REVIEW

WHITE MATTER ASSOCIATED DISEASES

Ahed J Alkhatib

Department of Legal Medicine, Toxicology of Forensic Medicine, School of Medicine, Jordan University of Science and Technology, Jordan

Submitted on: 21.05.18; Revised on: 28.05.18; Accepted on: 30.05.18

ABSTRACT:

In this mini study, we introduced some white matter associated diseases. White matter has gained special attention due to its importance in induction of disease. However, this topic is going to be the axis of my book (under preparation). We think two main points are of special interest: white matter ageing and the use of natural anti-oxidants as a therapeutic potential in future for neurological diseases.We introduced the concept of time from a physical point of view and integrated it with biological events that occur at cellular level that can be reversed to a point prior to the occurrence of its onset. The use of natural anti-oxidants may help in achieving this step efficiently.

KEY WORDS: White matter, ageing, natural antioxidants, biological events.

Corresponding author: Ahed J Alkhatib
E-mail: ajalkhatib@just.edu.jo
Mobile: 00962795905145

Indian Research Journal of Pharmacy and Science; 17(2018)1416-1419;
Journal Home Page: https://www.irjps.in
DOI: 10.21276/irjps.2018.5.2.2

INTRODUCTION:

One of well-known diseases associated with white matter is Huntington's disease (HD). HD is a disease with genetic background, autosomal-dominant disease with impacts on motor, cognitive, and psychiatric aspects[1]. It has been indicated that the volume of white matter looks abnormal for about 20 years before the symptoms of HD appear[2].

Velocardiofacial Syndrome is a genetic disease resulting from a deletion on chromosome 22q11.2. It is usually associated with cognitive, behavioral, and psychiatric problems. In this syndrome, reduced white matter volume is the most important feature. Using DTI, the researchers assessed the involvement of white matter in velocardiofacial syndrome and found that reduced white matter anisotropy was widely spread in the frontal, parietal, and temporal regions in addition to tracts connecting the frontal and temporal lobes[3]. White matter microstructure is associated with psychosis[4]. In their study, Friston and Firth[5] reported abnormal functional connectivity at prefronto-temporal area among patients suffering from schizophrenia. Later studies found that schizophrenic patients exhibited abnormal patterns in white matter in various brain areas[6, 7].

White matter abnormalities and BMI in mental illness patients were investigated. Adiposity has been reported to occur in non-psychotic individuals. On the other hand, an association between adiposity and abnormalities in white matter has been reported[8, 9]. Other studies reported the detection of white matter abnormalities in individuals at risk for psychosis[10, 11].

Barnea-Goralyet al[12]conducted a study to investigate the involvement of white matter disturbances in Autism. This study was conducted in the light of the fact that persons with autism suffer from social difficulties including communication and relationships. Study findings showed that the volume of white matter was reduced in various brain regions.

Agosta et al[13] evaluated the patterns of damage in both gray matter (GM) and white matter among 4 types of participants: patients with Parkinson's disease, mild cognitive impairment (PD-MCI), healthy controls, and cognitively unimpaired PD patients (PD-Cu). The study findings showed that no region of WM damage was present in PD-Cu patients in comparison with healthy controls. On the other hand, patients with PD-MCI exhibited abnormalities of white matter in the anterior and superior corona radiata, genu, and body of the corpus callosum, and anterior inferior fronto-occipital, uncinate, and superior longitudinal fasciculi, bilaterally.

Groot et al[14] conducted a study taking into account that reduced volume of brain white matter microstructure is a sign of neurodegenerative disease in an early stage. The study included 4532 nondemented elderly persons. They study changes associated with age in 25 tracts based on probabilistic tractography. They study the differences of diffusion through tracts with aging, and if this diffusion difference depends on macrocstructures of white matter, and if this is also affected by cardiovascular risk affects microstructure. Study findings showed that as age increases, there is an occurrence of deficient microstructural organization which is thought to due to lesions of white matter and atrophy.

Tugceet al[15] conducted a study to explore the involvement of white matter lesions among patients with PTEN hamartoma tumor syndrome (PHTS). Study findings showed the existence of both genetic deficits in PTEN protein and changes in white matter as detected by brain magnetic resonance imaging (MRI).

Kloppenborg et al[16] conducted a study to explore the risk factors in patients who have recent lacunar infarcts in both the basal ganglia and white matter. Results indicated the development of new lacunar infarcts in the basal ganglia and in the deep white matter.

Tully et al[17] conducted a study to assess the volume of white matter hyperintensities among patients with discrete depressive symptoms. The study included 1440 patients over 65 years, from Dijon, France. Study findings showed that the volume of white matter hyperintensities was significantly associated with incident depression cases ($p=0.026$), while the volume of deep white matter hyperintensities was significantly associated with dementia cases ($p=0.025$).

Feeney et al[18] conducted a study taking into account that traumatic brain injury (TBI) has little therapeutic options, and diffusion tensor imaging is used to evaluate recovery of axonal injury in white matter (WM) tracts following TBI. Also, it is known that growth hormone deficiency following TBI affects axonal recovery through and serum insulin-like growth factor-I (IGF-I) is thought to facilitate this effect. Study findings showed that there was axonal injury following TBI. It was also shown that the highest level of IGF-I was associated with significant

improvements in immediate verbal memory recall over time.

In their study, Kooistraet al[19] showed that diabetes mellitus (DM) reduced the total brain volume, and diabetic patients have smaller volume of gray matter, and larger volume of white matter compared with patients who had no DM.

CONCLUSION:

Several studies have indicated that patients with DM have alterations in cognitions which are attributed to changes in the structure of brain which is obvious in magnetic resonance imaging (MRI). Diabetic patients are more likely to develop brain lesions such as white matter lesions (WMLs) or infarcts compared with patients who have no diabetes[20-22].

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CONFLICT OF INTEREST REPORTED: NIL ; SOURCE OF FUNDING: NONE REPORTED