3D Modeling in Tractography DTI -MRI of Anatomical Components of the Central Nervous System

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***Abstract*—**The aim of this study is to reconstruct anatomical knowledge on the central nervous system namely the corpus callosum also called the white commissure through inter hemispherical three-dimensional modeling of white matter bundles demonstrating the connectivity of these inter hemispheric beams that connects different territories and brain areas of both hemispheres function and plasticity of the various constituent parts because the commissure with lots of beams which plays a fundamental role in linking brain areas cross through direct channels and indirect association and the data involved in the neurosurgical trauma and tumor pathology and especially formative congenital evil, as corpus callosum agenesis is very common and poses a problem of very major psychomotor disabilities requiring full knowledge of these hemispheres relaies.

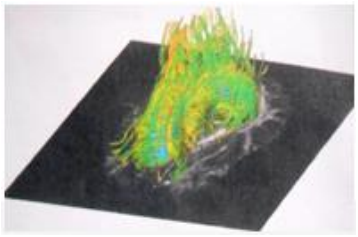
***Keywords*—**3D modeling, white commissure, psychomotor disabilities, central nervous system.

I. Materials and Methods

THE DTI-MRI of 04 patients on MRI collected from 3 tests, integrated in the software of 2D stiker for rebuilding in different mode tractographic beams of the white substance. The imagery by different magnetic resonance MRI lets capture the movement of water molecules bound locally by the form of brain tissue and extention of mapping the structure of white matter in vivo.

II. Results

Brain Tractography by allowing the fellow up and in non invasive way of the beams of the white substance, it is a new perspective in comprehension of normal and pathological process that affect the humain brain. The sclerosis in plaques and tumors are possible applications for this technique of anatomical modeling. On a technical plan the body callous commissure supra-testorielle brain, is selected for a comprehensive study for highlighting the connection of functional areas.



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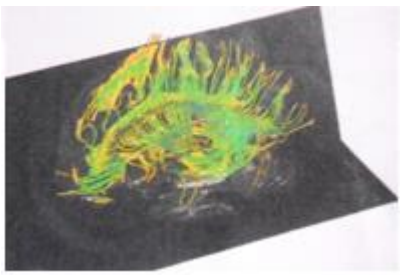
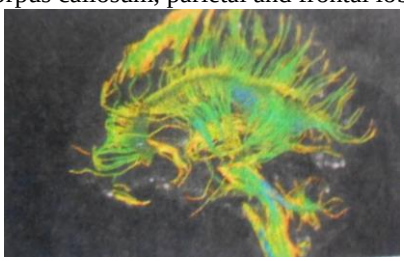
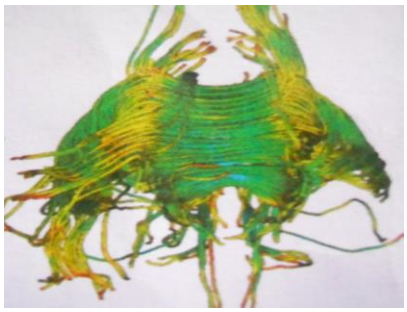
Anatomical-radiological correlation: on horizentale cut, calloused fiber differ in each hemisphere to reach the cortex, they are the center of Vieussens oval.



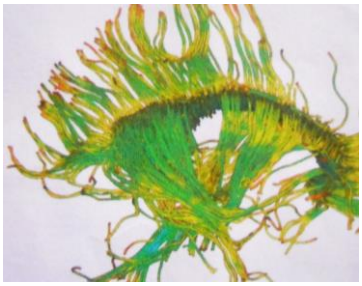
Antero-lateral left view, with insertion of sagittal and horizentale MRI corresponding to a segmentation of zone d`interest: corpus callosum, parietal and frontal lobes.



