Preventing Heart and Vascular Disease: What You Can Do and What We Can Do

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Inside a diseased artery

A fatty streak, possibly occurring in the early teen years

Atherosclerotic plaque—

- Begins as a fatty streak composed of foamy macrophages containing cholesterol and other elements
- Over time accumulates cholesterol and fat
- Narrows arteries
- Contributes to heart attacks, strokes, renal failure and other vascular problems

How Heart Attacks and Strokes Occur

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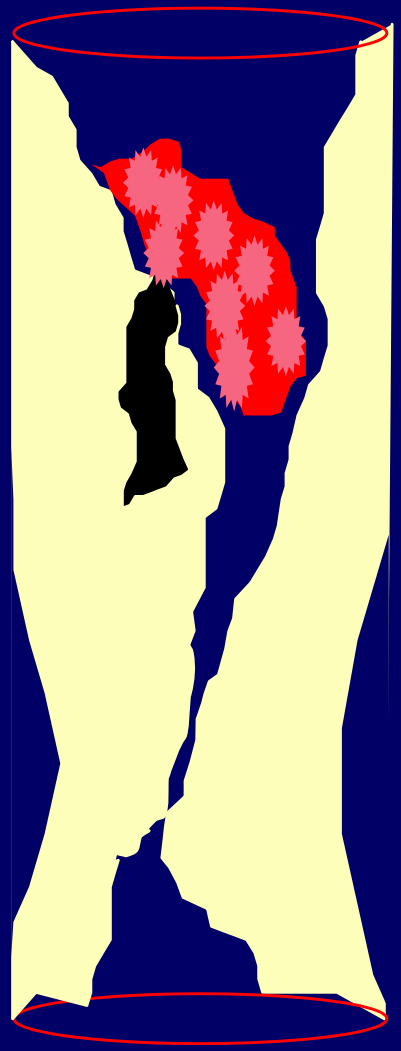
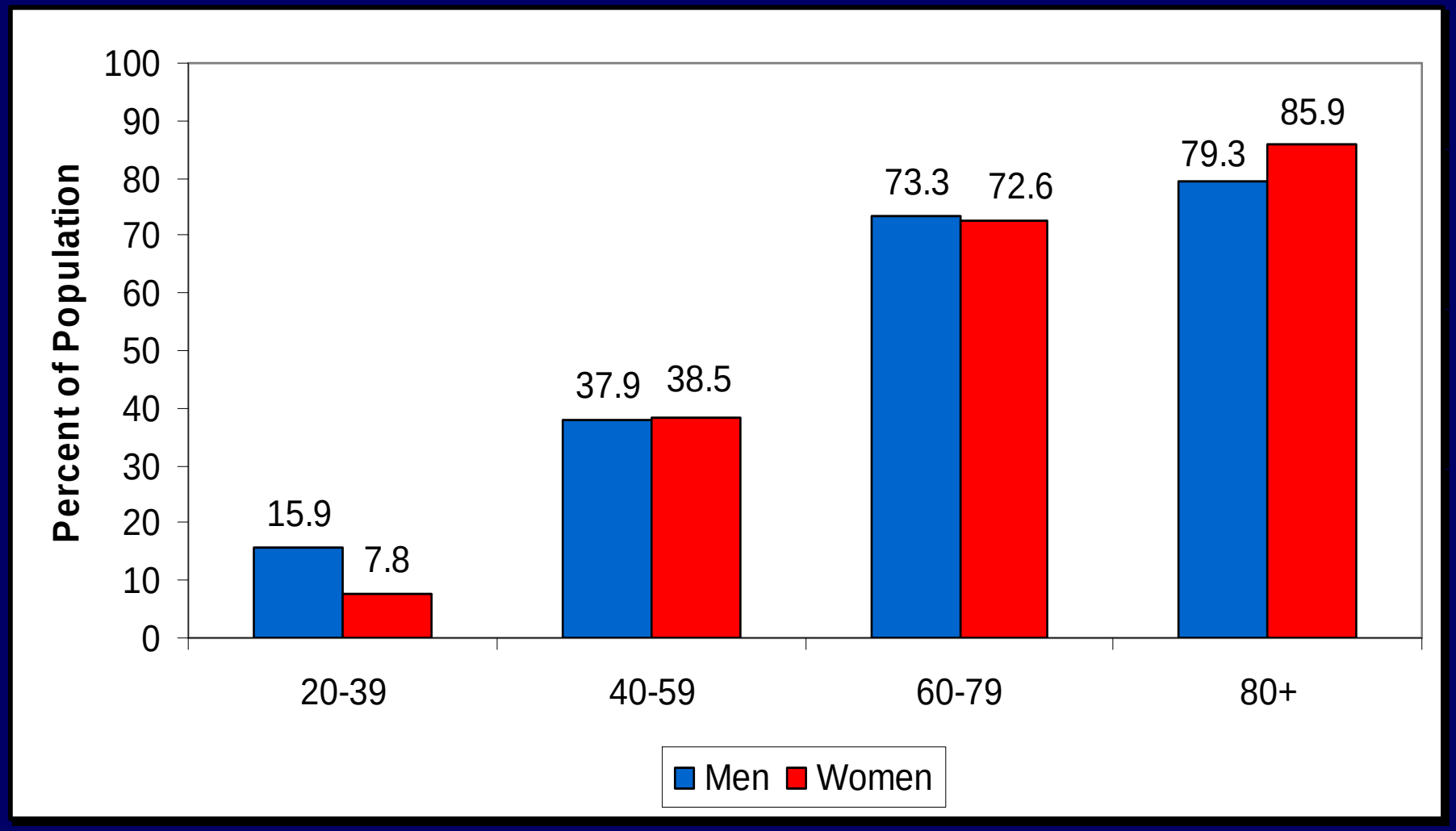
- Physical Stenosis
- Plaque Rupture
- Platelet Adhesion
- Thrombosis
- Vasospasm
- Blocked Artery



