



Eponymous Pupillary and Ocular Sensory Signs of Neurosyphilis: A Historical Review

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Abstract

The objective of this study was to review pupillary and ocular sensory signs historically associated with neurosyphilis, focusing on eponymous findings because they are the most traceable and consistently cited descriptors in the historical neuro-ophthalmic literature. These signs were originally described between 1850 and 1910 by five clinicians whose observations later received eponymous recognition. This study was designed as a narrative historical review supported by a structured search to ensure completeness. Only eponymous signs with established and consistent usage in the medical literature were included; purely descriptive or ambiguous terms were excluded. Searches were conducted and last updated on January 1, 2026, using PubMed/MEDLINE, Google Scholar, and major digitized archives (Gallica, HathiTrust, Internet Archive, and the Wellcome Collection). Search strategies in English, German, and French combined syphilis-related terms with the names of the relevant clinicians (Baillarger, Berger, Gowers, Hael, and Saenger). Two reviewers independently screened the sources and extracted data on the eponym, year of description, primary reference, clinical features, and biographical background. Disagreements were resolved by consensus. Three signs involved characteristic pupillary abnormalities: unilateral mydriasis (Baillarger sign), an oval or elliptical pupil (Berger sign), and absent light reaction with a sluggish near response (Saenger sign). Two additional signs

reflected sensory or autonomic involvement: diminished deep ocular sensation to digital pressure on the globe (Hael sign) and non-specific pupillary oscillation (hippus) described by Gowers. Taken together, these findings show how clinicians attempted to localize autonomic and sensory deficits in neurosyphilis in the era before serologic testing. Although current diagnosis depends largely on serologic testing, neuroimaging, and established treatment protocols, knowledge of these historical neuro-ophthalmic signs remains clinically relevant. They can assist in identifying atypical or delayed cases and help illuminate the development of diagnostic thinking in neurosyphilis.

Keywords: Syphilis, neurosyphilis, pupil, neuro-ophthalmology, history, eponym

Introduction

The ocular manifestations of syphilis were noted early in the nineteenth century, at a time when ophthalmology was transitioning from a predominantly surgical craft into a clinically grounded discipline supported by systematic bedside observation—such as pupillary testing and crude visual field assessment—and later by instrument-based examination.¹ In 1801, Johann Adam Schmidt (1759-1809) published the first structured clinical account of iritis.² Georg Joseph Beer (1763-1821) provided the earliest clear description of what was later recognized as syphilitic iritis in 1813, documenting iris inflammation with nodules and condylomata.³

By the mid-nineteenth century, clinical neuro-ophthalmic methods had advanced considerably. These gains were accelerated by Hermann von Helmholtz (1821-1894) and his introduction of the ophthalmoscope in 1851, which made direct visualization of the fundus possible for the first time and inaugurated modern instrument-

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based ophthalmology.⁴ This new diagnostic capability allowed clinicians to observe pupillary and oculomotor abnormalities with far greater accuracy. In 1869, Douglas Argyll Robertson (1837-1909) characterized the dissociation between light and near responses that later became strongly associated with neurosyphilis.⁵ Sir Jonathan Hutchinson (1828-1913) subsequently identified the triad of interstitial keratitis, notched incisors, and deafness—findings highly suggestive of congenital syphilis—illustrating the systemic diagnostic value of ocular examination.^{1,6}

Therapeutic innovations profoundly altered the natural history of ocular syphilis. Before penicillin, treatment relied on arsenicals, bismuth, iodides, and fever therapy. The introduction of penicillin in 1943 greatly reduced late neurosyphilitic complications, including ocular involvement.⁷ Despite these advances, recent surveillance demonstrates a global resurgence of syphilis across multiple demographic groups, renewing clinical attention to its variable ocular manifestations.^{7,8,9}

Within this broader historical trajectory, several late nineteenth- and early twentieth-century neurologists and ophthalmologists described distinctive pupillary and oculomotor abnormalities that later entered the medical lexicon as eponymous signs of neurosyphilis. These findings complement more widely known eponyms such as Hutchinson's triad.¹⁰ Importantly, although rarely encountered in regions with reliable access to treatment, these historical signs remain conceptually valuable. These signs illustrate early clinical recognition of neurosyphilitic pathways, highlight patterns still relevant to modern pupillary assessment, and provide diagnostic insight into atypical, delayed, or multisystem presentations.

This review synthesizes these pupillary and ocular sensory eponymous signs chronologically, clarifying their original descriptions, clinical significance, and relevance for contemporary neuro-ophthalmic practice.

