Positive effect of magnetism on cerebral malaria (A hypothesis)

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ABSTRAK

Sugeng Juvono Mandirusodo – Pengaruh pola magnetisme pada malaria cerebral (Ucapan hipotesis)

Malaria cerebral (MC) adalah salah satu komplikasi yang berat dari malaria falciparum yang dapat menyebabkan angka kematiannya tinggi di suatu daerah endemic tertentu. Plasmodium falciparum paling demam. Diduga antara banyak penyebab histopatologi, patogenesisa Mf dipicunya ditelahkan oleh sumbatan. Sumbatan dalam vena darah central oleh sel-sel darah merah yang inkrusta parasites malaria, yang dapat disebabkan oleh faktor-faktor lain yang terjadi berharap, misalnya depresi komplikasi lain dalam vena darah serebrum, penurunan imunitas humor atau selulosa, keluarnan endotoksin dan keluar faktor nekrosis tumor. Pengaruh-pengaruh biopasif dari magnetisme telah dijelaskan secara baik dan mendapat dalam waktu waktu lama paling tahun terakhir termasuk penelitian untuk penyembuhan -mikro-penyakit umum. Misalnya banyak peneliti yang diambil oleh para peneliti menunjukkan penelitian-penelitian yang tidak terbatas jumlahnya dalam bidang biologi magnetisme adalah: (1) sistem biologi sengga pada terhadap medan magnetik dan pengaruh magnetik mencapai setiap sal darah tulang karena daya terhadap yang tinggi darah magnetisme; (2) karena tanah lebih kasar maupun sal darah pulalan turun dan medan magnetik ada dalam tepi bapakhuthu yang kuat, magnetika dijalankan secara beraturan berpengaruh pola; (2) medan magnet parasit berpengaruh pehandalan pembuluh blokimawi malaria gambiran darah dan leki emas terhadap; (4) suatu medan magnetik dapat berpengaruh langsung terhadap otak bagi tanah dan depen. Hasil-hasil penelitian tentang pengaruh magnetisme terhadap dari vena parasite yang ada pada penelitian kandungan tali sal darah yang kemudian mencegahkan ana tubuh yang lemah yang semakin dipicunya yang menyebabkan depen, serta meningkatkan kesehatan kesehatan darah dan leki darah. Akan disusun berikutnya, bahwa magnetisme jadi dijalankan secara teratur berpengaruh pola terhadap penyakit malaria.

Key words : magnetotherapy — biomagnetism — biophysics — malaria — biopharmacology

ABSTRACT

Cerebral malaria (CM) is one of serious complications of falciparum malaria that may cause high mortality rate in a malaria endemic area where Plasmodium falciparum is prevalent. Based on a lot of histopathological findings, patogenesa of CM is thought to be mainly caused by the blockage of cerebral vessels by parasitized red blood cells (PRBC), that could be aggravated by secondary factors such as depositions of immune complexes in brain capillaries, reduced immunocompetence due to sequestration of immune responses, action of endotoxins, and the action of tumor necrosis factor (TNF). Biological effects of magnetism have been extensively and intensively studied in the past few decades including their applications to the treatment of common diseases. Among other conditions reached by scientists after immunoresearch experiments in the field of biomagnetism are (1) living systems are very sensitive to magnetic fields and magnetic effect reaches every cells in the body on account of the highly permeable character of magnetite; (2) as the entire body is infused with electrical energy and magnetic fields exist in every part of it, magnets, if properly applied exercise a positive effect on the electrical response behavior pattern; (3) effects on the blood picture and on erythrocyte sedimentation rate result from exposure of the organism to a constant magnetic field which initiate biochemical changes; (4) a magnetic field can exert direct influence on the diaphragm and the forebrain. Studies on the effect of magnetism on blood revealed the activation of the iron content in the blood and a weak current was discerned to have been generated, the protracted of lesion was hastened which freed the blood from danger of clotting and stimulated easier and more spontaneous flow of blood through the blood vessels and capillaries. It is hypothesized, therefore, that magnetism exerts a positive effect on CM.

