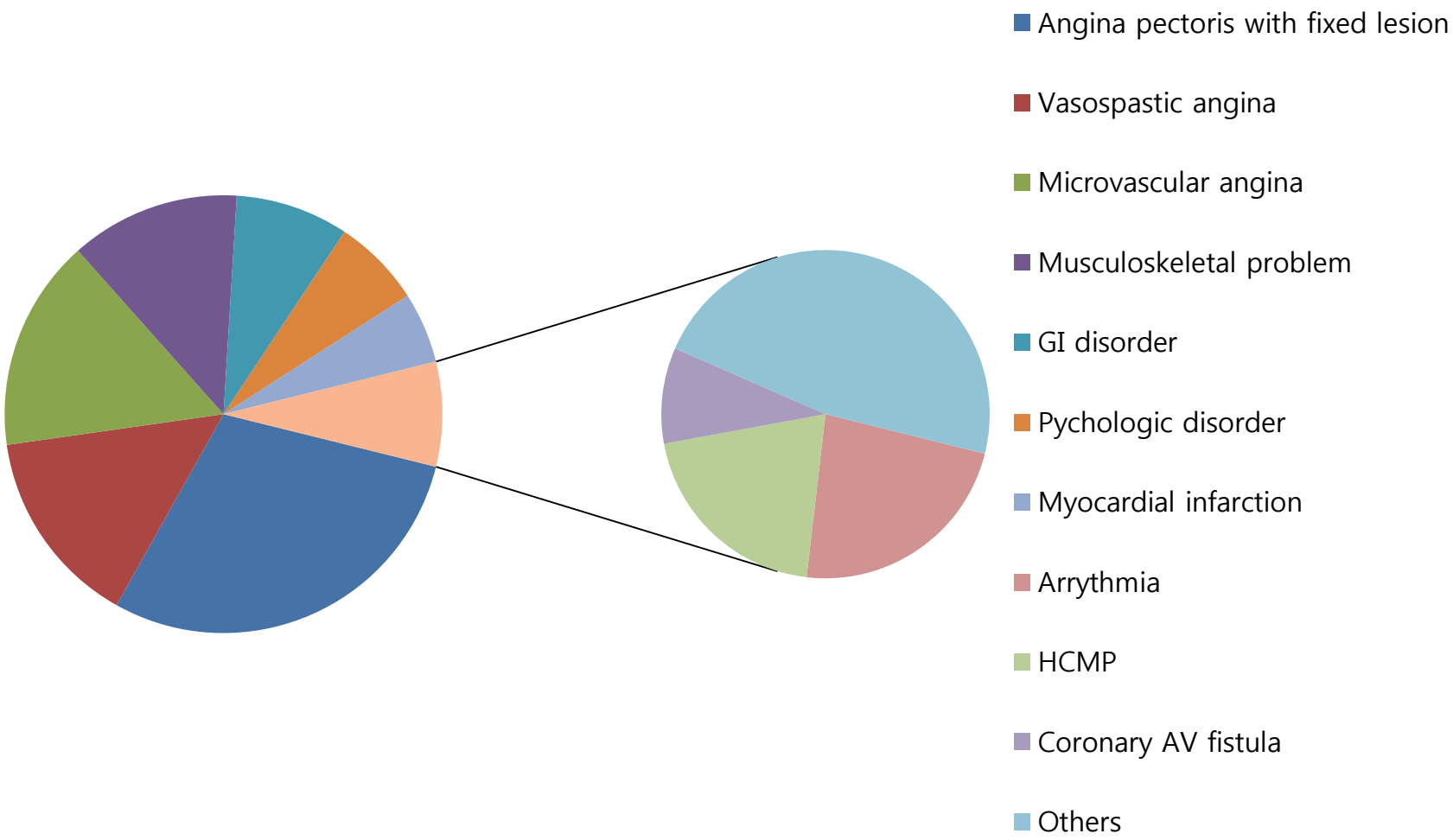
Reasons for catheterization

- Chest pain 98%
- Shortness of breath 20%
- Palpitation 15%
- Syncope 7%
- Headache 7%
- Other (e.g fatigue, dizziness, nausea, EKG change)

CAD > 50% stenosis



Diagnosis (non-CAD)



Results

Characteristic	CAD (+) (n = 178)	CAD (-) (n = 509)	*P* value
Age, years	65.7 ± 9.2	57.9 ± 11.4	< 0.001
BMI, kg/m^2	24.6 ± 2.8	24.8 ± 3.4	0.564
Diabetes, %	32.9	13.6	< 0.001
Hypertension, %	64.7	40.2	< 0.001
Dyslipidemia, %	22.8	22.9	0.423
Hemoglobin, g/dL	12.4 ± 1.2	12.8 ± 1.1	< 0.001
eGFR, mL/min/m^2	81.7 ± 28.4	87.3 ± 23.5	0.022
Fasting glucose, mg/dL	123 ± 51	107 ± 50	0.001
HDL-cholesterol, mg/dL	48.1 ± 13.1	52.1 ± 13.7	0.003
Triglyceride, mg/dL	137 ± 111	119 ± 74	0.028
LA diameter, mm	38.7 ± 5.9	36.3 ± 5.5	< 0.001
E/e’	13.0 ± 6.6	10.3 ± 3.8	< 0.001

Negative VS Positive TMT : TMT parameters

	Negative (n=297)		Positive (n=160)		*p*
	n	Mean±SD /Number(%)	n	Mean±SD /Number(%)	
Heart rate, baseline	283	75.6±15.1	159	74.5±12.4	0.403
Target heart rate	277	154.7±14.7	147	159.8±12.7	0.000
Maximum heart rate	285	148.8±20.4	159	150.0±9.4	0.523
Maximum heart rate/Target heart rate (%)	277	94.7±15.0	160	92.7±10.3	0.092
Systolic blood pressure, peak	282	163.4±26.3	159	169.6±25.4	0.015
Diastolic blood pressure, peak	281	81.3±16.8	159	81.0±0.832	0.832
Exercise capacity (METs)	277	9.5±2.3	159	9.2±2.5	0.216
Duration of treadmill test (seconds)	297	490.1±229.5	160	446.1±153.3	0.015
Cause of treadmill test termination (n,%)	200		113		
*Signs of ischemia		44 (22)		58 (51.3)	0.000
Target Heart rate		100 (50)		27 (23.9)	
Body or leg fatigue		50 (25)		27 (23.9)	
Other		6 (6)		1 (0.9)	
Arrhythmia during Treadmill (n,%)	272		158		
No		245 (90.1)		138(87.3)	0.273
Supraventricular		7 (2.6)		6 (3.8)	
Ventricular		15 (5.5)		14 (8.9)	
AV block		2 (0.7)		0 (0.0)	
Atrial fibrillation		3 (1.1)		0 (0.0)	

