

Multimodal Imaging In The Diagnosis Of Idiopathic Intracranial Hypertension: Lessons From Clinical Case Series

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Abstract

Background:

Idiopathic intracranial hypertension (IIH) is a neurological disorder characterized by elevated intracranial pressure without an identifiable structural cause. The condition predominantly affects women of reproductive age and often presents with visual disturbances and papilloedema. This case series highlights the role of **multimodal imaging** in the diagnosis and management of IIH and explores its clinical variability across different patient profiles.

Methods:

Five patients diagnosed with IIH were evaluated at a tertiary care center. Detailed ophthalmic examination, **B-scan ultrasonography**, **magnetic resonance imaging (MRI)**, and **magnetic resonance venography (MRV)** were performed for all cases. Parameters assessed included optic nerve sheath diameter (ONSD), papilloedema grade, and neuroimaging findings such as empty sella and transverse sinus narrowing. Clinical response to medical therapy and follow-up outcomes were documented.

Results:

The mean age of presentation was **41.8 years**, with a **female-to-male ratio of 4:1**. All patients exhibited **bilateral papilloedema**, and ONSD measurements ranged between **5.27 mm and 5.75 mm**. MRI revealed **partial or complete empty sella** in four cases, while MRV demonstrated **transverse sinus narrowing or hypoplasia** in all five. One male patient presented with **abducens nerve palsy**, and one postpartum female had grade 4 papilloedema. All patients responded favorably to **acetazolamide 250 mg twice daily**, with stabilization of visual acuity and reduction in optic disc edema during follow-up. No surgical intervention was required.

Conclusion:

This series underscores the diagnostic precision of multimodal imaging in IIH. The combination of **B-scan ultrasonography**, **MRI**, and **MRV** effectively identifies raised intracranial pressure and venous outflow abnormalities. The findings reaffirm the predominance of IIH in females, the association with postpartum and hormonal states, and the potential for atypical presentations such as cranial nerve palsy. **Early diagnosis, structured follow-up, and medical therapy** remain crucial in preventing irreversible optic atrophy and ensuring favorable long-term outcomes.

Keywords: Idiopathic intracranial hypertension, papilloedema, optic nerve sheath diameter, empty sella, venous sinus stenosis, multimodal imaging, acetazolamide.

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Introduction

Idiopathic Intracranial Hypertension (IIH) is a neurological condition characterized by elevated intracranial pressure in the absence of an identifiable structural, vascular, or infectious cause [1]. The disorder typically presents with headaches, transient visual obscurations and pulsatile tinnitus associated

with papilledema. Although once considered rare, IIH is now increasingly recognized across diverse populations, reflecting its complex association with systemic, hormonal, and metabolic factors [1].

The pathophysiology of IIH remains multifactorial, involving an imbalance between cerebrospinal fluid production and absorption, venous outflow

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obstruction, and obesity-related hormonal dysregulation [2]. Thurtell highlighted that the condition primarily affects obese women of reproductive age, suggesting a possible endocrine influence on cerebrospinal fluid dynamics [2]. The clinical diagnosis often hinges on the exclusion of secondary causes and confirmation of raised intracranial pressure through imaging and lumbar puncture findings.

In recent years, several comprehensive reviews have emphasized that IIH continues to be an enigmatic condition, given its heterogeneous clinical manifestations and diagnostic complexity [3]. Toshniwal and colleagues outlined that, beyond its classical presentation, IIH may present with subtle or atypical symptoms, leading to delayed diagnosis and irreversible visual sequelae if not promptly identified [3].

