BINASAL HEMIANOPIA

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BINASAL HEMIANOPIA

Primary Disciplinary Field(s): Neurology, Ophthalmology

1. Core Definition

Binasal hemianopia is a specific type of visual field defect characterized by the partial loss of vision in the inner, or **nasal**, half of the visual field of *both* the left and right eyes. The term itself is derived from Greek roots: *hemi* (half), *an* (without), and *opsia* (seeing), combined with the prefix *bi-nasal* (referring to both nasal fields). This condition results in the inability to perceive stimuli originating from the central region of the visual periphery. It is important to distinguish binasal hemianopia from other forms of visual field loss, particularly bitemporal hemianopia, which involves the loss of the outer (temporal) visual fields.

Unlike most visual field defects that result from damage occurring after the optic chiasm, binasal hemianopia often implies damage specific to the fibers that do not cross the midline at the chiasm, or compression affecting the lateral margins of the optic chiasm or the optic nerves themselves. Because of the complex and relatively rare anatomical arrangement required for this specific pattern of loss, **binasal hemianopia** is considered clinically uncommon compared to its counterparts.

2. Anatomical Basis of Visual Fields

To understand binasal hemianopia, a clear knowledge of the visual pathway and the **optic chiasm** is essential. The visual field perceived by each eye is split into two halves: the temporal (outer) field and the nasal (inner) field. Light from the nasal visual field falls upon the temporal retina, while light from the temporal visual field falls upon the nasal retina. The subsequent processing of this information dictates the type of vision loss that results from damage along the pathway.

The crucial event occurs at the optic chiasm, a structure located directly above the pituitary gland. Here, the nerve fibers originating from the nasal halves of both retinas (which carry information about the temporal visual fields) cross over to the opposite side of the brain. Conversely, the nerve fibers originating from the temporal halves of both retinas (which carry information about the nasal visual fields) travel backward **uncrossed**, continuing ipsilaterally into the optic tract.

Therefore, binasal hemianopia--the loss of the nasal visual fields--is caused by damage affecting the uncrossed fibers originating from the temporal retinas. Since these fibers are located on the outside (lateral) margins of the optic chiasm, damage must specifically involve the lateral aspect of both the left and right optic tracts, or bilateral lesions anterior to the chiasm, to produce the characteristic bilateral nasal field defect.

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3. Pathophysiology and Causation

The pathophysiology of binasal hemianopia is characterized by simultaneous injury to the lateral, uncrossed visual nerve fibers originating from the temporal retinas of both eyes. This bilateral, peripheral damage pattern is anatomically demanding, which explains its rarity compared to the central compression that causes bitemporal defects. The primary mechanisms involve compression or a localized lesion.

One common category of causes involves conditions that lead to lateral compression of the optic nerves or the lateral aspects of the chiasm. For example, **hydrocephalus**, a congenital or acquired condition involving the buildup of cerebrospinal fluid, can cause generalized compression on surrounding brain structures. In rare cases, severe hydrocephalus results in the expansion of the third ventricle, pushing the internal carotid arteries outward, leading to pressure on the lateral, non-decussating fibers of the chiasm and causing binasal hemianopia.

Other potential etiological factors include:

Aneurysms: Specifically, highly situated aneurysms of the internal carotid arteries, which might exert bilateral pressure on the outside edges of the optic nerve or chiasm.
Trauma: Bilateral injury or inflammation that selectively damages the lateral aspects of the optic nerves or chiasm.
Mass Lesions: Rarely, tumors or mass lesions, such as meningiomas, that develop laterally and compress the visual pathways from the outside rather than centrally.

4. Clinical Manifestations and Diagnosis

Individuals suffering from binasal hemianopia experience a blind spot or a lack of visual awareness in the inner half of their field of view. While the overall visual acuity may remain normal, the loss of the nasal visual fields can significantly impair peripheral vision necessary for navigation and spatial awareness. Functionally, this condition rarely presents as dramatically limiting as other hemianopias, partly because the central field of vision, which is responsible for detailed tasks, is often preserved.

Diagnosis relies primarily on **visual field testing**, or perimetry. This specialized assessment maps the extent of the patient's field of vision and precisely identifies the defect pattern. The hallmark diagnostic finding is the symmetrical loss of sensitivity in the nasal quadrants of both eyes, respecting the vertical midline. Once the defect is confirmed, subsequent neuroimaging, typically Magnetic Resonance Imaging (MRI), is necessary to pinpoint the exact location and cause of the compression or lesion responsible for the damage to the optic pathway.

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5. Differential Diagnosis

Binasal hemianopia must be differentiated from other types of visual field loss, which often indicate damage at different points along the visual pathway. Understanding these differences is crucial for accurate diagnosis and determining the underlying neurological cause.

The main types of visual field defects involving half of the visual field (hemianopia) include:

Bitemporal Hemianopia: This is the most common chiasmal disorder, characterized by the loss of the temporal (outer) visual fields in both eyes. It results from damage to the central, crossing fibers of the optic chiasm, most frequently due to pituitary adenomas or other suprasellar masses.

Homonymous Hemianopia: This involves the loss of the same half of the visual field (either the left or the right) in both eyes. This pattern indicates damage occurring **behind** the optic chiasm--in the optic tract, lateral geniculate nucleus, optic radiations, or the visual cortex--as the visual information has already been reorganized to represent the contralateral field of vision.

Altitudinal Hemianopia: This involves the loss of the upper or lower half of the visual field, regardless of whether it is nasal or temporal. This pattern typically suggests vascular lesions or trauma affecting the retina or optic nerve before the chiasm.

Further Reading

Optic Chiasm
Hemianopsia
Hydrocephalus

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