* Chest pain/discomfort or significant ST segment shift

Coronary Artery Disease status based on TMT and CAG

		Treadmill test		*n*
		Negative	Positive	
Coronary angiography	Non-significant	241 (56%)	104 (24.2%)	345
	Significant	32 (7.4)	53 (12.3)	85
n		273	157	

sensitivity ***62.4%***

Specificity ***69.9%***

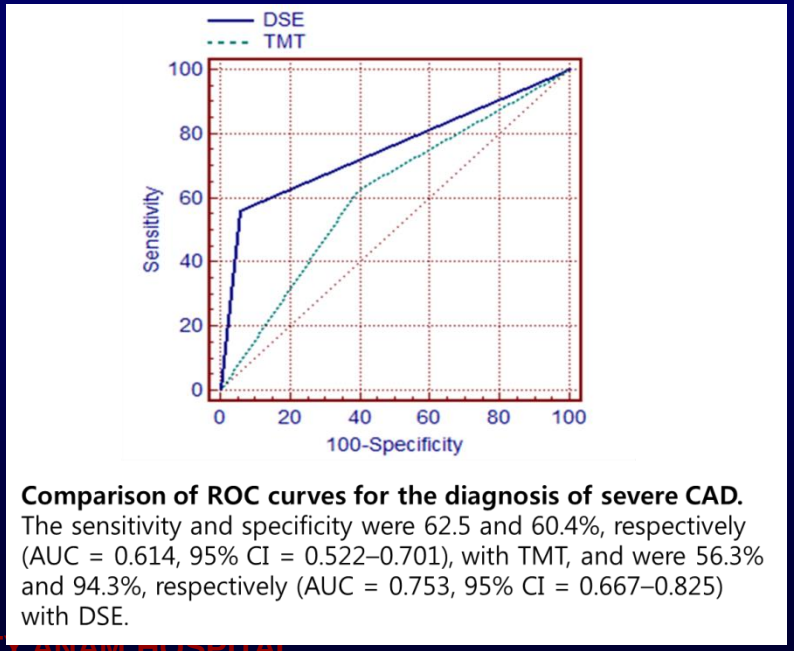
Positive predictability ***33.8%***

Negative predictability ***88.3%***

Comparison of diagnostic accuracy of TMT & DSE for the diagnosis of CAD (n=122)

	all CAD	severe CAD	multivessel CAD
TMT			
Sensitivity (%)	63.3	62.5	69.25
Specificity (%)	64.1	60.4	94.3
DSE			
Sensitivity (%)	40	56.3	53.8
Specificity (%)	87.7	94.3	94.4

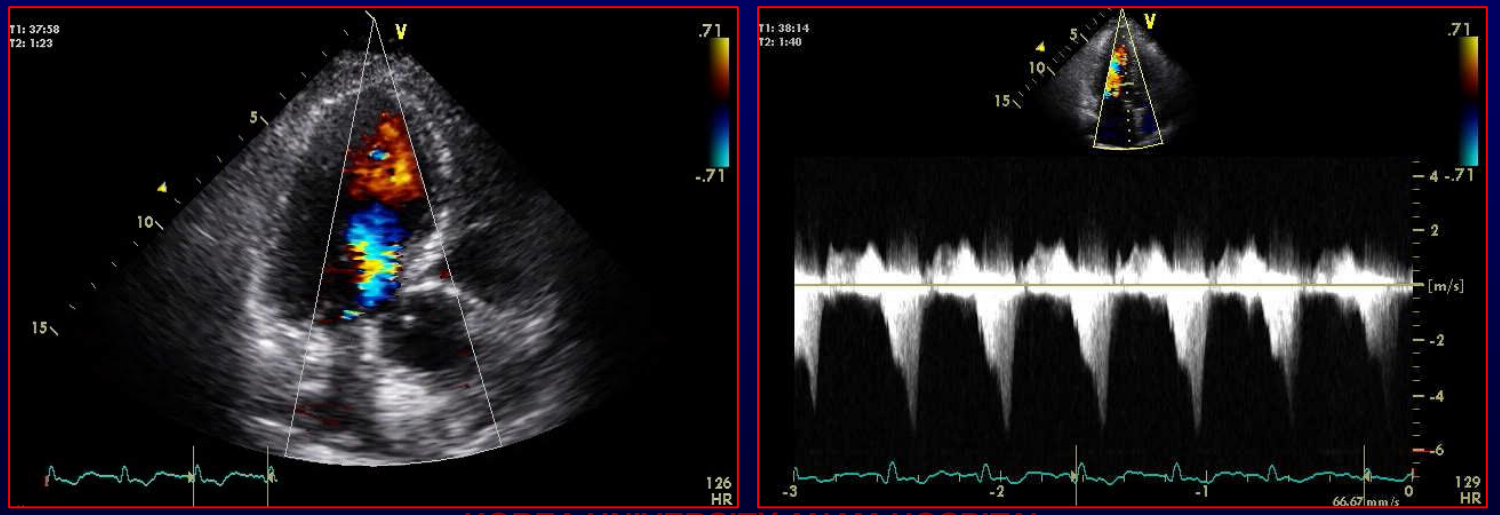
• The diagnostic accuracy for the presence of CAD was similar between two methods (p=0.44) and for severe CAD, was slightly better with DSE than with TMT (p=0.08).



Comparison of ROC curves for the diagnosis of severe CAD. The sensitivity and specificity were 62.5 and 60.4%, respectively (AUC = 0.614, 95% CI = 0.522–0.701), with TMT, and were 56.3% and 94.3%, respectively (AUC = 0.753, 95% CI = 0.667–0.825) with DSE.