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INTRODUCTION

Human malaria is a serious infection of the blood by haemoglobin-digesting single-celled Plasmodium protozoa, transmitted by the bites of Anopholes mosquitoes. There are four species of Plasmodium, commonly called malaria parasites, infecting man, namely P. falciparum, P. vivax, P. malariae and P. ovale. The first being the most dangerous one due to many life-threatening complications it causes such as cerebral malaria (CM), heavy anaemia, shock ("algid malaria"), complicating bacterial infections, pulmonary edema, haemostatic disturbances and blackwater fever. Such complications, mainly CM, could be the main direct cause of death of the malaria patients, particularly in Africa where it is believed to be responsible for deaths of some one million children each year. Although CM could be caused by P. vivax as reported by Sachdev and Mohon (cit. Haworth) in India, rightly, most media attention, and most research, concentrates on the P. falciparum-form of disease, particularly on the pathogenesis of CM, one of the most dreadful clinical conditions of falciparum malaria.

Many attempts of CM treatment and management have been done based on the pathogenesis of the disease with some degree of success, ranging from the use of various antimalaria chemotheraphy, such as intravenous quinine hydrochloride to the use of various drugs other than antimalarials to overcome cerebral edema, unconsciousness and other severe clinical conditions. Management of severe and complicated malaria, particularly with CM, therefore, still constitutes a major topic of research in the world. Any studies and practices of alternative medicine or disease management, that scientifically sound, and are supportive to modern medicine, specifically in the treatment or management of severe and complicated malaria, should not be overlooked. Bansal & Bansal have written their experiences in treating at least 85 kinds of the common diseases of man, and described the scientific basis of magnetism for possible alternative in the treatment of diseases due to infections or non-infections. Thus, whether the application of magnets would exert remedial effect on CM in man is an interesting question to answer.

The present paper discusses some aspects of CM due to P. falciparum, and the basic principles of how the magnetism works and exerts biological effects on the human body. The specific objective of this paper is to establish hypothesis that could be the starting point for testing of the value of magnetism in the treatment or management of malaria cases, particularly with CM and other severe complications of falciparum malaria.

DISCUSSION

Cerebral malaria (CM)

Symptomatology. CM is defined by MacPherson et al. and Oo et al. as an acute, diffuse, symmetric encephalopathy in patients with falciparum malaria. It has been estimated that it may occur in about 2% of non-immune subjects. The symptomatology of CM includes headache and drowsiness succeeded by a comatous state with contracted pupils and abolished or exaggerated deep reflexes. Some CM patients may show different neurological symptoms simulating meningitis, epilepsy, acute delirium, intoxication, heat stroke, etc. Schmutzhard & Gerstenbrand described clinical symptoms of 66 cases with CM in Tanzania, all of them were under 15 years old, as follows: hyperthermia (94%), comatous state with signs of midbrain syndrome (72.7%), epileptic fits - local or generalized (63.5%), vomiting (60.6%), headache (47%), focal signs (24.2%), neck stiffness (15.2%) and neurologic ophthalmoplegia including organic psychosyndrome (7.5%), hemiparesis/hemisensory impairment (4.5%), and residual epileptic fits with residual hemiparesis (1.5%). The mortality of the 66 cases of CM was 18%, all death was due to bulbar brain syndrome. Drowsiness and disorientation are the warning signs heralding the onset of CM. Sachdev and Mohon (cit. by Haworth), reported 6 cases of CM due to P. vivax in India, all in children under 12 years old, 4 of them died, and the associated symptoms included renal failure, hypoalbuminemia and deep coma.

The clinical variability of symptoms of parasitic attacks of falciparum malaria with cerebral involvement causes some difficulty in
confirming the provisional diagnosis in fatal cases of the infection in infants and children in highly endemic areas. Rangele10 proposed a simple method for post-mortem confirmation of the brain which was claimed to be rapid and leaving no trace on the body.