Neuro-ophthalmic assessment plays a pivotal role in the evaluation of IIH, as papilledema remains the most consistent and defining clinical sign. The correlation between visual function and the degree of optic disc swelling has been explored extensively, particularly in populations, where late presentation and underdiagnosis remain challenges [4]. Rehman and associates demonstrated that timely evaluation of visual fields and fundoscopic changes can serve as critical prognostic indicators for visual outcomes [4]. Epidemiologically, studies from India have contributed substantially to the understanding of IIH patterns in developing countries. Pal and co-investigators reported that Indian patients often present at a younger age, with female predominance and variable associations such as hypothyroidism and obesity [5]. Their findings underscored the need for contextual clinical awareness to prevent vision-threatening complications. Similarly, Sharma and colleagues described the clinical and radiological spectrum in a large Indian cohort, reinforcing the utility of magnetic resonance imaging and venography in diagnosis [6].

The pediatric presentation of IIH adds another layer of diagnostic complexity. Roy and colleagues documented that, in children, the disease often presents without classic features such as papilledema or headache, demanding a high index of suspicion and tailored imaging strategies [7]. Adult series from Indian tertiary centers have similarly revealed diverse manifestations, emphasizing the importance of ophthalmic examination and imaging correlation [8]. Given these diagnostic intricacies, multimodal imaging has emerged as a cornerstone in evaluating suspected IIH. Rohit and collaborators emphasized that

combining fundus imaging, B-scan ultrasonography, MRI, and MRV provides an integrated understanding of disease mechanisms, aiding in both diagnosis and monitoring [9]. Characteristic findings such as empty sella, posterior scleral flattening, and distended perioptic subarachnoid spaces are key markers of raised intracranial pressure. Advanced neuroimaging further assists in differentiating IIH from mimicking conditions, such as cerebral venous sinus thrombosis and secondary intracranial hypertension [10].

Recent literature emphasizes that multimodal imaging serves as a cornerstone in improving the diagnostic precision of idiopathic intracranial hypertension. Incorporation of advanced modalities such as high-resolution MRI, MRV, and B-scan ultrasonography has enhanced the early identification of characteristic findings including optic nerve sheath dilation, posterior scleral flattening, and venous sinus narrowing, thereby facilitating timely intervention and improved visual prognosis [10]. Furthermore, contemporary evidence highlights that comprehensive management of IIH requires a coordinated, multidisciplinary framework integrating neurological, ophthalmological, and radiological expertise to ensure accurate diagnosis, individualized treatment planning, and effective follow-up of patients [11].

Given this evolving understanding, there remains a pressing need for case-based analyses from diverse populations to enhance diagnostic precision and awareness of IIH. This case series aims to elucidate the role of multimodal imaging in the diagnostic evaluation of idiopathic intracranial hypertension, integrating clinical findings with neuroimaging and ophthalmic correlations to highlight practical lessons for early identification and effective management.

Case 1

Demographic and Clinical Background

A 29-year-old female, admitted under the Department of Medicine for the management of enteric fever, was referred for ophthalmic evaluation on the sixteenth postpartum day following a full-term normal vaginal delivery. She had been diagnosed with pregnancy-induced hypertension on the third postpartum day and commenced on tablet Labetalol 100 mg twice daily, which was later tapered to a once-daily regimen. She was a known case of hypothyroidism on regular Thyronorm 50 µg once daily. During her medical admission she was started on tablet Nimodipine. Her antenatal period had been complicated by chickenpox in the second trimester and mild albuminuria, while the

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delivery and immediate postpartum period were otherwise uneventful.

Clinical Presentation

The patient was referred for routine fundus evaluation to exclude hypertensive or intracranial causes of visual disturbance. At the time of examination she denied diplopia, transient visual obscurations, or vomiting, and reported only intermittent mild headache without subjective visual loss.

Ophthalmic Examination

Anterior segment evaluation of both eyes was within normal limits. Best-corrected visual acuity measured 6/6 in the right eye and 6/9 in the left eye. Colour vision was normal bilaterally. Fundus examination revealed clear ocular media in both eyes. The right optic disc was hyperaemic and elevated with indistinct and obscured margins; a splinter haemorrhage was noted along the disc margin, and the peripapillary vessels were partially hidden. Spontaneous venous pulsation was absent. Retinal arterioles showed focal attenuation, the macula displayed an intact foveal reflex, and the background retina appeared normal. The left eye exhibited comparable changes with disc elevation, margin blurring, vessel obscuration, absent spontaneous venous pulsation, and focal arteriolar attenuation, while the macular area remained normal. The fundoscopic appearance corresponded to bilateral grade 4 papilloedema.