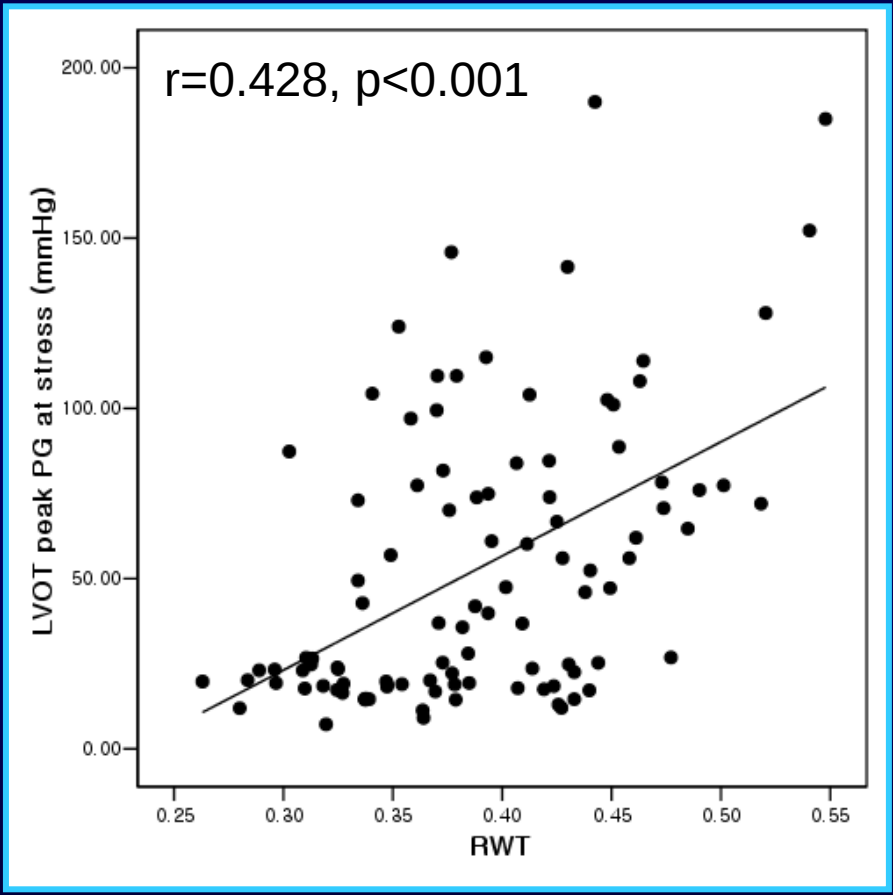
Dynamic Left Ventricular Outflow Tract Obstruction

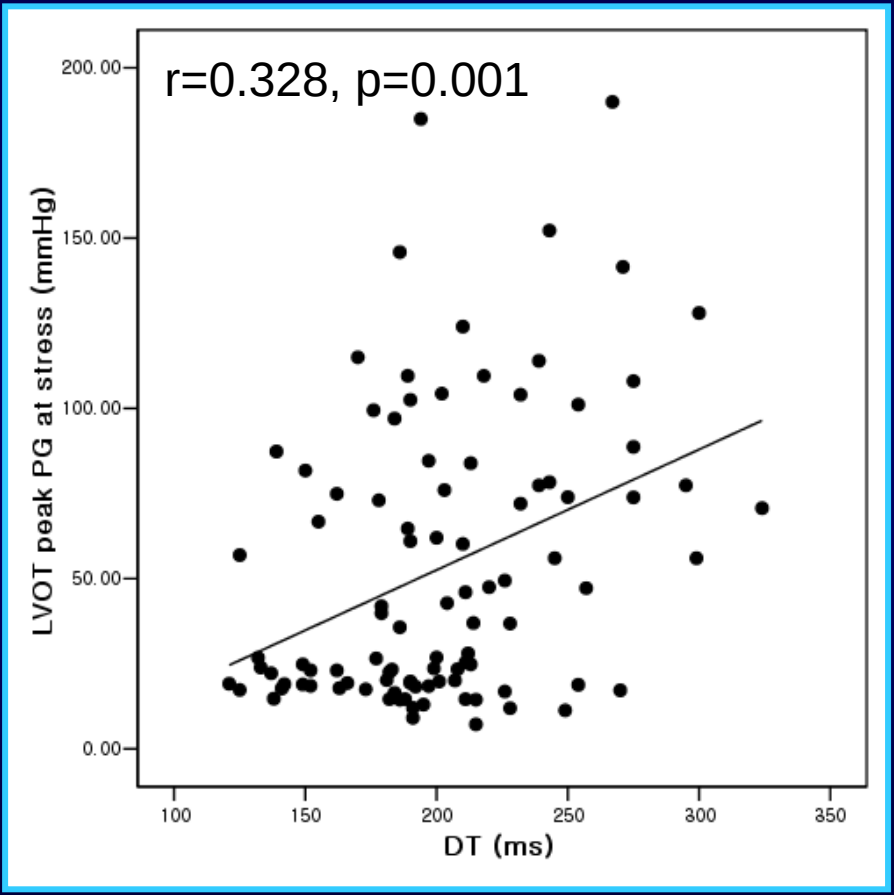
- Hypertrophic cardiomyopathy
- After valve operation
- Anterior myocardial infarction
- In states of hypercontractility
- **Dobutamine stress echocardiography (DSE)**



KOREA UNIVERSITY ANAM HOSPITAL

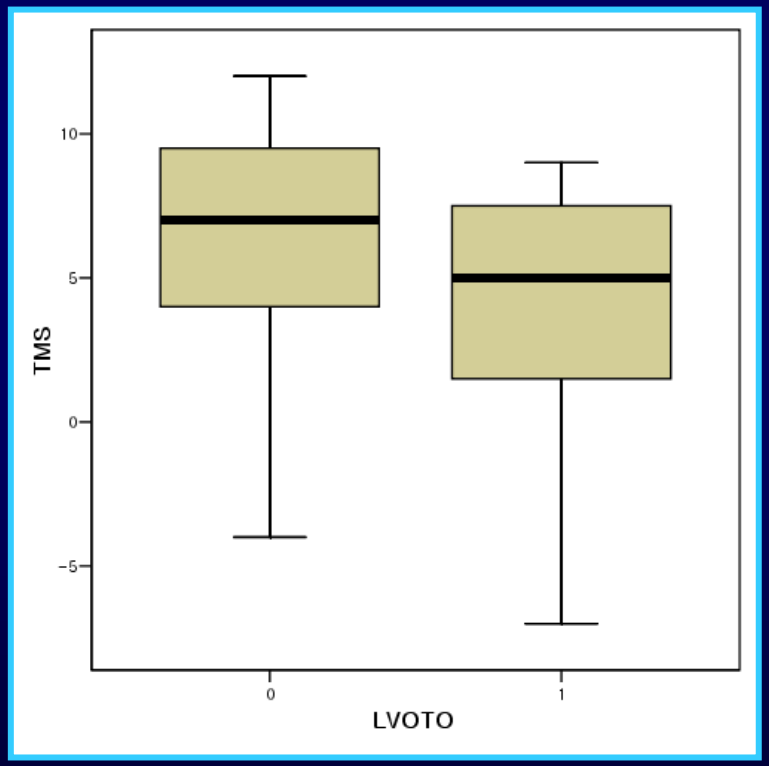
Relation between peak LVOT PG at stress and RWT & DT