Pathological figures. The main cause of pathology in malaria are considered to be tissue
anoxia, which is due to impaired oxygen-carrying capacity of the blood vessels, and general and local changes in blood flow.7

Bruce-Chwatt2 noted that the involvement of central nervous system was considered to be the main cause of 20-50% of deaths of patients with falciparum malaria. He further concluded that there were three main types of pathological changes in the brain tissues due to CM as seen on autopsy, namely: (a) gross congestion of meninges and the brain itself with the small vessels of the grey matter packed with erythrocytes containing pigmented parasites in all stages of development, (b) occlusion of the capillaries and precapillaries of the cortex, ring haemorrhage around the 'blocked' arterioles and numerous petechial haemorrhages in the subcortical white matter of the cerebrum, brain stem and cerebellum, and (c) necrotic lesions in midbrain brain tissue with a peripheral reaction of small glial cells ('malarial granuloma') around an occluded capillary.

An electron microscopic study of human brain in CM was presented by Pongponrat et al.11 using Thai patient, a boy of 13 years old, who died of CM, pulmonary edema and pneumonia. They concluded that there was a morphological evidence of adhesion of parasitized red blood cell (PRBC) to the endothelium of cerebral vessels via knobs, and of platelets sticking to the injured endothelium. It was found that the endothelial vesicular membrane was in close adhesion to the PRBCS, and to the platelets involved in the mechanism, and no evidence of inflammation, fibrin or thrombin formation were observed in their study.

Aikawa12 has studied in detail the pathological changes of brain tissues in human patients who died of CM using light and electron microscopy and an immunoperoxidase technique. He summarised the light microscopic results that blockage of cerebral capillaries by P. falciparum infected erythrocytes appeared to be the principle cause of CM. From electron microscopic results, it was concluded that knobs on PRBCs acted as focal junctions which mediated adhesion to endothelial cells. The knobs were again believed to be important contributors to the blockade of the capillary lumen and ensuing pathological changes in cerebral tissues. Further studies by the authors using peroxidase technique revealed host cell molecules such as OKMS and threm

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Pathogenesis. Most authors relate the symptoms of CM to the blockade of cerebral vessels by the PRBCs, but some investigators indicate that CM is a form of disseminated vasculomyleopathy, a hyperergic response of the central nervous system to the antigenic challenge of P. falciparum. Pathological changes begin with an alteration of the endothelial permeability of the capillaries of the brain followed by perivascular infiltrates and dureteralisation. Clark15 reviewing the cell-mediated immunity in protection and pathology of malaria proposed five possible factors contributing to the development of CM which include: (a) the blockade of cerebral vessels by the PRBCs, (b) deposition of immune complexes in brain capillaries, (c) reduced humoral or cell-mediated immune responses, (d) action of endotin, and (e) action of tumor necrosis factor (TNF). Among these, the blockade of cerebral vessels was considered to be the major factor in the pathogenesis of CM. This opinion was supported by histopathological findings as described by Pongponrat et al.11 and Aikawa.12 The blockades of cerebral vessels due to the adhesion of the PRBCs via their surface knobs to the endothelium of cerebral vessels lead to vascular obstruction and disturbances of microcirculation in the brain and consequently result in tissue
hypoxia. In addition, attachment of the platelets to the injured vascular endothelial cell may play a role in obstruction of cerebrospinal fluid, that may lead further to cerebral edema, and also responsible to low circulating platelets.

Das et al.,13 studying pathological features of CM through brain necropy of falciparum malaria patients, showed the presence of edema, fibrin deposits, mononuclear cells infiltration, and increased cerebrospinal fluid protein and lipid peroxidation products. The authors proposed that CM might be caused by increased permeability of vascular endothelium resulting from increased lipid peroxidation in the endothelial cell membrane.

