Functional MRI – Metabolic Changes in the Brain

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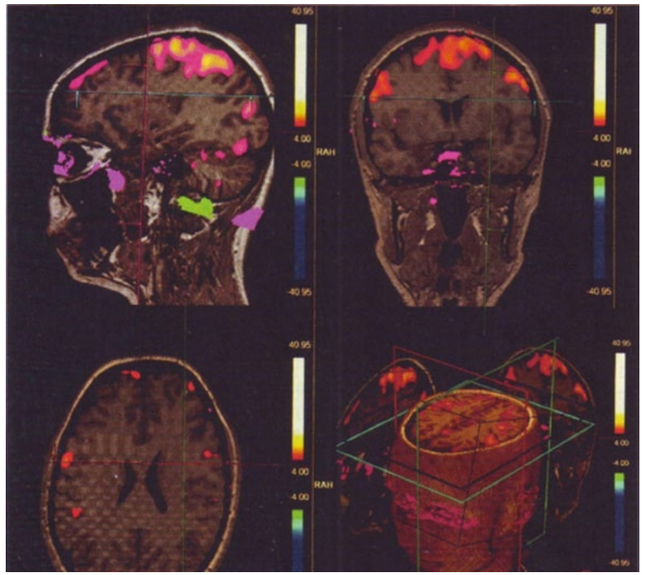

Functional MRI (fMRI) is a relatively new promising invention of magnetic resonance imaging (MRI), developed to identify metabolic changes in the brain. Till this date, there are still lots of efforts, debates, and research expenditures in exploring its medical applications. Neuroscientists refer to fMRI among other tools, to identify brain regions responsible for activities such as; speech, movement, feelings, and even thoughts. fMRI is also being referenced as a non-invasive diagnostic device to map the brain neural circuits.

fMRI was medically explored for the first time back in 1992. A group of biomedical researchers from Bell Laboratories and Massachusetts General Hospital discovered that visual stimulation produces an easily detectable increase in the intensity of magnetic resonance signals in the brain.

fMRI measures the hemodynamic response of the brain. An increase in neuronal activity requires a rapid increase in the supply of glucose and oxygen, which is delivered by blood. And blood rich with oxygen has different magnetic properties than blood poor in oxygen. fMRI refers to this blood-oxygen-level dependence (BOLD) and blood flow as the technique to measure the activity of neurons in the brain, which cannot store glucose and oxygen. The output is a nice color coded 3D map of the brain, with medically important colors signifying differences in activities.

fMRI is coupled with brain functionality, and has been har¬nessed to help assess the effects of stroke, trauma or degenerative disease (such as Alzheimer's). It monitors the growth of brain tumors and guides the planning of surgery, radiation therapy, or other surgical treatments for the brain.

The brain uses different regions for different activities, from simple tasks like controlling the hand to com¬plex cognitive activities like understand¬ing language. The brain also has many spe¬cialized sections, so that vision, hearing, touch, language, memory, etc. have dif¬ferent patterns of brain activity. Neuroscientists have used fMRI to estab¬lish this concept.

fMRI studies the depths of the brain and maps its activities, while Electroencephalography (EEG) on the other hand, signals the electrical activity of the brain from the superficial layers of the cortex. fMRI is also non-invasive and safer than positron emission tomography (PET), in which a radioactive tracer has to be injected into patients. Using PET in this capacity is accompanied by concerns about the strength of tracers required to cross the blood-brain barrier in order to make the technique effective.

On the other hand, the low temporal resolution of fMRI remains a major challenge and may be considered as a hindrance. The brain's hemodynamic response is short-lived, with blood flow rises peaking in about five seconds after neuronal demand. This means it is difficult to distinguish BOLD responses from other events.

Another key problem, however, is that fMRI simply establishes that a particular activity correlates to a specific area of the brain, not to whether it is the cause. For the time being, fMRI cannot easily differentiate between function-specific processing and neuro-modulation and may potentially confuse excitation and inhibition.