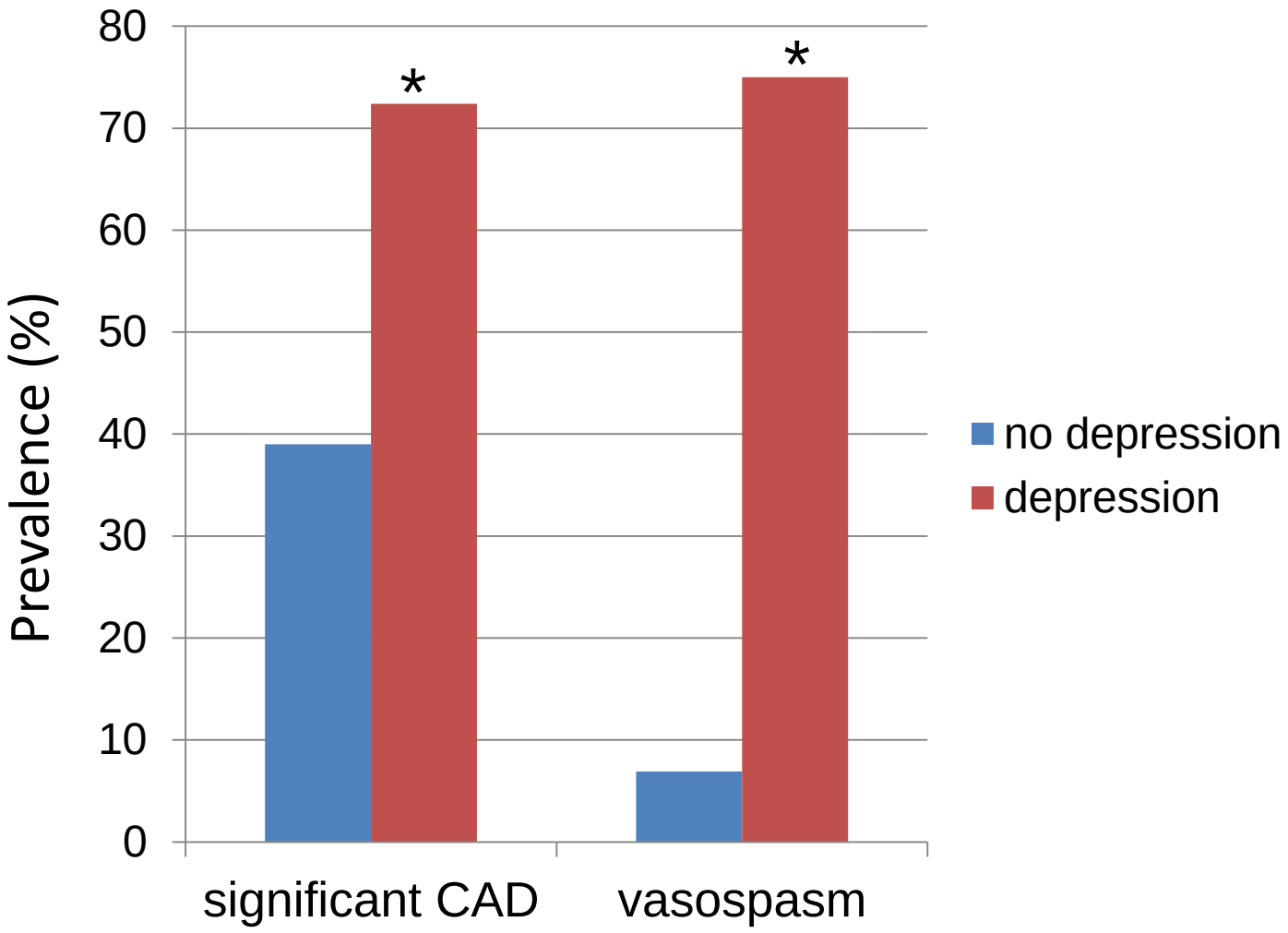




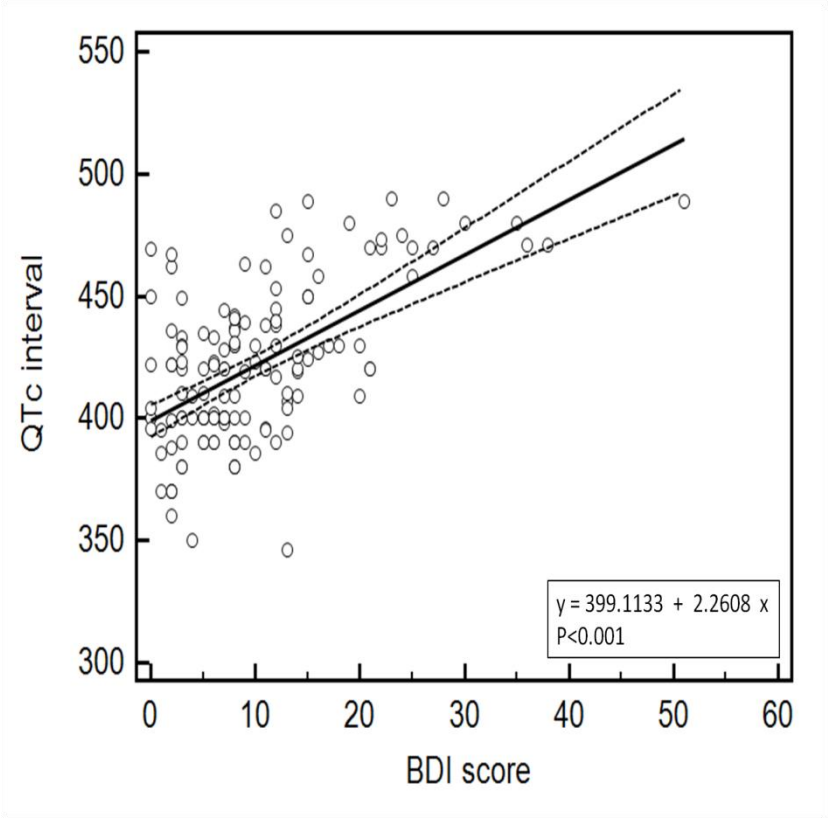
LVOTO and DTS

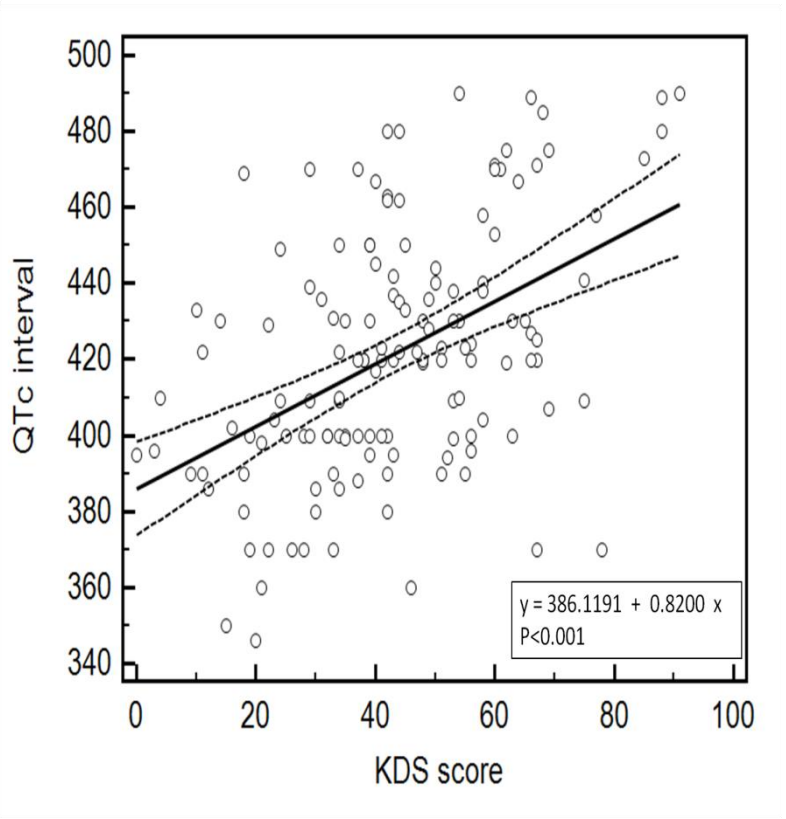
- Patients with LVOTO had lower DTS (3.9±4.1 vs. 6.1±4.1, p=0.02).




80
70
60
50
40
30
20
10
0
Prevalence (%)
*
*
significant CAD
vasospasm
no depression
depression

Regression analysis of depression parameters and QTc interval





Microvascular Angina

known as cardiac syndrome X

- Aginal chest pain
- Abnormal stress test
- Normal coronary arteries on angiography

- At least one cardiovascular risk factor
- More common in women than in men