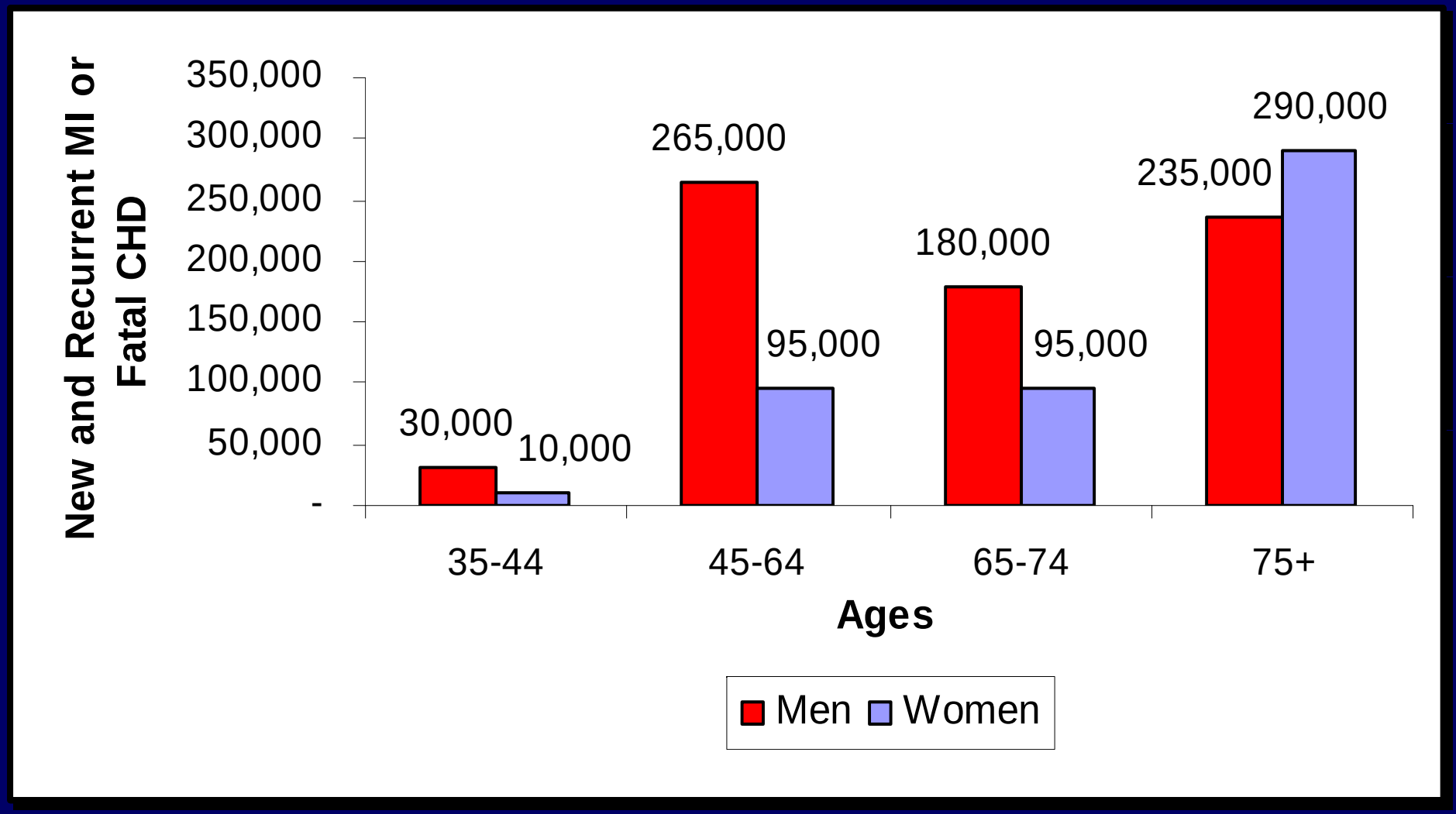
The Endothelium and Vascular Disease

February 26, 2009

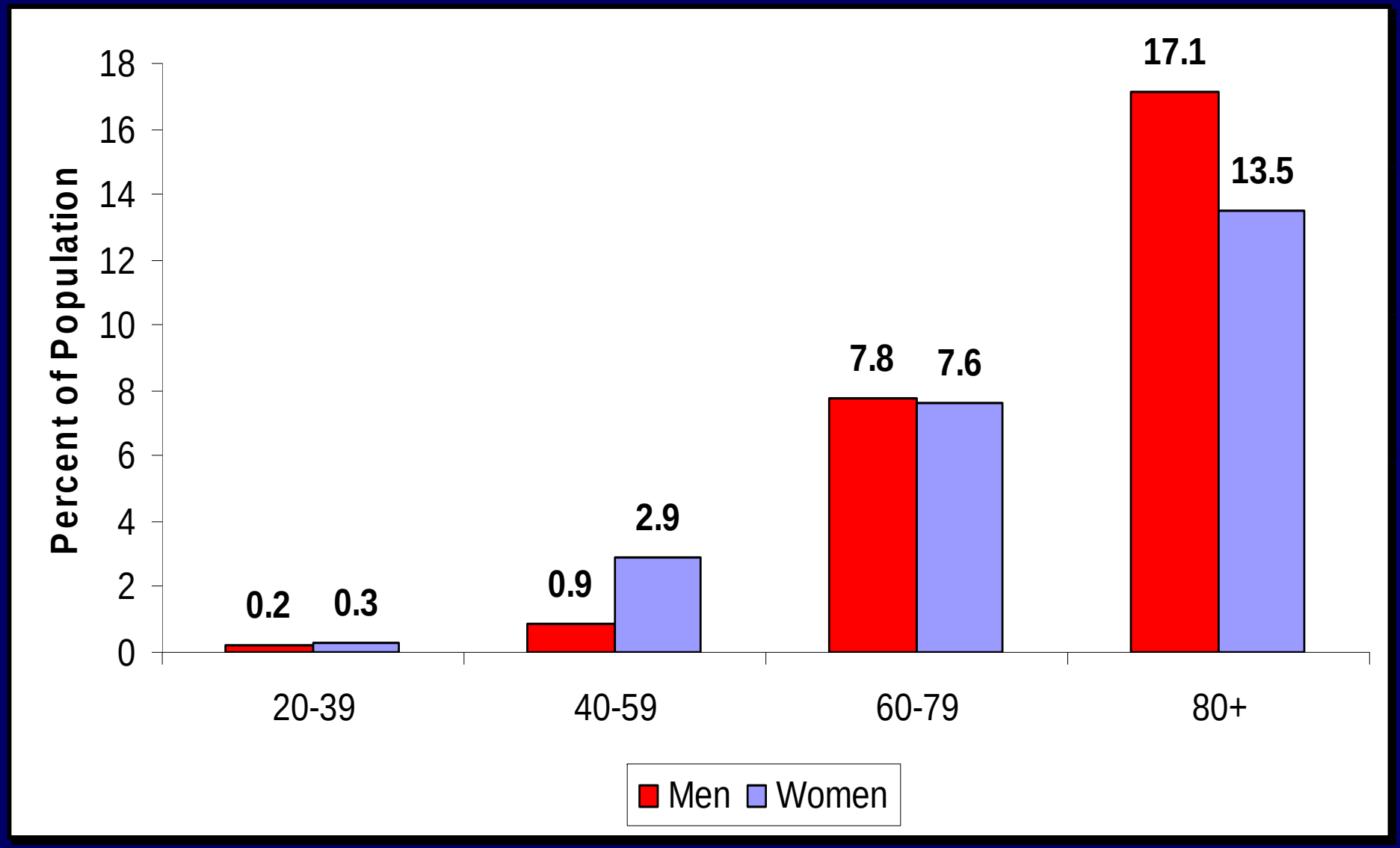
Prevalence of Cardiovascular Disease in adults age 20 and older by age and sex. These data include coronary heart disease, heart failure, stroke and hypertension.



Annual number of U.S. Adults having diagnosed heart attack by age and sex.



Prevalence of stroke by age and sex



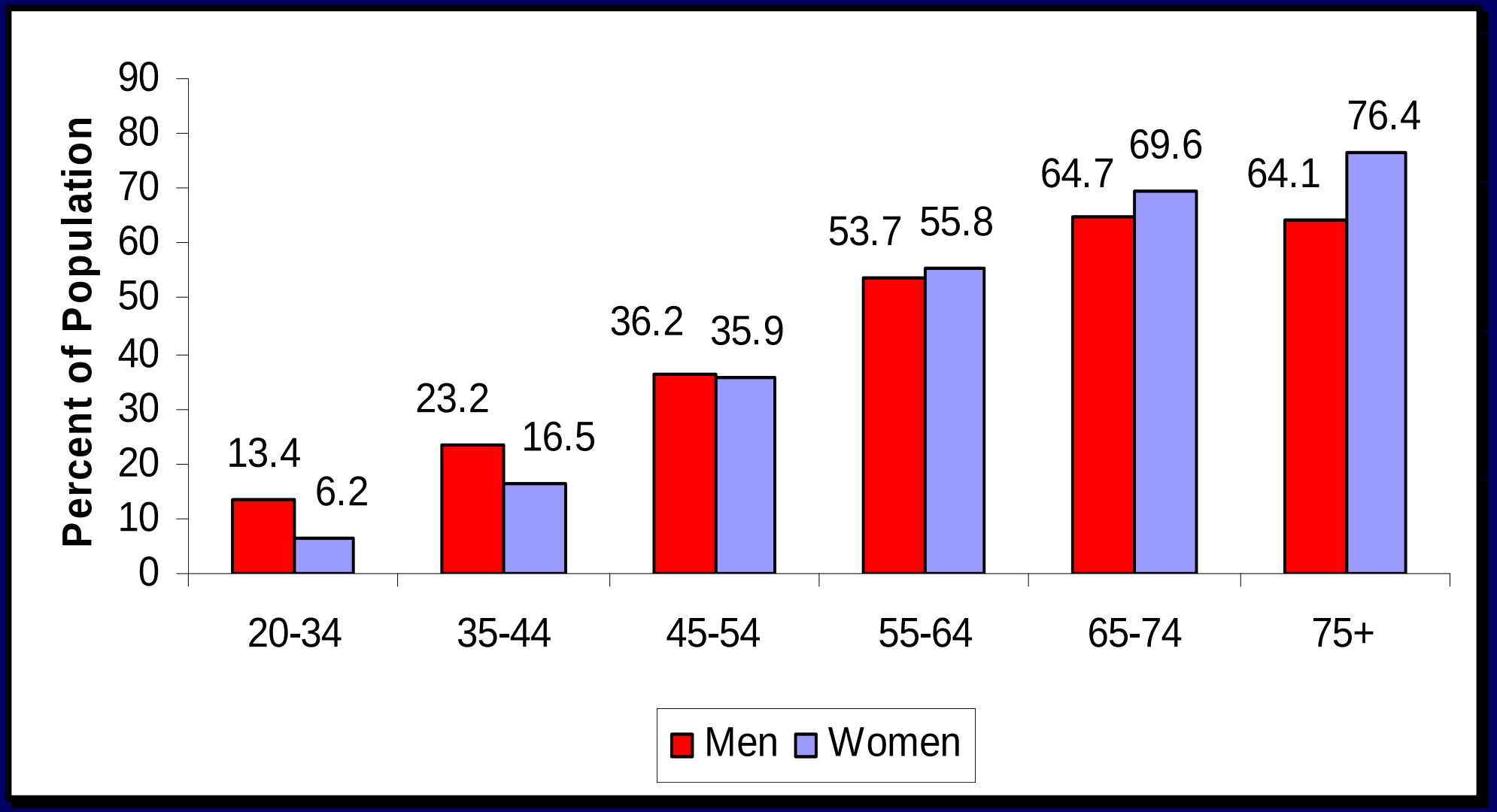
Established Risk Factors for Cardiovascular Disease

- **Nonmodifiable**
  - Age
    - >45 male
    - >55 female
  - Sex
  - Family History
    - age <55 father or other first degree male relative
    - age <65 mother or first degree female relative
- **Modifiable**
  - Hypertension
  - Cholesterol
  - Elevated Low Density Lipoprotein (LDL)
  - Reduced HDL
  - Physical inactivity
  - Obesity
  - Diabetes Mellitus
  - Cigarette Smoking

Classification of BP for Adults Age 18 Years and Older

Category	Systolic (mmHg)	Diastolic (mmHg)
Normal	<120	<80
Pre-Hypertension	120-139	80-89
Hypertension		
Stage I	140-159	90-99
Stage II	160-179	100-109
Stage III	180-209	110-119
Stage IV	≥210	≥120

Prevalence of high blood pressure in Adults by age and sex (NHANES: 2005-2006). Source: NCHS and NHLBI.



Consequences of High Blood Pressure

- Heart attacks
- Strokes (Brain attacks)
- Heart failure
- Kidney Dysfunction
- Vascular Disease

Lifestyle Modifications That Lower Blood Pressure

- Exercise
- Diet
- Alcohol

Exercise- How Is it Helpful?

- Lowers blood pressure
- Facilitates weight loss and maintenance of weight
- Raises HDL
- Reduces chances of getting diabetes
- Overall, less likely to have a clot coronary artery
- Improves quality of life

How Much Exercise is Enough to Reduce Risk of Heart Attack and Improve Quality of Life?

- **Moderate exercise 3x week**
  - **25 minutes 3x/week – some benefit**
  - **40 minutes 3x/week – more benefit**
  - **60 minutes 3x/week – more benefit**

Martin, C. K. et al. Arch Intern Med 2009;169:269-278.
JAMA. 1996;276:241-246.

What types of activities count?

- Brisk walking
- Jogging
- Treadmill set at 5 miles per hour
- Snowshoeing
- X-country skiing
- Bicycling
- Singles tennis
- Skiing
- Farm work

Martin, C. K. et al. Arch Intern Med 2009;169:269-278.
JAMA. 1996;276:241-246.

Exercise-Related Variables at Baseline and After Exercise Training 4,8, or 12 kilocalories per kilogram of body weight/wk (KKW) = 74, 138 and 183 min/week respectively of exercise

Table 2. Exercise-Related Variables at Baseline and After Exercise Training[a]

Exercise-Related Variable	All Participants (N=430)	Control Group (n=92)	Exercise Groups		
			4 KKW (n=147)	8 KKW (n=96)	12 KKW (n=95)
Peak relative $\dot{V}O_2$, mL/kg/min					
Baseline	15.4 (2.9)	15.5 (3.1)	15.5 (3.0)	14.7 (2.5)	15.7 (3.0)
Change	0.78 (1.9)	−0.30 (1.9)	0.65 (1.9)	1.33 (1.6)	1.52 (1.80)
6-mo Adherence, %[b]	92.8 (20.4)	NA	95.4 (15.5)	88.1 (26.4)	93.7 (19.5)
Sessions per week, mean	2.9	NA	2.7	2.9	3.1
Time spent exercising, min/wk[c]	113.8 (61.3)	NA	73.9 (15.5)	138.3 (25.3)	183.6 (43.3)

Abbreviations: KKW, kilocalories per kilogram of body weight per week; NA, not applicable; $\dot{V}O_2$, volume of oxygen consumed.

[a] Data are given as mean (standard deviation) unless otherwise indicated.

[b] Adherence was calculated for each individual by dividing the number of kilocalories expended during the 6-month exercise training by the number of kilocalories prescribed for the training period times 100.

[c] Among individuals who completed the intervention. Data are for the exercise training period but excluding the initial ramping period, which represents 6 months of data for the 4-KKW group, 5 months for the 8-KKW group, and 4 months for the 12-KKW group.

Martin, C. K. et al. Arch Intern Med 2009;169:269-278.