Fig 1 : Fundus Image Showing Disc Swelling With Splinter Hemorrhage(RE)



Fig 2 : Fundus Image Showing Disc Swelling With Peripapillary Halo(LE)

Investigations

B-scan ultrasonography demonstrated a widened optic nerve sheath diameter measuring 5.37 mm in the right eye and 5.56 mm in the left eye, findings consistent with raised intracranial pressure. Magnetic resonance imaging of the brain with magnetic resonance venography revealed a partial empty sella and bilateral thickening of the optic nerve sheath complexes. The left transverse and sigmoid sinuses appeared hypoplastic, suggesting a degree of venous outflow compromise. No intracranial mass lesion, space occupying process, or venous thrombosis was detected.

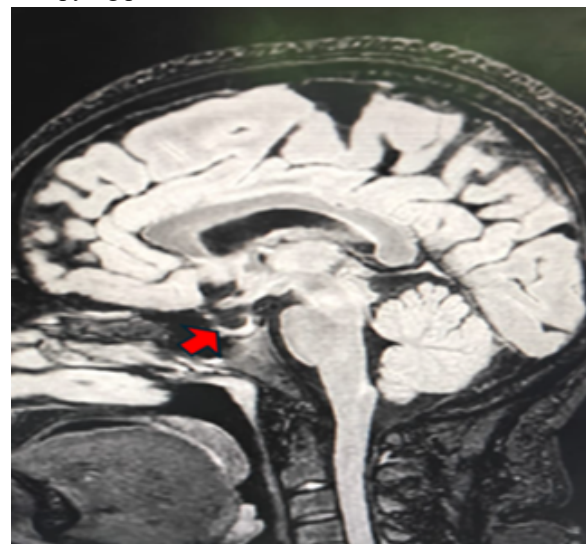


Fig 3 : MRI Showing Partial Empty Sella

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Fig 4 : Mrv Showing Left Transverse & Sigmoid Sinus Hypoplasia

Diagnosis

In consultation with neurology, the clinical and imaging findings were consistent with idiopathic intracranial hypertension presenting as bilateral grade 4 papilloedema. Secondary causes of intracranial hypertension were excluded on the basis of imaging and clinical correlation.

Management

The patient was initiated on tablet Acetazolamide (Diamox) 250 mg twice daily to reduce cerebrospinal fluid production and lower intracranial pressure. Dietary sodium restriction and close neuro-ophthalmic follow-up, including serial visual field testing and repeat fundus documentation, were advised.

Case 2

Demographic and Clinical Background

A 27-year-old female presented to the Ophthalmology Outpatient Department with complaints of recurrent headaches for approximately ten years. The headaches were described as intermittent, of moderate intensity, and occasionally associated with transient blurring of vision but no nausea, vomiting, or diplopia. There was no history suggestive of systemic hypertension, diabetes mellitus, thyroid disorder, or chronic medication use. The patient had no prior ophthalmic illness or ocular trauma. There was no relevant family history or history of recent childbirth or hormonal therapy.

Clinical Presentation

At the time of evaluation, the patient was alert, cooperative, and systemically stable. Neurological review revealed no focal deficits. Ophthalmic evaluation was sought to rule out optic disc pathology

or papilloedema secondary to raised intracranial pressure, given the chronicity of the headache and the absence of systemic causes.

