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Visual Impairment in Glaucoma: How Visual Field Loss Impacts Activities of Daily Living

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ABSTRACT

Background: Glaucoma is known as the second leading cause of blindness and is seen as a public health concern due to its irreversible vision loss. Symptoms will start to appear in an advanced stage of the disease and result in vision loss. Visual field loss particularly peripheral visual field loss will affect a patient's Quality of Life (QoL) in performing activities of daily living. ***Objective:*** To review the effect of visual field loss in glaucoma patients on their ability to perform activities of daily living based on previous works of literature. ***Method:*** Google Scholar, PubMed, and ScienceDirect were used to retrieve information on how visual field loss in glaucoma patients impacts activities of daily living using keywords such as "glaucoma", "visual field loss", and "activities of daily living" with the total of 37 articles were used for this literature review. ***Result:*** As the severity of visual field loss increases, performance in activities of daily living decreases. Further studies are needed to assess specifically the visual field loss stage to each kind of activity of daily living.

Keywords: Glaucoma; visual field loss; activities of daily living.

INTRODUCTION

Glaucoma is globally known as the second leading cause of blindness after cataracts. Unlike cataracts, glaucoma-induced blindness is reversible, making it a significant public health concern [1]. The number of glaucoma cases worldwide is estimated to increase as much as 74% between 2013 to 2040 with a total of 111.8 million [2]. Glaucoma is a term used to describe a set of ocular diseases with multifactorial causes that are linked by a clinically characteristic intraocular pressure-related optic neuropathy [3]. Intraocular pressure plays a vital role in the disease progression through several mechanisms such as retinal ganglion cell death, increased resistance to aqueous outflow, or due to an obstructed drainage flow. If not treated properly, intraocular pressure remains high and will result in visual loss [4]. As the loss of vision typically occurs progressively after a long period of time and symptoms only appear when the disease stage is advanced, glaucoma is also called the "silent thief of sight". When a visual field is lost, our vision can't be returned to normal so treatment should be focused on preventing further loss [5].

Early and unnoticeable glaucomatous visual field loss is a dangerous aspect of the disease. Patients diagnosed with early vision loss have difficulty on adhering to treatment leads on the danger of development to an advanced stage [6]. As visual field loss severity increases, higher limitation on daily activities occurs. Not only difficulties in performing tasks, but patients with advanced-stage glaucoma sometimes also have a poor perception of their limitations [7]. The negative effect of visual impairment on a patient's quality of life was found with reading and accessing information related to label reading and medical instruction as the most common issue experienced [8]. Visual field loss particularly peripheral visual field loss impacts Visual Related-Quality of Life (VR-QoL) on several daily tasks such as a limitation on vision-dependent activities, difficulty reading, driving and independence, mobility, emotional concerns, and social function [9]. Glaucoma patients with bilateral visual field loss exhibit worse self-reported visual abilities and worse measured performance on tasks [10].

Impaired driving ability is experienced by older drivers with glaucoma in spite of having only mild to moderate visual field loss, especially in complex situations [11]. In old patient groups, the probability of stopping and having difficulty driving is higher with the occurrence of glaucomatous visual field loss [12].

Despite advancements in treatment, the progressive nature of visual field loss requires a better understanding of its impact on activities of daily living (ADL), This review aims to explore how glaucoma-related visual impairment affects ADL on key domains such as reading, driving, mobility, social function, and emotional well-being. By synthesizing existing studies, this review seeks to highlight areas for future research and strategies to improve the quality of life for glaucoma patients.

METHODS

To review the impact of visual field loss on activities of daily living in glaucoma patients, we used Google Scholar, PubMed, and ScienceDirect to find published articles, journals, and books. The search is done by using keywords like "glaucoma", "visual field loss", and "activities of daily living". Thematic search terms in one sentence, "glaucoma and visual field loss", "glaucoma and activities of daily living", or "glaucoma and quality of life" were used. To broaden the literature search, we also explored the kinds of activities of daily living that we want to discuss on "reading", "driving", "social function", "mobility", and "emotional well-being".