Materials and Methods

A historical-documentary narrative review was conducted to identify pupillary and ocular sensory signs historically associated with neurosyphilis. Only eponyms with clear usage in the medical literature were included; purely descriptive or ambiguous terms were excluded. No temporal, geographic, or linguistic restrictions were applied, and both European and non-European literature was eligible. Searches of non-European literature did not identify additional pupillary or ocular sensory eponyms meeting the inclusion criteria.

Searches were completed and last updated on January 1, 2026, using PubMed/MEDLINE, Google Scholar, and major digitized repositories (Gallica, HathiTrust, Internet Archive, Wellcome Collection). Search terms in English, German, and French combined syphilis-related terminology with the names of individual physicians (e.g., Baillarger, Berger, Gowers, Haenel, and Saenger). Two reviewers independently screened all sources and extracted data on the eponym, year of origin, primary reference, clinical description, and brief biographical details. Disagreements were resolved through discussion and consensus.

Results

Between 1850 and 1910, five clinicians described pupillary and ocular sensory findings of neurosyphilis that later became established as eponymous signs (Table 1). Their original accounts were verified through primary sources and supported by authoritative secondary literature. Three signs involve distinct pupillary abnormalities: unilateral mydriasis (Baillarger), an elliptical pupil (Berger), and a sluggish near reaction with absent light response (Saenger). The remaining two signs reflect sensory or autonomic dysfunction: reduced deep ocular sensation on globe pressure (Haenel) and non-specific pupillary instability or hippus (Gowers).

Table 1. Eponymous ocular signs of neurosyphilis (1850-1910)

Name	Nationality	Date	Description	Primary finding
Baillarger sign	French	1850	Unilateral mydriasis observed in a patient with general paralysis	Pupil
Berger sign	Austrian	1889	Elliptical or oval pupil, typically with the long axis directed superomedially	Pupil
Gowers sign	British	1895	Irregular alternating pupillary constriction and dilation, sometimes observed in tabes dorsalis	Pupil/iris motility
Saenger sign	German	1902	Absent light reaction with extremely sluggish accommodation and prolonged post-accommodative constriction	Pupil
Haenel sign	German	1910	Marked reduction or absence of deep ocular sensation during firm globe pressure in patients with tabes dorsalis	Ocular sensation

Discussion

Baillarger Sign

Jules Gabriel François Baillarger (1809-1890; [Figure 1](#)) was born in Montbazon, France, and studied medicine in Tours and Paris.¹¹ He began his career under Jean-Étienne Esquirol (1772-1840) at the Maison de Charenton and, from 1840 onward, served as a physician at the Salpêtrière Hospital, where he spent most of his professional life. He also collaborated with Jacques-Joseph Moreau (1804-1884) at the Maison de Santé d'Ivry, eventually helping direct the institution. His 1842 monograph on hallucinations earned recognition from the National Academy of Medicine in France.^{11,12}

During his life, Baillarger was a well-known figure in French psychiatry. In 1843, he helped start *Annales Médico-Psychologiques* (*Annals of Medical Psychology*). In 1847, he became a member of the National Academy of Medicine, and in 1878, he became its president.¹³ His scientific work encompassed neuropathology and mental disease, including studies of cerebral cortex structure, automatism, melancholia, and general paralysis. His collected writings

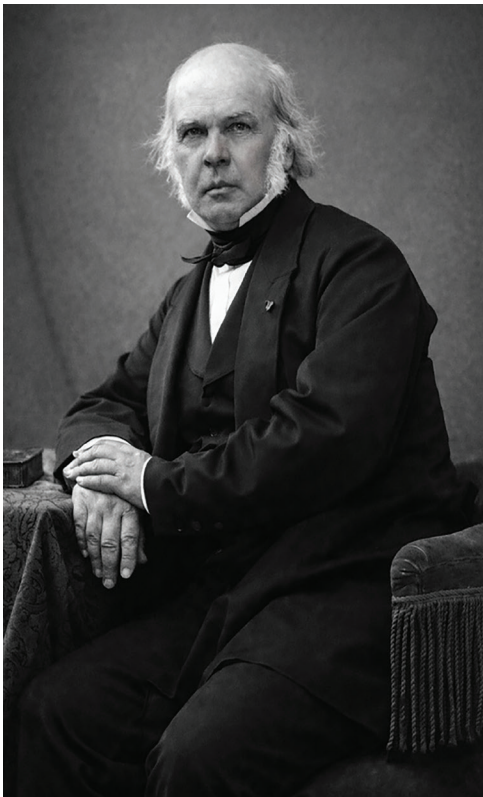


Figure 1. Jules Gabriel François Baillarger (1809-1890). Portrait recreated from an archival photograph, designed by H. Tekiner with digital-enhancement assistance

were later assembled as *Recherches sur les maladies mentales* (*Studies on Mental Illnesses*).^{11,14}

In 1850, Baillarger¹⁵ briefly reported the case of a 59-year-old woman with general paralysis who exhibited a markedly dilated right pupil. He regarded unilateral mydriasis as an additional sign of the disease but provided no information on the light or near responses, leaving the mechanism uncertain ([Table 1](#)).

