

TANGENT SCREEN

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The Tangent Screen (Campimetry) in Visual Field Assessment

The Core Definition of the Tangent Screen

The Tangent Screen, often referred to interchangeably with the term Perimetry, is a fundamental, non-automated diagnostic tool utilized in both ophthalmology and clinical Neuropsychology for mapping the central 30 degrees of the Visual Field. It is a critical method for assessing the extent and characteristics of a patient's peripheral and central vision, helping to identify potential defects that may signal underlying ocular disease, neurological impairment, or damage to the optic pathways. The tool itself typically consists of a large, flat, black felt screen, usually measuring one or two meters square, mounted vertically at a fixed distance from the patient, often one meter, although different testing distances can be utilized depending on the required sensitivity and the size of the target stimulus.

The fundamental mechanism behind the Tangent Screen relies on the principle of geometric projection. By maintaining a constant distance between the patient's eye and the screen, the examiner can accurately measure the angular extent of the visual field corresponding to various points on the screen. The patient focuses on a central fixation target while the examiner introduces small test objects (stimuli) of varying sizes and colors from the periphery toward the center. When the patient first perceives the stimulus, that point is marked on the screen. The collection of these marked points, when connected, delineates the boundary of the patient's field of vision, revealing areas where vision is compromised or entirely absent--known clinically as a Scotoma. This manual, interactive process allows the clinician to detect subtle defects that require continuous patient feedback and observation, offering qualitative data about the patient's attention and consistency during the examination.

While modern automated devices have largely taken over routine screening, the Tangent Screen remains invaluable for its simplicity, cost-effectiveness, and ability to test subjects who may have difficulty operating complex machinery or maintaining fixation for extended periods. It provides a tactile, easily visualized map of visual loss, which is highly effective for teaching purposes and for assessing specific, large visual defects that extend beyond the capabilities of some automated methods. Understanding the pattern of visual field loss is essential, as different disease processes leave distinct signatures on the visual field map, guiding diagnosis toward specific neurological or retinal etiologies.

Historical Context and Development

The origins of standardized visual field testing date back to the late 19th and early 20th centuries. While basic perimetry concepts existed earlier, the formalization of the method using a flat screen apparatus is largely attributed to the work of Scandinavian ophthalmologist Hjalmar Bjerrum in the

1890s. Bjerrum recognized the need for a precise method to map subtle central visual field defects, particularly those associated with early-stage Glaucoma. Bjerrum's method utilized small test objects moved across a large black curtain at a fixed distance, enabling the detailed mapping of the central 30 degrees of the visual field. This innovation significantly improved the ability to detect pathology before severe, irreversible vision loss occurred.

Prior to the development of the Tangent Screen, visual field testing was often crude, relying on confrontation tests or simple perimeters that only mapped the extreme periphery. Bjerrum's contribution was crucial because diseases like glaucoma often first manifest as subtle arcuate scotomas (blind spots shaped like an arc) that emanate from the blind spot and curve toward the central field. Detecting these defects required the high sensitivity provided by the large-scale Tangent Screen setup, which allowed for a more accurate angular measurement of these critical central areas. The method quickly gained widespread acceptance globally due to its reliability and relative ease of implementation in clinical settings, becoming the gold standard for central field assessment for decades.

The evolution of the Tangent Screen paved the way for more sophisticated devices. While the original screen was manual, it laid the mathematical and procedural groundwork for subsequent iterations of perimetry. The crucial shift occurred in the late 20th century with the introduction of computerized, automated perimeters (such as the Humphrey Field Analyzer), which standardized stimulus presentation and automatically recorded and analyzed patient responses. Nonetheless, the underlying principles of isolating and mapping the central visual field, as established by the Tangent Screen, remain foundational to all modern visual field testing techniques.

A Practical Clinical Example

Consider a patient, 55 years old, presenting to a clinic with complaints of frequently bumping into objects on their left side and difficulties reading the left margin of a newspaper, suggesting a potential visual field defect. The physician suspects a possible neurological event, such as a mild stroke affecting the right side of the brain responsible for processing vision from the left visual field. To confirm and precisely localize this deficit, a Tangent Screen examination is ordered as part of the initial comprehensive assessment, providing crucial data for the patient's care plan.