- Approximately 50% of these patients have physiologic evidence of microvascular coronary dysfunction

Limitation of Diagnosis of Microvascular Angina

- No recognition
- No vaso- or coronary reactivity test
- Subjective diagnosis
- Slow flow
- Specific hospital bias
- Co-existing mild coronary stenosis (<50%) or myocardial bridging

~2014.3 KoROSE data

943 women with chest pain who suspected IHD

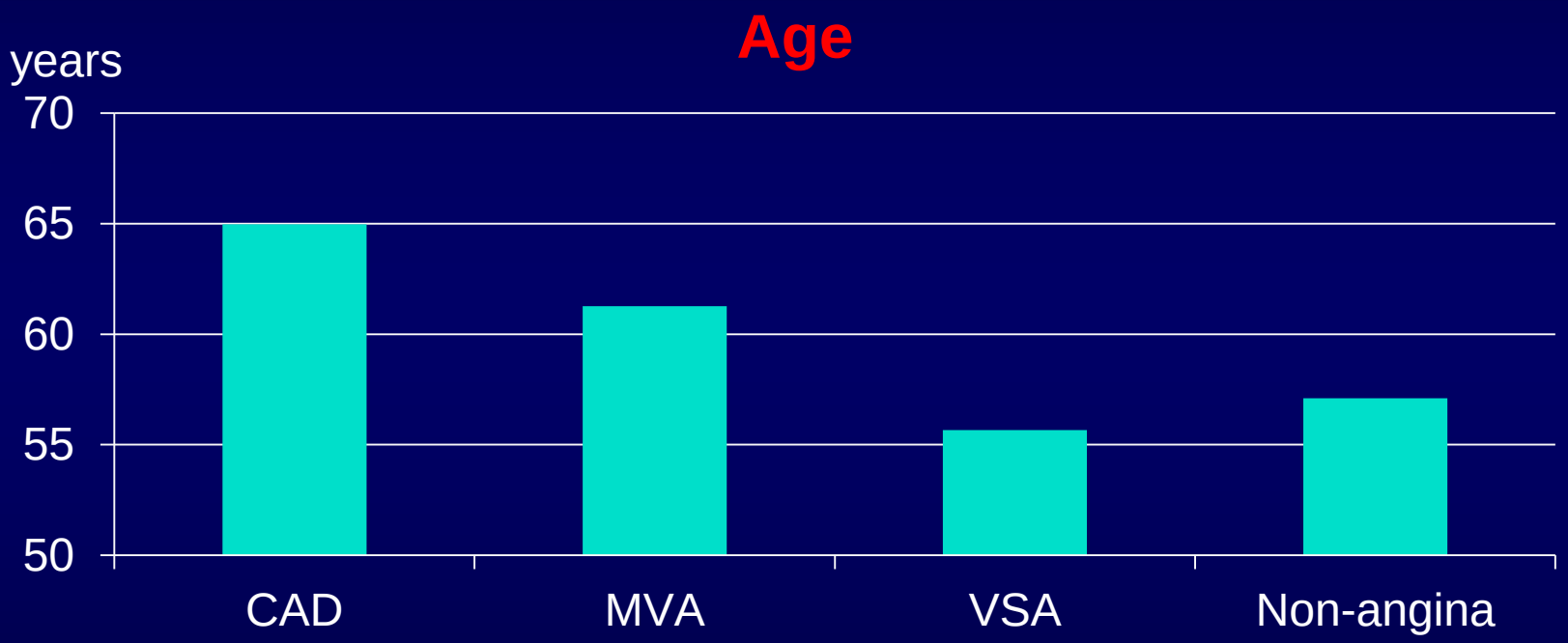
444 patients diagnosed as angina

499 patients diagnosed as non-angina

- 216 patients with obstructive CAD
- 122 patients with microvascular angina
- 106 patients with vasospastic angina

