POSSIBILITIES OF MRI STUDIES IN VISUALIZATION OF THE VASCULAR BED OF THE LOWER EXTREMITIES

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Abstract:

For many decades, radiopaque phlebography (CVD) has been the gold standard in the examination of patients with Chronic Venous Disorders (CVD) [1]. This diagnostic method was of particular importance when deep vein thrombosis (DVT) was suspected. Comprehensive examination using distal and proximal contrast injection methods made it possible to exclude thrombotic occlusion at the level of any segment of the lower extremities and pelvis (Lower Extremities Deep Vein Thrombosis, LEDVT), as well as to establish the severity of morphological and functional changes in deep veins as in patients with post-thrombotic disease.

Keywords:

MRI,vascular bed,post-thrombotik disease.

Obstruction of the blood supply to part of the brain causes an ischemic stroke. Although diminished blood flow can result in cell death, it typically promotes two-phase cerebrovascular remodeling involving arteriogenesis and angiogenesis. Arteriogenesis, induced by physical forces such as fluid shear stress and circumferential wall stress, is a process that improves collateral circulation by vasodilating pre-existing circulatory anastomoses[1]. Vasodilation lasts until the physical forces are normalized[2]. Then, the dilated vessels are known to return to their normal diameter[3]. However, the remodeling of venous vessel size and its association with ischemic edema status is rarely investigated in the post-ischemic brain. Angiogenesis is triggered by hypoxia and induces pro-angiogenic factors that result in the sprouting of new capillaries from pre-existing vessels for maintenance or restoration of local oxygen and nutrition supplies[1,4]. In general, arteriogenesis is involved in both macro- and microvascular remodeling, while angiogenesis is a mechanism of microvascular remodeling. Adequate collateral circulation status through arteriogenesis and increased microvessel density through angiogenesis have been shown to correlate with better clinical outcomes and recovery after ischemic stroke[5,6,7,8,9,10,11,12,13]. However, noninvasive methods for simultaneously assessing morphological macro- and microvascular remodeling after ischemic stroke have not been established, and there is little experimental evidence of the need for such evaluation.

As a noninvasive imaging modality, magnetic resonance imaging (MRI) can provide morphological information about the vascular system. With those advantages, MRI is being widely used to investigate vascular remodeling after ischemic stroke. Time of flight MR angiography (TOF-MRA) has revealed an association between arteriogenic collateral circulation and clinical outcomes In a preclinical study of transient middle cerebral artery occlusion (tMCAO) in a rat model, TOF-MRA showed that macrovascular remodeling occurred at the rat brain surface region.However, previous TOF-MRA studies on the ischemic stroke brains have focused mainly on arterial blood vessels, and vascular remodeling of venous pial vessels has hardly been studied to our knowledge. Also, the low spatial resolution of MRA limits the direct local morphological visualization of microvascular remodeling.

A magnetic resonance angiogram, or MRA, is a study of the blood vessels using MRI technology. It is an important tool for diagnosing vascular malformations. MRI uses a magnetic field and radio waves to create detailed two- and three-dimensional pictures of soft structures in the body. The test takes 40 to 90 minutes. Before the test begins, a small IV needle is inserted into your hand or arm. The doctor injects contrast dye into a vein, which allows the blood vessels and arteries to be seen clearly on the magnetic image. It doesn't hurt, but you may feel a warm sensation throughout your body from the liquid.

Magnetic resonance imaging (MRI) is a medical imaging technique used in radiology to image the anatomy and physiological processes of the body. MRI scanners use strong magnetic fields, magnetic field gradients and radio waves to create images of organs in the body. MRI does not include X-rays or the use of ionizing radiation, which distinguishes it from computed tomography and PET. MRI is a medical application of nuclear magnetic resonance (NMR) that can also be used for imaging in other NMR applications such as NMR spectroscopy.

