



# The New York Center for the Prevention of Heart Disease

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## Nuclear and Echo Stress Tests Do Not Predict Heart Attacks

The vast majority of heart attacks are caused by cholesterol deposits (plaques) in the coronary arteries that are never picked up by even the most sophisticated stress testing. These deposits are **non-obstructive**, not reducing the flow of blood on stress testing, yet the cause of the majority of heart attacks in the United States, including most that are fatal. So what do stress tests detect?

**Obstructive** cholesterol deposits, which significantly narrow the artery and reduce the flow of blood at times of exercise, are the only ones detected by stress tests, yet are the cause of the minority of heart attacks. Research has now well documented that heart attacks are caused over 60% of the time by **non-obstructive** cholesterol deposits within the coronary arteries, which become biochemically active, expand, or rupture, into the bloodstream leading to a blood clot which completely closes off the blood flow. Unless immediately opened by angioplasty and stenting, that portion of the heart muscle supplied by the suddenly completely blocked coronary artery, will irreversibly die and become non-functioning scar tissue. When this process occurs in the blood vessels leading to the brain, it causes a stroke. So how do we detect these deposits and prevent heart attacks or strokes?

**Non-obstructive** deposits can be detected only by MDCT (Multidetector ultra fast CT scans) which can non-invasively see both the calcium deposits that act as markers within the cholesterol deposits and also obtain exquisitely detailed 3 dimensional pictures of the coronary arteries. This accounts for the well documented clinical scenario in past decades where a patient would be given a "clean bill of health" after a normal stress test only to succumb to a massive heart attack in the days, weeks or months after. For decades physicians were looking for the wrong culprit, obstructive plaques with stress testing and missing the non-flow limiting non-obstructive cholesterol buildups in the artery that when they rupture are the culprit in the vast majority of 1.5 million heart attacks in the U.S. each year.

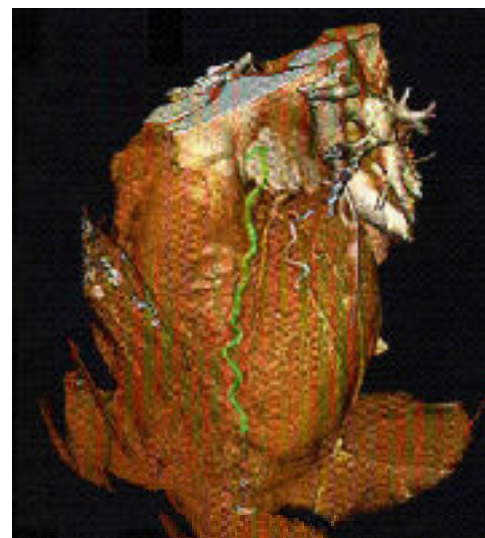
We now focus not on whether a particular cholesterol deposit is physiologically obstructive on a stress test, since this is not an indication of high risk for heart attack, but rather on identifying the **high risk patient** and aggressively reducing the risk of his non-obstructive cholesterol deposits becoming active, rupturing and causing an often fatal heart attack.

## Calcium Scores and Non-invasive CT Angiography

Calcium scores can now be determined to quantify the amount of calcified deposits already present in the coronary arteries. Large studies done at Tulane and St. Francis Hospital have clearly shown that patients with high calcium scores when followed for several years have a much higher risk of developing a heart attack. When compared with the standard heart attack risk factors of age, obesity, hypertension, high cholesterol, diabetes and cigarette smoking, a high calcium score was found to be an independent predictor of high risk. With time the body reacts to cholesterol accumulation within the arteries by depositing calcium on these buildups. It should be noted that there is no relationship between supplemental calcium that women should take to prevent osteoporosis and the calcification of cholesterol