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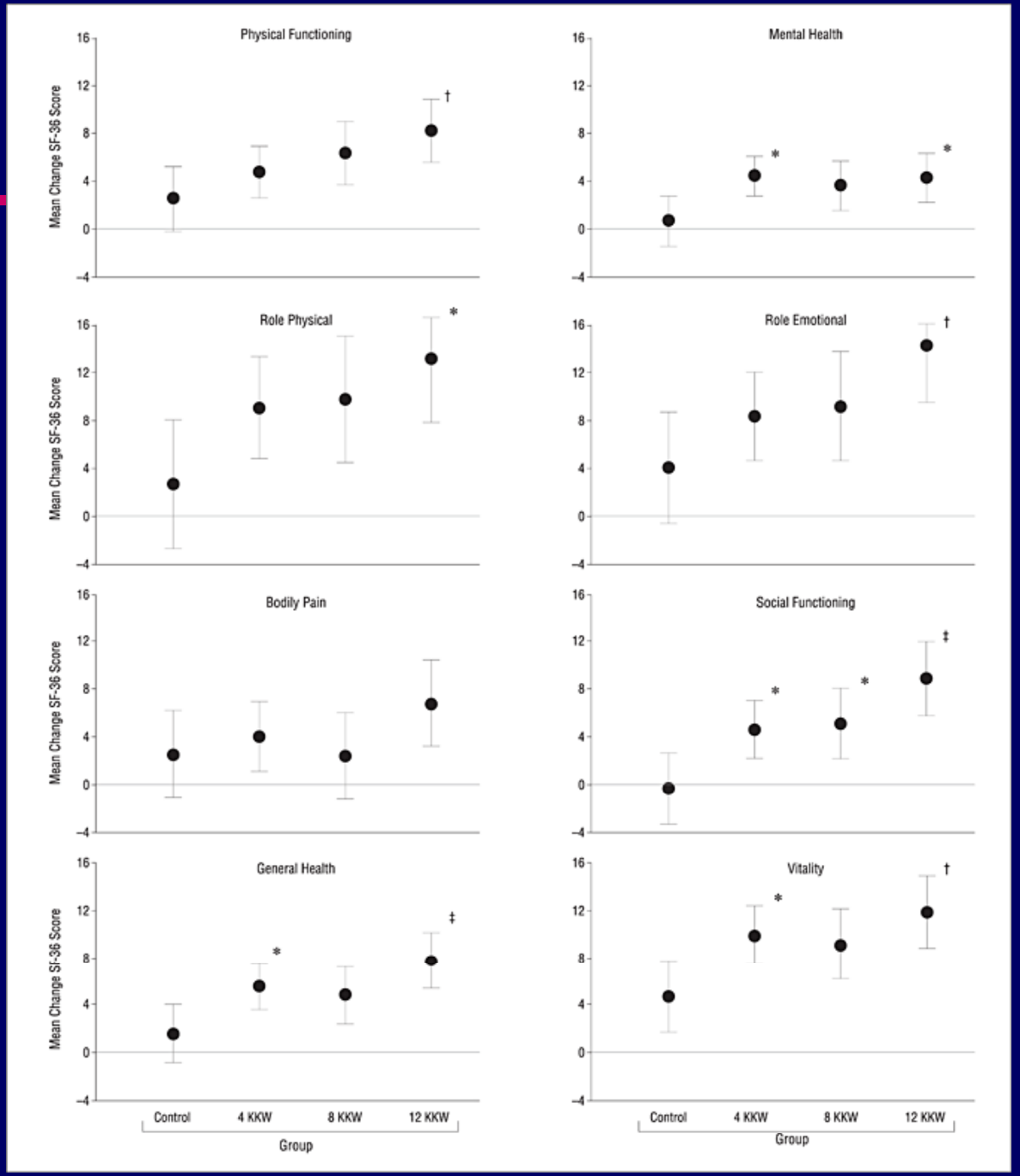
Mean change (least-squares [LS] means {+/-} 95% confidence interval [CI]) in Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) scores for the control and exercise groups



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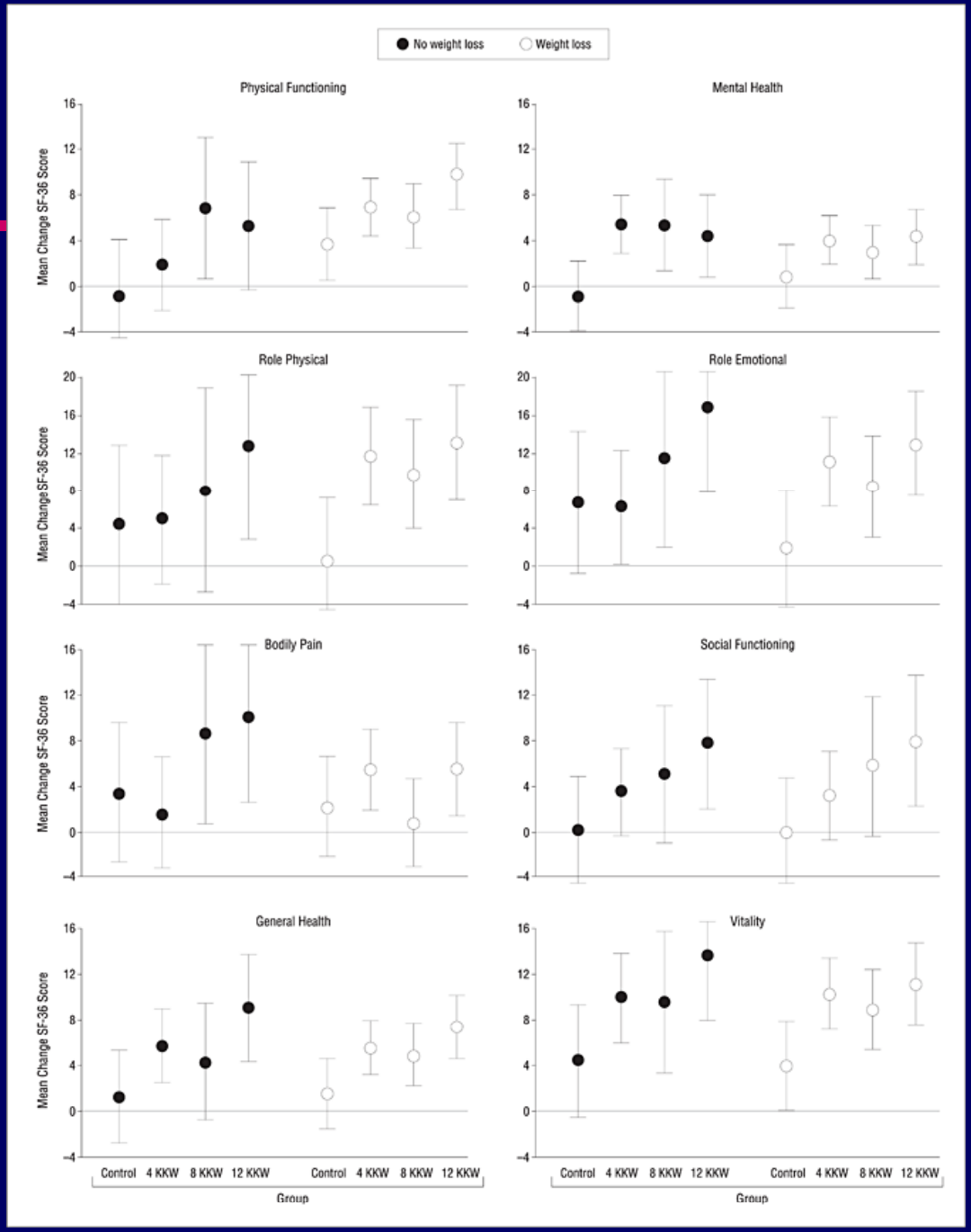
Mean change (least-squares means {+/-}95% confidence interval) in Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) scores across the exercise groups was examined for 2 subgroups, those who lost weight vs those who maintained or gained weight, using analysis of covariance (ANCOVA) with baseline age, antidepressant use, employment status, ethnicity, marital status, and smoking status as covariates



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Consume Less Sodium and Eat More Potassium

- **Sodium restriction**
  - Typical American diet >6 gm sodium/day
  - Limit should be 2 gm sodium/day
  - Read labels, make your own food
- **Potassium is good for you**
  - Good evidence that high intake lowers BP
  - Fresh fruit - banana, apricots, grapefruit, plums
  - Vegetables - potatoes, spinach, brocolli, mushrooms, cauliflower, artichoke globe
  - Legumes - beans, lentils, chick peas

Alcohol - Moderation

- 1 oz of ETOH: Neutral or lowering effect on BP
  - 24 ounces of beer
  - 8 ounces of wine
  - 2 ounces of 100 proof whiskey
- Greater than 1 oz of alcohol raises blood pressure

Medications – Many choices

- Diuretics (water-pills)
- Angiotensin Converting Enzyme Inhibitors
- Calcium Channel Blockers
- Angiotensin II Receptor Blockers
- Renin Inhibitors
- Beta Blockers
- Alpha Blockers

Optimum cholesterol levels

Total cholesterol	<200
LDL cholesterol	<100
HDL cholesterol	>40
Triglycerides	<150

Your coronary heart disease (CHD) risk level

Target levels for LDL-C are determined by the following questions:

- Do you have coronary heart disease (CHD)?
- Do you have a coronary risk equivalent?
- Do you have major risk factors other than LDL cholesterol?

Someone with CHD or equivalent is considered at high risk and has an LDL-C goal of <100 and perhaps even <70

Coronary Heart Disease Equivalents

This classification includes—

- Diabetes mellitus
- Peripheral artery disease
- Abdominal aortic aneurysm
- Symptomatic carotid artery disease (stroke, transischemic attack)
- Any combination of multiple risk factors with a 10-year risk of CHD > 20 percent, based on the Framingham risk calculation

Patients in this classification have the most aggressive LDL-C goal (<100 *and perhaps even <70).*

Evaluating your CHD risk

- The CHD risk level for someone without CHD or CD
- risk equivalent is assessed through a two-step process.
- Count your risk factors.
- If you have two or more risk factors, use the Framingham algorithm to calculate your 10-year absolute risk of CHD.
- If you have a risk factor of 0 or 1, you are generally considered to have a low absolute CHD risk (<10 percent).

Evaluating your 10-year risk according to Framingham

Age	Men	Women
20-34	-9	-7
35-39	-4	-3
40-44	0	0
45-49	3	3
50-54	6	6
55-59	8	8
60-64	10	10
65-69	11	12
70-74	12	14
75-80	13	16

Evaluating your 10-year risk according to Framingham

Men

Chol /age	20-39	40-49	50-59	60-69	70-79
<160	0	0	0	0	0
160-199	4	3	2	1	0
200-239	7	5	3	1	0
240-279	9	6	4	2	1
>280	11	8	5	3	1

Women

Chol /age	20-39	40-49	50-59	60-69	70-79
<160	0	0	0	0	0
160-199	4	3	2	1	1
200-239	8	6	4	2	1
240-279	11	8	5	3	2
>280	13	10	7	4	2

Evaluating your 10-year risk according to Framingham

Men, by age	20-39	40-49	50-59	60-60	70-79
Nonsmoker	0	0	0	0	0
Smoker	8	5	3	1	1

Women, by age	20-39	40-49	50-59	60-60	70-79
Nonsmoker	0	0	0	0	0
Smoker	8	5	3	1	1

Evaluating your 10-year risk according to Framingham

HDL	Points
>60	-1
50-59	0
40-49	1
<40	2

Evaluating your 10-year risk according to Framingham

Systolic BP, men	If untreated	If treated
<120	0	0
120-129	0	1
130-139	1	2
140-159	1	2
>160	2	3

Systolic BP, women	If untreated	If treated
<120	0	0
120-129	1	3
130-139	2	4
140-159	3	5
>160	4	6

Evaluating your 10-year risk according to Framingham

Point total, men	10-year risk, %
0-4	1
5-6	2
7	3
8	4
9	5
10	6
11	8
12	10
13	12
14	16
15	20
16	25
>17	>30

Point total, women	10-year risk, %
<9-12	<1
13-14	2
15	3
16	4
17	5
18	6
19	8
20	11
21	14
22	17
23	22
24	27
>25	>30

LDL-C goals

CHD risk category	10-year CHD risk	LDL-C goal (mg/dL)
CHD or CHD risk equivalents	>20 percent	<100 or <70
2 or more risk factors (CHD equivalent)	>20 percent	<100 or <70
2 or more risk factors	10 to <20 percent	<130
0 to 1 risk factor	<10 percent	<160

When is medication advisable?

