How does a **heart** surgeon prevent a **heart** attack?

Michael Richman M.D., F.A.C.S.

CEO and Director,

The Center for Cholesterol Management

Los Angeles, California

Heart disease: #1 killer in the U.S.

Grim Statistics (I):

- Each year an estimated 635,000 people have a 1st heart attack or death due to CAD

- 280,000 people have a recurrent event

Total: 915,000

- Every 34 seconds one American has a heart attack

- Every minute one will die from one

Source: AHA 2013 Update on Heart Disease and Stroke Statistics

Heart disease: #1 killer in the U.S.

Grim Statistics (II):

- 2009: CVD accounted for 787,931 deaths, 32.3% of all deaths or 1 out of every 3 deaths in the U.S.
- 2000: "nearly 950,000 Americans die each year as a result of CVD, accounting for 39.4% of all deaths.
    - *Source: U.S. Surgeon General Report on CVD, 2004*
- 1976: heart attacks accounted for some 700,000 deaths
    - *Source: Myocardial Revascularization, A Surgical Atlas*
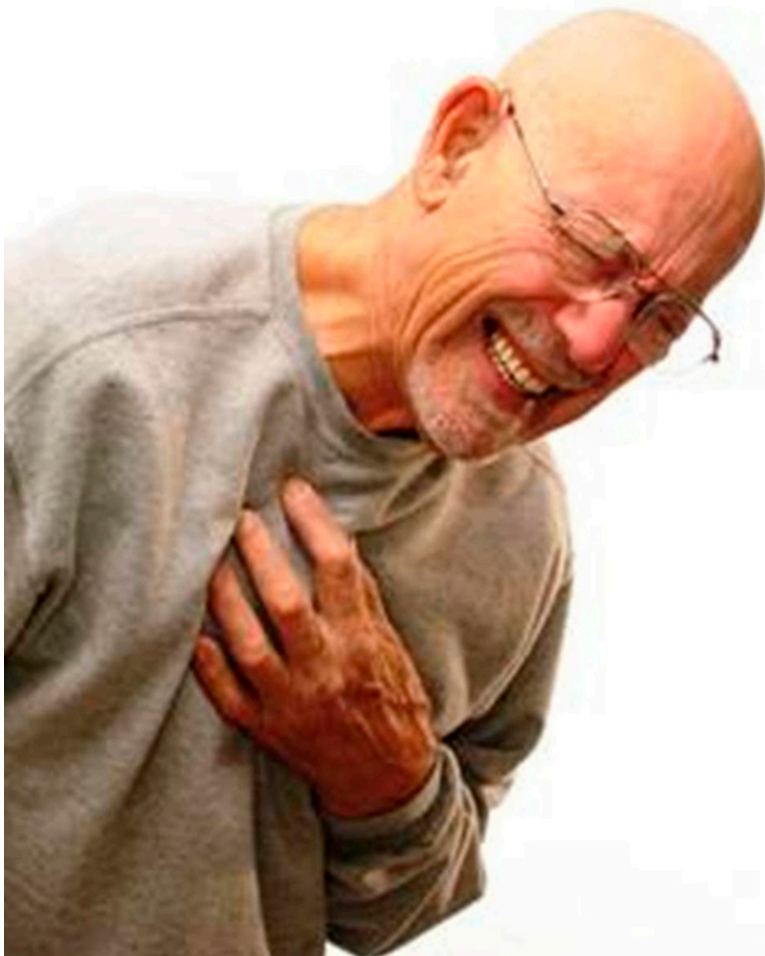
Heart disease: #1 killer in the U.S.