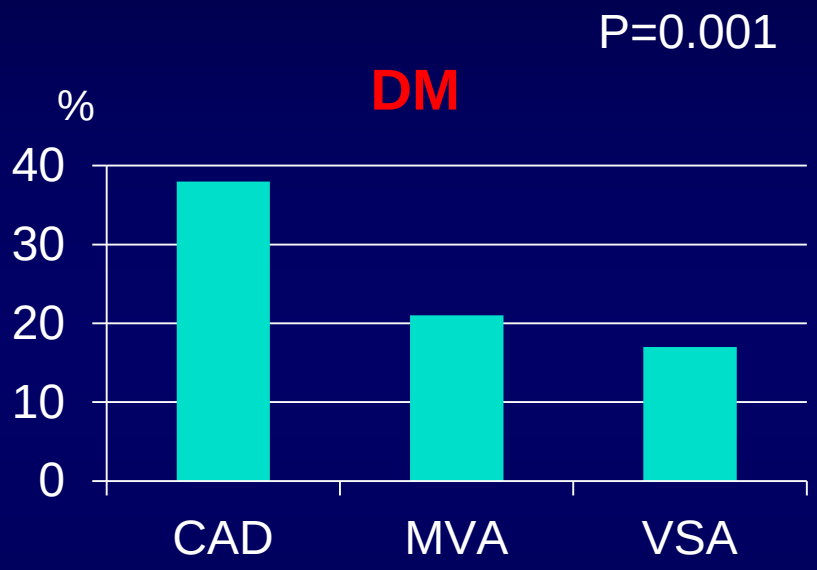
~2014.3 KoROSE data

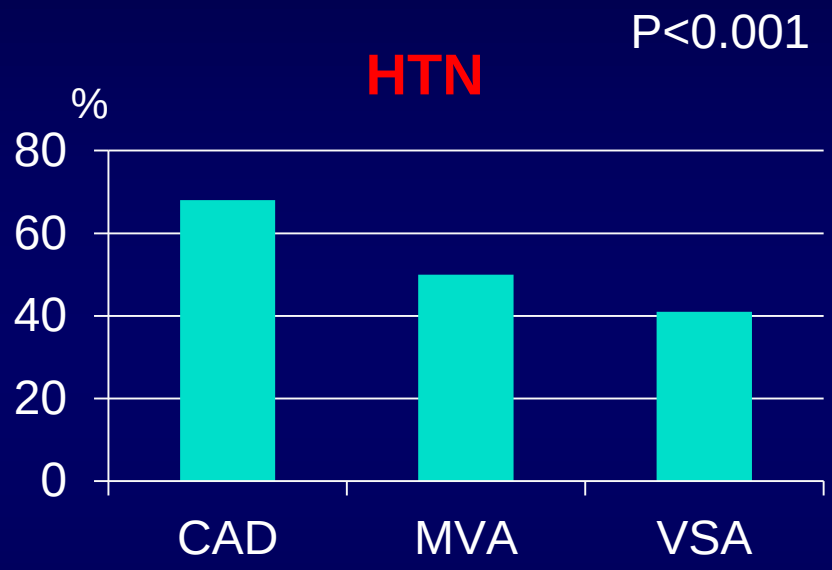
P<0.001



Non-angina
CAD: obstructive coronary artery disease
MVA: microvascular angina
VSA: vasospastic angina