RESULTS AND DISCUSSION

Reading

All levels of visual impairment in glaucoma patients had a negative effect on quality of life. Visual impairment significantly impacts on reading and information-accessing area, specifically related to reading labels and medication instruction. Additionally, difficulties in reading a standard size paper, newspapers, and watching television are also a huge issue [8]. As glaucoma patient has a low vision condition, they tend to have worse reading skills and participate in fewer reading activities [13]. Early in the disease, central and near vision are mostly spared, whereas reading was noted damaged only in severe stages [32]. It is consistent with another finding where reading performance is usually lower in patients with more advanced visual field defects compared to the controls [14]. Many studies found that reading speed is impaired in glaucoma patients, particularly as the disease progresses to cause advanced visual field loss as they tend to read slower compared to controls [9,14,15,16]. Variation in reading speed in patients with advanced visual field loss can be explained by eye movement behavior [17]. From a SEE study, their finding of affected reading speed that only occurred in the bilateral and severe stages patient group supports the concept of reading relying mostly on central vision [16]. Reading speed markedly decreases on a sustained silent reading than an out-loud reading in a short time [18].

In a previous qualitative study, participants with peripheral visual field loss found it hard to carry out reading activities in dim lighting, small-sized print, and continuous text. However, another patient in that study also expressed difficulties when reading on a larger screen and larger print [9]. Another study revealed that visual field loss does have an impact on the maximum reading speed of different text sizes, which suggests that text size does not independently limit reading [18]. Kwon et al. (2017) stated that even patients in the moderate stage of glaucoma reported having difficulty reading. The self-limiting reading habit was found to be linked with more severe visual field loss, with book, newspaper, and puzzle types of readings being affected [15].

Driving

Difficulty in driving is one of the most common issues experienced among glaucoma patients [9,11,12,19,20]. Driving limitations can be in the form of not driving at nighttime, in the rain, in unfamiliar places, more than one hour away, beyond the neighborhood, to a neighboring town or area, outside the region, driving less than 2 times per week, or less than 5,000 miles per year. Limitations become more apparent as the severity of the disease increases. Driving cessation is more likely to happen in glaucoma subjects with more advanced visual field loss [9]. Similar research conducted by The Salisbury Eye Evaluation (SEE) Project discovered that both bilateral and unilateral glaucoma can lead to higher rates of driving cessation. It was also stated in their study that patients with milder visual field loss were able to continue driving, whereas others with more severe visual field loss had to stop [19]. A review study concluded that visual field loss negatively impacts the skills needed for driving, and drivers utilized different kinds of tactics to overcome the issue. Visual field loss notably on central defects imposes more issues than on the peripheral, and complete/bilateral visual field loss causes more difficulty than partial/monocular loss [20]. In contrast, an experimental study stated that binocular visual field loss does not always affect driving safety. They discovered that binocular glaucomatous visual field loss patients in their study exhibited safe driving behavior as they adjusted their viewing behavior by increasing visual scanning [22].

Even mild to moderate visual field loss drivers showed poorer driving performance and less safety compared to controls [11]. Another cross-sectional study by McKean-Cowdin et al. (2007) also demonstrated that individuals struggle with driving even with mild visual field loss [21]. Impairments such as maintaining lane position, observation, planning, and approach, with mistakes often made at traffic-light controlled or give-way intersections are significantly found in drivers [11]. A similar finding was also discovered in a study by Kasneci et al. (2014) where glaucoma patient has problems in crucial parts of driving relating to lane-keeping, speed, and scanning [24].

Some drivers with glaucomatous field loss may be able to compensate for their field loss as shown by the absence of the driving errors [11]. Another review study revealed that even though most of the presented studies show a correlation between worsening glaucoma severity to less safe driving, the limitations are compensated and the safety of their driving is maintained [23]. Despite the struggles, glaucoma patients with mild to moderate visual field loss executed numerous real-world maneuvers safely [24].