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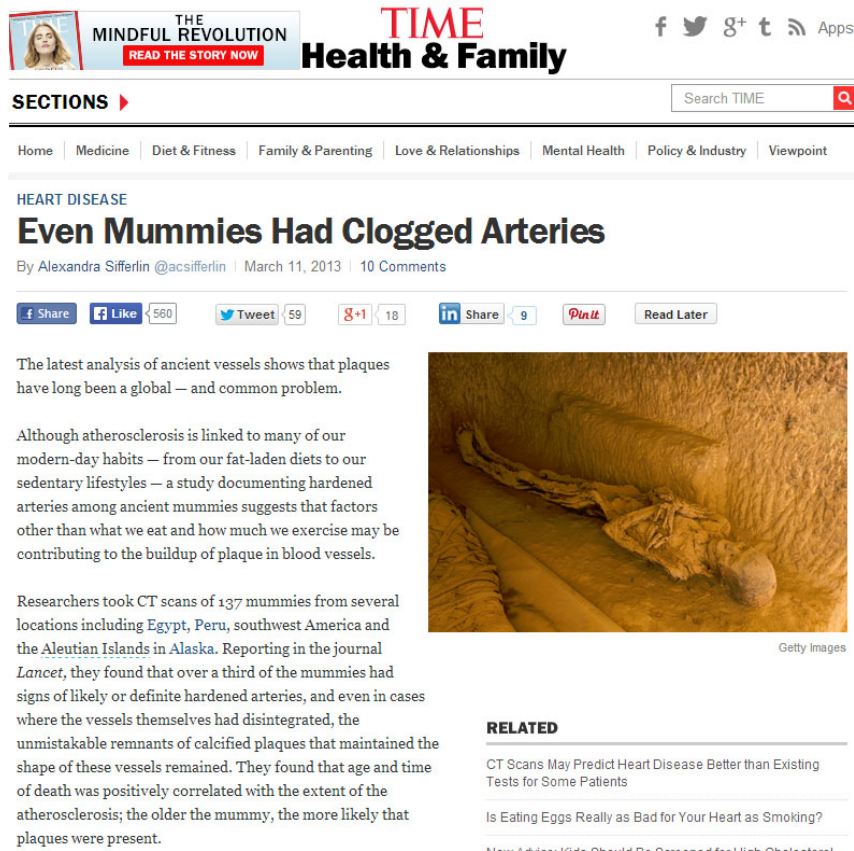### Why has so little changed over the last 40 years?

Heart disease: STILL #1 killer in the U.S.

- Heart disease kills more men and women each year than the next seven causes of death combined

- We're dealing with people, not simply statistics

Mummies & clogged arteries

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HEART DISEASE

Even Mummies Had Clogged Arteries

By Alexandra Sifferlin @acsifferlin | March 11, 2013 | 10 Comments

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The latest analysis of ancient vessels shows that plaques have long been a global — and common problem.

Although atherosclerosis is linked to many of our modern-day habits — from our fat-laden diets to our sedentary lifestyles — a study documenting hardened arteries among ancient mummies suggests that factors other than what we eat and how much we exercise may be contributing to the buildup of plaque in blood vessels.

Researchers took CT scans of 137 mummies from several locations including Egypt, Peru, southwest America and the Aleutian Islands in Alaska. Reporting in the journal Lancet, they found that over a third of the mummies had signs of likely or definite hardened arteries, and even in cases where the vessels themselves had disintegrated, the unmistakable remnants of calcified plaques that maintained the shape of these vessels remained. They found that age and time of death was positively correlated with the extent of the atherosclerosis; the older the mummy, the more likely that plaques were present.

Getty Images

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CT Scans May Predict Heart Disease Better than Existing Tests for Some Patients

Is Eating Eggs Really as Bad for Your Heart as Smoking?

New Advice: Kids Should Be Screened for High Cholesterol

Coronary Artery Disease is NOT a disease of modern civilization

- **Mummies reveal that clogged arteries plagued the ancient world** – *reported last year in the Lancet*
  - CT scans on 137 mummies' coronary arteries
  - Multiple populations spanning 4,000 years

- CAD found in women and young adults, even among active hunter-gatherers with no access to junk food

Mummies & clogged arteries

- 34% of mummies showed plaques and were diagnosed with coronary atherosclerosis

- Challenges belief that CAD primarily affects men and is largely due to high-fat diets, little exercise

- Could heredity be one of the most important factors?

Wake-up Call

Cadavers tell no lies.

Over a third of mummies had signs of CVD; they certainly didn't get it from eating a diet of fast foods.

I see that as a wake-up call to re-examine our assumptions.