Risk category	LDL goal	LDL level at which to start…	
		Lifestyle changes	Drug therapy
High	<100	>100	>130
Moderate	<130	>130	10-20% risk: >130
			<10% risk: >160
Low	<160	>160	>190

Imaging Modalities of Your Heart and Blood Vessels

- CT Angiography
- Magnetic Resonance Imaging
- Echocardiography

Historical Perspective on Coronary Artery Imaging: 1490s, Leonard da Vinci - 2 Days to Draw

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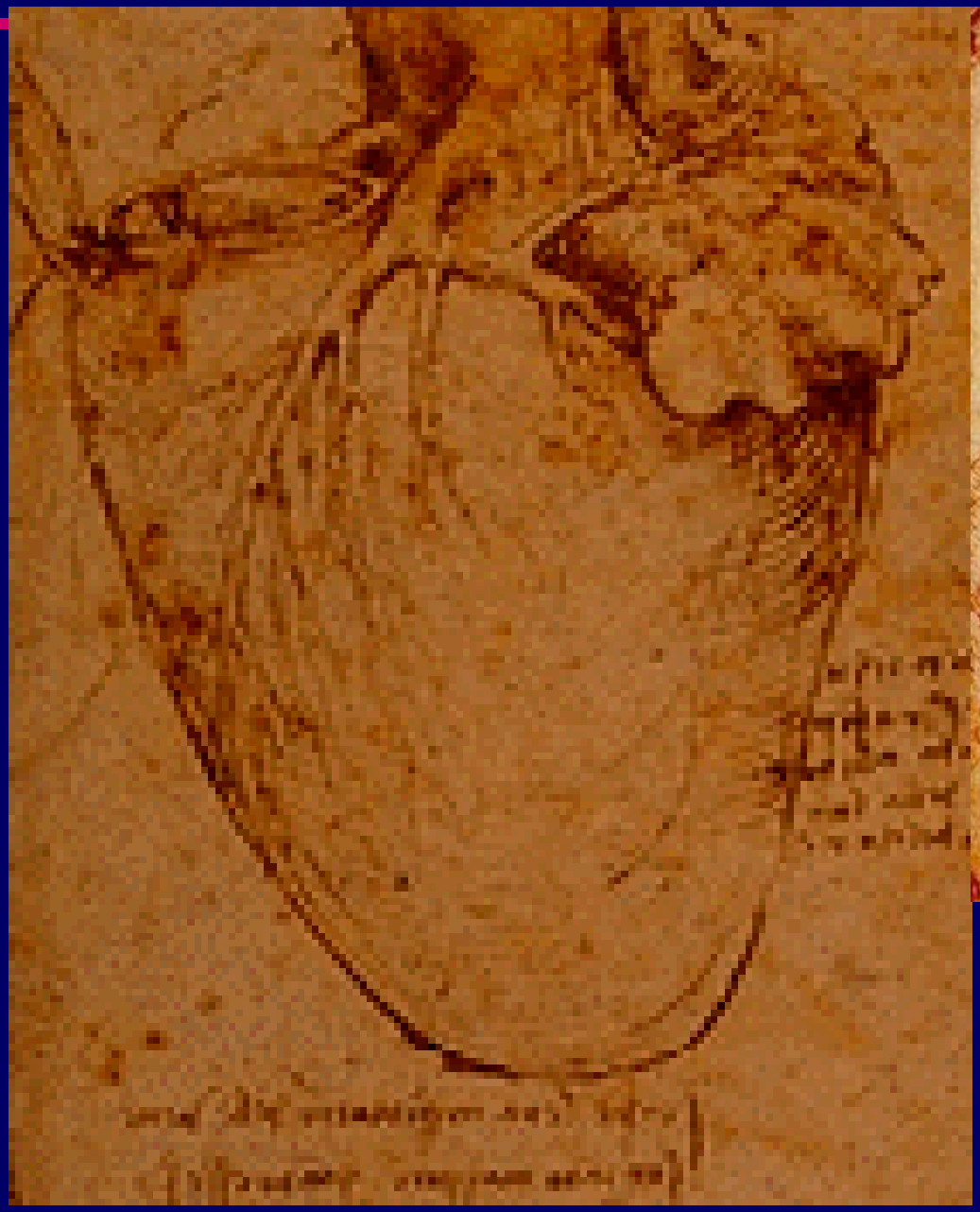
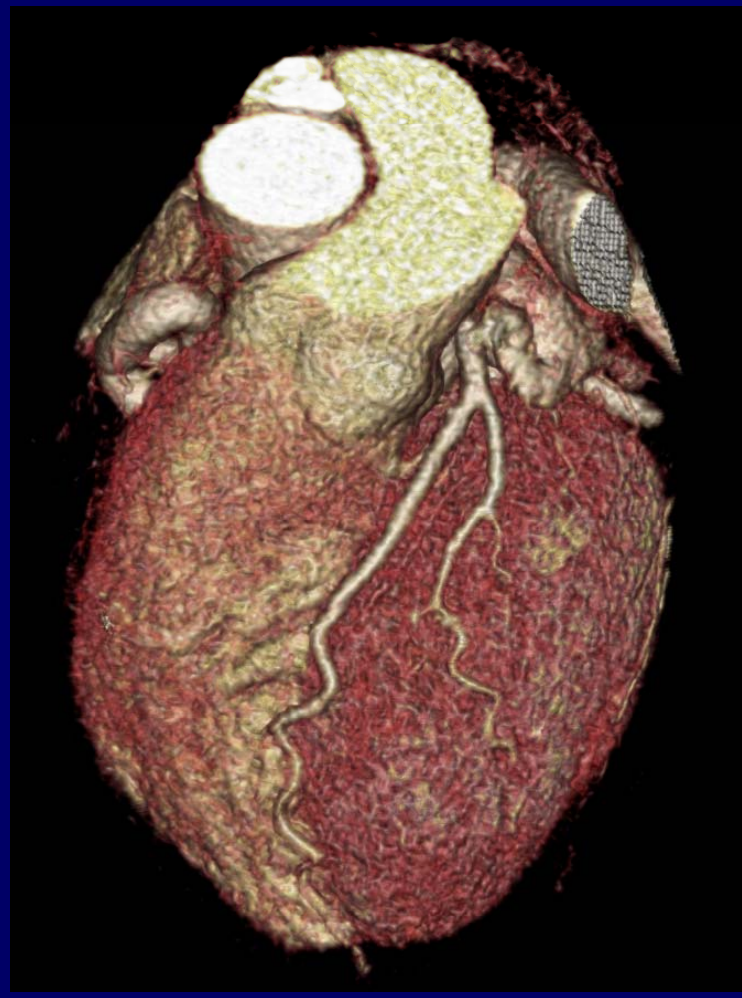


1490s, Leonardo da Vinci

1490s da Vinci, 2 days

2003, Sensation 16, <20 sec



2006 Definition, <10 sec

CT Angiogram of the Right Coronary Artery

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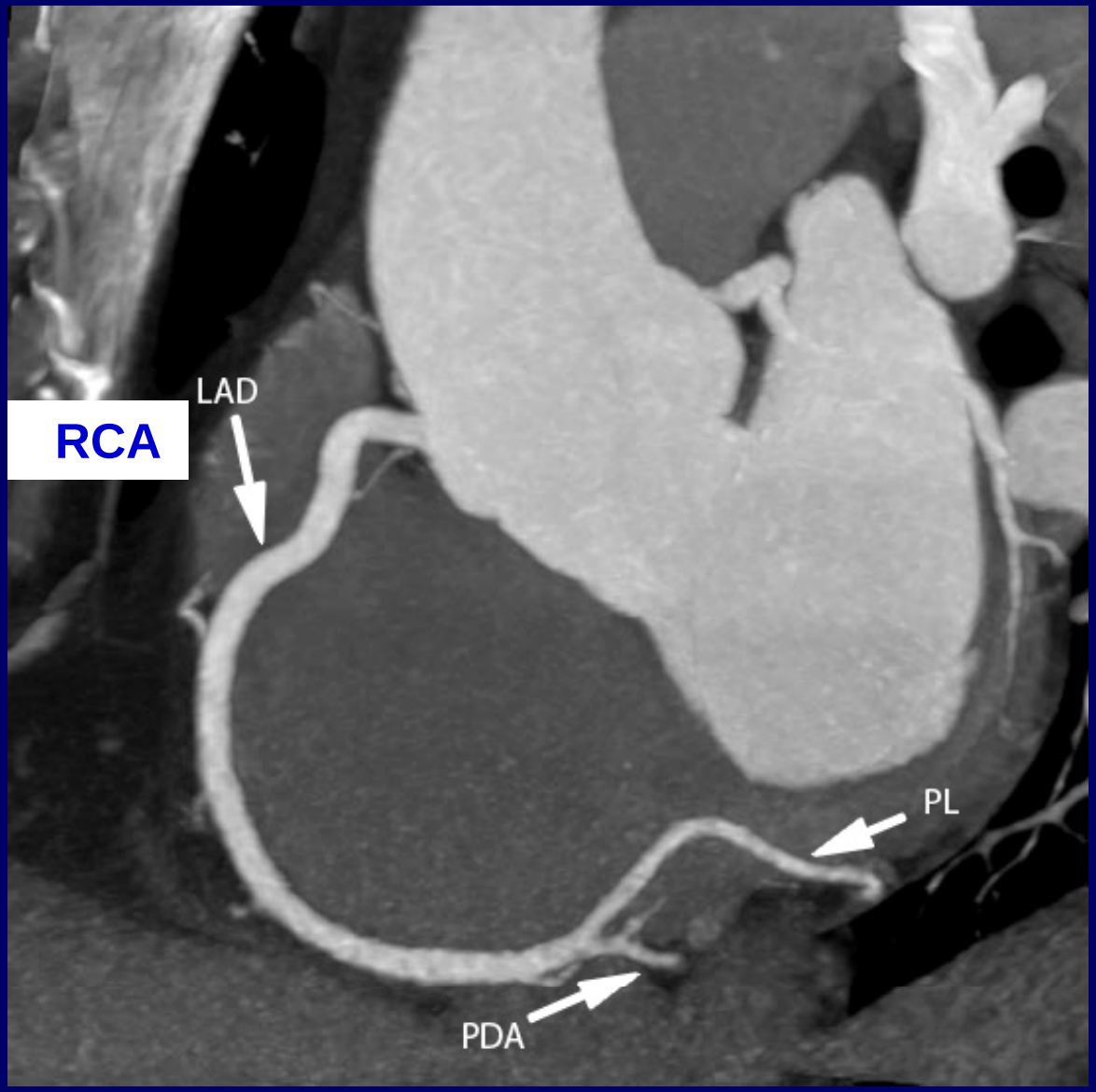

