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EFFECT OF SYNTHOPHYLLIN, HEPARIN AND RESERPINE ON THE OXYGEN  
SATURATION OF ARTERIAL BLOOD IN PATIENTS WITH  
IMPAIRED CEREBRAL CIRCULATION

- USSR -

by S. D. Rolle

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EFFECT OF SYNTHOPHYLLIN, HEPARIN AND RESERPINE ON THE OXYGEN  
SATURATION OF ARTERIAL BLOOD IN PATIENTS WITH  
IMPAIRED CEREBRAL CIRCULATION

- USSR -

Following is a translation of an article by S. D. Rolle  
(of the Institute of Neurology of the USSR Medical  
Academy, directed by N. V. Konovalov) which appeared  
in the Russian-language journal Sovetskaya meditsina  
(Soviet Medicine), Vol. XXIV, No. 5, Moscow, May 1960,  
pages 116-118.]

This study of the oxygen saturation of arterial blood was made using Professor Kreps cathode oxyhemometer and Professor Brinkman's "cyclops". Until recently the only method for evaluating oxygen saturation of arterial blood was the Van Slyke method based on taking blood samples which were then analyzed chemically.

Any method which requires taking blood samples from vessels through a needle has serious inherent shortcomings. Not every physician can take samples of blood from the arteries and in addition an analysis of blood gases is lengthy, troublesome and little suited for making important dynamic observations. For this reason there was a natural effort to make possible a study of the oxygen saturation of arterial blood by a bloodless method (non involving puncture of a vessel) and which could be done continuously over a long period.

The sensitivity of the cathode oxyhemometer is high, it detects fluctuations in oxygen saturation which take place in a few seconds. The most convenient for such measurements is the human ear. To the ear is attached a photoelectric cell on a clip with a bulb to heat the skin. While the heat is maintained, the vessels remain dilated. The heat must be sufficient but not enough to induce burns.

There are persons in whom heating of the ear causes edema which makes measurements impossible. In addition to the oxyhemometer, the oxygen saturation of the arterial blood was studied by means of Professor Brinkman's "cyclops." The very name "cyclops" indicates that the device is attached to the forehead. However, the "cyclops" may be fastened for this purpose to the shoulder, thigh, lower leg, foot and chest. It is also not

necessary that the blood be arterialized for operating the cyclops. It can be obtained by histamin ionophoresis. For ionophoresis a special apparatus is attached to the cyclops; this apparatus includes batteries, a potentiometer and a milliammeter.

Work on the cyclops requires much more attention and time than the cathode oxyhemometer. In both cases it is essential that the subject be given no less than 15-20 liters of oxygen from the oxygen pillow. Parallel studies on two devices make the data obtained more reliable. By comparing the results obtained from the oxyhemometer and the cyclops, we can be assured of the accuracy of the results.

In the literature we found no material on changes in the oxygen saturation of the arterial blood as related to the action of synthophyllin, heparin or reserpine.

Below we are given the data which we obtained with relation to the oxygen saturation of arterial blood under the effect of these drugs. We made 50 studies of the administration of synthophyllin to 8 patients with acute apoplexy. [See Note.] Each patient was given an intravenous injection of 20 milliliters of a solution consisting of 10 milliliters of 24% synthophyllin and 10 milliliters of 40% glucose. By comparison with other preparations synthophyllin has the greatest effect in increasing the oxygen saturation of the arterial blood. Usually with the first intravenous injection of synthophyllin the oxygen saturation of the arterial blood increased 5-9%, and 5-6% with subsequent injections. The elevated level lasted for not less than 5-6 hours. Patients responded well to the intravenous injection of synthophyllin. (Note: Synthophyllin, a preparation obtained from Czechoslovakia, is an analog of euphyllin. M. D. Mashkovskii describes euphyllin as a strong vasodilator, acting on the coronary vessels and particularly relaxing the smooth muscles of the bronchi.)

Later the oxygen saturation of the arterial blood was studied with relation to heparin which, as we know, is a drug which retards coagulation and reduces the cholesterol content of the blood. Eight patients with acute apoplexy were given from 2 to 5 milliliters of heparin intramuscularly (25,000 units per milliliter); after this the oxygen saturation of the arterial blood was determined. A total of 50 examinations were made, showing that heparin actually increased the oxygen saturation of the arterial blood 3-4% within 15-20 minutes after injection. Repeated injections of heparin in the original dosage increased saturation by 2-3%. Oxygen saturation of the blood remained high for 3-4 hours.

We also made a study of oxygen saturation of arterial blood in hypertensives, with an inclination toward cerebral crises, while they were being treated with reserpine. We made 90 studies of

6 hypertensive patients. We know that reserpine has a tranquillizing effect on the central nervous system and reduces both maximum and minimum arterial pressure. At the same time there is a general improvement in the patient's condition and cardiac activity returns to normal. Reserpine is taken orally in 0.1 gram tablets 3 times per day for 21 days.

After the first reserpine tablet the oxygen saturation of the arterial blood increases 5-7%, with subsequent tablets 4-5%. In the majority of patients the increase occurred within 15 minutes; this effect lasted for 5-6 hours.

Synthophyllin, heparin and reserpine all caused an increase in oxygen saturation, in the majority of cases within 10-15 minutes, and this increase lasted 5-8 hours. All these drugs have a vasodilatory effect and are capable of increasing the oxygen saturation of arterial blood. The question arises as to whether other vasodilators do not also have this effect.

In addition to synthophyllin, heparin and reserpine, intravenous injections of ephyllin and nicotinic acid were used in a great number of studies on oxygen saturation of arterial blood. These preparations also have a vasodilative function. As a result of their administration there was an increase in the oxygen saturation of arterial blood, particularly after the first intravenous injection (5-9%), with a somewhat smaller increase after subsequent injections (3-7%).

All these facts give us reason to believe that vasodilators have the ability to increase the oxygen saturation of arterial blood to a greater or lesser degree.

In isolated cases we did observe exceptions. For instance, when patients K. and M. were given reserpine there was actually a drop in the oxygen saturation of the arterial blood (3% after the 20th and 21st tablets containing 0.1 gram of reserpine). This phenomenon occurred within 15 minutes and lasted for approximately 12 hours. Apparently the drop in the oxygen saturation of the arterial blood caused by the administration of reserpine depended in this case on significant functional changes in the neural apparatus which regulates these processes.

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