Assessing Risks for Heart Disease

Framingham Risk Assessment

- Most accepted way of assessing the risk of having a coronary event in the next 10 years

- Designed for 20+ years old

  - **Who don't have** heart disease

  - Nor diabetes

- Takes into account: age, gender, total cholesterol level, HDL level, smoker? And systolic blood pressure
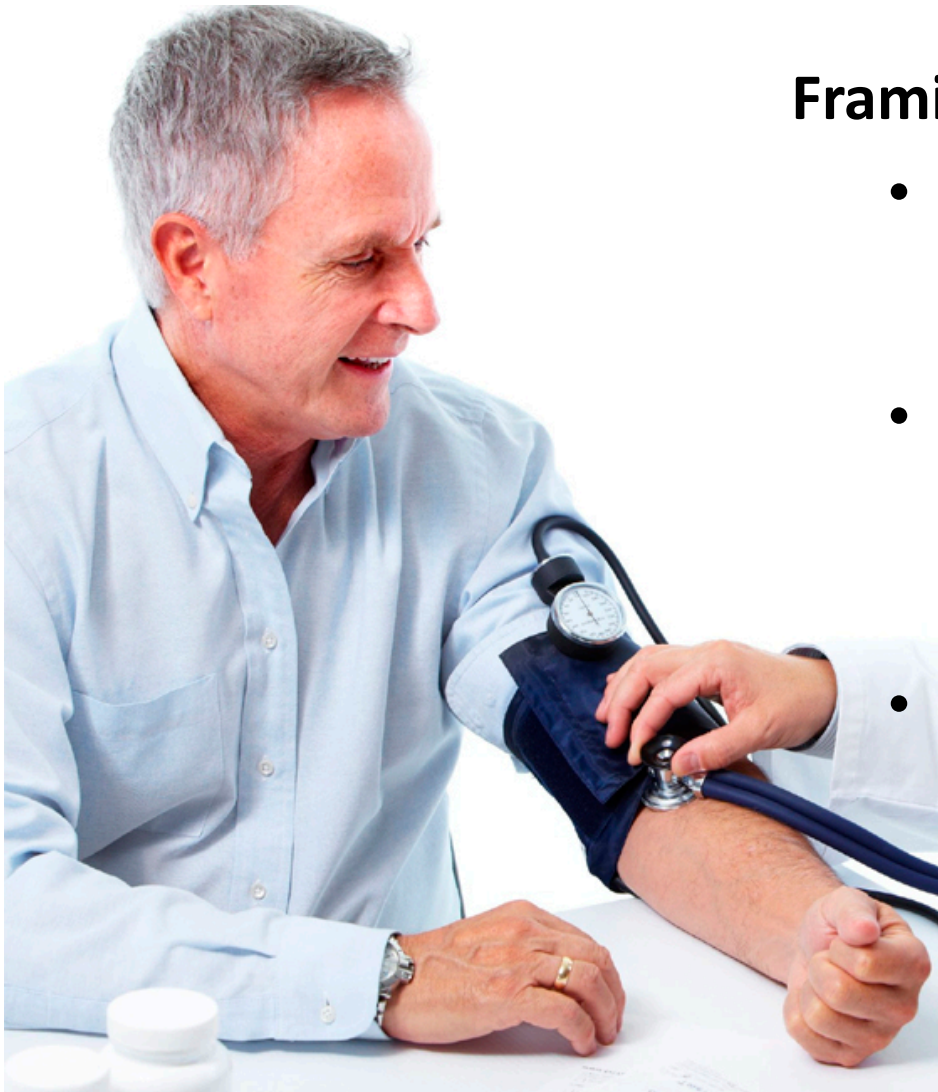
Framingham Risk Assessment