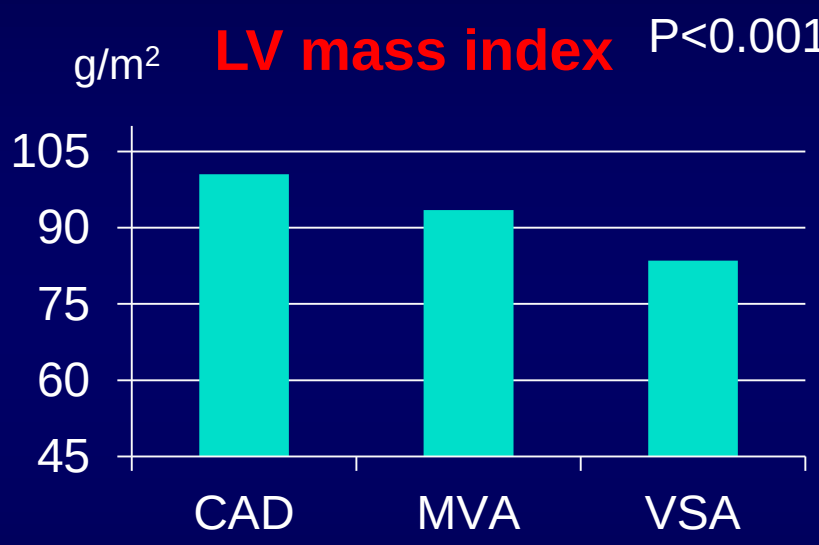
CV risk factors

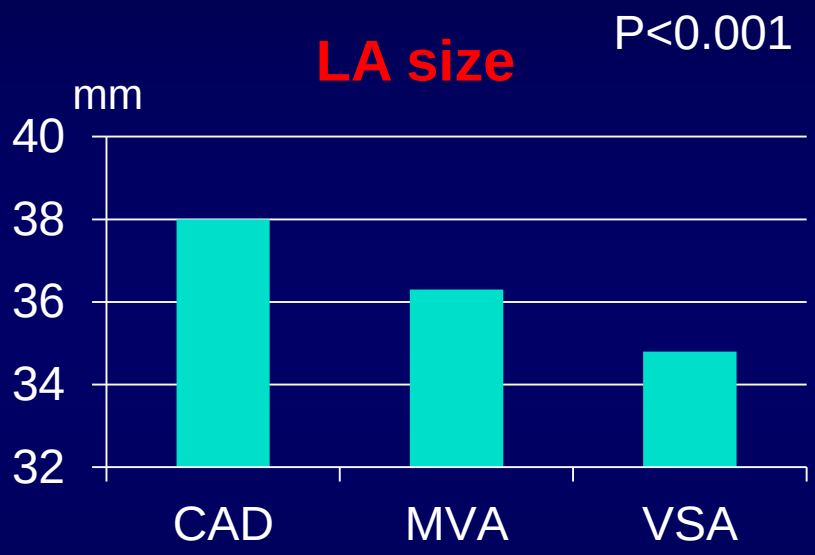




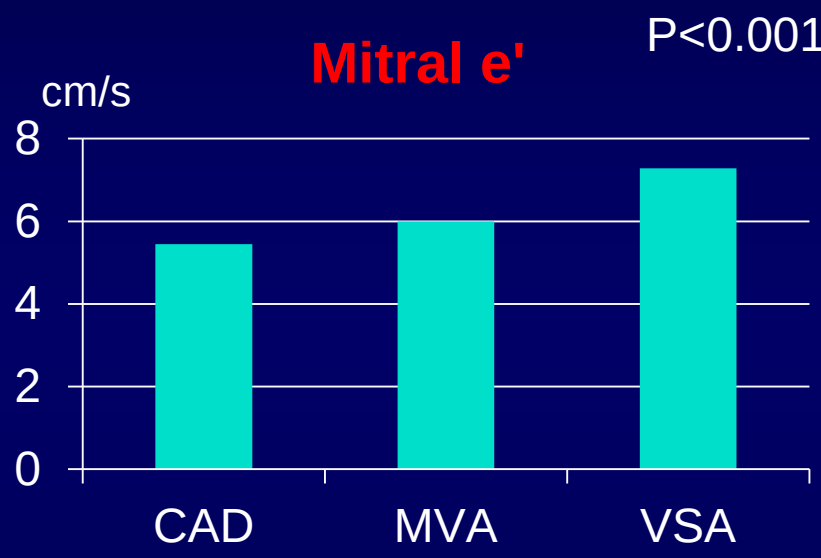
Smoking, Dyslipidemia: NS

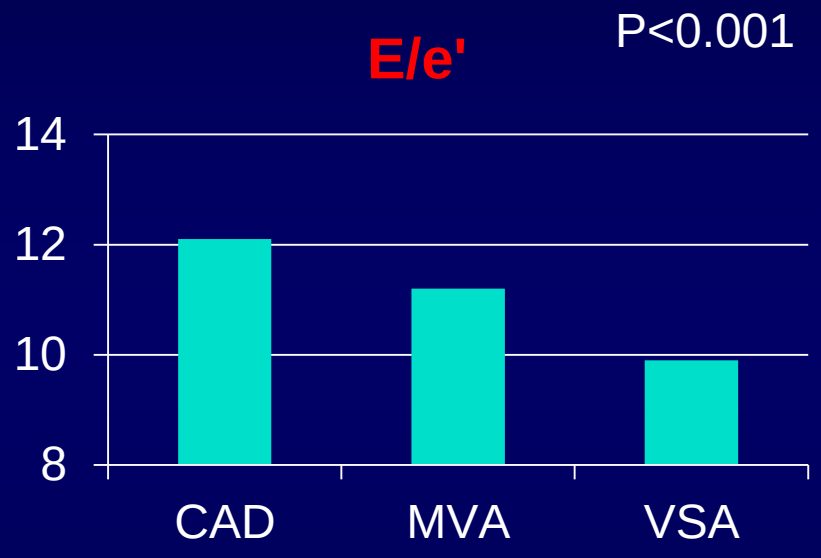
LV diastolic function



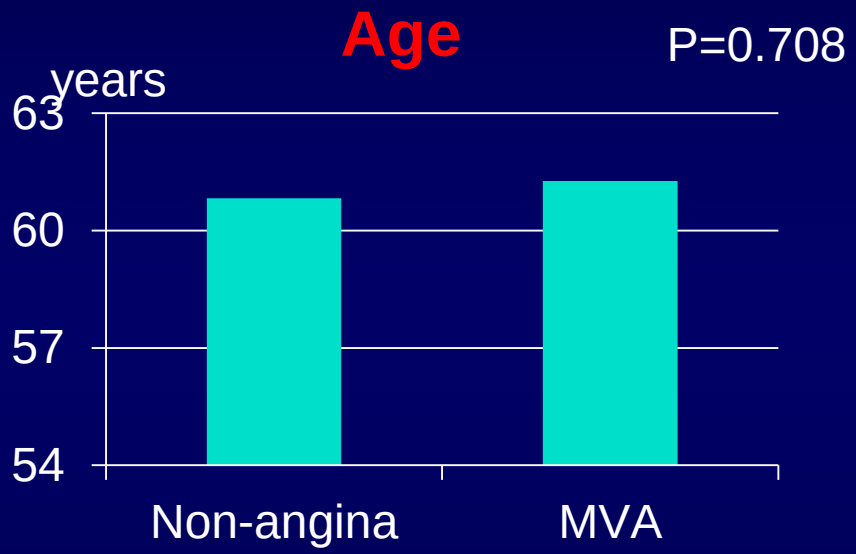


LV diastolic function





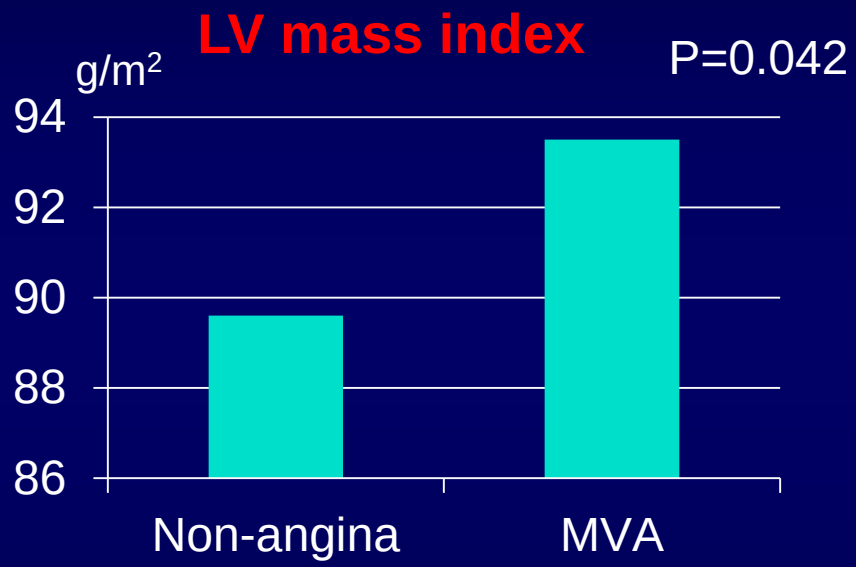
Age-matched non-angina vs. MVA

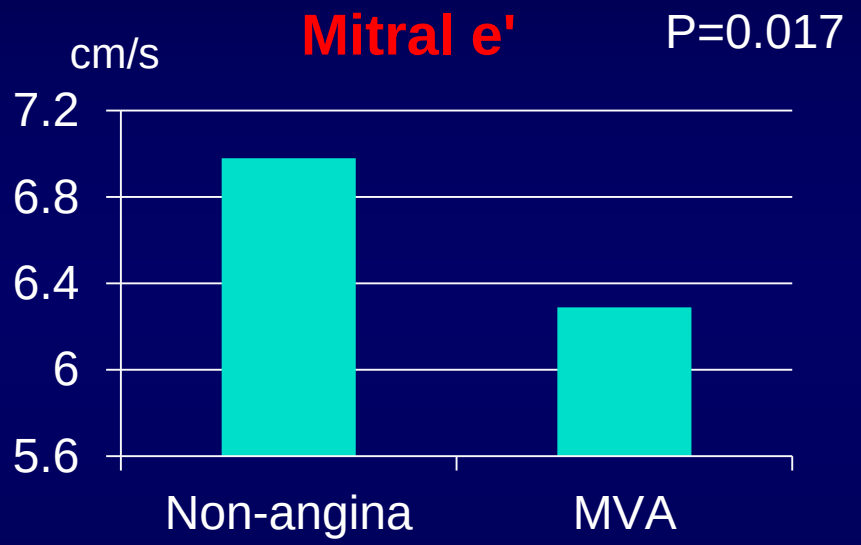


Prevalence of DM, HTN, smoking and dyslipidemia between two groups: NS

Non-angina, n=122