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deposits. Calcification is the bodies general response to injury, whether it be within an elbow tendon or a coronary artery. **Non-invasive CT Angiography** besides providing calcium scores also provides high resolution 3-D images of the coronary arteries (see picture page 1). Many experienced invasive cardiologists now believe that 70% or more of diagnostic invasive angiograms (cardiac catheterization) used to look for blockages, will be replaced by this much safer non-invasive procedure. If the diagnostic non-invasive CTA shows a significant blockage, a therapeutic invasive procedure with a stent or bypass surgery can be done. The concern of course is will the diagnostic accuracy of the non-invasive CTA be good enough to allow for clinical decision making. Recent studies from the Netherlands have shown a **95% sensitivity** and **98% specificity** in the detection of significant blockages by **16 slice CTA** when compared to cardiac catheterization. Currently the 3 major manufacturers, GE, Siemens and Toshiba are now in early 2005 installing the first faster **64 slice scanners** in Manhattan. I have had a chance to review the coronary images from these newest 64 slice scanners in my practice and I can say clearly that the images are spectacular. I now have routinely incorporated them into my practice at **NYCPHD**. The time has arrived where we are able to visualize **nonobstructive** and **obstructive** plaques and watch over time as intensive lipid lowering therapy causes regression and stabilization of disease. This ability to follow lipid and risk factor therapy sequentially by calcium scores and CTA as well as to follow whether stents and bypass grafts are still open, is now leading in our hands at the **NYCPHD** to the prevention of heart attacks.

**"the prevention  
of disease  
is the  
highest  
level of  
medical care"**

## 50% of Patients with Heart Attacks Have "Normal" Cholesterol Levels

The average total cholesterol level for a patient in the U.S having a heart attack is **220**. The average **LDL** (bad cholesterol) for this patient is **130**. Many individuals, without a prior history of heart disease, have LDL levels that by current guidelines would not receive therapy. What are we missing? Many have very low **HDL** (good cholesterol) levels and are not being correctly identified as very high risk for a cardiac event. Approximately 50% of patients with heart disease have an abundance of **small LDL particles**, the particles which most easily enter into the artery wall, and most quickly build up the cholesterol blockage (atherosclerotic plaque). These patients often have "normal" LDL cholesterol levels on standard lab tests but are ticking time-bombs. When analyzed by **Advanced Lipid Analysis** at the **NYCPHD** many of these so called normal patients are found to have a predominance of small LDL particles, particularly if they are overweight or obese. Those individuals with an abundance of small LDL have **300 percent** more heart disease risk than people with large LDL.

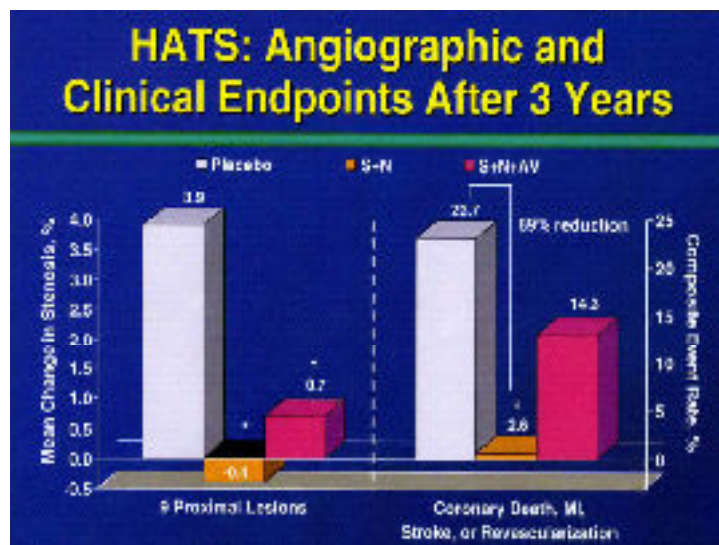
At the **NYCPHD** our **Advanced Lipid Analysis** also measures other emerging risk markers for heart disease: **C- Reactive Protein, LPA, Homocysteine, HDL particle size** and **LDL particle number**. This information about LDL particle size and LDL particle number, along with these other new lab markers, helps to identify the 50% of patients who have a myocardial infarction with so called "normal" cholesterol values. **Fifty percent of patients having a heart attack do not survive it.** At the **NYCPHD** our goal is to identify these high risk patients and prevent their heart attacks and strokes from ever occurring.

## Combination Therapy Can Stop and Reverse Atherosclerosis

Data from many cholesterol trials involving medical therapy with statin medication alone, including Zocor, Lipitor, or Pravachol have all demonstrated from 24 to 40% reduction in either heart attacks, death, strokes or need for bypass surgery or coronary stenting. The **Heart Protection Study** in the U.K showed conclusively that in

any patients identified by their doctor as having vascular disease, there was a survival benefit in adding a statin even if the starting LDL was less than 100 or the patient was over 80 years of age.

