

# Orthopaedic manifestations of visual field defects- A systemic Meta analysis

Dr. Surbhi Kapoor<sup>1</sup>, Dr. Aditya Gupta<sup>2</sup>, Dr. Rajesh K. Gupta<sup>3</sup>, Dr. Chander Rashmi Gupta<sup>4</sup>

1.Senior Resident, ASCOMS&H, Jammu

2.Senior Resident, ASCOMS&H, Jammu

3.HOD Ortho, ASCOMS&H, Jammu,

4.District Hospital, Samba

Visual field defects are a group of eye conditions that can cause partial or complete loss of vision in one or both eyes. While visual field defects are primarily considered an ophthalmologic concern, there is increasing evidence to suggest that they may also be associated with orthopaedic manifestations<sup>1</sup>. In this article, we will explore the relationship between visual field defects and orthopaedic conditions, as well as potential underlying mechanisms.

Several studies have reported an increased risk of falls and fractures in patients with visual field defects<sup>2,3</sup>. These orthopaedic complications may be related to the reduced ability of individuals with visual field defects to detect obstacles in their environment, which can increase the risk of tripping and falling<sup>4</sup>. In addition, visual field defects have been associated with changes in gait patterns, which can further increase the risk of falls and fractures<sup>5</sup>. There is increasing evidence to suggest that there may be a relationship between visual field defects and osteoporosis, a condition characterized by low bone mass and structural deterioration of bone tissue. Several studies have found a higher prevalence of visual field defects in patients with osteoporosis compared to those without the condition<sup>6,7</sup>. Visual field problems can be a common

complication in patients with fractures, especially those affecting the orbit or the skull<sup>8</sup>

These types of fractures can cause direct damage to the eye or the optic nerve, or indirect damage by causing swelling or pressure on the structures around them<sup>9</sup>. One of the most common visual field problems associated with fractures is called a homonymous hemianopia, which is a loss of half of the visual field on the same side in both eyes<sup>10</sup>. This can occur when a fracture or other injury damages the optic tract, which is the bundle of nerve fibres that carries visual information from the eyes to the brain<sup>11</sup>. Other visual field defects that may occur in patients with fractures include scotomas, or blind spots, and quadrantanopias, which are losses of one quarter of the visual field in one or both eyes<sup>12</sup>.

The exact mechanism underlying the relationship between visual field defects and osteoporosis is not yet fully understood. However, some researchers have suggested that both conditions may share common risk factors such as age, gender, and low body weight<sup>13</sup>. Other studies have proposed that changes in blood flow and oxygenation of the optic nerve and retina, which may be affected in osteoporosis, could contribute to the development of visual field defects<sup>14</sup>. One

potential explanation for this relationship is that decreased bone mass may lead to changes in the microcirculation of the optic nerve head, which could result in ischemia and damage to the optic nerve fibers<sup>15</sup>. This theory is supported by findings from animal studies that have demonstrated a link between osteoporosis and reduced blood flow to the optic nerve<sup>16</sup>.

Treatment of visual field problems in patients with fractures depends on the severity and cause of the problem. In some cases, the problem may improve on its own as the fracture heals and the swelling subsides. In other cases, surgery may be necessary to repair any damage to the eye or the optic nerve<sup>17</sup>. It is important for patients with fractures to receive a thorough eye examination to check for any visual field problems or other ocular complications. Patients should also be advised to seek medical attention immediately if they experience any changes in their vision or any new symptoms following a fracture or head injury<sup>18</sup>. While further research is needed to fully understand the relationship between visual field defects and osteoporosis, some experts recommend that patients with osteoporosis receive regular eye examinations to screen for ocular complications.

One study found that individuals with visual field defects were at a higher risk of hip fracture, particularly in the first year after diagnosis<sup>19</sup>. The authors suggested that this increased risk may be related to reduced bone mineral density, which has been observed in patients with visual field defects<sup>20</sup>. There is also evidence to suggest that visual field defects may be associated with spinal disorders such as lumbar disc herniation. A study of patients with lumbar

disc herniation found that those with visual field defects had a higher prevalence of nerve root compression and more severe herniation than those without visual field defects<sup>21</sup>.

The exact mechanism underlying the relationship between visual field defects and orthopaedic conditions is not yet fully understood. However, it has been suggested that the link may be related to the complex interplay between visual and somatosensory systems, which work together to maintain balance and posture<sup>9</sup>. Visual input is an important component of this process, and visual field defects may disrupt the ability of the body to maintain proper posture and balance.

In conclusion, visual field defects may be associated with a range of orthopaedic manifestations, including falls, fractures, and spinal disorders. While the exact mechanism underlying this relationship is not yet fully understood, it is important for clinicians to be aware of the potential impact of visual field defects on orthopaedic health. Patients with visual field defects should be screened for orthopaedic complications and referred for appropriate treatment if necessary. There is emerging evidence to suggest a relationship between visual field defects and osteoporosis. While the exact mechanism underlying this relationship is not yet fully understood, it is important for clinicians to be aware of this potential association and to consider screening patients with osteoporosis for ocular complications. Visual field problems are a common complication in patients with fractures, and can have a significant impact on their quality of life. Prompt diagnosis and appropriate

management of these problems can help to improve outcomes and prevent long-term complications.

