

# Beyond cataracts: binocular vision challenges in older adults

Além da catarata: alterações da visão binocular no envelhecimento

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## INTRODUCTION

The aging of the world population has been a reality since the 19th century. Currently, this trend is becoming more pronounced in less developed countries, particularly after the mid-20th century. It has been observed that poorer countries experience a decline in fertility and birth rates, along with an increase in life expectancy and quality of life among their populations.<sup>(1,2)</sup>

Age-related changes in binocular vision and the prevalence of visual disturbances in the elderly receive little attention. Only a few studies have investigated alterations in binocular vision status in older adults, and to date, no population-based study has specifically examined the prevalence of strabismus in the geriatric population.<sup>(3)</sup>

Binocular vision disorders are abnormalities of the visual system that impair visual performance. Adult-onset strabismus is not associated with amblyopia, but probably results from paralytic disturbances or small, yet significant deviations, causing persistent diplopia.<sup>(4)</sup>

According to some reports, the pattern of strabismus in older adults differs from that found in other age groups.<sup>(3,4)</sup>

## WHY IS IT IMPORTANT TO STUDY BINOCULAR CHANGES IN THE GERIATRIC POPULATION?

These disorders may cause asthenopic complaints which interfere with patients' daily activities. Reduced stereopsis due to sensory loss, or the collapse of binocular function secondary to strabismus, also plays a role. Diminished stereopsis has been associated with postural instability, increasing the risk of falls and fractures in older adults. Such disorders are sometimes related to systemic or neurological diseases and may often serve as diagnostic clues to these conditions.<sup>(3,4)</sup>

Several studies have shown that aging causes changes in accommodative convergence and vergence adaptation. In 1995, Rosenfield et al. reported that fast fusional vergence responses showed age-related increases in latency and decreases in peak velocity and acceleration under binocular stimulus conditions, but not in accommodative vergence. Conversely, sustained vergence showed no age-related effects under binocular conditions, although steady-state accommodative vergence velocity decreased with age, and latency increased.<sup>(5,6)</sup>

An important study by Guyton in 2006 revealed dynamic mechanisms involved in regulating muscle length, playing a critical role in the long-term maintenance of ocular alignment.<sup>(7)</sup> Bruenech et al. demonstrated that the oculomotor system's ability to stabilize gaze and maintain a stable retinal image declines with age.<sup>(8)</sup>

Functional alterations cannot be separated from structural changes, particularly in dynamic structures such as the extraocular muscles. Sarcopenia, reduced incorporation of amino acids and proteins, and increased levels of catabolic agents such as interleukin-6 contribute to age-related structural changes. Collagen and elastin undergo profound alterations in both structure and biochemical functionality, contributing to these modifications. Such changes result in binocular dysfunction, affecting ocular alignment and motility.<sup>(9,10)</sup>

Over the past three decades, imaging studies have made major contributions to the understanding of different types of strabismus. Age-related strabismus has been thoroughly investigated through magnetic resonance imaging by Demer et al. Comparative magnetic resonance image and histological studies have demonstrated that degeneration of the band between the lateral and superior rectus muscles allows the lateral rectus muscle to sag inferiorly in elderly non-myopic patients - a mechanism similar to that seen in high myopia. Imaging can therefore help identify this mechanical cause of age-related strabismus, referred to as "sagging eye," described by Rutar et al.<sup>(11-13)</sup>

Some binocular disorders in older adults can be successfully managed with orthoptic therapy, prismatic correction, or surgery. However, no randomized clinical trials have assessed the efficacy of vision therapy for binocular disorders in older adults, making this an important area for future research.<sup>(14)</sup>

Today, many patients benefit from modern cataract surgical techniques and premium intraocular lens designs, which provide good near and distance vision without optical correction. Consequently, solutions involving spectacles with prism correction for near or distance vision are often poorly accepted by these patients. Surgical correction of age-related strabismus – which often involves horizontal, vertical, or torsional components – is frequently indicated. Surgical options are diverse and must consider the comorbidities and anesthetic risk inherent to this age group.

In conclusion, the management of age-related strabismus represents a broad and increasingly relevant field of research, given the ongoing aging of the global population.

## AUTHORS' CONTRIBUTION

Both authors actively contributed to the production of the manuscript.

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