REVIEW

The Epidemic of the 20th Century: Coronary Heart Disease

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ABSTRACT

Heart disease was an uncommon cause of death in the US at the beginning of the 20th century. By mid-century it had become the commonest cause. After peaking in the mid-1960s, the number of heart disease deaths began a marked decline that has persisted to the present. The increase in heart disease deaths from the early 20th century until the 1960s was due to an increase in the prevalence of coronary atherosclerosis with resultant coronary heart disease, as documented by autopsy studies. This increase was associated with an increase in smoking and dietary changes leading to an increase in serum cholesterol levels. In addition, the ability to diagnose acute myocardial infarction with the aid of the electrocardiogram increased the recognition of coronary heart disease before death. The substantial decrease in coronary heart disease deaths after the mid-1960s is best explained by the decreased incidence, and case fatality rate, of acute myocardial infarction and a decrease in out-of-hospital sudden coronary heart disease deaths. These decreases are very likely explained by a decrease in coronary atherosclerosis due to primary prevention, and a decrease in the progression of nonobstructive coronary atherosclerosis to obstructive coronary heart disease due to efforts of primary and secondary prevention. In addition, more effective treatment of patients hospitalized with acute myocardial infarction has led to a substantial decrease in deaths due to acute myocardial infarction. It is very likely that the 20th century was the only century in which heart disease was the most common cause of death in America.

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The 20th century was the first century in which heart disease was the most common cause of death in the US, and it may be the last century during which it was the leading cause of death. As shown in **Figure 1**, heart disease was uncommon in the early years of the 20th century.[1] In 1900 it was the fourth most common cause of death, trailing infectious diseases such as pneumonia and tuberculosis.[2] Three decades later, heart disease deaths had increased to become the commonest cause of death in the US.[3] Heart disease deaths continued to increase until the mid-1960s.[1]

The large majority of cardiac deaths in the US are due to coronary heart disease secondary to coronary atherosclerosis. In 2009 coronary heart disease accounted for 64% of all cardiac deaths.[4]

Many explanations for the increase in coronary heart disease deaths from 1900 to the 1960s have been offered. The marked increase in deaths attributed to heart disease, from 1900 until the late 1960s, was almost certainly due to an increase in the incidence of coronary atherosclerosis, with resultant coronary heart disease.

Americans were living longer due to a decrease in deaths from infectious diseases. Changes in diet led to the consumption of processed foods, more saturated fats, added sugars and other high glycemic index carbohydrates. There was a spectacular increase in cigarette smoking: <5% of Americans were smokers in 1900, compared with 42% in 1965.[5] Others point to a decrease in exercise and regular physical activity as most Americans gained access to automobiles.

Part of the increase in mortality attributed to coronary heart disease was due to increased recognition of myocardial infarction. Herrick, in 1912,[6] was the first to diagnose heart attacks during life, and 6 years later he encouraged the use of the electrocardiogram to diagnose myocardial infarction.[7] The ability to diagnose myocardial infarction during life increased the recognition of coronary heart disease on death certificates.

In the mid-1960s, heart disease deaths began a remarkable and steady decline that has persisted to the present (Figure 1). Coronary heart disease deaths decreased from 466/100,000 in 1965 to 345 in 1980: a 26% relative decrease.[8] From 1980 to 2008, the decrease was 64%: from 345 to 123/100,000.[8]

The reasons for this decline in cardiac deaths are not clear and are likely to be multifactorial, as in the development of coronary heart disease. Was the decline due to better medical and surgical treatment? Primary prevention of coronary atherosclerosis? Secondary prevention of myocardial infarction and sudden death in patients with coronary heart disease? Everyone would like to take credit. As John Kennedy said after the Bay of Pigs debacle: "Victory has a hundred fathers; defeat is an orphan."

Given that coronary heart disease is a complex, multifactorial process, it is unlikely that there is a single explanation for the decline in coronary heart disease deaths in the US over the past 50 years.