MVA: microvascular angina, n=122

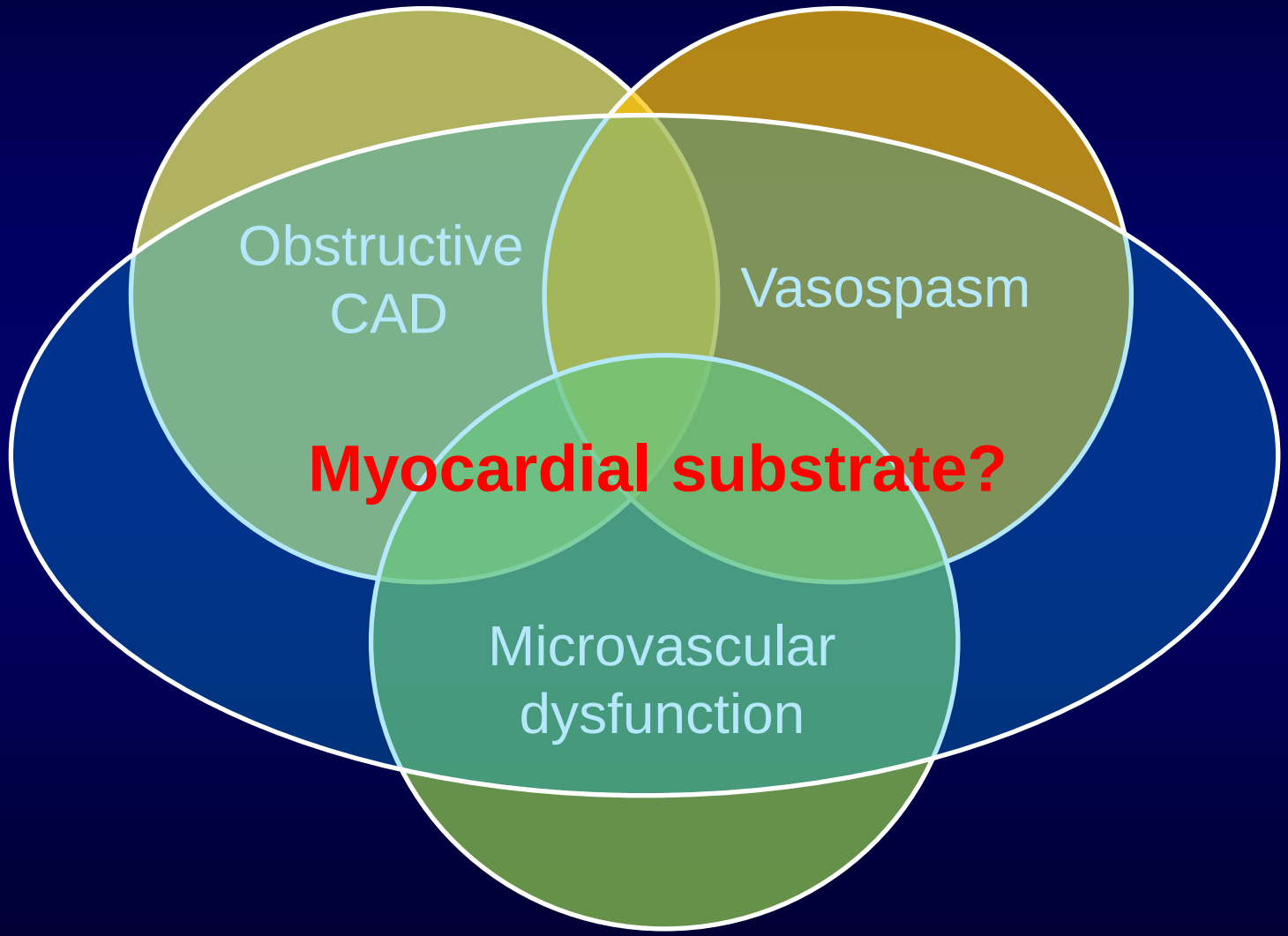
Age-matched non-angina vs. MVA





Non-angina, n=122
MVA: microvascular angina, n=122

Ischemic Chest Pain



Summary

In women,

- Aging is the most strong factor for IHD.
- Considerable patients may have microvascular angina.
- Impairment of LV diastolic function may have some relation to microvascular angina.
- Additional studies with specific diagnostic testing are required.

KoROSE
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