Ophthalmic Examination

Anterior segment examination was within normal limits in both eyes. The cornea, anterior chamber, iris pattern, and lens were clear, and there was no evidence of anterior segment inflammation or pupillary abnormality. Visual acuity was 6/6 in both eyes with full extraocular movements. Colour vision was normal in both eyes. Fundus examination showed clear media bilaterally. In the right eye, the optic disc was hyperaemic, elevated, and exhibited blurred and indistinct margins with obscuration of peripapillary vessels. The spontaneous venous pulsation was absent, and the arteriovenous ratio was approximately 2:3. The macular reflex was present and foveal light reflex intact. The left eye displayed similar findings, with disc hyperaemia, elevation, blurring of margins, vessel obscuration, absence of spontaneous venous pulsation, and a normal macular reflex. There were no haemorrhages, exudates, or choroidal folds observed. The overall picture was consistent with bilateral papilloedema of moderate severity, corresponding to grade 3 changes.

Investigations

B-scan ultrasonography of the optic nerve sheath showed right optic nerve sheath diameter measuring 5.45 mm and left measuring 5.75 mm, both values suggesting elevated intracranial pressure. Magnetic resonance imaging of the brain revealed bilateral widening of the perioptic subarachnoid spaces, with the right optic nerve measuring 5.4 mm and the left optic nerve measuring 5.8 mm in diameter. Partial empty sella was also noted, consistent with chronically raised intracranial pressure. Magnetic resonance venography demonstrated narrowing of both lateral segments of the transverse sinuses, with more pronounced stenosis on the left side. There was no evidence of venous sinus thrombosis or other intracranial pathology.

Diagnosis

Following neuroimaging and neurological consultation, a diagnosis of idiopathic intracranial hypertension was established. The condition was classified as bilateral grade 3 papilloedema secondary to IHH. Secondary causes of raised intracranial pressure such as intracranial mass, thrombosis, infection, and endocrine abnormalities were systematically excluded.

Management

The patient was commenced on tablet Acetazolamide (Diamox) 250 mg twice daily to reduce cerebrospinal fluid production. She was counselled regarding the

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importance of weight control and adherence to therapy. Regular follow-up was advised with serial visual field testing and fundus documentation to monitor response to therapy and detect any progression of optic nerve head swelling.

Case 3

Demographic and Clinical Background

A 48-year-old male presented to the Ophthalmology Outpatient Department with a one-week history of diplopia and transient episodes of blurred vision. The diplopia was binocular, horizontal, and more noticeable on right gaze. There was no history of headache, vomiting, tinnitus, or recent febrile illness. The patient was a known hypertensive for the past six months but was non-compliant with antihypertensive therapy. There was no history of diabetes mellitus, trauma, or use of corticosteroids or vitamin A supplements. He denied any recent weight gain, chronic medication use, or systemic illness suggestive of secondary intracranial hypertension.

Clinical Presentation

On general examination, the patient was hemodynamically stable with mildly elevated blood pressure at presentation. Neurological assessment revealed a mild limitation of right eye abduction consistent with a partial sixth cranial nerve palsy. There were no other cranial nerve deficits or focal neurological signs. Given the acute onset diplopia with transient obscuration of vision, an urgent ophthalmic and neuroimaging evaluation was undertaken to assess for possible papilloedema and raised intracranial pressure.

Ophthalmic Examination

Anterior segment evaluation was normal in both eyes, with clear cornea, deep and quiet anterior chamber, and no signs of inflammation. The pupils were equal and reactive to light, and there was no relative afferent pupillary defect. Best-corrected visual acuity was 6/6 in both eyes. Colour vision testing was normal. Worth four-dot testing did not elicit diplopia in the primary position, suggesting an intermittent component. Fundus examination of the right eye revealed clear ocular media and a hyperaemic optic disc with blurred margins and mild elevation. The cup-disc ratio was approximately 0.3:1. The retinal arterioles showed attenuation with arteriovenous crossing changes suggestive of vascular compression secondary to disc swelling. The macular foveal reflex appeared dull. The left fundus demonstrated similar findings of a hyperaemic elevated disc with indistinct margins, a cup-disc ratio of 0.3:1, arteriolar attenuation, and dull foveal reflex. The retinal background was otherwise

unremarkable. These findings were consistent with bilateral optic disc edema of moderate degree, compatible with papilloedema.