What follows here are some possible explanations for the decreasing number of coronary heart disease deaths over the past 5 decades.
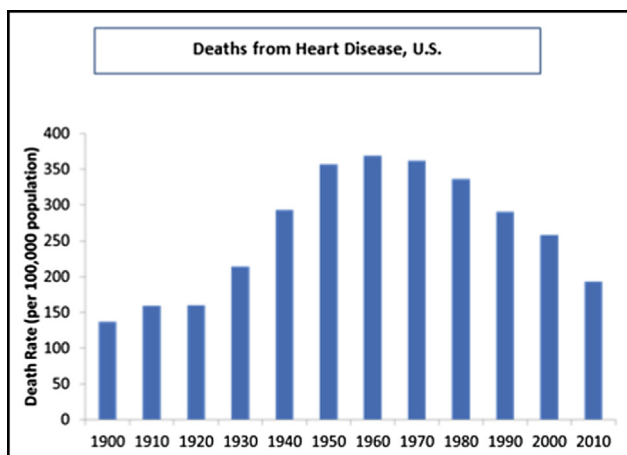
CLINICAL SIGNIFICANCE

- The increase in coronary heart disease deaths in the 1930s, 1940s and 1950s was due to an increase in coronary atherosclerosis.

- A decline in coronary atherosclerosis that began in the late 20th century was associated with decreased smoking and a decrease in cholesterol levels.

- Primary and secondary prevention has decreased the incidence of acute myocardial infarction and sudden cardiac deaths from the mid-1960s to the present.

- More effective treatment of acute myocardial infarction has decreased the number of deaths due to acute myocardial infarction.

DECREASING INCIDENCE OF CORONARY ATHEROSCLEROSIS

The continuing decline in coronary heart disease deaths could be due to a decreasing prevalence of coronary atherosclerosis, which would lead to a decrease in the prevalence of coronary heart disease.

The Pathobiological Determinants of Atherosclerosis in Youth Study was a multi-institutional study of atherosclerosis in 15- to 34 year-old American men.[9] Investigators from this study reported the results of 2876 autopsies performed in this population between 1987 and 1994. They demonstrated that coronary atherosclerosis begins as fatty streaks at ages 15-25 years and progresses to raised intimal lesions during ages 25-35 years.[9]

The first evidence that the prevalence of coronary atherosclerosis might be decreasing in the US population was based on the autopsy findings of young American servicemen who died during the Korean,[10] Vietnam,[11] and Iraq and Afghanistan[12] wars. The average age of the casualties in the Korean and Vietnam wars was 22; none were known to have symptoms of coronary heart disease before their wartime deaths.

As shown in Figure 2, in 1951-1953, a relatively small autopsy study of 300 American casualties in the Korean War showed that 77% of the American casualties had some evidence of coronary atherosclerosis.[10] In 35% there was fibrous streaking or intimal fibrous thickening without luminal obstruction. Forty-two percent had plaques causing
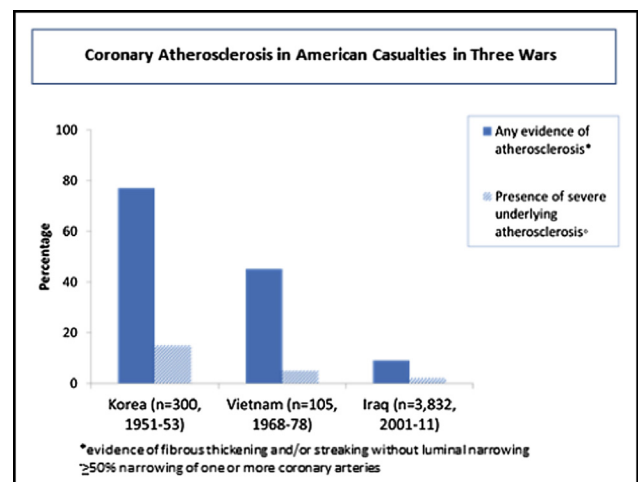

Figure 1   US heart disease deaths/100,000 1900-2010.[1]

Figure 2   Postmortem evidence of coronary atherosclerosis in American casualties in 3 wars.[10-12]