Severe atherosclerotic lesion in the mid- left anterior descending artery

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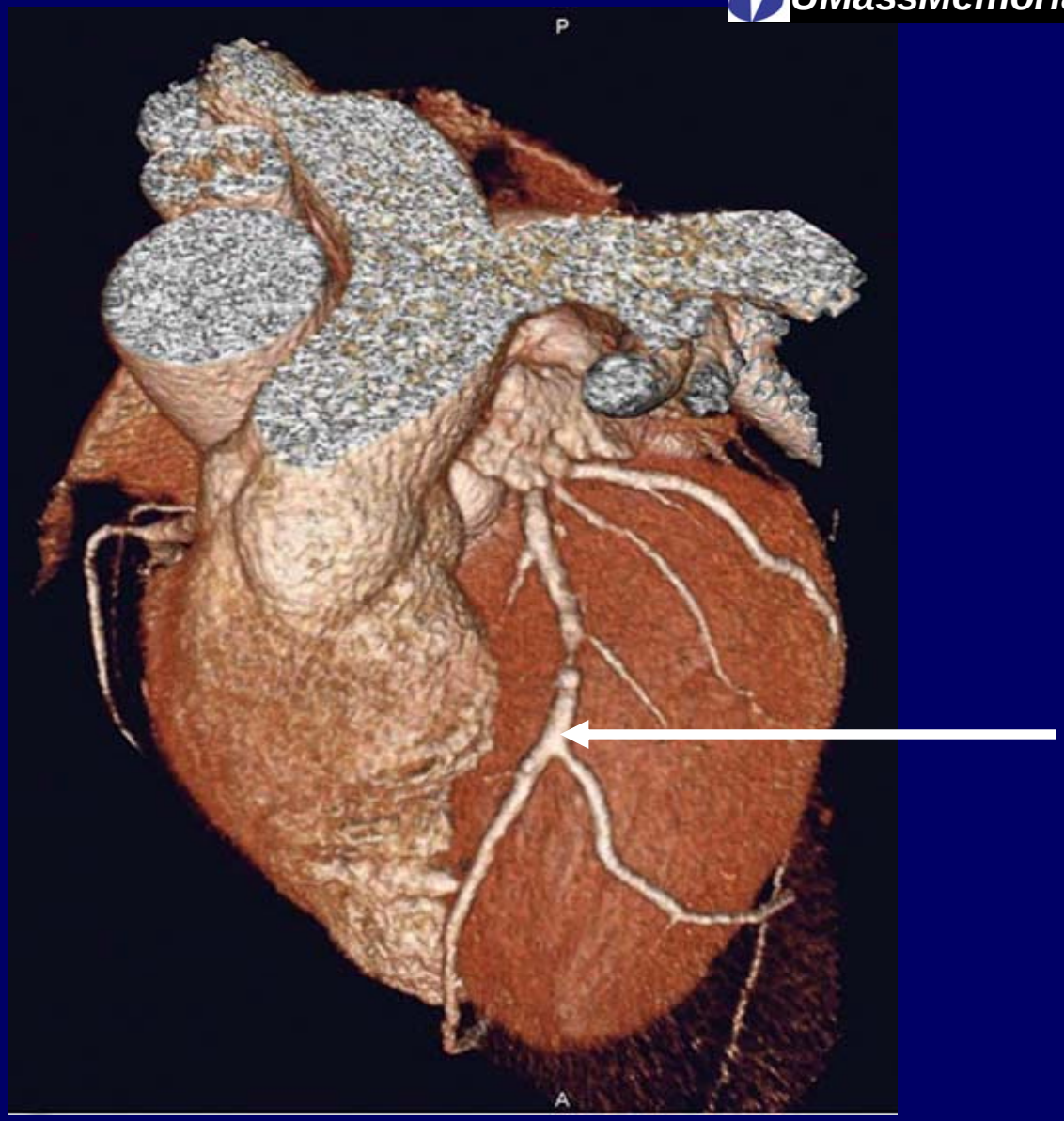
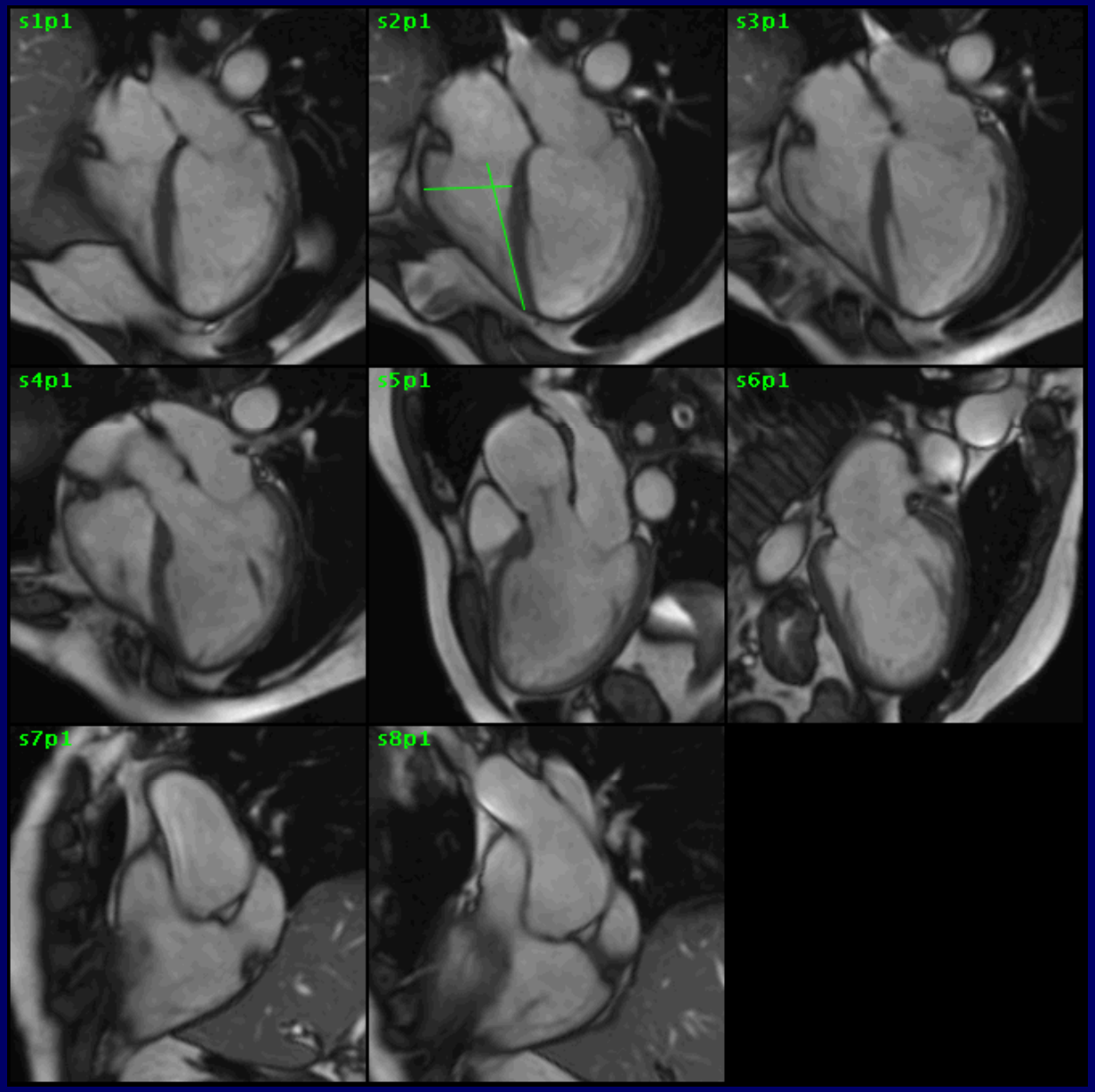
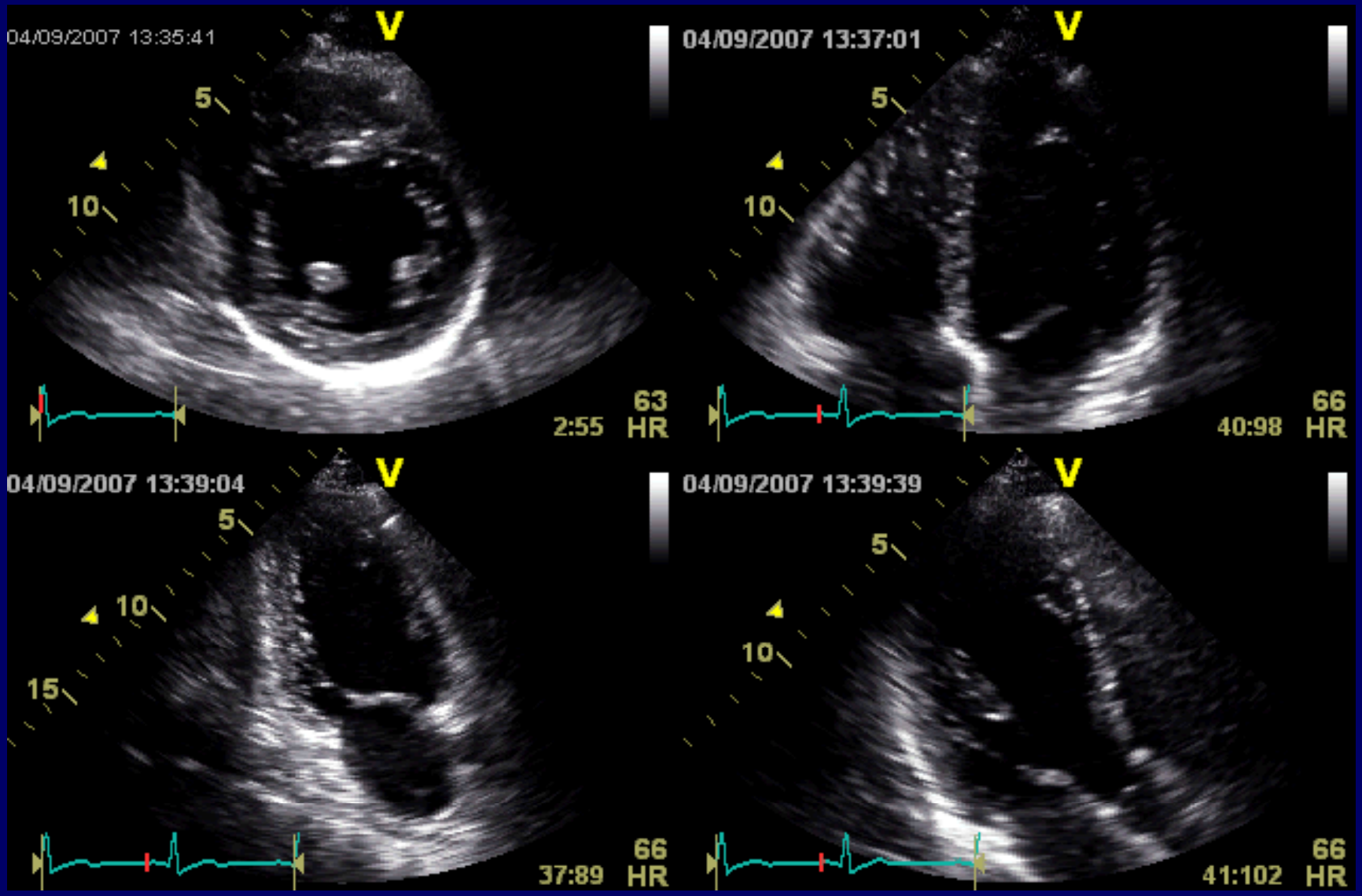


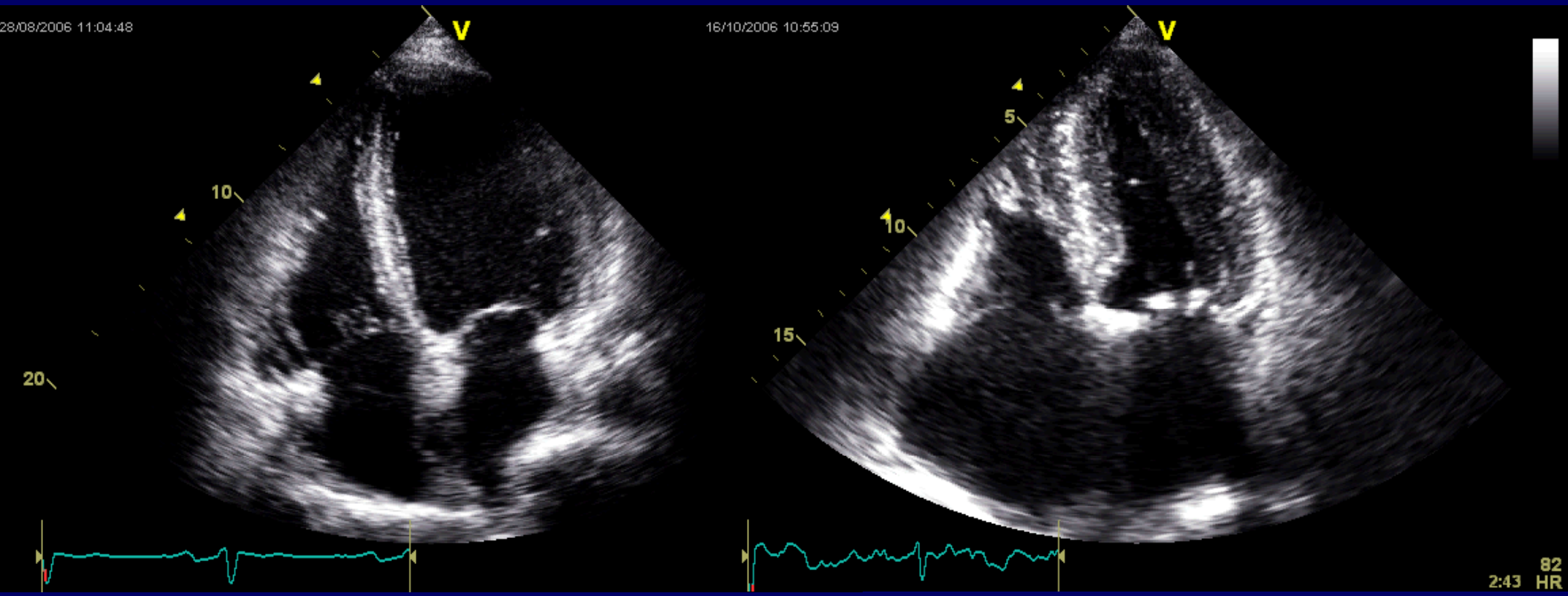
MRI of a Normal Heart and One with A Leaky Aortic Valve