Mobility

It is well-established from many previous studies that visual impairment interferes with quality of life, with mobility difficulties being one of its forms [8,9,10,21,30,31]. A higher level of visual impairment negatively impacts activities of daily living and mobility [8]. From Fenwick et al. (2016) who assessed the correlation of visual impairment in major eye diseases with mobility and independence, glaucoma was found independently associated with worse mobility and independence. Glaucoma patients in their study are especially worried about falling or tripping. Due to a lack of visual field loss data such as MD and PSD, they indicated that visual field defects are unlikely to influence the link between visual impairment and mobility and independence [31]. In contrast, McKean-Cowdin et al. (2007) in their population-based study showed that visual field loss has a significant effect on mobility and an individual's capacity to function independently [9]. Bilateral visual field loss individuals in particular have a measurably poorer task ability, especially in mobility and driving [10]. Dark adaptation, glare, outdoor mobility, and peripheral vision become impaired even in moderate glaucoma cases [32]. Individuals with visual field loss are concerned for their safety while navigating challenging environments, such as unfamiliar, dark, or crowded places. Obstacles like bicycles, strollers, and small children are often difficult to detect. Street crossing is particularly challenging and dangerous, primarily due to peripheral field loss, which makes it harder to notice oncoming vehicles, especially on the corners [9]. In an observational study, patients with advanced glaucoma were found to exhibit difficulties while walking in a crowded room and on an irregular floor. Some patients collided more than three times, others collided one to three times, and the rest experienced either mild difficulty or no difficulty at all. On an uneven floor, most patients showed some proprioception difficulties, some faced the risk of falling, and only a small were unable to complete the task [7]. An interview study by Azoulay-Sebban et al. (2020) found that in terms of performance in a stimulated mobility test, glaucoma patients had more mobility incidents than control groups. They stated that glaucoma patients usually showed little change in the binocular visual field which results in unaffected mobility. As the disease advances, both eyes may experience severe visual field loss causing variations in mobility performance [33].

Social Function

There haven't been many studies that specifically assessed the impact of visual field loss severity directly on social functioning. Visual impairment experienced by glaucoma patients has a negative impact on their mental health and social function, which causes limited physical activity in patients with more severe stages [25]. Visual impairment was also found to result in decreased social participation in adults [26]. Although having a good central vision, social involvement is limited in patients with severe visual field loss including community, religious, and cultural activities, travel, and relationships. Compared to patients with milder stages, they are less pleased with their capacity to travel and participate in social gatherings [27]. In an interview study by Lange et al. (2021), patients with severe peripheral field loss reported challenges in sustaining close relationships but it helped them overcome their vision impairment on the other hand. Some of the barriers are such as trouble recognizing faces and making eye contact [9]. A schematic model made by a previous review study showed how vision loss impacts the quality of life. As the disease progresses, vision loss takes place both in the central and peripheral. Central vision loss will lead to poor face recognition and difficulties in reading, meanwhile, the peripheral loss causes loss of activities and mobility. Social isolation and depression occur as a result of both loss of activities and mobility combined with poor face recognition [28]. Another interview study revealed a high average score on social functioning even with monocular sight with severe visual field loss, it was stated that the condition was due to strong social relations and the population's traditional structure [29].

Emotional Well-Being

As highlighted in existing studies, visual field loss primarily peripheral visual field loss impairs Vision Related-Quality of Life (VR-QoL) including emotional well-being [8,9,25,31,34]. Frustration feelings were expressed by patients with glaucoma over their limited vision, causing some of them to stumble and bump into objects and others needed to plan ahead and operate at a slower pace. Embarrassment, anxiety, sadness, anger, helplessness, and even depression also occurred [9]. This finding is in accordance with another study by Chan et al. (2015), where psychological functioning declines as visual field loss worsens in the early stage of the disease, especially in anxiety, self-image, and confidence in health care [36]. From Huang et al. (2020), mental health scores were found significantly decreased in glaucoma patients than in normal patients [25]. Progression rate of visual field loss was found to be substantially linked to depression symptoms in glaucoma patients over time. Patients with quickly developing diseases had a higher number of depressive symptoms [35]. On the other hand, another study found that depression itself in the elderly can affect glaucoma disease progression [37].

CONCLUSIONS

Based on the review, it can be concluded that as the severity of visual field loss increases, the ability to perform activities of daily living—such as reading, driving, mobility, social functioning, and emotional well-being diminishes.

Although some daily tasks are significantly affected only in the advanced stages, difficulties can occur even in the earlier stages. Compensations for the visual field loss might be done as the patient can still perform activities without or with mild difficulty. However, future research is needed to specifically evaluate the effect of the visual field loss stage on each of these activities, as current discussions remain limited and mostly focus on visual impairment or the glaucoma disease stage in general.

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