- Only for a 10 year period -- life time risk is much higher

- Underestimates true risk of heart attack

- Heart disease is #1 killer

- Diabetes is going up

  - 25.8 million have diabetes

  - 79 million 20+ years old are pre-diabetic

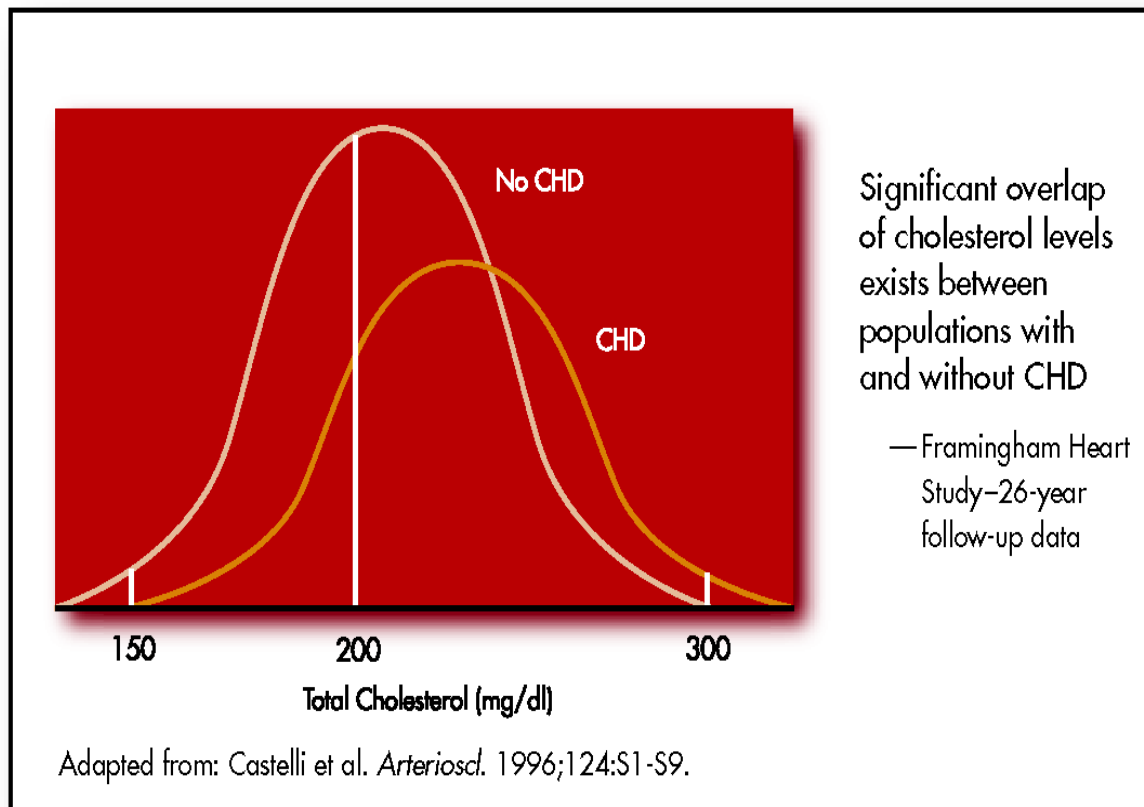- Reduction of TC not a goal of lipid management

Limitations of Measuring Cholesterol

"It is now generally recognized that although traditional risk factors are reasonably good at predicting excess risk above the baseline for particular populations, they allow clinicians to **predict only approximately 50% to 60 %** of the variation in absolute risk in individual patients. **Therefore, factors that enhance predictive ability in an** additive fashion over traditional risk factors **would have considerable clinical usefulness, allowing better decisions to be made regarding the use of proven preventive therapies.**"

D.J. Rader, MD
Lipid Disorders
Textbook of CardiovascularMedicine

Framingham Heart Study: measuring Cholesterol Does Not Tell Us Enough

Significant overlap of cholesterol levels exists between populations with and without CHD

—Framingham Heart Study–26-year follow-up data

Adapted from: Castelli et al. *Arterioscl.* 1996;124:S1-S9.

- 80% of people who had an MI had similar cholesterol levels as those who did not have an MI

- 50% of people who suffered a heart attack had normal cholesterol levels

What about heredity?

"All students of the subject are agreed that it has a strong **hereditary** background. So far, no one has been able to alter this aspect."