From a modern perspective, this finding may represent a tonic (Adie-type) pupil in the setting of neurosyphilis, a presentation later documented in both unilateral and bilateral forms.^{16,17,18} Alternative explanations include pharmacologic dilation, partial oculomotor palsy, traumatic sphincter damage, or severe optic nerve or retinal pathology. Because pupillary reflex testing was not described, the etiology remains speculative. Baillarger sign refers to the earliest recorded description of unilateral mydriasis in general paralysis. It illustrates how clinicians closely observed pupillary abnormalities in neurosyphilis before systematic neurological examinations and serologic testing became established.

Berger Sign

Emil Berger (1855-1926) was an Austrian ophthalmologist born in Vienna. He received his medical education at the University of Vienna under Eduard von Jaeger (1818-1884), a key figure of the Vienna ophthalmological school. Berger continued his postgraduate training in Halle with Alfred Karl Graefe (1830-1899) and in Berlin under Julius Hirschberg (1843-1925), thereby gaining exposure to several leading German-speaking ophthalmic centers.¹⁹ From 1883 to 1887, he served as an associate professor in ophthalmology at the University of Graz. He later moved to Paris, where he worked with Photinos Panas (1832-1903) and Édouard Meyer (1838-1902), completed his medical degree, and established a private eye clinic.^{19,20}

Berger combined clinical practice with technical and scientific innovation. In 1883, he designed an ophthalmoscope equipped with an automatic lens-changing mechanism, reflecting his interest in improving fundus examination and increasing the reproducibility of ocular assessment. His research on ocular anatomy and on the systemic determinants of ocular pathology earned recognition from the medical faculty in Graz and from the Paris Academy of Sciences.¹⁹

In his 1889 study of visual disturbances in tabes dorsalis, Berger described a characteristic pupillary deformation: an elliptical or oval pupil in which the long axis typically lay obliquely upward and inward.²¹ He also documented other atypical forms, such as pupils that

were longer vertically or had angular irregularities. Berger attributed these pupillary configurations to localized dysfunction of the iris sphincter, which made the aperture mechanically imbalanced.²¹

Berger sign denotes this characterization of an elliptical pupil in individuals with tabes dorsalis (Figure 2). Berger did not intend this observation as a diagnostic criterion; instead, he reported it as a recurring morphological pattern in a subset of tabetic individuals. Irregular pupils may arise from various conditions, including congenital iris anomalies, postoperative changes following corneal or cataract surgery, posterior synechiae from iritis, traumatic mydriasis, or even in association with Argyll Robertson pupil (ARP). Nonetheless, Berger's description represents one of the earliest systematic observations of iris deformities in neurosyphilis and illustrates the morphological diversity of pupillary changes encountered before the advent of serologic testing (Table 1).

Gowers Sign

Sir William Richard Gowers (1845-1915; Figure 3) was born in London and began his medical career through an apprenticeship in Essex before training at University College Hospital.²² He became a Member of the Royal College of Surgeons in 1867, received his M.B. in 1869, and completed his M.D. with gold-medal distinction in 1870. Gowers later held senior appointments at the National Hospital for the Paralyzed and Epileptic and at University College Hospital, became a Fellow of the Royal College of Physicians in 1879, was elected to the Royal Society in 1887, and was knighted in 1897.²³

A prolific neurologist, Gowers authored several influential texts—including *Medical Ophthalmoscopy* (1879), *The Diagnosis of Diseases of the Spinal Cord* (1880), and the two-volume *Manual of Diseases of the Nervous*

System (1888)—which helped formalize the neurologic examination and emphasized the value of pupillary assessment.²⁴

In his writings on the nervous system, Gowers noted that in most patients with tabes dorsalis there is a loss of the light reflex. He observed that the pupil may alternately constrict and dilate even when the light reflex appears absent, noting that this instability is seen in various neurological disorders, including neurosyphilis.^{24,25} In cases where the pupillary reaction to light appears absent, using a binocular loupe may reveal delayed and passive contractions in response to light.