Echocardiogram of a Normal Heart

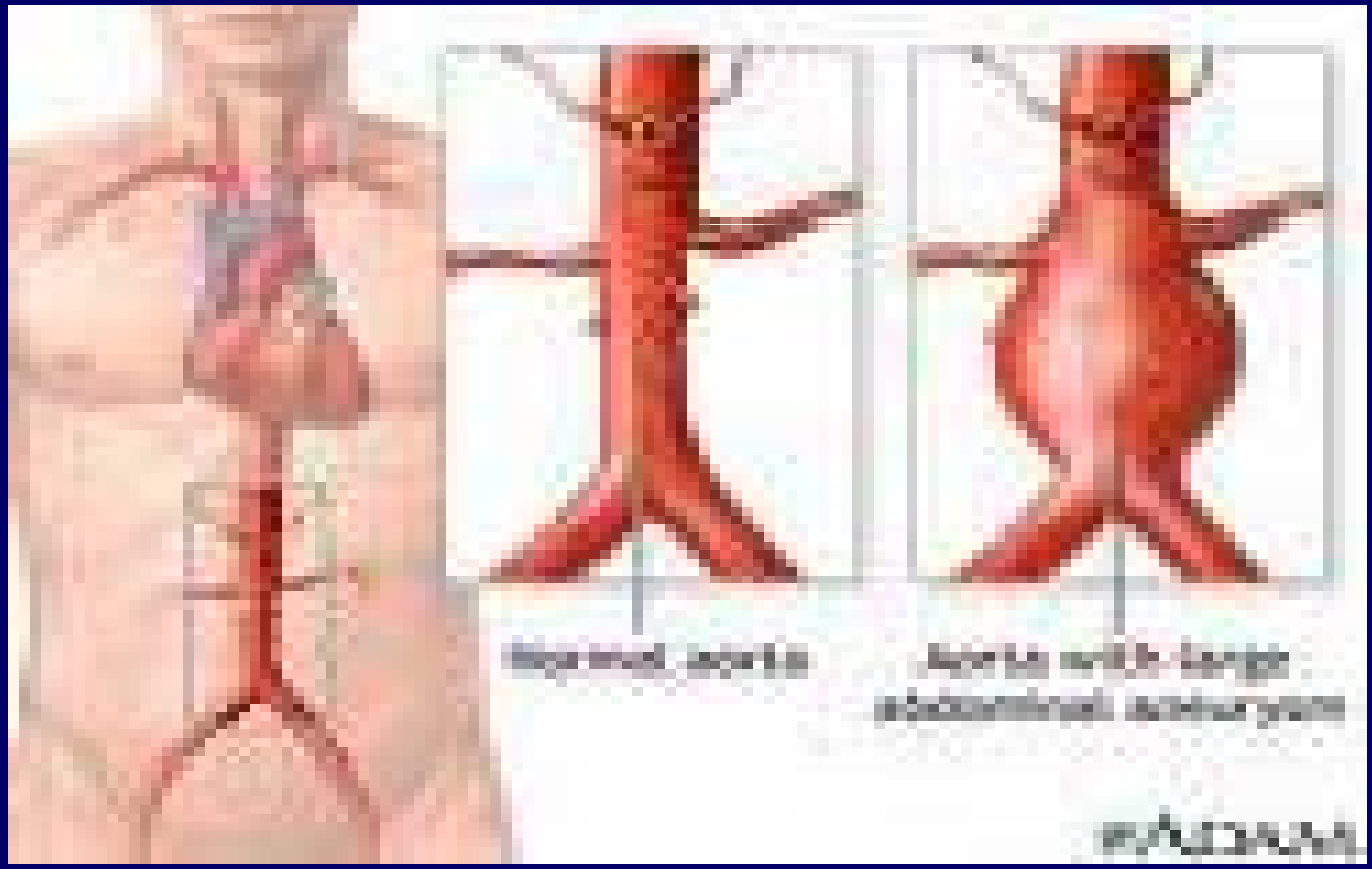


Echocardiogram of a Dilated Heart (L) and a Hypertensive Heart (R)



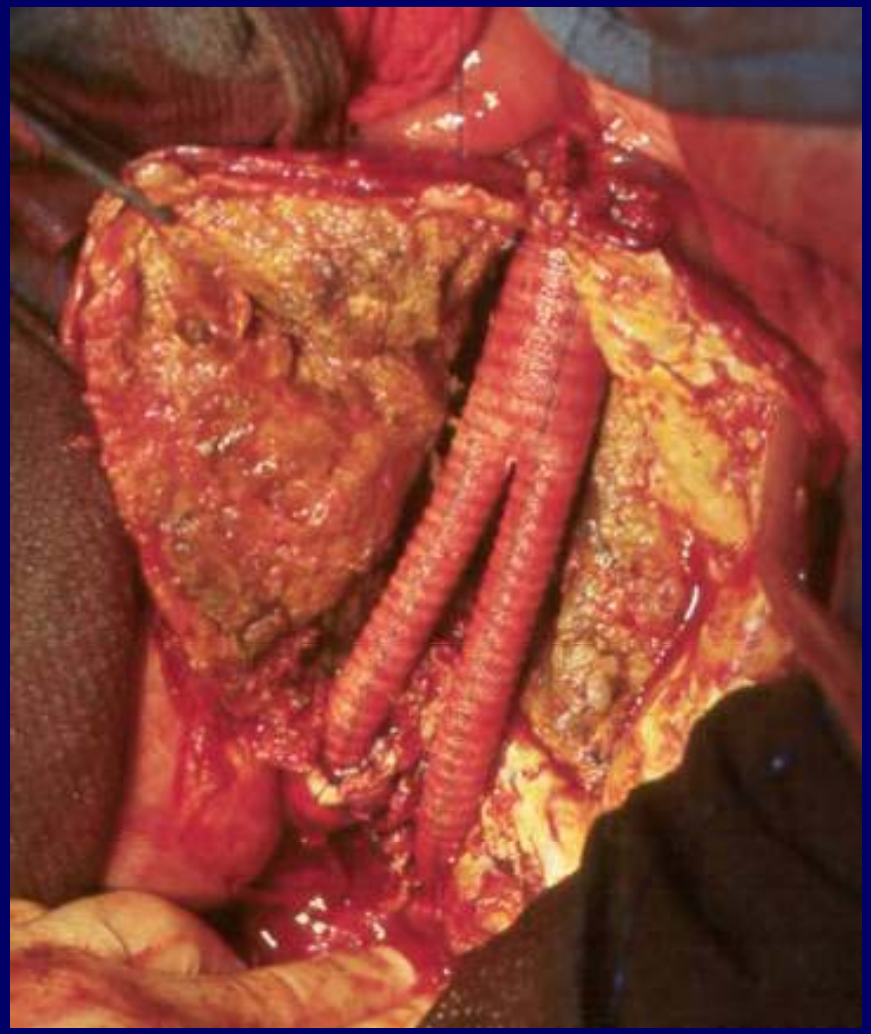
New and Minimally Invasive Vascular Surgery

Anatomy of An Abdominal Aortic Aneurysm



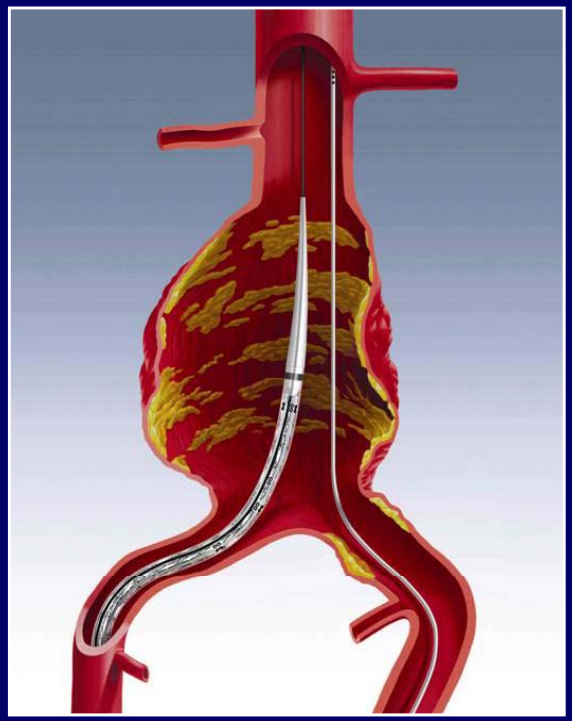
Open Repair of Abdominal Aortic Aneurysm

- **Why do it?**
  - If Aneurysm bursts, chance of death is high
- **Disadvantages of Surgery:**
  - Long, complicated surgery
  - Long recovery
  - Disfiguring



Open Surgical AAA Repair – Long Recovery, Big Scar

Endovascular AAA Repair

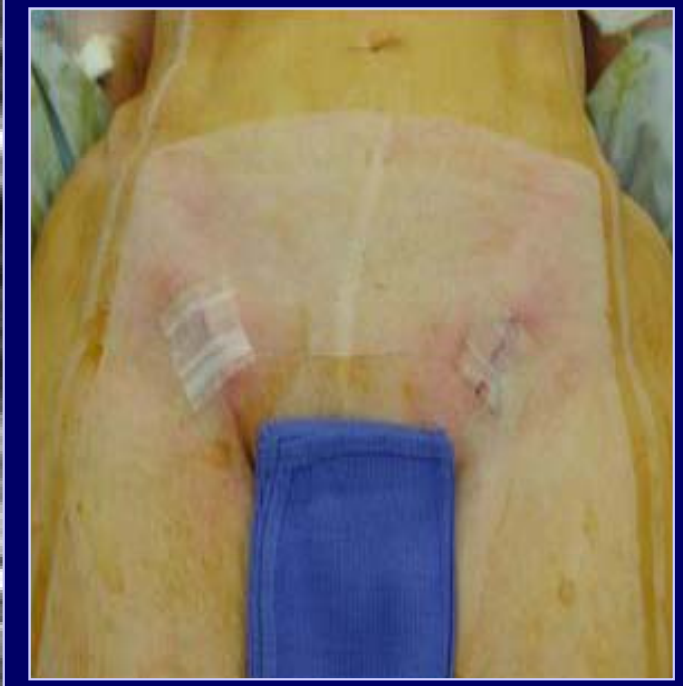


- Advantages
  - No Surgery
  - Minimal to no recovery time
  - Excellent Function

