BRIEF DEFINITION OF FUNCTIONAL MRI :-

Functional magnetic resonance imaging(fMRI) is a technique for measuring brain activity. It is non-invasive test which avail a strong magnetic field and radio waves to discover detailed images of whole body. It looks at flow of blood in the brain to detect portion of activity. As it detects the changes in oxygenation of blood and flow that occur in response to neural activity such that when a brain area is more active it absorbs more oxygen due to which there is increase in demand of blood flow which increases the active area. The magnetic field inside the scanner affects the magnetic nuclei of atoms. As the field will become stronger the degree of alignment will be the greater. The tiny magnetic signals from individual nuclei sum up which results in a signal which is large enough to measure. By imaging this modality, we obtain a means of discriminating between grey matter, white matter and cerebral spinal fluid in structural images of the brain as well as produce activation maps depicting parts of the brain involved in a specific mental process and detect abnormalities within the brain that cannot be found with other imaging techniques. [1]

LARGE CONTROVERSY OF BENNETT-SALMON-2009 IN fMRI COMMUNITY :-

Bennett used a dead Salmon Fish for fMRI scanning and he showed it a series of photographs regarding human behaviour in some conditions. After the fMRI scan, it seemed like pictures which had been shown in form of pixels were in its mind. The pixels which were obtained in an fMRI scan are called voxels, or volume picture elements. fMRI scans provide brain slices that is reconstructed in 3D. A typical fMRI scan can contain 130,000 voxels. The images were verified for change between the brain processing picture recognition tasks and the brain at rest, voxel by voxel. He found various active voxel clusters in the dead salmon’s brain which depicts some information regarding photographs shown to it before scanning. He claimed that these results can be easily be derived using analytical methods. This dispute is based on the fact that when values are less than the critical value, the output may be incorrect but if any hypothesis is pursued and a precise outcome is generated, then the hypothesis may be corrected only by chance. He emphasizes on multiple comparisons correction method just to confirm that the obtain result is definitely correct or not. This could have provoked a controversy as some investigators used the statistical methods on spurious signals in the dead salmon’s brain and obtaining the results using False Discovery Rate and Familywise Error Rate which he defined as False Positive. He also derived a relationship between signal in voxel and its variability by establishing the Pearson Correlation ship to justify his poster.[2]

EPI AS REFERRED IN MRI ACQUISITION :-

Echo planar imaging (EPI) is the mostly used MRI technique used for neurosciences due to its extremely fast imaging speed and unique contrast mechanisms. EPI combined with diffusion sensitive gradient pulses provides 3D visualization of axonal fibres, which reveals the connectional anatomy of the human brain. By EPI acquisition the complete image is formed from a single data sample of a gradient echo or spin echo sequence with an acquisition time of about 20 to 100 Ms. All the lines of k-space can be acquired in a single TR known as single-shot echo-planar imaging while TRs known as multi-shot echo-planar imaging. It requires higher performance from the MRI scanner which requires larger gradient amplitudes. It is more vulnerable to magnetic susceptibility effects and it provides greater tissue contrast and therefore echo-planar imaging sequences are used extensively assess cerebral perfusion. It is also nearly exclusively used for fMRI given its extremely high sensitivity to changes in blood oxygen level dependent (BOLD) contrast in different regions of the brain, revealing maps of neuronal activity. It is used in the application like diffusion, perfusion and functional magnetic resonance imaging.[3]

References:-

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3.Cohen MS, Schmitt F. Echo planar imaging before and after fMRI: a personal history. Neuroimage. 2012 Aug 15;62(2):652-9.