ISSN: 2574-1241
DOI: 10.26717/BJSTR.2018.09.001816
Hortense Chatard. Biomed J Sci & Tech Res

Opinion

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Postural Training in Age-Related Macular Degeneration Subjects: Issues and Impact

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Received: : September 27, 2018; **Published:** October 03, 2018

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Abbreviations: AMD: Age-Related Macular Degeneration; IVT: Intravitreal Injection; VEGF: Vascular Endothelial Growth Factor; CDP: Center of Pressure

Opinion

Age-related macular degeneration (AMD) is the leading cause of visual impairment and blindness after fifty years old in developed countries [1,2]. It is estimated AMD will affect 288 million of elderly in 2040 [3]. This pathology is defined by a uni- or bilateral progressive degeneration of photoreceptors in macular area, peripheral vision is conserved. The early level of AMD is characterized by an accumulation of extracellular material ("drusen") underneath the retinal pigment epithelium and/or irregularities of retinal pigment epithelium. At the advanced level of AMD, the disease gets complicated with a geographic atrophy in dry AMD, or a choroidal neovascularization (growth of pathologic blood vessel from the choroide into the subretinal space) in the wet AMD. This one just affects 10-15% of AMD subjects but emerges and progresses quickly to blindness without intravitreal injection (IVT) of anti-VEGF [4]. Thus, the majority of patients (dry AMD) has no curative treatment, loses visual acuity and his autonomy step by step [5]. AMD gives functional disability (risk of falls, difficulty reading, driving restriction, etc). Some authors evaluated that 33% of subjects older than 65 years have experienced at least one fall per year [6,7]. The loss of autonomy in elderly subjects generates also an augmentation of some pathologies (anxiety and depressive disorders, cardiovascular and metabolic diseases, etc) with a high medical cost [8-10]. One of the solutions to reduce the functional disability and preserve the autonomy of AMD subjects is the development of low-vision rehabilitation. Nowadays, this coverage lacks of evidence and studies while the functional benefit seems admitted by patients.

Postural control is an elaborated process which allows a coordinated relationship of body segments [11,12], and is controlled by vestibular, proprioceptive, and visual information [13-15]. The vestibular system contributes to postural stability with eyes open [16]. Vision and proprioception participate to the detection of slow movements in the visual environment. When the visual or the vestibular system is affected, subjects need to compensate with other sensorial inputs [17]. Some visual factors have a high impact of postural stability and falls: contrast sensitivity and visual field loss [18]. The visual impairment subjects due to increase their somatosensory contribution in order to conserve a good postural stability [19]. However, mechanoreceptors sensibility decreases with aging as well as the capacity of treatment of sensorial information by the central nervous system [20]. Thus, AMD subjects have a deficit of postural control and poor postural adaptive mechanisms [21]. Few studies investigate the impact of AMD on postural control probably because of difficulty of recruitment (age, comorbidities, etc). Most of them use the visual acuity like inclusion criteria. In our past study, we choose to compare the impact of unilateral vs. bilateral AMD on postural sway, and the influence of different visual conditions [21]. Our results showed that postural parameters (surface area and the antero-posterior displacement of the center of pressure, CdP) are larger in bilateral AMD subjects than in unilateral AMD subjects; and that in eyes closed condition, AMD subjects are more instable than healthy age-matched subjects. We explained this result by the low mobility and degraded physical performances observed in AMD subjects. Such hypothesis is confirmed by previous studies [9,22]. With aging, we note a muscular deterioration. Moreover, the body stability needs interactions between skeletal muscles and sensorial inputs hence a postural instability [23].

There is no age limit to train visual and postural capacities, even if cerebral plasticity decreases. Some studies investigate the impact of visual and/or postural training in AMD subjects [24,25]. Our previous study seemed shown that postural stability was better in dominant eye viewing condition than in binocular eye viewing condition in AMD subjects [21]. This result could be explained by a worse binocular visual acuity than dominant eye visual acuity when there is a difference between visual acuity of each eye for instance due to AMD [26]. Park et al. (2011) showed that in elderly subjects there is a statistical difference between postural stability in dominant eye viewing vs non-dominant eye viewing, which is not found in young subjects [27]. These authors suggested that elderly subjects have a high dependency on the dominant eye. Moreover, in clinical observation, few AMD patients closed their non-dominant eye for some activities (for instance during reading). This comment is a line of thought of new rehabilitation techniques development. We know also that oculomotor training (for instance, eccentric viewing training, microperimetric feedback) improves reading speed in AMD subjects [28,29]. Based on all these findings, we make the hypothesis that oculomotor training, improving the accuracy of visual input capture, could improve postural stability. Please note that a first step in oculomotor training should be the wearing adapted glasses because of the pathology. Unfortunately, many AMD subjects have multifocal glasses, which increase postural instability and fatigability during a reading task [30]. To conclude, we need evidence of the impact of postural training on AMD subjects in order to decrease the functional disability and to give more autonomy to patients. One of our ongoing study aims to develop efficient postural rehabilitation.

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