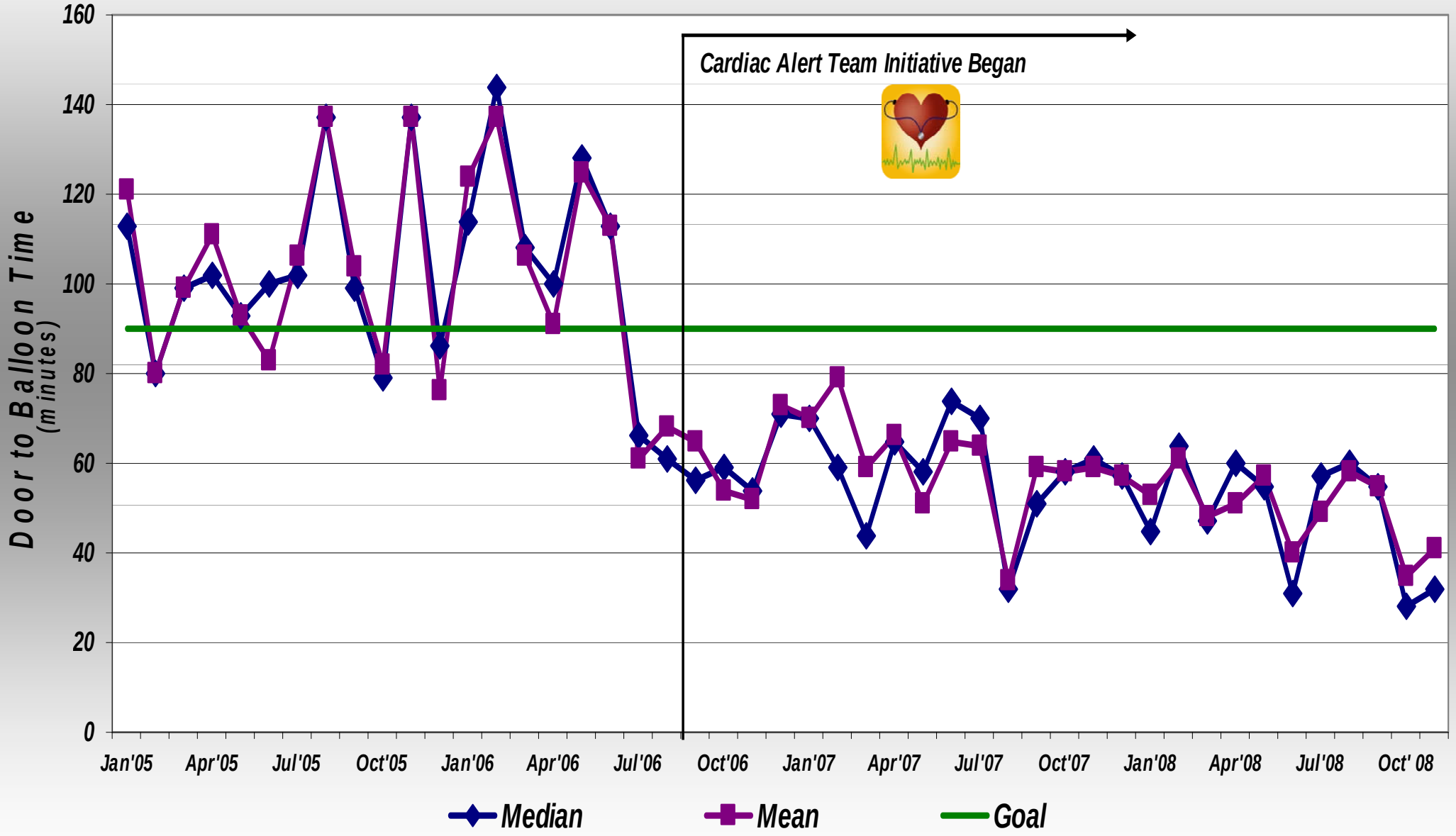
Endovascular Repair of Abdominal Aortic Aneurysm

BEFORE

AFTER



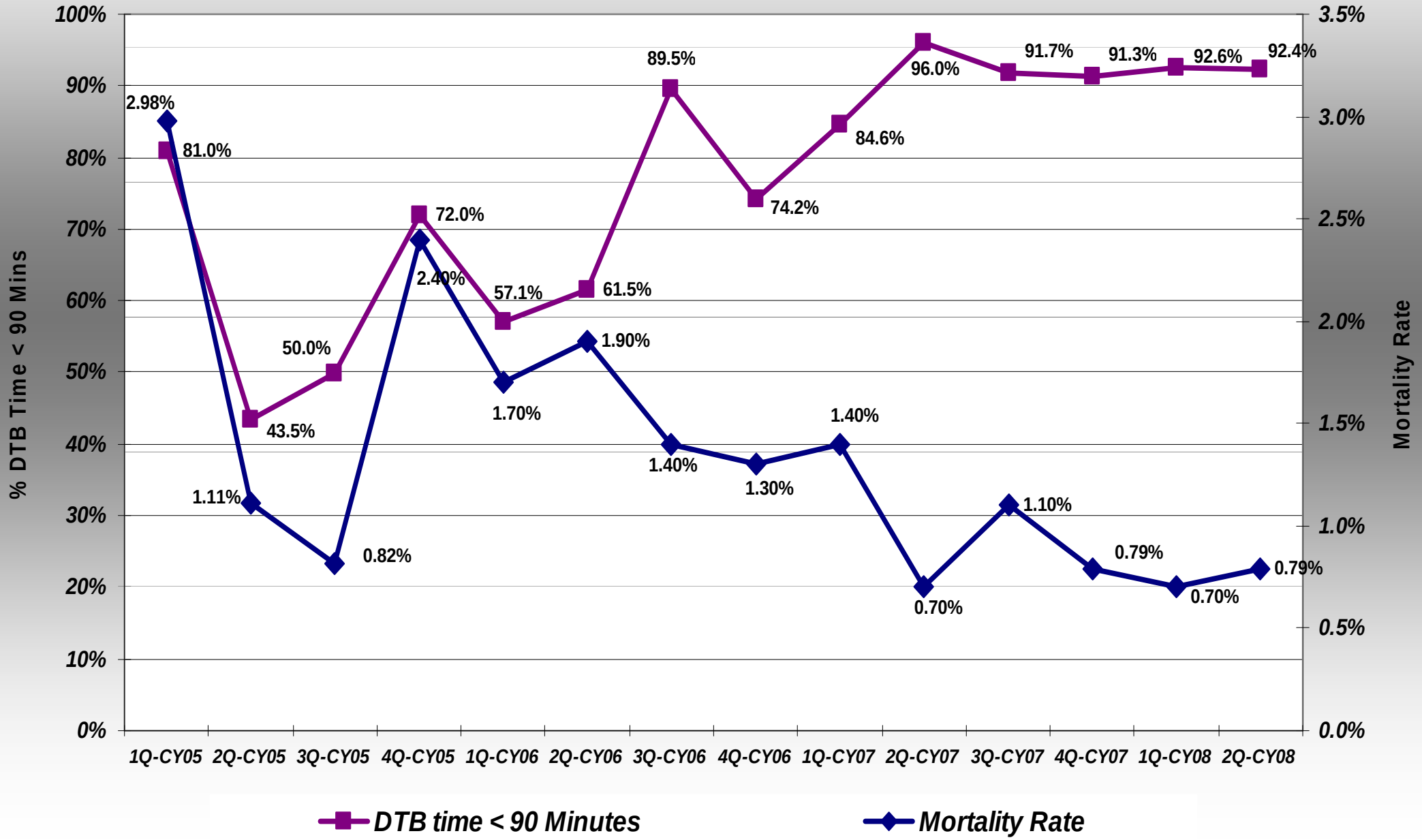
ST Segment Elevation Myocardial Infarction (STEMI)
UMMHC Process Improvement: 2005-2008



Number of Cases

CY2005: 55 CY2006: 62 CY2007: 89 CY2008 (through 10/2008): 63

ST Elevation Myocardial Infarction (STEMI): Door To Balloon (DTB) and Mortality Improvement