Investigations

Magnetic resonance imaging (MRI) and magnetic resonance venography (MRV) of the brain were performed to evaluate the underlying cause of raised intracranial pressure. Imaging revealed hypoplasia of the right transverse sinus with no evidence of thrombus, mass lesion, or other structural abnormality. The ventricular system appeared normal, and no hydrocephalus was noted. B-scan ultrasonography confirmed an increased optic nerve sheath diameter consistent with raised intracranial pressure, though exact measurements were not specified. The imaging findings correlated with the clinical impression of idiopathic intracranial hypertension.



Fig 5 : FUNDUS IMAGE Showing Disc Edema With Peripapillary Halo(RE)

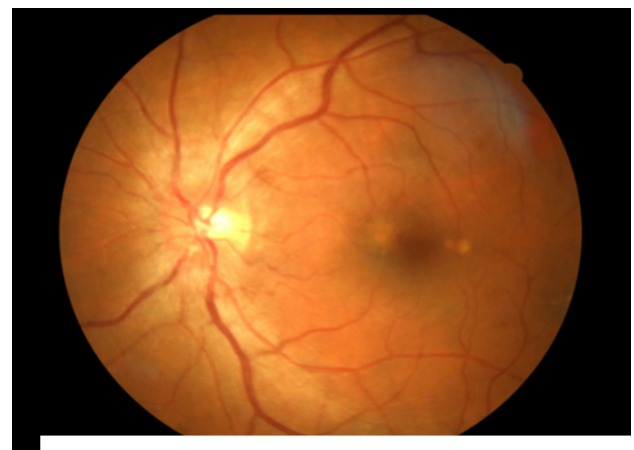


Fig 6 : FUNDUS IMAGE Showing Disc Edema With Obscuration Of Vessels (LE)



Fig 7 : MRV Showing Left Transverse Sinus Hypoplasia

Diagnosis

Based on the ophthalmic findings, radiological features, and absence of a secondary cause, the patient was diagnosed with idiopathic intracranial hypertension presenting as bilateral papilloedema associated with right sixth cranial nerve palsy. The diplopia was attributed to pressure-related involvement of the abducens nerve within the intracranial compartment.

Management

The patient was commenced on tablet Acetazolamide (Diamox) 250 mg twice daily to reduce intracranial pressure. Strict blood pressure control was advised, and antihypertensive therapy was optimised. The patient was instructed to avoid medications known to increase intracranial pressure, such as tetracyclines and corticosteroids. Follow-up was scheduled for periodic visual field testing, repeat fundus evaluation, and neuroimaging to monitor the response to medical therapy and assess the resolution of disc edema and diplopia.

Case 4

Demographic and Clinical Background

A 45-year-old female presented to the Ophthalmology Outpatient Department with complaints of gradually progressive diminution of vision in both eyes for six months. There was no history of headache, diplopia, vomiting, or transient visual obscurations. She denied any prior systemic illness such as hypertension, diabetes, or thyroid disease. There was no history of drug intake known to precipitate intracranial hypertension. The patient had no history of recent pregnancy or weight gain.

Clinical Presentation

The patient reported gradual blurring of distant vision without associated pain or photophobia. There were no

features suggestive of neurological deficit or cranial nerve palsy. Systemic examination at presentation was within normal limits.

Ophthalmic Examination

Anterior segment examination was within normal limits in both eyes, with clear cornea, deep and quiet anterior chambers, and normal iris pattern. Best-corrected visual acuity was 6/6 in both eyes, and colour vision was normal. Fundus evaluation revealed clear ocular media. In both eyes, the optic discs appeared hyperaemic, elevated, and blurred with complete obscuration of the disc margins. Peripapillary vessels were obscured, and spontaneous venous pulsation was absent. Retinal vessels appeared of normal calibre with no arteriolar attenuation. The macula showed a distinct foveal reflex with a normal background retina. These findings were consistent with bilateral papilloedema, graded as moderate-to-severe.