The "How-To" of the Tangent Screen application follows a specific sequence. First, the patient is seated one meter away from the black screen, with one eye occluded. They are instructed to keep the tested eye fixed on the central target throughout the procedure. The examiner, standing beside the screen, utilizes a thin wand to move the test object (a small white or colored disc, perhaps 1mm in diameter for high sensitivity) from the non-seeing area (the periphery) inward toward the center. The patient indicates verbally the exact moment they first perceive the stimulus.

The application of the psychological principle involves mapping the patient's subjective perception

onto the objective spatial grid. If the patient has suffered a right occipital lobe stroke, the test will reveal a left homonymous hemianopsia--a loss of vision in the entire left visual field of both eyes. The examiner meticulously maps the boundary where the patient reports seeing the stimulus. On the screen, this boundary will form a sharp vertical line dividing the left and right sides of the visual field. The physical marks on the screen provide immediate, tangible evidence of the visual deficit, which is then transcribed onto a permanent chart (the campigram) for clinical documentation. This highly visual and interactive process ensures that both the patient and the clinician have a clear understanding of the extent of the damage, guiding subsequent decisions regarding neurological imaging and rehabilitation.

Significance and Impact on Diagnosis

The Tangent Screen holds immense significance in clinical psychology and medicine primarily because it provides invaluable, quantifiable evidence of functional integrity along the entire visual pathway, from the retina to the visual cortex. Its ability to accurately map central visual defects means it is a cornerstone in the early detection and management of several sight-threatening conditions. For instance, the characteristic arcuate scotomas and nasal steps mapped by this method are definitive signs used in the diagnosis and monitoring of progressive Glaucoma, a disease involving damage to the optic nerve. Without tools like the Tangent Screen, these subtle changes could be missed until vision loss is advanced and irreversible.

Furthermore, in the field of Neuropsychology, the Tangent Screen is crucial for localizing neurological lesions. Specific patterns of visual field loss correlate precisely with damage to different parts of the brain or optic nerve. For example, bitemporal hemianopsia (loss of peripheral vision in both eyes) strongly suggests a lesion at the optic chiasm, often caused by a pituitary tumor. Homonymous defects (loss of the same half of the visual field in both eyes) localize the lesion posterior to the chiasm, typically in the optic tract, lateral geniculate nucleus, or the visual cortex. The Tangent Screen's immediate visual feedback allows psychologists and neurologists to correlate behavioral symptoms with precise anatomical damage.

The application of this concept extends beyond primary diagnosis into ongoing patient monitoring and rehabilitation. By comparing successive visual field maps generated by the Tangent Screen, clinicians can track the progression or regression of a disease or the effectiveness of treatment protocols. In rehabilitation settings, the clear visualization of the field loss helps patients with neurological damage understand their physical limitations, enabling them to develop compensatory scanning strategies to navigate their environment safely and effectively, thereby improving their quality of life.

Connections and Relations to Other Concepts

The Tangent Screen method is intrinsically linked to several broader psychological and medical concepts, most notably the field of Sensation and Perception. It is a direct application of psychophysical methods, specifically the method of limits, used to determine the absolute threshold of visual perception across the visual field. By moving a stimulus until it is just perceived, the examiner is empirically measuring the sensitivity of the retina and the corresponding cortical areas at various spatial locations. The presence of a Scotoma simply represents an elevated threshold (decreased sensitivity) in that specific region.

It is also closely related to modern automated Perimetry. While the Tangent Screen is manual, automated perimeters (such as the Goldmann perimeter and the aforementioned computerized analyzers) are direct technological descendants. Automated perimetry uses precise luminance and stimulus timing controlled by a computer, often utilizing statistical algorithms to analyze results, whereas the Tangent Screen relies on the examiner's skill and the patient's subjective, immediate verbal response. Both methods, however, aim to map the isopters (lines connecting points of equal sensitivity) across the visual field.

Finally, the findings derived from the Tangent Screen are foundational data for clinical Neuropsychology. The assessment of visual field integrity is one component of a comprehensive neurocognitive battery. Visual field defects often accompany or explain deficits in spatial awareness, reading ability (hemianopic dyslexia), and neglect syndromes. Therefore, the Tangent Screen serves as a crucial bridge between basic visual science, neurological anatomy, and the functional cognitive assessment of the patient.

The broader category of psychology to which the Tangent Screen assessment belongs is primarily **Sensation and Perception**, under the umbrella of **Experimental Psychology** due to its rigorous psychophysical methodology, and secondarily **Clinical Neuropsychology**, where the results are applied diagnostically to understand brain-behavior relationships following injury or disease.