Clinical management. The first principle in the management of CM is the intravenous administration of an effective antimalaria schizonticide.9 In areas where chloroquine resistant strain of P. falciparum has emerged, quinine hydrochloride is the drug of choice. In such situation, clinical CM cases that are confirmed positive for P. falciparum in their blood are commonly treated with quinine hydrochloride intravenous injection at the dosage of 10 mg/kg body weight.1 Special attentions should also be directed to the improvement of clinical conditions of the CM patients who are invariably shocked and often dehydrated, and suffering from acute haemolytic anaemia. Therefore, transfusion with blood or with packed red cells may be necessary as soon as parasitological treatment and treatment for dehydration and shock have been instituted.

One thing that is overlooked in the management of severe falciparum malaria, particularly with CM complication, is that, a method or methods to prevent or minimize the PRBCs in the capillary blood vessels, from producing blockade of the blood capillaries, particularly in the cerebrum and other vital organs. Supposed, the blockade of the cerebral blood vessels that are the major factor of CM could be hindered to minimal, and thus the microcirculation in the affected cerebral tissues could be well maintained, the fatal outcome of CM could be prevented and the mortality rate due to the cerebral involvement could be reduced to minimum.

Magnetism : Its effect on the human body

Magnetism is one of the natural phenomenon in which pieces of iron or certain metal alloys (serving as permanent magnets) show strong attraction or repulsion for one another. The phenomenon is most familiar through the compass, indicating the direction of the Earth's magnetic poles, and through small permanent magnets used in household fixtures and as children' toys. Most of the importance of magnetism, however, is connected to the relation between magnetism and current electricity.16

It was Dr. William Gilbert (1540-1606 A.D.) of England, the court physician to Queen Elizabeth I, who pioneered in the scientific study of electricity and magnetism and was the first to declare that the earth itself was a huge magnet.17 The earth possesses a magnetic moment, ascribed to the planet about its own axis.18 The magnetic field of the Earth affects the motions of the electrons in the electrified region of the atmosphere known as the ionosphere and of charged particles approaching from the outside19, and in turn, also affects the motions of the electrons in the living beings as described by Markel20, Bansal & Bansal21 and Suryadipura.22

With the existing background the bio-magnetists in America, Russia, Japan, France, India and others, carried out extensive research works and practices of healing during the last 50 years on the nature and scope of the magnetic field and its biological effects on living organisms.4 As examples, two volumes of textbooks entitled 'Biological Effects of Electric and Magnetic Fields' have been published and edited by Carpenter and Ayrupneyt23, results of many studies on the effects of geomagnetic field on various organisms, such as magnetic bacteria, migratory bird, bees, and elasmobranch fishes, have been compiled by Markel27, electromagnetism and its relation to the foundation of life, particularly to the process of regeneration in living organisms has been described in great detail by Becker and Selden24, and a book on magnetotherapy for common diseases has been written by Bansal and Bansal.25 In this book the two authors mentioned some of the enormous numbers of extensive experiments on magnetism, for examples : the use of magnets
plant growth and fertility could be increased, their tissues rejuvenated, and they could be protected from frost and other dangers. The lifespan of houseflies could be doubled by feeding them on magnetised sugar, life of a mouse was extended to nearly half of its normal lifespan and a mouse under experimentation astonishingly gave birth at the advanced age of four, the maximum span being three years. Quite recently Beason et al. provided evidence for the use of a magnetic material (perch magnetic) by a migratory bird, belohink (Poliholoxo erryphotus), to detect the earth's magnetic field for orientation of the place where it is going to.

Magnetotherapy is a clinical system in which human ailments are treated and cured through the application of magnets to the body of the patients. Magnet, actually is not new to mankind, but the knowledge of its healing properties has been very sparse and rare, right up to the modern era, but therapeutic system around the healing properties of magnet started evolving only in the 19th century. It was Paracelsus (1493-1541), a Swiss alchemist and physician, who pioneered work on the magnet and brought the light to its healing powers. He made the revolutionary observation that the magnet could cure all inflammation, infestates, ulceration and many diseases of bowels and uterus, that it could be useful both in internal as well as external ailments, and had an opinion that any disease part of the human body, when exposed to the magnetic force, will be cured better and more rapidly than by any medicines. Then, perhaps Father Hall as cited by Bansal and Bansal, an Austrian Professor of Astronomy in the 18th century, took cue from Paracelsus and treated nervous men and women by applying magnets, as remedial tools, to their bodies; this remedial action was closely watched by Dr. Mesmer (1734-1815).

