

Title: Malaria and the Nervous System: Cerebral Haemodynamics and Metabolism in Patients with Malaria and Central Nervous System Symptoms. The Response of the Diseased Cerebrovascular System to Vasodilators

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Introduction In earlier reports, the effects of carbon dioxide and acetazolamide, singly and in combination, on cerebral haemodynamics were investigated in 21 patients with occlusive cerebrovascular disease.

It was found that after the administration of acetazolamide the cerebral blood flow increased by 40%. A mixture of 5% carbon dioxide and 95% oxygen alone increased the flow by 46%. When both were given together, the increase was 176%.

The present report is concerned with a similar study in normal volunteers. In addition, we have included a study of the effect of cigarette smoking on cerebral blood flow in those people as well as in a few patients with occlusive cerebrovascular disease. It is currently believed that cigarette smoking has a deleterious effect on patients suffering from transient cerebral ischemia, although, to our knowledge, cerebral haemodynamics during smoking has never been documented.

During the period covered by the present report, 12 normal subjects were studied. Technical difficulties during blood gas analyses necessitated exclusion of three cases from the total of twelve. Among the remaining nine normal volunteers, the effects of 5% carbon dioxide and acetazolamide were studied in six. Three normal subjects and six patients with occlusive cerebrovascular disease were studied regarding the effect of smoking.

Results The study on six normal volunteers has shown a similar increase in cerebral blood flow after the administration of acetazolamide or 5% carbon dioxide. The additive effect which these two agents have on the cerebral blood flow was also demonstrated.

The mean age of these volunteers was 22 years. The mean cerebral blood flow was 69 ml./min./100 grams of brain (range: 39.4 to 94.2). The mean cerebral vascular resistance (CVR) was 1.4 mm. Hg./min./100 grams of brain. The mean cerebral oxygen consumption was 4.05 ml./min./100 grams of brain.

After the administration of acetazolamide, there was an increase in cerebral blood flow by 28%. A mixture of 5% carbon dioxide and 95% oxygen alone increase of 103%.

In six patients with occlusive cerebrovascular disease on whom the effect of cigarette smoking was studied, the mean age was 49 years. The mean cerebral blood flow before and during smoking was 42.3 and 43.2 ml./min./100 grams of brain respectively. The results in three normal controls on these were as follows: mean age 24 years; cerebral blood flow before smoking 62.8, after smoking 62.9 ml./min./100 grams of brain.

Comment Thus, with regard to the effect of vasodilators, the normal volunteers responded in the same manner as those patients with occlusive cerebrovascular disease previously studied. The increases in cerebral blood flow, after the administration of acetazolamide, or 5% carbon dioxide and the two together, in both groups were comparable. Admittedly, the mean age of these two groups were different, since normal volunteers of the same age range as that of patients with cerebrovascular diseases were not available. The age factor, however, would appear to be insignificant. The results from these studies have clearly demonstrated the remarkable increase in cerebral blood flow with the administration of acetazolamide and carbon dioxide, regardless of the age of the subjects studied and the state of the cerebral vasculature.

From the limited series of patients and normal controls, cigarette smoking seemed to have no significant effect on cerebral blood flow and vascular resistance. The investigation on this matter will be continued.