Review Article

CEREBROVASCULAR DISEASES IN INDIA — A PATHOLOGISTS VIEWPOINT

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Cerebrovascular diseases (CVD) or strokes constitute one of the major causes of human mortality and morbidity. In the Western countries the incidence of CVD is reported to be 500 to 800 per 100,000 population per year. Precise data of similar type are not available for India but some reports indicate the incidence to be 13 to 33 per 100,000 population per year [1]. These figures are definitely lower as compared to the Western countries but considering the total population of India, numerically the problem is perhaps greater than most of the other countries. My own interest in the subject is due to the fact that CVD is a common diagnosis in our neuropathology material. In the combined biopsy and autopsy material, CVD are next only to neoplasms and infections. In my discussion I have excluded vascular problems due to trauma and those secondary to other intracranial problems like infections and tumour.

Study of CVD involves not only the categorization of various disease entities but also of those factors which, directly or indirectly, contribute to the pathogenesis of these conditions. During the last 25 years we have studied some aspects of various forms of CVD and some of the contributing factors. I would like to confess at the very outset however, that considering the magnitude of the problem, our effort is indeed very limited.

Anatomical anomalies

In view of the reported relevance of anatomical anomalies and some structural abnormalities of the circle of Willis (CW) in the pathogenesis of saccu-

lar or berry aneurysms, we have studied these in routine autopsies as a part of a collaborative study under the Indian Council of Medical Research [2].

A high incidence of anomalous CW has been reported in patients with saccular aneurysms of the intracranial arteries [3,4]. We found 153 anomalous CW in the 404 brains examined, that is in 38 per cent, which is comparable to the figures reported from other countries. Even higher figures have been reported [5] and it has been said that these are so common that they should be considered as normal variations rather than anomalies. Most of these anomalies can be explained on the basis of embryologic development and persistence of some of the foetal structures as the CW evolves to its normal adult form.

Medial defects

Another aspect of the structure of the intracranial arteries, which has received considerable attention in the pathogenesis of berry aneurysms, is a medial defect (MD).

In this condition the tunica media is absent in a short segment of an artery which is otherwise structurally normal. The defect is particularly common at or near the sites of branching.

We have studied step serial sections of 7 arterial junctions from each of 30 CW using haematoxylin and eosin and elastic tissue stains. MD was detected in at least one site each in the 30 CW's and in 43 per cent of the 210 arterial junctions studied. Similar results were obtained at the Delhi centre as well [2].

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Aneurysm and Subarachnoid haemorrhage

During this study we observed 3 (1.7%) berry aneurysms in the 181 consecutive brain autopsies and in a later study of a larger series there were 43 (2.1%) berry aneurysms in the 2023 brains [6]. These figures are lower than those reported from the Western world [7,8]. Since anomalous CW and MD in our material were as common as in the West, the lower number of aneurysms indicate a lack of causal relationship.

It must be noted however, that our autopsy data on aneurysms does not indicate its actual incidence in the population or in clinical practice because autopsies are performed in a selected and small number of cases. In the collaborative study [2] of clinical material in six centres, aneurysms were detected as cause of subarachnoid haemorrhage (SAH) in 18 to 54 per cent cases, the average being 36.7 per cent. The investigators felt that the number could have been higher if all investigations were available uniformly. Although the study fails to answer whether incidence of SAH in India is same or different from the West or Japan, the incidence of aneurysm as a cause of SAH is not significantly different.

Atherosclerosis

The two major risk factors of stroke are atherosclerosis and hypertension. Thrombotic infarctions of the brain are generally due to atherosclerosis which may be located in the intracranial arteries or, more importantly, in the extracranial portions of the internal carotid and vertebral arteries. Due to certain limitations our data on atherosclerosis and occlusion of the extracranial arteries in the neck are very limited, but it is amply documented in the literature that these arteries are involved in a significant number of cases of cerebral thrombosis [9].

The aetio-pathogenesis of atherosclerosis is a vast subject which is beyond the scope of this article, but a very brief mention must be made about the experimental work carried out in our laboratory [10]. Adult rhesus monkeys fed on a high fat high cholesterol diet for 7 months developed hyperlipidaemia, increased tissue lipids and morphological changes of atherosclerosis in the major intracranial arteries and extracranial portions of the internal carotid arteries.

The lesions were, however, not severe enough to cause significant narrowing of the lumina of the affected arteries or any ischaemic lesions in the brain. Although not much can be inferred from this limited short term study, it does confirm the role of hypercholesterolaemia in cerebral atherosclerosis.