Within this historical context, Gowers emphasized that pupillary dynamics are shaped not only by basic light and near reflexes, but also by broader autonomic and central nervous system factors (Table 1). Although Gowers did not specifically use the term, “hippus” refers to a rhythmic, involuntary oscillation in pupillary diameter. Hippus is a non-specific finding that may accompany autonomic imbalance, metabolic disturbances, encephalopathy, or a range of other neurological disorders. This contrasts with ARP, which lacks a light response but retains constriction to near stimuli.

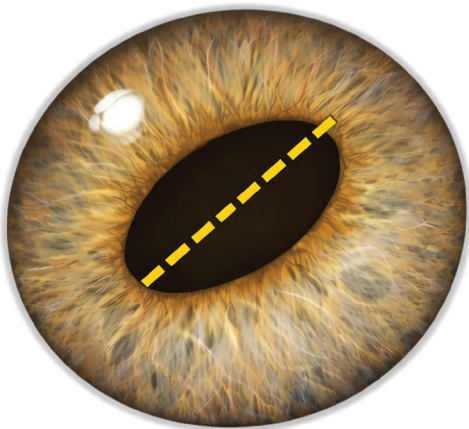


Figure 2. Berger sign and oval pupil

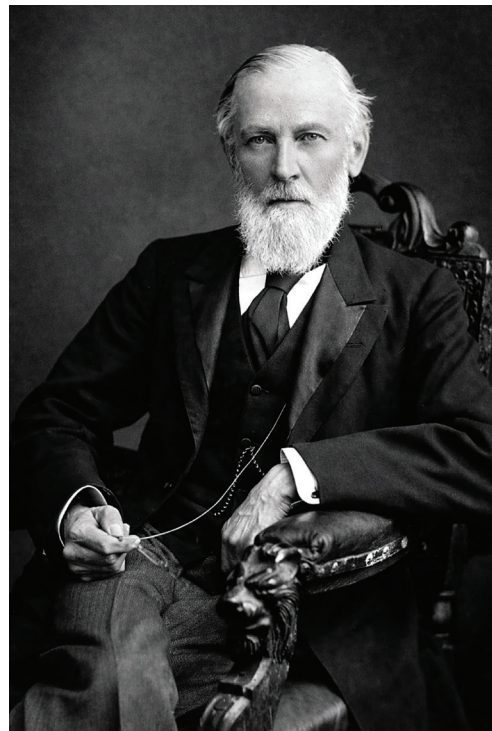


Figure 3. Sir William Richard Gowers (1845-1915). Portrait recreated from an archival photograph, designed by H. Tekiner with digital-enhancement assistance

In contemporary neurology, the term “Gowers’ sign” is more commonly used for the maneuver observed in proximal myopathy, where patients use their hands to “climb up” their thighs when rising from the floor. In this review, the term is used in a more restricted historical sense, specifically referring to Gowers’ observation of pupillary instability rather than the myopathic sign.

While hippus is rarely used as a diagnostic clue today, Gowers’ description highlights the dynamic pupillary abnormalities seen in pre-penicillin neurosyphilis and contributes to the historical framework of neuro-ophthalmic examination.

Saenger (Pupillary) Sign

Alfred Saenger (1860-1921) was born in Mergentheim (now Bad Mergentheim) in the Kingdom of Württemberg. After completing his medical studies, he trained in Hamburg under Heinrich Eisenlohr at the Eppendorf Hospital and, from 1890, worked in the Eye Clinic at St. Georg’s Hospital under Dr. Haase—an environment closely linked with the emerging academic clinics of Hamburg. This early dual exposure shaped his later neuro-ophthalmic work.²⁶ Working alongside Hermann Wilbrand (1851-1935), he contributed to the development of neuro-ophthalmology as a distinct field. Saenger later became associate professor of neurology at the University of Hamburg, and by 1910, chief of the Third Medical Clinic at St. Georg’s Hospital. He was appointed extraordinary professor in 1919.²⁶ His major works include *Über Sehstörungen bei funktionellen Nervenleiden* (*On visual disturbances in functional nervous disorders*, 1892), the nine-volume *Die Neurologie des Auges* (*The Neurology of the Eye*, 1900-1922) co-authored with Wilbrand, and *Die Beurtheilung der Nervenerkrankungen nach Unfall* (*The assessment of nervous disorders following injury*, 1896).²⁷

Saenger’s eponymous contribution derives from his 1902 report of a patient with progressive tabes dorsalis and ARP. He observed marked pupillary asymmetry: the left pupil measured 6.2 mm, had an irregular angular contour, and showed no response to light.²⁸ During accommodation, however, it constricted extremely slowly and remained contracted for prolonged periods—sometimes up to five minutes—before re-dilating. The right pupil measured about 3 mm, also showed no reaction to light, and exhibited a slightly faster—though still delayed—response to near stimulation. Saenger regarded this pattern as indicative of marked disruption of the pupillary reflex pathways in tabes dorsalis ([Table 1](#)).²⁸

Today, Saenger’s sign denotes the triad of absent light reaction, markedly delayed accommodation, and unusually prolonged post-accommodative constriction. It represents a variant within the broader spectrum of

pupillary abnormalities in late neurosyphilis, distinct from but related to the classical ARP. Although rarely encountered in modern practice, Saenger’s detailed description remains an instructive example of early neuro-ophthalmic observation and of the careful bedside examination characteristic of the pre-penicillin era.