Yet what about the 60 -70 % of patients who we not able to reduce cardiovascular events in? Over 60% of patients with heart disease have low HDL cholesterol, yet this is not addressed with statin monotherapy. In the **HATS** study published in 2001 by Dr. Greg Brown at the University of Washington, one of the leading lipid researchers in the United States, the combination therapy of **statin** and **niacin** in patients with coronary disease showed both a **90% reduction** in deaths, heart attacks or revascularization and a significant reduction in coronary blockages on repeat angiograms over a three year followup. Combination therapy with a **statin, niacin** and a **resin** (Colestipol, similar to Questran) in the **FATS 10 Year** follow up showed a **95%**



**"we now have the ability and obligation to prevent the vast majority of heart attacks and strokes... when disease is already present, to prevent its progression"**

reduction in deaths and a **79%** reduction in cardiovascular events. These are the current capabilities and goals of aggressive, well monitored combination therapy, far beyond the 30% -40% reductions with a statin alone. The safety of combination regimens has been well documented in recent years when monitored carefully at the **NYCPHD**. In these studies we did not even have available the newest medications , Zetia or Tricor, which because of different mechanisms of action, can also be used in combination with statins with a great degree of safety as well as efficacy.

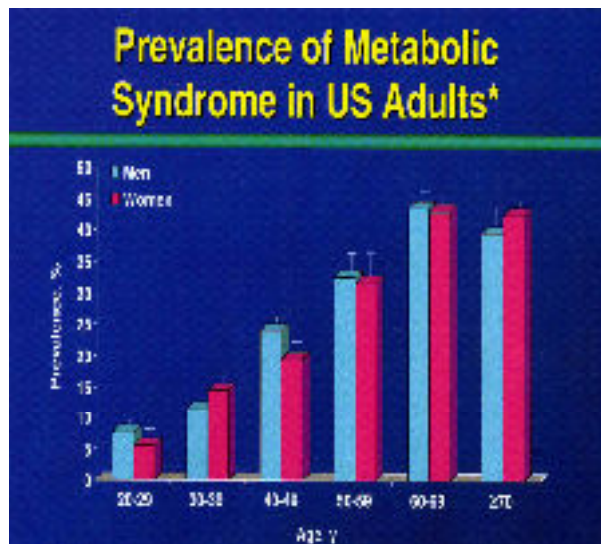
## **OBESITY, DIABETES AND THE METABOLIC SYNDROME**

The epidemic of obesity and along with it the development of diabetes is sweeping the United States. The prevalence of obesity was **12%** in **1991** and **20.9%** in **2001**. The prevalence in the U.S. of diabetes was **4.9%** in **1990** and **7.9%** in **2001**. The **Metabolic Syndrome** has been defined by the National Cholesterol Education Program as a constellation of lipid and non-lipid risk factors. Adults have MS when 3 or more of the following risk determinants are present:

Abdominal Obesity	Men greater than 40in Woman greater than 35in
Triglycerides	Greater than or equal to 150
HDL Cholesterol	Men less than 40 Women less than 50
Blood Pressure	Greater than or equal to 130/85
Fasting Glucose	Greater than 110

The prevalence of MS in U.S. adults is **35% in men** and over **30% of women** by **ages 50 -59**. By ages **60 -69** in the U.S. the prevalence of metabolic syndrome approaches **45%** of the population. A Finnish study in 2002 showed that men who had the Metabolic Syndrome had almost a **400% greater risk** of cardiovascular death compared to those without the Metabolic Syndrome. A great deal of work needs to be done in this population to prevent the epidemic of cardiovascular disease which will continue and worsen without aggressive multimodality therapy including weight loss, diet modification, exercise and aggressive combination lipid therapy to both lower the LDL cholesterol and raise the HDL cholesterol.

While intensive therapy of glucose control reduces the risk of **kidney** and **retinal** disease, it has shown no difference in the risk of amputation, heart attack or stroke. Most diabetics die from **heart attacks** and **strokes** and many lose limbs due to peripheral vascular disease. These vascular endpoints need to be aggressively addressed by combination lipid therapy at the same time that retinal and kidney disease are addressed by intensive glucose control.



**Next Issue:**

- C-Reactive Protein
- Post Prandial Atherogenic Lipoproteins
- CAD: A Genetic Disease

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