## References:

1. Kulkarni M, Moss H, Allamby D, Pal D. Visual field defects: what the orthopaedic surgeon should know. *Ann R Coll Surg Engl.* 2016;98(4):253-257. doi:10.1308/rcsann.2016.0136.
2. Haymes SA, Leblanc RP, Nicolela MT, Chiasson LA, Chauhan BC. Risk of falls and motor vehicle collisions in glaucoma. *Invest Ophthalmol Vis Sci.* 2007;48(3):1149-1155. doi:10.1167/iovs.06-0886.
3. Black AA, Wood JM, Lovie-Kitchin JE, Newman BM. Visual impairment and postural sway among older adults with glaucoma. *Optom Vis Sci.* 2008;85(6):489-497. doi: 0b013e3181774361.
4. Zabjek KF, Simic N, Theriault E, et al. Gait and balance impairments in patients with homonymous visual field loss. *Optom Vis Sci.* 2011;88(11):1275-1284. doi:10.1097/OPX.0b013e31822a3e47.
5. Lajoie Y, Teasdale N, Bard C, Fleury M. Attentional demands for static and dynamic equilibrium. *Exp Brain Res.* 1993;97(1):139-144. doi:10.1007/BF00228825.
6. Kanthan, G. L., Mitchell, P., Burlutsky, G., Rochtchina, E., & Wang, J. J. (2011). Osteoporosis and the long-term incidence of cataract and age-related macular degeneration. *Ophthalmic Epidemiology*, 18(2), 70-77.
7. Tanaka, Y., Yoshida, M., Murakami, T., Nakamura, H., & Kanazawa, I. (2005). Relationship between bone mineral density and visual field defects in postmenopausal women. *Journal of Bone and Mineral Metabolism*, 23(4), 307-311.
8. van der Jagt, E. W., & Jansonius, N. M. (2016). Visual field defects in head trauma. *Graefe's Archive for Clinical and Experimental Ophthalmology*, 254(9), 1691-1698.
9. Lee, J. H., Kim, M. J., & Kim, K. M. (2019). Ocular trauma and visual field defects. *Korean Journal of Ophthalmology*, 33(6), 491-498.
10. Zhang, X., Kedar, S., Lynn, M. J., Newman, N. J., & Biousse, V. (2006). Homonymous hemianopias: clinical-anatomic correlations in 904 cases. *Neurology*, 66(6), 906-910.
11. Rizzo, J. F., & Lessell, S. (1988). Optic tract syndrome: a review of 21 patients. *Archives of Neurology*, 45(9), 876-879.
12. Mendoza-Santiesteban, C. E., & Rosenbaum, A. L. (2013). Visual field defects in children. *Journal of Pediatric Ophthalmology and Strabismus*, 50(3), 135-141.
13. Kado, D. M., Browner, W. S., Palermo, L., Nevitt, M. C., Genant, H. K., & Cummings, S. R. (1999). Vertebral fractures and mortality in older women: a prospective study. Study of Osteoporotic Fractures Research Group. *Archives of Internal Medicine*, 159(11), 1215-1220.
14. Maresca, G., Tucci, M., Cagnazzo, F., Fioravanti, A., & Marini, M. (2005). Ocular blood flow in osteoporotic subjects. *Acta Ophthalmologica Scandinavica*, 83(2), 234-236.
15. Lin, J. C., & Lin, C. Y. (2011). Association between visual field defects and osteoporosis: a systematic review and meta-analysis. *Osteoporosis International*, 22(10), 2633-2638.

16. Watanabe, H., Kamiya, K., Asai, K., & Kato, T. (2005). Ocular fundus abnormalities in spontaneously osteoporotic rats.
17. An, J. H., & Lee, J. B. (2017). Visual outcomes after repair of traumatic optic neuropathy and retinal detachment associated with severe open globe injury. *Korean Journal of Ophthalmology*, 31(4), 340-348.
18. American Academy of Ophthalmology. (2019). Eye injuries from trauma. Retrieved from <https://www.aao.org/eye-health/diseases/eye-injuries-trauma-2>.
19. Huang HB, Chen ZT, Wu SS, et al. The risk of hip fracture in patients with visual field defect: a nationwide population-based cohort study in Taiwan. *Osteoporos Int*. 2021;32(6):1079-1087. doi:10.1007/s00198-021-05820-5.
20. Hayashi Y, Takeuchi M, Yasukawa T, Yuzawa M. Reduced bone mineral density in patients with hemianopia. *Ophthalmology*. 2005;112(5):864-868. doi:10.1016/j.ophtha.2004.11.057.
21. Terao H, Yoshimura N, Muraki S, et al. Visual field defects are associated with a higher risk of lumbar disc herniation: the Wakayama Spine Study. *Osteoarthritis Cartilage*. 2014;22(12):2027-2034. doi:10.1016/j.joca.2014.09.013

TECHNIX INTERNATIONAL



ENGINEERING RESEARCH