Frank Netter, M.D., in his classic volume on the Heart, late 1960s

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FRANK H. NETTER, M.D.
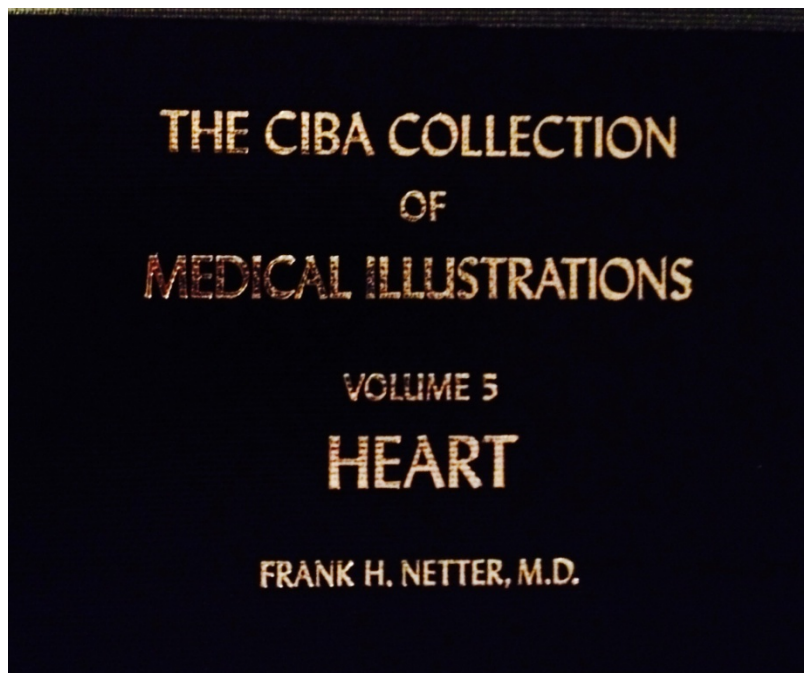
Modern times: measuring coronary calcium with CTs of heart arteries

Should physicians use CT scans of coronary artery calcification as a screening tool to improve risk assessment?

- Radiation exposure

- Should presence of higher coronary artery calcium score justify more aggressive lipid management?

- Therapy does not slow CAC progression rate but does reduce CV events in patients with higher CAC.

What do we really learn from these CT Scans?

Coronary Artery Disease

CME

The Absence of Coronary Calcification Does Not Exclude Obstructive Coronary Artery Disease or the Need for Revascularization in Patients Referred for Conventional Coronary Angiography

Ilan Gottlieb, MD,†# Julie M. Miller, MD,† Armin Arbab-Zadeh, MD,† Marc Dewey, MD,‡
Melvin E. Clouse, MD,¶ Leonardo Sara, MD,* Hiroyuki Niinuma, MD,§ David E. Bush, MD,†
Narinder Paul, MD,‖ Andrea L. Vavere, PhD,† John Texter, PA-C,† Jeffery Brinker, MD,†
João A. C. Lima, MD,† Carlos E. Rochitte, MD*

São Paulo and Rio de Janeiro, Brazil; Baltimore, Maryland; Berlin, Germany; Morioka, Japan;
Toronto, Ontario, Canada; and Boston, Massachusetts

Study on coronary calcification:

- Of 383 vessels with no coronary calcification, 47 of them (12%) had 50% stenosis.

- Of 64 that had 100% blockage, 13 of them (20%) had no calcium.

But, the lack of calcium does not exclude the absence of CAD
 -- Why are we radiating patients and doing expensive tests to show what we already know from autopsy studies in asymptomatic patients?

LDL-C is the Focus of Attention

"... all **abnormalities** in plasma lipid concentrations, or dyslipidemia, can be translated into **dyslipoproteinemia**."

"... the **shift of emphasis to lipoproteins** offers distinct advantages in the **recognition** and **management** of such disorders."

Fredrickson et al.
NEJM 1967; 276: 148

Prevention of heart attacks starts with identifying ALL people at risk

Traditional lipid testing measuring LDL-C may miss up to 50% of people who will have a heart attack.

So what is the answer?

Advanced lipoprotein testing identifies everybody at risk for developing atherosclerosis and misses no one.

- Does not look for the overall level of lipids

- Uses NMR technology to measure the number of lipoproteins in the blood,

The "Richman Analogy:"

It is the number of cars that cause a traffic jam on a highway, <u>not</u> the number of people in the cars.