In the collaborative study referred to earlier [2] the incidence, degree, and distribution of atherosclerosis were studied in routine medical autopsies. The CW was examined in 185 cases by making cross sections at 22 sites and measuring the degree of narrowing of the lumen and grading as 1 to 4. Atherosclerosis was detected in 83 cases. The youngest subject was a 12-year-old boy with a total score of 4. The incidence increased with age and 61 out of 83 cases above 40 years of age had atherosclerosis. All the 20 males above 60 years of age showed atherosclerosis.

Hypertension

Hypertension and atherosclerosis are closely related as hypertension is known to accelerate the atherosclerotic process. Hence, it is not always easy to determine their role in stroke independently. Nevertheless it is generally accepted that hypertension is the most important cause of intracerebral haemorrhage (ICH). We have attempted to work out evidence of hypertension in different types of stroke in the autopsy material. Apart from recorded blood pressure, ECG, and retinal changes during life, left ventricular hypertrophy and vascular changes in the kidneys and brain at autopsy have also been studied for diagnosis of hypertension.

Since hypertension is a common disease, a chance association is always difficult to exclude. Our findings of the presence of hypertension in 70 per cent of ganglionic haemorrhages and all cases of pontine haemorrhages strongly indicate a causal relationship but the same can not be stated for ruptured saccular aneurysms and cerebral arterial infarctions. Forty four per cent of the former and 52 per cent of the latter were hypertensive in our material.

Stroke in the young

In our analysis of CVD we have observed that 36.8 per cent of the cases were below the age of 40 years [6]. This is similar to the experience of other

workers from India [11] but is in sharp contrast to that in the Western countries where less than 2 per cent of all stroke cases occur in patients below 40 years of age [12]. It should be noted, however, that our data cannot be strictly compared with the reports on clinical material. A large proportion of our cases are those of cerebral embolism secondary to rheumatic heart disease, and infective endocarditis, cerebral venous thrombosis (CVT) and hypertensive ICH secondary to chronic renal disease. Not only do these conditions generally affect younger subjects but their prevalence is more in developing countries and are associated with higher mortality.

Cerebral Embolism

In 89 cases of infarction due to embolism, the source of embolus was identified in the heart in 63 (70.8%) cases. Rheumatic heart disease, myocardial infarction, and infective endocarditis with or without pre-existing heart disease were the main setting for emboli. Another source of embolus could be the arteries of the neck which were not investigated adequately. In cerebral infarction due to embolism occlusion of the appropriate intracranial artery is demonstrable more readily than in the cases of thrombosis. Occurrence of multiple infarcts is more frequent in embolism and the carotid circulation is involved more often than the vertebrobasilar. The average age for embolism is 42.5 years compared to 47.4 years for thrombosis. If the cases of myocardial infarction are excluded, the average age would be still lower. Infective endocarditis in normal cardiac valves deserves special mention. Over 40 per cent of infective endocarditis occurred in normal valves in our autopsy material [13] and majority of such cases were most probably iatrogenic.

Rare causes of embolism affecting the CNS, in our experience, include fat embolism, tumour embolism [14] and cartilage embolism of the spinal cord [15].

Cerebral Venous Thrombosis

Aseptic cerebral venous thrombosis (CVT) constituted nearly 10 per cent of CVD in our autopsy material. A majority of these cases were related to pregnancy and puerperium. It is well recognized that pregnancy related CVT is far more common

in India than other countries [16]. What is less recognized is the occurrence of CVT not related to pregnancy. Dehydration is a known cause of CVT in children. In the adults CVT has been described in association with a number of extracranial conditions as well as without any associated conditions [16]. Until recently these cases were rarely diagnosed in life but the advent of newer imaging techniques has improved the situation. In 13 such cases in our material the associated conditions included colonic tuberculosis, chronic ulcerative colitis, and chronic diarrhoea in one case each and the other 10 cases did not have any associated disease. We have also observed 3 cases of CVT in the biopsy material two of which occurred soon after tubectomy. These 3 cases recovered following craniotomy and decompression.

It can be said in conclusion therefore, that a major part of the problem of CVD can be minimized by measures which are well known and common knowledge. These include modification of life style, early detection and effective treatment of hypertension, and control of infections. These measures should be more cost effective than the management of CVD in tertiary care medical centres.

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