Magnetic Therapy of Aneurysma

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Introduction

In my manuscript I describe the magnetic therapy of aneurysma and I explain the physical processes underlying this therapy.

Study design

The study design is to describe the magnetic therapy of aneurysma, and to explain the physical processes underlying this therapy.

Description

Possible treatments

A clipping treatment: In which the anaeurysma is disconnected by a small metal clip (which remains in the body). The blood of the clipped aneurysma is transformed by the body into a blood connective tissue, which reduces the risk of a bleeding.

A cathedral treatment: The cathedral is introduced in an inguinal artery. Then it is advanced until the site of the aneurysma *via* the cathedral small platinum coils are placed into the aneurysma, this leads to a coagulation of the blood in the aneurysma, so that no blood can flow into the aneurysma and the risk of a strong bleeding after a rapture of the aneurysma does not appear.

Stent treatment: A stent can be introduced aside of the aneurysma in such a way that the blood does not flow through the aneurysma but only through the stent, so that in the case of a rapture of the aneurysma no bleeding occurs.

All these treatments have their some risks. A new treatment is the magnetic treatment, which is easy to apply and which does not have side effects, so that it is superior to the other treatments in this sense.

Magnetic therapy

In the magnetic therapy of aneurysma magnetic particles, *i.e.*, magnetite nanoparticles Fe_3O_4 in a shell of a polymeric material in a salty environment ae brought into the blood. The magnetite nanoparticles ha a giant magnetostriction. When applying an external magnetic field perpendicular to the blood flow, then large magnetostrictive strains appear and the polymeric material is linearly deformed. Thereby dipole fields occur at the ends of the polymeric material. These dipole fields induce dipoles in the walls of the blood vessels of the aneurysma. Dipole-dipole interactions then lead to an adhesion of the polymeric material at the walls of the blood vessel covers the blood vessel and this enforces thereby the blood vessels at the site of the aneurysma, so that the danger of a rupture of the aneurysma decreases. An additional effect leading to the adhesion is the interactions of the hydrogen atoms in the polymeric material and in the walls of the blood vessels.

An additional effect of the magnetic therapy is the following. The blood contains charged particle, mainly Ca^{2+} ions and many other positive and negative ions. The magnetic field is applied perpendicular to the flow direction of the blood. Then Lorentz forces F appear,

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

Here v is the velocity of the charged particle in the blood, q is the charge of the particle, the symbol x in equation (1) denotes the cross product. The vector B is given by

$$B=H+4\pi M \qquad (2)$$

With the magnetic field H and the magnetization M is the magnetization. These Lorentz forces accelerate the charged particles in the direction of the walls on the blood vessels, and they delivery energy to the blood walls. This energy delivery leads to a certain amount of warming up the tissue. By this warming the diameter of the blood vessel increases and the blood can flow with a reduced pressure. The decrease of the blood pressure reduces the risk for a rupture of the blood vessel at the aneurysma.

Conclusion

In the present paper I discussed causes, symptoms and possible treatments, concentrating on the magnetic therapy. I explained the physical processes underlying the magnetic therapy.

This is a further very interesting example of the treatment of aneurysma. There are also several other magnetic therapies of human diseases, e.g., the pulsed electromagnetic field treatment of cancer.

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