For Example:

Consider a person with an LDL-C of 110mg/dL on a routine lipid panel -

Using our analogy, how can you tell if there are:

- 110 cars with one person driving?

- Or two buses with 55 people in each?

No way to know without quantifying ApoB lipoprotein particles. 90% of circulating lipoprotein particles in blood are LDL-P.

Traditional lipid concentration testing measures the <u>number of passengers</u> and lipoprotein testing measures <u>the number of cars.</u>

Lipoprotein particles cause atherosclerosis, not lipids

AFCAPS, AMORIS, Framingham Offspring Trial and many others all showed that people who have too many ApoB lipoprotein particles are at much higher risk for a CV event.

It is the number, not the size, of lipoprotein LDL particles, that determine risk of CHD.
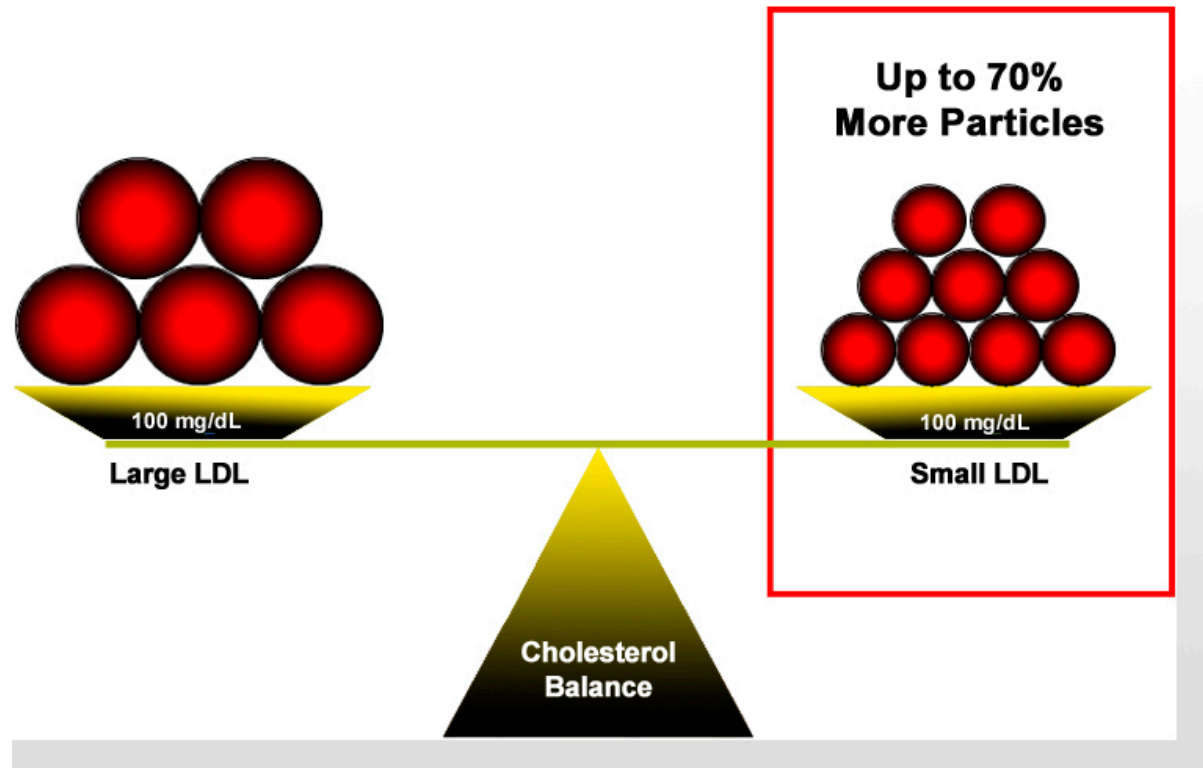
CONCLUSION

- Quantifying the number of lipoprotein particles is the answer for identifying all those at risk for CHD.

- Using the number of lipoprotein particles as a guide to the effectiveness of therapy is the only accurate way of knowing if we are treating people aggressively enough.

Thank You!

In memory of my best friend, my pal, my dad

Fredric Richman