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Short Communication

Magnetic Therapy of High Blood Pressure

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Abstract

In the present paper we describe the magnetic therapy of high blood pressure and explain the physical processes underlying this therapy

Study Design: The study design is to describe the magnetic therapy of a high blood pressure, and to explain the physical processes underlying this therapy.

Methods: High Blood Pressure, Causes, Symptoms

Many people suffer from high blood pressure. The hypertension disease is dangerous because it can lead to heart attacks and strokes. There are different possible causes for the high blood pressure, such as genetic disposition or high stress. Unfortunately, hypertension could have no symptoms, patients do not feel anything. This could be dangerous because when not being aware of this problem, people may not try to reduce the high blood pressure. Hypertension can be treated by medical drugs,, e.g., beta blockers, ACE hemmers, etc. Unfortunately there are often dab unwanted side effects, cough, diarrhea , erection problems, feeling nervous, feeling fatigue, weak, drowsy or a lack of energy, headache, weight loss, etc.. A new type of treatment is the magnetic therapy of high blood pressure. It is safe, easy to apply, and it does not have side effects. In this sense it is superior to the use of medical drugs.

Results: Magnetic Therapy of High blood Pressure

We distinguish between two cases. In the first case the magnetic field is parallel to the direction of the blood flow. In this case, the magnetic therapy is described in reference 1.Thereby a modified electromagnet is used with a bore .When the patient places his arm into the bore, then the magnetic field is parallel to the blood flow direction. In addition, there is no magnetic field outside the device. The blood contains red cells with iron, which .will be polarized by a strong magnetic field. Without an external magnetic field, the red cells are randomly distributed, and this gives a high blood viscosity, so that a high pressure is required to move the blood flow. When applying a strong magnetic field in the blood flow direction, the red cells are tilted to make their disc surfaces parallel to the magnetic field and form short chains along the magnetic field. There are several benefits of this:

1) The blood viscosity along the flow direction is reduced, so that the required pressure to move the blood flow is reduced.

2) The blood velocity in the direction perpendicular to the blood flow is changed, and as a result turbulences in the blood flow are suppressed, because the blood viscosity in the direction perpendicular to the flow direction is increased, The blood flow becomes a smooth laminar flow.

3) Because of the Segre effect of a laminar flow, atherosclerotic plaques in the blood vessel walls are removed.

4) Because red cells are of disc shape and hemoglobin is on red cell disk surfaces, in the magnetic field the red cells will make their disc surfaces parallel to the magnetic field, fully exposed. This improves the blood oxygen function.

During the treatment, the blood flows continuously into the arm and experiences the magnetic treatment. The treated blood flows out of the magnetic field into the other parts of the body. Meanwhile, untreated blood comes to the magnetic field is treated in the magnetic field. Because the red-cell chains last for a time of more than 24 hours, in about 15 to 20 minutes the blood of the whole body is treated, i.e., the red-cell chains are all over the body. During the treatment one can measure the patient's blood pressure. In fact, the blood pressure is going down continuously during the magnetic field treatment and the blood of the whole body is treated. Therefore, it is clear that the whole blood is treated by treating explicitly the blood in the arm, i.e., it is sufficient to treat explicitly only the blood in the arm.

Concerning the treatment of high blood pressure, the most important effect is the reduction of blood viscosity along the flow direction by the magnetic field, so that the pressure required to move the blood flow is lower than the original blood pressure before the magnetic field is applied. After the magnetic field is removed, because the induced short red- cell chains can survive quite a while, the blood pressure can be kept low for more than 24 hours.

In the second case the magnetic field is perpendicular to the direction of the blood flow. The patient experiences the magnetic field of an electromagnet placed at his arm. Thereby there is no bore in the device, and the magnetic field can be applied perpendicular to the blood flow direction. There are two effects of the application of a magnetic field in this direction. We start by describing the first effect. The experiments have shown that the red cells form short chains along the magnetic field direction. Because the magnetic field direction is perpendicular to the blood flow, the chains within the magnetic field are perpendicular to the blood flow, making the local blood viscosity along the flow direction increased. The red--cell chains have the tendency to remain inside the magnetic field Therefore, if the magnetic field is extremely strong,, say larger than 10 T, then the red-cell chains may stay along the direction of the local magnetic field, blocking the blood flow and this makes the area painful for the person.

On the other hand, when the magnetic field is not so strong, then

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the blood flow will push the red-cell chains out of the magnetic field. Once these chains leave the magnetic field, they will rotate by 90 degrees to make their axes parallel to the blood flow. Therefore, within the magnetic field the local blood viscosity along the flow direction is larger than the original viscosity, but in areas without the magnetic field the blood viscosity along the flow direction is smaller than the original viscosity. Therefore, when the magnetic field is turned off, then the blood pressure is lower than the original blood pressure, as it was the case when applying a magnetic field in the blood flow direction.

We now discuss the second effect- In the blood there are charged particles, mainly Ca^{2+} ions. The concentration of them is between 0.013 mmole/litre and 0.022 mmole/litre /2/. There are also many other charged particles, with positive and negative charges. They move with the blood flow at velocity **v**. In a magnetic field these particles with charge q experience Lorentz forces **F**,

$$\mathbf{F} = q\,(\mathbf{v} \times \mathbf{B}), \qquad (1)$$

where the symbol x denotes the cross product. In equation 1 we have the magnetic induction

$$\mathbf{B} = \mu_0(\mathbf{H} + \mathbf{M}) \qquad (2)$$

With the vacuum permeability μ_0 ,the magnetic field **H** and the magnetization **M**.

The Lorentz forces make the charged particles circling around the magnetic field. The positive and negative charges are circling in opposite directions. The result of these forces is that the particles run to the surfaces of the blood vessels, giving some of their energy to the blood vessels, generating a certain heat to warm up the tissue.. When warming up the blood vessels, the diameters of the blood vessels increase, i.e., the vasodilatation effect. The required blood pressure for the blood flow can be lowered.

It is worth noting that while applying the magnetic field perpendicular to the blood flow could maximize the collisions between the charged particles and the blood vessel walls, these collisions could also occur when the applied magnetic field is not parallel, but has a small angle with the blood flow. For example, when the applied magnetic field and the blood flow has a 30-degree cross angle, the aggregate red-cell chains will not block the blood flow and the charge particles will circle around the magnetic field by the Lorentz forces and collide with the blood vessel wall, too. The collisions will be weaker but the affected area will be larger than the collision when the magnetic field is perpendicular to the blood flow.

We should emphasize that the consideration related to the Lorentz forces so far are theoretical calculations. The predicted effect of warming up the tissue and increasing the diameters of the blood vessels could be checked in principle by measuring the change of the diameters of the blood vessel.

Far are theoretical calculations.

Altogether, application of a magnetic field can effectively treat hypertension disease, improve the blood flow and lower the required blood pressure.

Discussion

In the present paper we described the causes, symptoms and possible treatments of high blood pressure. We concentrated on the magnetic therapy, which is superior to treatments with medical drugs, because it does not have side effects. We explained the physical properties underlying this treatment. The magnetic therapy has the effect to improve blood flow, lower the required blood pressure, and cure hypertension.

This is a very interesting application of magnetic fields to cure human diseases. Magnetic or electromagnetic fields are also used to treat other human diseases. An example the pulsed electromagnetic field treatment of cancer /3/.

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