According to Bansal and Bansal there are three basic principles, or the triple action, underlying the action and reactions triggered in a physical system consequent to its getting exposed to a magnetic field, namely:

1. Any biological system is composed of different chemicals/molecules which in turn are conjunctions of atoms holding within themselves electrons and the nuclei, the charged particles. When the system is exposed to a magnetic field, these charged particles within the molecules are displaced or their relative placement is disturbed or changed resulting in the increased activity in the ions.

2. In addition, this displacement of charged particles or charge in their relative placement causes the creation of extra pervasive heat in the system;

3. Different chemicals present in all parts of the body are continuously generating a very weak electricity and the associated magnetic field to be used up in all voluntary and involuntary functions within the system. All nervous signals sent by the brain and received by it are flashed through these electric impulses in collaboration with surrounding magnetic fields.

Bansal and Bansal also noted conclusions reached by scientists after innumerable experiment in the field of biomagnetism that could represent the scientific basis in magnetotherapy:

1. Living systems, including the human body, are very sensitive to magnetic fields and magnetic effect reaches every cell in the body on account of the highly pervasive character of magnetism;

2. As the entire human body is infused with electrical energy and magnetic fields exist in every part of it, if magnets if properly applied exercise a positive effect on electrical response behaviour pattern;

3. A constant magnetic exposure initiates biochemical changes in the blood. Biomagnetoists found that the magnetic contact immediately activated the iron content in the blood hemoglobin, resulting in generation of weak electric current in a blood, and hastening of process of ionisation in the blood ensuring the free flow of the blood throughout the body. Flow of the ionised blood enlivens every organ, wastes out lethargy from all the systems within the body, i.e., digestive, excretory, nervous, respiratory, etc., and gives strength to brain, heart, and all the muscles. Mild heat generated in the blood activates glands
regularising essential secretions. In a similar way, magnets works upon other and chemicals present in the body. Through its working on blood and other liquids the effect of application of magnets reaches the magnetic fields within the body and affects them internally.

(4) Qualitative and quantitative effects of a magnetic field are visible on tissue and on cellular metabolism.

(5) It has been confirmed that fibroblast proliferation and fibrosis are reduced in magnetic fields.

(6) An interaction exists between function of the nervous system and external magnetic fields.

(7) A magnetic field can exert direct influence on the diencephalon and the forebrain.

(8) Magnetic treatment has stabilising effect on the genetic code.

(9) A magnetic field produces predominantly an inhibitory effect.

The experimenting biomagnets and practising magnetothers have demonstrated that magnetic treatment drives out all types of bodily pains, helps in speedy healing of wounds and fractured bones, dissolved any blood clotting in the blood vessels, washes out stones in kidney and gall bladder and cures such diseases as angina, tumours, stiffness in limbs, arthritis, spondylitis, swellings and inflammations, paralytic and polio effects and to some extent even the dreaded cancer.²

CONCLUSIVE HYPOTHESIS

Based on (1) the facts that the pathological evidence of CM is mainly due to tissue anoxia resulting from the blockade of cerebral capillaries by PRBCs and impaired oxygen-carrying capacity of blood, damage to the endothelial cells lining the blood vessels, and general and local changes in blood flow, and on (2) the facts that exposure of magnets to the human body initiates hastening of ischaemia process and electricity in the blood which consequently frees the blood from danger of clotting and stimulates easier and more spontaneous flow of blood through canals, and causes an increase in the number of red blood cells and strengthen the inactive and decayed ones, it is hypothesized that magnetism and magnetic exposure exert positive effects on CM and extend the patient lifespan.

REFERENCES