While the hazard of ionizing radiation is now well controlled in most medical contexts [citation needed], MRI may still be considered a better choice than computed tomography. MRI is widely used in hospitals and clinics for medical diagnosis, staging and follow-up of the disease without exposing the body to radiation. MRI can provide different information than CT. Risks and discomfort can be associated with MRI. Compared to CT scans, MRI scans usually take longer and louder, and usually require the object to be trapped in a narrow limiting tube. In addition, people with some medical implants or other non-removable metal inside their bodies may not be able to get an MRI scan safely.

Initially, MRI was called MRI (nuclear magnetic resonance imaging), but the "nuclear" was abandoned to avoid negative associations. [1] Some atomic nuclei are capable of absorbing radio frequency energy when placed in an external magnetic field; The resulting developing spin polarization can induce an RF signal in the RF coil and thus be detected. [2] In clinical and exploratory MRI, hydrogen atoms are most often used to create macroscopic polarization, which is determined by antennas located near the object of interest. [2] Hydrogen atoms are naturally abundant in humans and other biological organisms, especially in water and fat. For this reason, most MRI scans essentially show the location of water and fat in the body. The pulses of radio waves excite a nuclear spin energy transition, and magnetic field gradients localize polarization in space. By varying the parameters of the pulse sequence, it is possible to create various contrasts between tissues based on the relaxation properties of hydrogen atoms in them.

MRI has a wide range of applications in medical diagnostics, and it is estimated that there are more than 25,000 scanners in use worldwide. MRI has an impact on the diagnosis and treatment of many specialties, although the impact on improving health outcomes has been disputed in some cases.

MRI is the study of choice in the preoperative stage of rectal and prostate cancer, which plays a role in the diagnosis, staging and follow-up of other tumors [17], as well as for identifying areas of tissue for sampling in biobanks.

MRI is the preferred instrument for the study of neurological cancer over CT because it provides better visualization of the posterior fossa, which contains the brainstem and cerebellum. The contrast between gray and white matter makes MRI the best choice for many conditions of the central nervous system, including demyelinating disease, dementia, cerebrovascular disease, infectious disease, Alzheimer's disease, and epilepsy. Because many of the images are taken at intervals of a few milliseconds, it shows how the brain responds to various stimuli, allowing researchers to study both functional and structural brain abnormalities in psychological disorders. MRI is also used in guided stereotactic surgery and radiosurgery to treat intracranial tumors, arteriovenous malformations, and other conditions amenable to surgical treatment using a known device. as an N-localizer.

(Post-Thrombotic Disease, PTD), and with primary varicose veins of the lower extremities (Varicosity Disease, VD) [1].

Cardiac MRI is complementary to other imaging techniques, such as echocardiography, cardiac CT, and nuclear medicine. It can be used to assess the structure and the function of the heart. [27] Its applications include assessment of myocardial ischemia and viability, cardiomyopathies, myocarditis, iron overload, vascular diseases, and congenital heart disease.

Musculoskeletal

Applications in the musculoskeletal system include spinal imaging, assessment of joint disease, and soft tissue tumors. Also, MRI techniques can be used for diagnostic imaging of systemic muscle diseases.

Liver and gastrointestinal Edit

Hepatobiliary MR is used to detect and characterize lesions of the liver, pancreas, and bile ducts. Focal or diffuse disorders of the liver may be evaluated using diffusion-weighted, opposed-phase imaging and dynamic contrast enhancement sequences. Extracellular contrast agents are used widely in liver MRI, and newer hepatobiliary contrast agents also provide the opportunity to perform functional biliary imaging. Anatomical imaging of the bile ducts is achieved by using a heavily T2-weighted sequence in magnetic resonance cholangiopancreatography (MRCP). Functional imaging of the pancreas is performed following administration of secretin. MR enterography provides non-invasive assessment of inflammatory bowel disease and small bowel tumors. MR-colonography may play a role in the detection of large polyps in patients at increased risk of colorectal cancer.

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