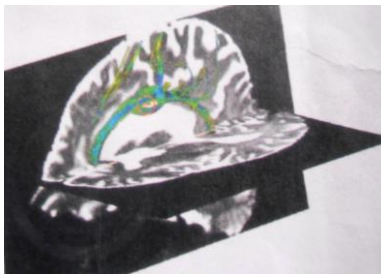
Topographic reconstruction: according to their destination cortex, calloused fibers are classified into three groups, previous radiation middle and posterior. Reconstruction is representative of the minor or anterior forceps fibers in relation to the lateral ventricles and the corresponding fiber to the body and distribute to the posterior part of the frontal lobe.



Tractography: with this new processing technique of radiological imaging in MRI DTI diffusion, the constituent fibers of the corpus callosum are identified and hemespherique inter-connectivity mapped. colors are related to fibers orientation.



History: anatomy of callosum has since high antiquity causes interest of doctors, and particularly anatomists. They wondered what could be the connections of this comissure that the eye lost sight immediately after it have penetrated into hemispheres. until the end of the last century, that the anatomy of corpus callosum is precise with Dejerive 1834 Telle, Poirier ...etc



Selective segmentation: technical ultra-selective of exploration of DTI fiber, uses evidence the crossing of vertical and horizentale fibers, and the temporal lobes ditribution, parietal and occipital left.

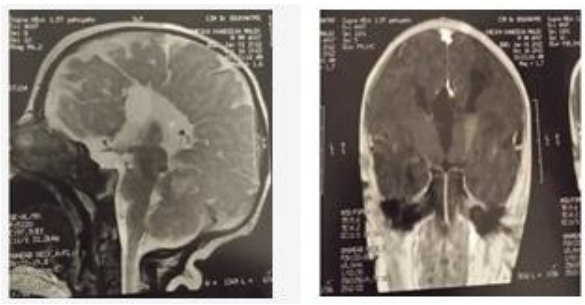
Aicardi syndrome

It is a genetic disease characterized by a combination of severe epilepsy plus agenesis of the corpus callosum, at Neurological examination we found: axial SGA, peripheral hypertension, spastic disorder developmental delay and mental retardation which are all constant and the presence of orthopedic disorders (scoliosis, arthrogryposis) at the exam.

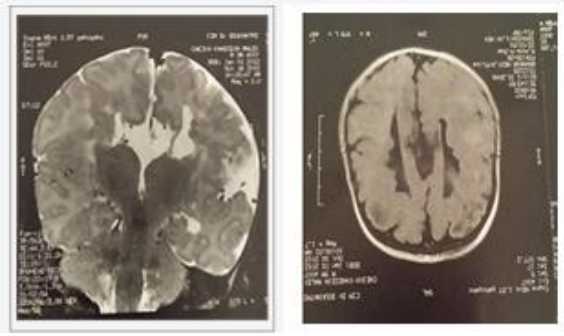
Inter hemispheric commission will approach the neurophysiological mechanisms of the transmission of complex information and their preparation. Breaking this commissure reproduced varying degrees of symptoms properly cortical lesions. The synergistic complementary skills is provided by inter hemispherical commissures

Inter hemispherical commissure allows integration of motor and cognitive sensory information between the two hemispheres

We took as an example the case of a patient KADIDJA Sheikh Malak, aged of 4 years, which has a corpus callosum agenesis, observed on MRI which shows a partial agenesis of the corpus callosum most heterotrophy nodular of the gray substance in the ventricular wall (V3) and the presence of a cequelaire allure encephalomalacia probably anoxic post.



Clinically the patient has neurological disorders convulsion, severe epilepsy, orthopedic disorders and spastic type engines with a peripheral hypertension and persistent axial hypotonia, plus a psychomotor delay.



The patient is under neurological treatment

III. Discussion

Cerebral tractography by MRI sensor diffusion has the potential to contribute in a decisive way in knowledge of cerebral connectivity and integration of data in conventional system of neuro-navigation, and enable assistance in per operative.

IV. Conclusion

characterizing in vivo the central nervous system and especially the corpus callosum by tractographique study in DTI-MRI brings unique information's. Accessible only in Histology, and thus allows for further approach in Functional correlates of individual variability

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