Right Coronary Artery with Normal Blood Flow

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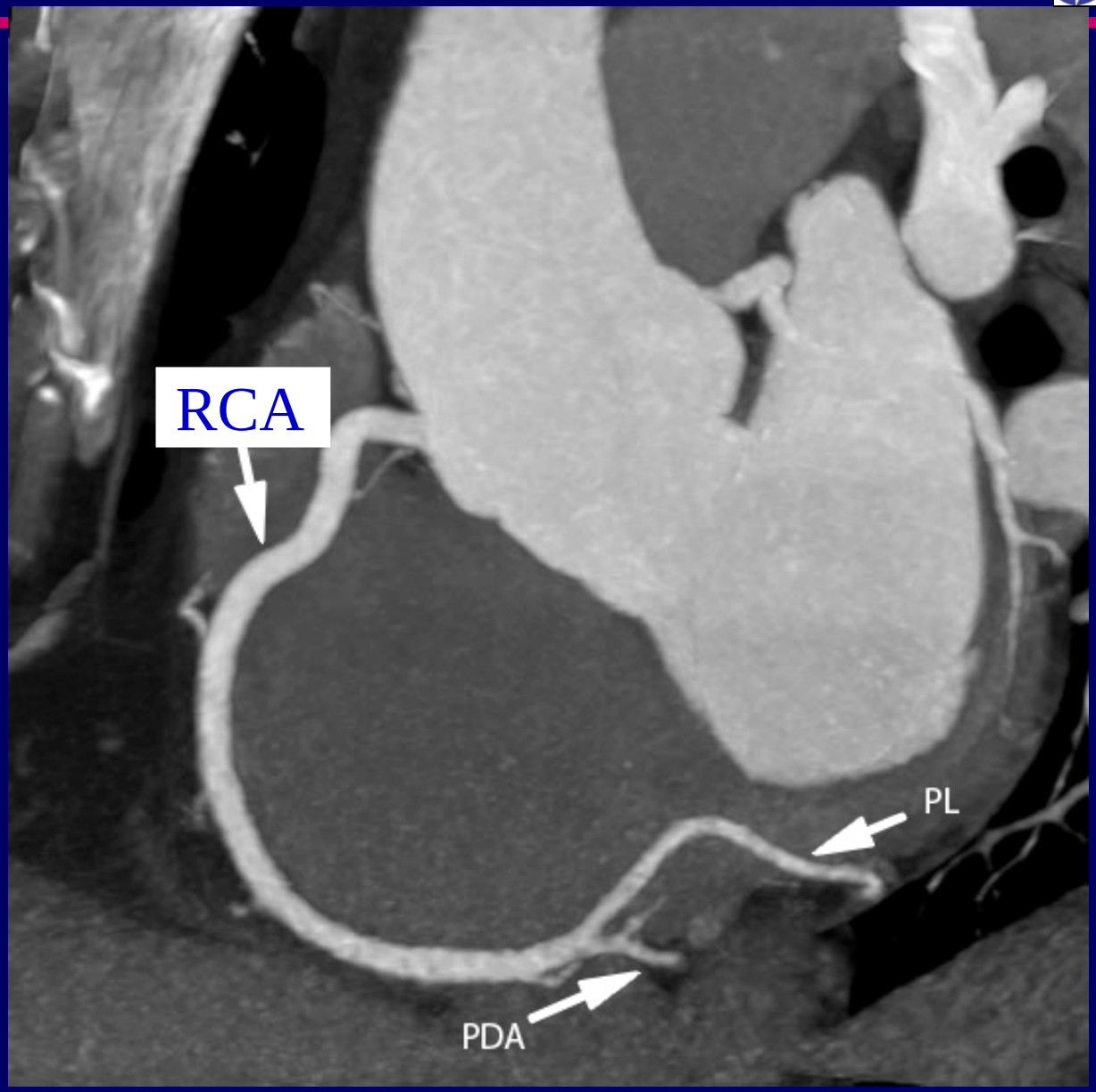
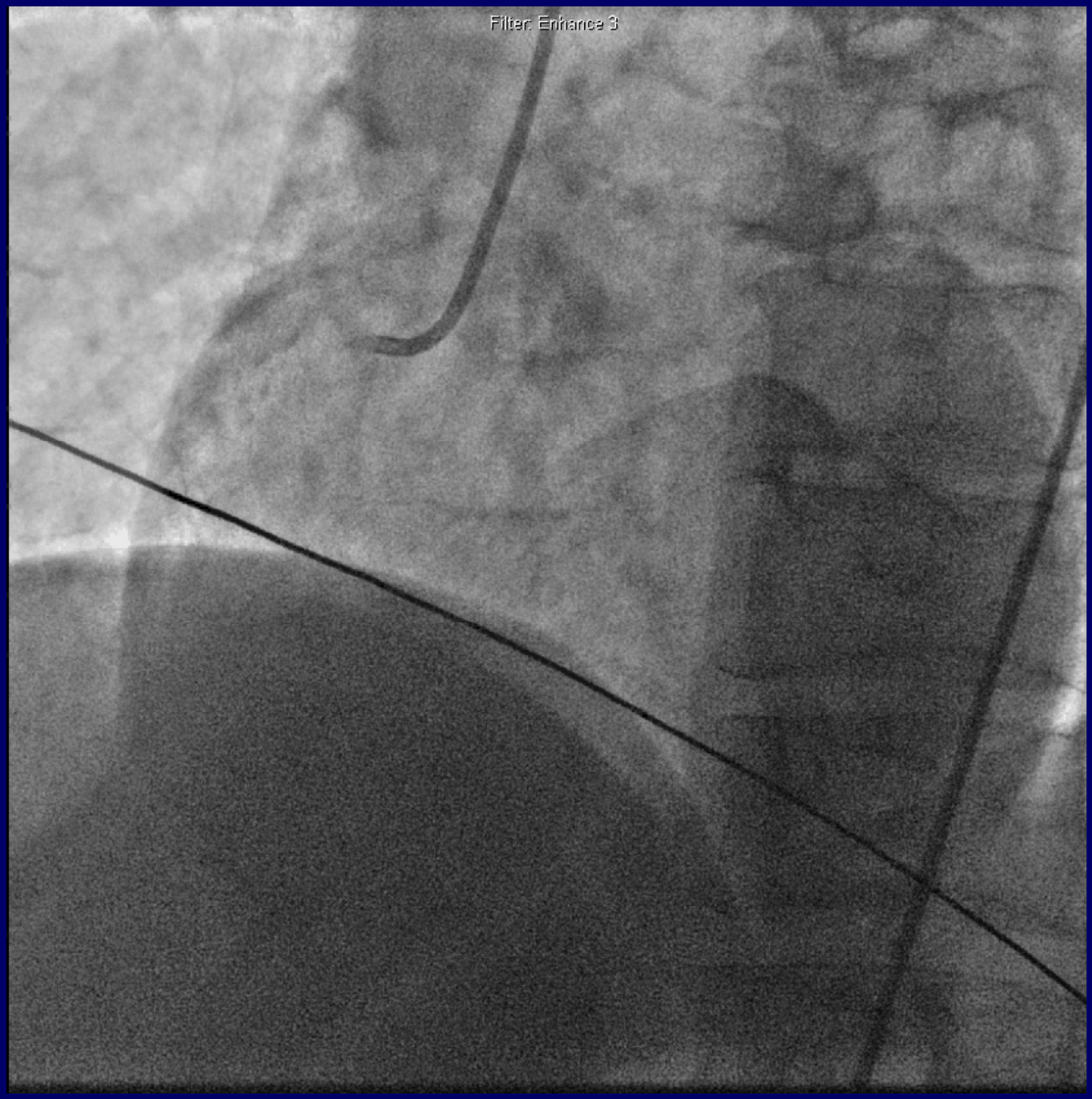
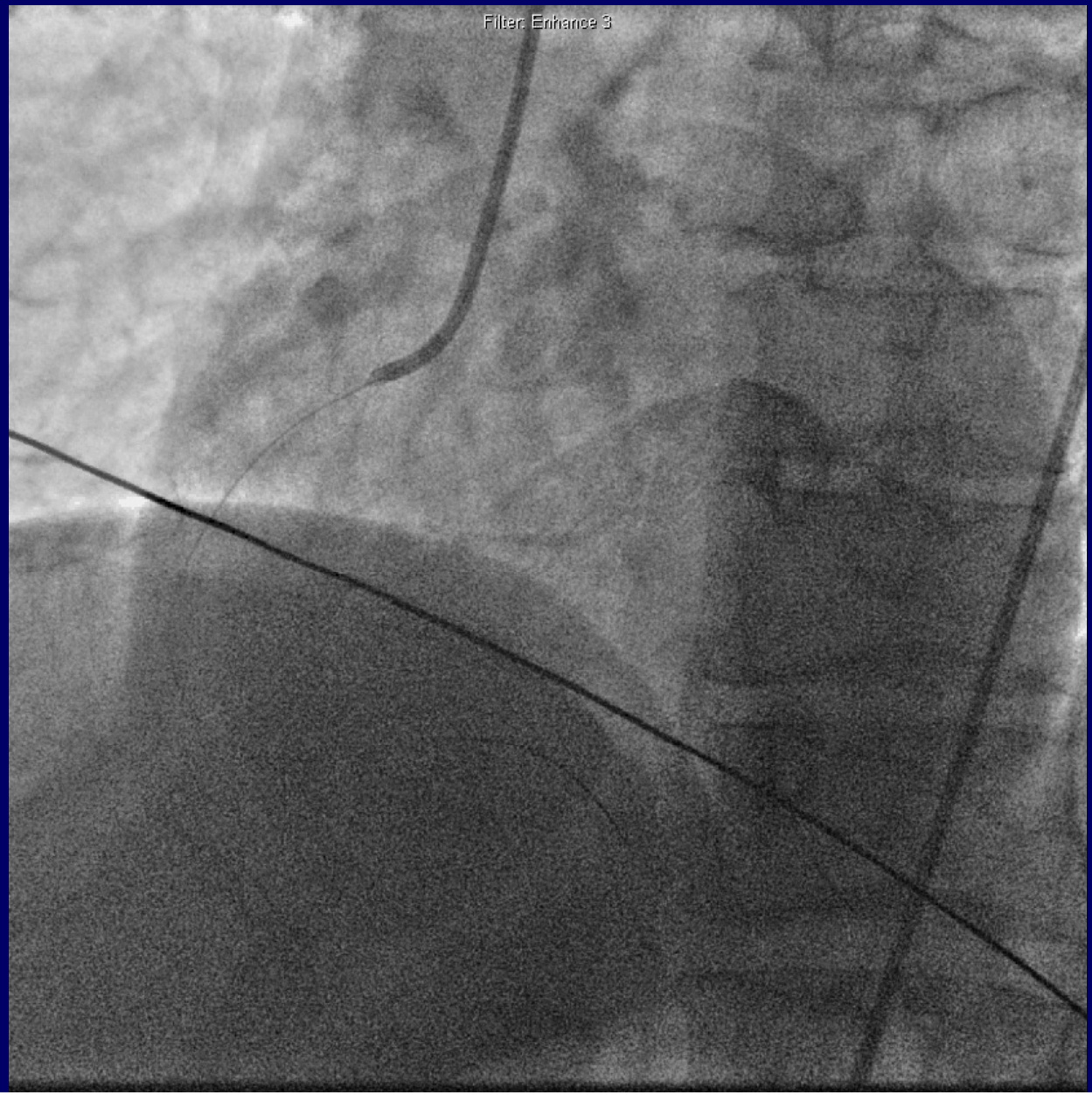


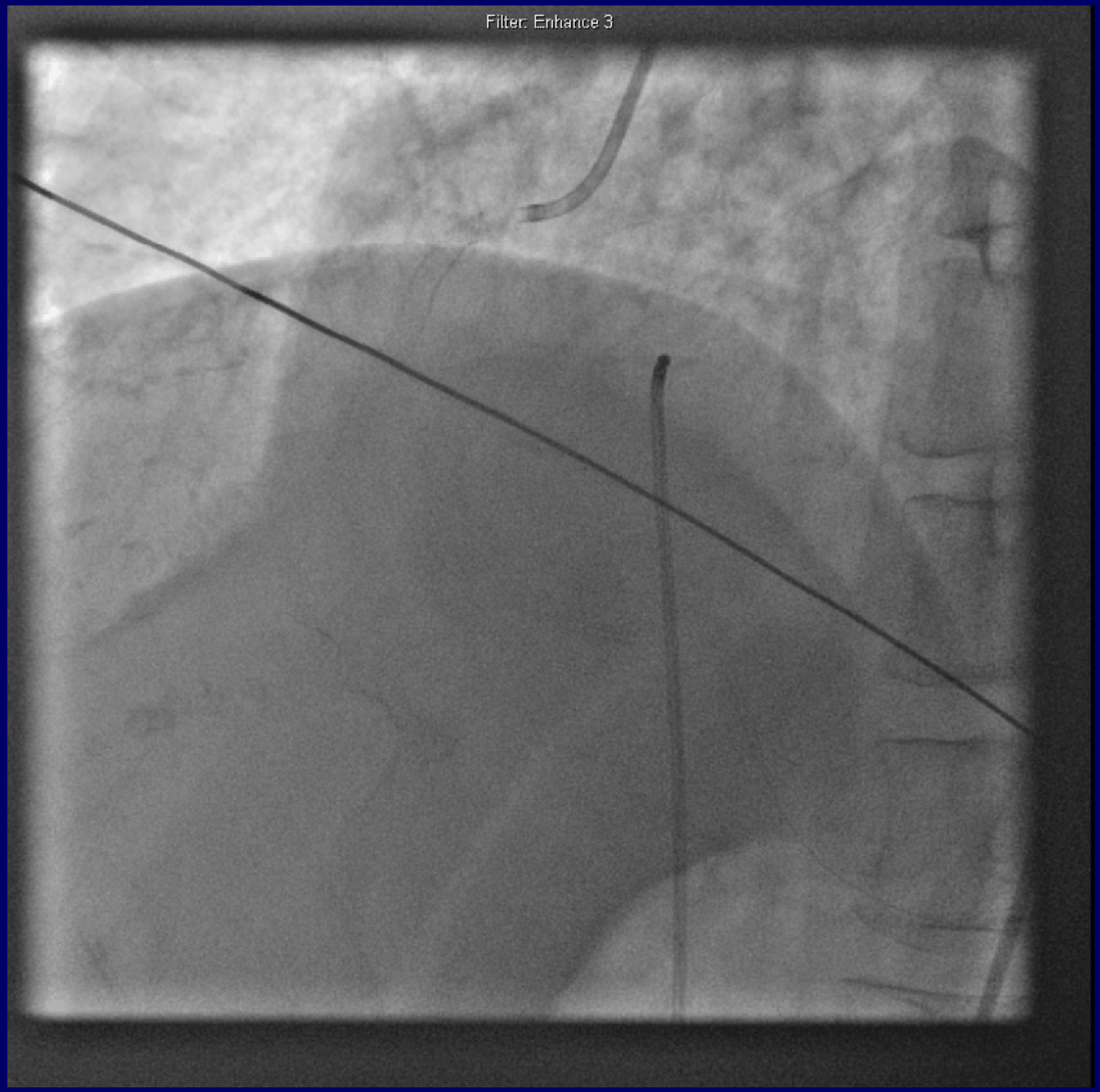
Heart Attack with Blocked Right Coronary Artery – No Blood Flow



Heart Attack Aborted with Angioplasy – Blood Flow Restored



Aborted Heart Attack with Stent in Right Coronary Artery



Thank you!

Stay Healthy!