Haenel Sign

Hans Haenel (1874-1942) was born in Chemnitz, then part of the Kingdom of Saxony within the newly unified German Empire. He studied medicine at the University of Heidelberg and subsequently worked at the Psychiatric Clinic in Halle and the Municipal Hospital in Dresden-Friedrichstadt, both centers where neuropathological methods were increasingly integrated into psychiatric practice.²⁹ He later became chief psychiatrist at the Waldpark Sanatorium in Dresden-Blasewitz, a prominent early twentieth-century institution for mental and nervous diseases. His clinical work reflected the German neuropsychiatric tradition of careful bedside examination and close phenomenological observation.^{29,30}

In 1909, at a meeting of the Central German Psychiatrists and Neurologists in Jena, Haenel presented the observation that came to be known as Haenel’s sign. While examining patients with tabes dorsalis, he noted that firm pressure applied to the globe using one or two fingers against the orbital floor failed to provoke pain, discomfort, blinking, or defensive head movement. This marked reduction in deep ocular sensation occurred in roughly half of the tabetic patients he assessed and could be unilateral or bilateral.³⁰ Haenel attributed the finding to degenerative involvement of sensory and autonomic pathways affected in neurosyphilis, a conclusion consistent with the neuropathological understanding of the time ([Table 1](#)).

Although Haenel’s sign is no longer used diagnostically, it illustrates the profound sensory deficits once seen in late neurosyphilis before the advent of effective antimicrobial therapy. In contemporary practice, pronounced ocular hypoesthesia more commonly suggests trigeminal neuropathy, neurotrophic keratopathy, or sensory impairment secondary to herpetic, diabetic, or surgical injury rather than tabes dorsalis. Nonetheless, Haenel’s account remains a clear example of early neuro-ophthalmic bedside elicitation and of how clinicians sought subtle sensory changes to characterize neurosyphilitic involvement of the cranial nerves.

Study Limitations

Historical research presents certain constraints when performing a review. Digitization biases have primarily favored fully digitized journals in English, French, and

German, which has resulted in underrepresentation of sources in other languages or those with limited archival preservation. Moreover, unsuccessful or negative bedside signs were likely underreported, contributing to survivorship bias. Incomplete biographical information and variations in translation introduce further limitations.

Conclusion

Syphilis remains a substantial clinical and public health concern, particularly among individuals aged 18–49 years. Recent U.S. surveillance data indicate that between 2019 and 2023, syphilis cases in females increased by 112%, while congenital syphilis rose by 106%—a pattern echoed internationally.⁷ This epidemiological revival coincides with increasing reports of syphilitic eye disease, highlighting the necessity for timely diagnosis, partner assessment, and suitable treatment. Intravenous aqueous crystalline penicillin G remains the recommended treatment for neurosyphilis and ocular involvement.

Importantly, while early ocular syphilis most commonly manifests as uveitis or optic neuropathy, the eponymous signs described by Baillarger, Berger, Saenger, Haenel, and Gowers predominantly represent late neurosyphilis—especially *tabes dorsalis*—and are now rarely seen where effective treatment is accessible. These historical observations clarify the diverse mechanisms through which *Treponema pallidum* can affect the visual system and demonstrate how detailed documentation of pupillary and ocular sensory findings once guided neurologic diagnosis. Although contemporary management relies chiefly on serologic testing, neuroimaging, and standardized treatment protocols, familiarity with these earlier signs—together with careful pupillary examination—may still aid in recognizing atypical, multisystem, or treatment-delayed presentations, and serves as an educational link between historical neuro-ophthalmic practice and modern clinical reasoning.

Declarations

Authorship Contributions

Concept: H.T., S.H.Y., E.S.Y., Design: H.T., S.H.Y., E.S.Y., Data Collection or Processing: H.T., S.H.Y., E.S.Y., Analysis or Interpretation: H.T., S.H.Y., E.S.Y., Literature Search: H.T., S.H.Y., E.S.Y., Writing: H.T., S.H.Y., E.S.Y.

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