There are some concerns meanwhile, about over-enthusiasm in fMRI and rush in increasing the technology expenditure. These concerns have led some researchers to return to older and more proven techniques such as EEG and PET. There is now growing interest, for example, in combining fMRI and EEG data to benefit from the superior spatial sensitivity of the fMRI and the better temporal resolution of the EEG.

Clearly, the potential of fMRI is vast. Inventors are consuming huge efforts to further enhance the sensitivity of fMRI by increasing the power of the magnets in the scanner. The 1.5 tesla MRIs are still the working horse for conventional MRI images. The 3-tesla machines developed in early 2000s began now to yield place in the second half of the decade to super power 7-tesla MRI systems. The year 2012 witnessed the launch of unbelievably powered 11.7-tesla MRI machine comprising of 100 tons of equipment and 136 kilometers of cables. But this has an explicit mandate to investigate additional medical applications. We must definitely choose very prudently in which healthcare technology we should invest our financial resources. Healthcare institutions are invited to investigate the medical outcomes of newly marketed equipment, non-relying solely on the application information provided by suppliers.

Infos

Esthétique Médicale: le Marché Mondial en Croissance de 14,3% en 2014

Le marché mondial de l'esthétique médicale a enregistré une croissance de 14,3% en 2014, tiré par la zone Asie-Pacifique et une situation plus favorable aux Etats-Unis, et devrait continuer sur le même rythme jusqu'en 2019, selon des projections présentées dernièrement.

Le marché des produits utilisés en esthétique médicale et chirurgicale totalisait 5,7 milliards d'euros en 2014, en hausse de 14,3% sur un an, selon l'étude annuelle de l'IMCAS (International Master Course on Aging Skin) publiée à l'occasion du congrès européen du secteur.

Cette croissance est plus importante que l'estimation précédente, "du fait de la réévaluation du marché chinois", a précisé l'Imcas dans un communiqué.

En 2014, l'Asie est passée devant le marché européen: 1,26 milliard d'euros contre 1,117 milliard.

Le marché devrait atteindre 6,2 milliards d'euros en 2015, soit une hausse de 8,4%. Ce rythme devrait se maintenir d'ici 2019, a indiqué à l'AFP Laurent Bronès, directeur du développement de Symatese.

Cette croissance traduit "un dynamisme toujours solide de ce secteur dans un contexte économique encore difficile de certaines zones géographiques", selon l'Imcas.

L'association relève notamment une "situation plus favorable" aux Etats-Unis, une zone Asie-Pacifique qui "tire toujours la croissance globale" avec une croissance de plus de 13%, et un marché "relancé" en Europe du Sud. Mais l'Amérique latine "reste affectée par le ralentissement".

A l'horizon 2019, l'Imcas prévoit un marché mondial à 8,6 milliards d'euros, où les Etats-Unis représenteront toujours près de la moitié de l'activité (44%) devant l'Asie (28%) et l'Europe (18%).

Le marché européen devrait passer de 1,2 milliard d'euros en 2015 à 1,6 milliard en 2019, tandis que l'Asie croîtrait de 1,4 milliard à 2,4 milliards dans la même période.

Par segments de marché, les produits injectables (toxines botuliques, produits de comblement) demeurent le premier marché en valeur, passant de 2,3 milliards d'euros en 2015 à 3,2 milliards en 2019, soit une croissance annuelle moyenne de 8,2%.

Parallèlement, les équipements à base d'énergie (laser, ultrasons) et ceux destinés au remodelage corporel vont poursuivre leur croissance de plus de 9,8% par an. Ce secteur représenterait plus de 3 milliards d'euros en 2019, avec un croissance moyenne de 10,8%.

Les segments de la cosmétique active et des prothèses mammaires implantables devraient connaître une croissance moins élevée, respectivement de 7,3% et 4,9% par an.