Epidemiology of Stroke: Emphasis on Transient Cerebral Ischemic Attacks and Hypertension

BY JACK P. WHISNANT, M.D.

Abstract:
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The three factors other than age that are the most important determinants of stroke occurrence are (1) transient cerebral ischemic attacks (TIAs), (2) hypertension, and (3) cardiac disease.

In the Rochester population study, a stroke developed during the period of observation in 36% of the patients with TIAs. Fifty-one percent of all the strokes occurred during the first year after the TIA, and 21% occurred during the first month after the first attack.

Hypertensive persons have an increased incidence of each of the major atherothrombotic diseases as compared to normotensive persons.

During the full 25 years of study of the Rochester population, there was a decrease from the earliest to the latest five-year period of 32% for all strokes in women and 20% in men. This may reflect treatment of this population.

Additional Key Words
population surveys
risk factors
cerebrovascular disease
autopsy series
hospital series
age

It is easy to get a biased view of the relative frequency of the various categories of stroke. Hospital series are usually biased because they are composed of referred patients; autopsy series overemphasize cerebral hemorrhage because nearly 90% of such patients die early; and mortality statistics have shown a gross overstatement of intracerebral hemorrhage.

Population surveys provide the best information, and one such study of the population of Rochester, Minnesota, has indicated that nearly 80% of all strokes are due to cerebral infarction, with or without evidence of embolism, that about 10% are due to cerebral hemorrhage, and that 7% are due to subarachnoid hemorrhage.

To have an impact on the occurrence of stroke in general, preventive measures must have some effect on the large group with stroke from cerebral infarction. The three factors other than age that are the most important determinants of stroke occurrence are (1) transient cerebral ischemic attacks, (2) hypertension, and (3) cardiac disease. Cardiac disease seems to be primarily related to embolic infarction, so the aim here will be to show the importance of transient ischemic attacks and hypertension as precursors of stroke. These are two conditions in which treatment can have an impact on the prevention of stroke.

Transient Ischemic Attacks

Transient cerebral ischemic attacks are usually episodes of focal neurological deficit that last from 10 to 30 minutes. These have been arbitrarily defined as episodes in which the residual deficit does not last for more than 24 hours. These attacks are not episodes of faintness, dizziness, wooziness, transient amnesia, or unexplained loss of consciousness, but are focal neurological deficits.

A general population survey of initial episodes of transient ischemic attacks from the Rochester, Minnesota, population showed that such episodes occurred at an incidence of 31/100,000 population per year for all ages and that there was no change in this annual incidence during the three five-year intervals from 1955 to 1969. The incidence rates of transient ischemic attacks for the various ages increased sharply with age, and more than 2/1,000 of the population between 65 and 74 years old were affected each year. For all age groups except the oldest (more than 75 years old), the rates were higher in men than in women.

The transient ischemic attack may be the beginning of the disease process itself, but for purposes of...
management, the attack can be considered a precursor to stroke. In the Rochester population study, a stroke developed during the period of observation in 36% of the patients with transient ischemic attacks. For the 15-year study, this would be an average follow-up of seven and one-half years. The percentage of patients in whom stroke developed was a little higher with increasing age, as might be expected because age is such an important determinant of stroke. However, it is more important to look at the occurrence of stroke in relation to time. The probability of persons with transient ischemic attacks surviving free of stroke, that is, the probability of not having a stroke during the ten years after the first attack, can be compared with the expected probability of not having a stroke, for the population as a whole with the same age and sex distribution (fig. 1). The ratio of expected strokes to observed strokes for persons with transient ischemic attacks surviving free of stroke was 1 to 16.5 (two expected and 33 observed) at the end of the first year and 1 to 9.5 (7.6 expected and 72 observed) for the full period of the study. This indicates the great risk of stroke occurrence in persons with transient ischemic attacks; 51% of all the strokes occurred during the first year, and 21% during the first month after the first attack.

The probability of survival with transient ischemic attacks was compared to the expected survival for the general population with the same age and sex distribution (fig. 2). There was only a slight difference in survival between the two groups. The reasons for this lack of significant difference were that only 28% of the deaths resulted from stroke and that 37% resulted from heart disease, usually either myocardial infarction or congestive failure. Among all persons in this population study who had cerebral infarction, a little less than 10% had preceding transient ischemic attacks. This was a much lower percentage than expected, as judged from referral practice from many other sources.

Thus, it can be stated that a transient ischemic attack is an important warning of stroke and that effective means are available for preventing stroke in some patients.

**Hypertension**

Actuarial data from insurance companies have shown that the ratio of actual to expected mortality from vascular lesions of the central nervous system increases sharply as the level of blood pressure increases. The most complete information concerning hypertension has come from the sample population from Framingham, Massachusetts. Hypertensive persons in that population had an increased incidence of each of the major atherothrombotic diseases as compared to normotensive persons. The blood pressure relationship was most striking for stroke and for congestive heart failure. For stroke, the relationship was as strong for nonembolic cerebral infarction as it was for intracranial hemorrhage. For all strokes and for cerebral infarction there was no critical level of blood pressure. The morbidity ratio (or the ratio of observed to expected strokes for a particular set of patients) increased with each higher level of blood pressure. This increase was much greater in
The Rochester population study of stroke indicated that incidence rates for all strokes and cerebral infarction decreased in each succeeding five-year interval since 1955. During the full 25 years of study of the Rochester population, there was a decrease from the earliest to the latest five-year period of 32% for all strokes in women and 20% for all strokes in men. This decreasing incidence of strokes may reflect the treatment in the population, such as the increasing use of effective antihypertensive medication during this time; however, this has not been documented as the cause for the decline in rates in this population.

Some causes of secondary hypertension can be identified and treated. Essential hypertension in most persons can be controlled with drugs and weight control. This is not being done everywhere. Possibly, hypertension is being treated adequately in patients who seek out the physician. However, it is not being controlled by the medical profession as a whole for the population as a whole.

An industry survey from Chicago revealed that only 25% of persons who were hypertensive were receiving treatment and 11% were under control. The study showed that more than 60% of previously known hypertensive persons were being treated but that less than one-third of those who knew they had hypertension were being treated. Among all of the hypertensive patients, only 9% were under treatment with good control.

If these surveys are representative of the population as a whole, we have a long way to go to adequately manage hypertension. There is every reason to believe that proper identification and management of transient ischemic attacks and hypertension could make an impact on stroke prevention.

**References**

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