Investigations

B-scan ultrasonography revealed an optic nerve sheath diameter of 5.46 mm in the right eye and 5.27 mm in the left eye, indicating raised intracranial pressure. Magnetic resonance imaging and magnetic resonance venography of the brain demonstrated right transverse sinus hypoplasia and a partially empty sella. There was no evidence of intracranial mass lesion, thrombosis, or hydrocephalus.

Diagnosis

Based on the clinical and radiological features, a diagnosis of idiopathic intracranial hypertension presenting with bilateral papilloedema was established. No secondary cause of raised intracranial pressure was detected.

Management

The patient was started on tablet Acetazolamide (Diamox) 250 mg twice daily. Lifestyle modification, including weight management and regular follow-up for visual field analysis and optic disc monitoring, was advised.

Case 5

Demographic and Clinical Background

A 60-year-old female presented to the Ophthalmology Outpatient Department with complaints of progressive diminution of vision in both eyes for approximately one year. The visual decline was gradual, painless, and not associated with redness, photophobia, or diplopia. The patient reported occasional mild frontal headaches but denied any nausea, vomiting, or transient visual obscurations. There was no history of systemic hypertension, diabetes mellitus, thyroid disorder, or recent weight gain. She was not on any chronic medication known to precipitate intracranial

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hypertension and had no history of trauma or intracranial infection.

Clinical Presentation

The patient appeared clinically stable, with normal vital parameters and no neurological deficits. General examination did not reveal any stigmata of endocrine or metabolic disorders. She was referred for detailed ophthalmic evaluation to rule out optic neuropathy or papilloedema as a cause of her gradual visual deterioration.

Ophthalmic Examination

Anterior segment evaluation of both eyes showed a quiet eye with clear cornea, normal anterior chamber depth, and intact pupillary reactions. Best-corrected visual acuity was 6/12 in the right eye and 6/18 in the left eye. Colour vision testing revealed a mild reduction in the left eye. Extraocular movements were full in all directions of gaze. Fundus examination revealed clear ocular media in both eyes. The right optic disc was elevated and hyperaemic with indistinct margins and blurred peripapillary borders. There was partial obscuration of the disc vessels, and spontaneous venous pulsation was absent. The macular reflex was preserved, and the background retina appeared normal. The left optic disc exhibited similar findings with diffuse swelling and indistinct margins, suggesting bilateral papilloedema of moderate severity. No haemorrhages or exudates were observed in either fundus.

Investigations

B-scan ultrasonography demonstrated an optic nerve sheath diameter of 5.36 mm in the right eye and 5.52 mm in the left eye, consistent with raised intracranial pressure. Magnetic resonance imaging of the brain revealed a partially empty sella and distension of the perioptic subarachnoid space. Magnetic resonance venography showed bilateral transverse sinus narrowing without thrombosis. No mass lesion or hydrocephalus was detected.

Diagnosis

In view of the bilateral optic disc edema, enlarged optic nerve sheath diameter, empty sella, and absence of secondary causes, a diagnosis of idiopathic intracranial hypertension was made. The chronicity of visual symptoms suggested a longstanding form of the disease with gradual progression.

Management

The patient was initiated on tablet Acetazolamide (Diamox) 250 mg twice daily for intracranial pressure reduction. She was advised on adequate hydration, weight management, and regular follow-up with serial visual field testing, optic disc photography, and

neuroimaging to monitor progression. The patient was counselled regarding the need for lifelong ophthalmic surveillance due to the risk of optic atrophy if left untreated.

Table 1. Demographic, Clinical and Ophthalmic Profile of Patients with Idiopathic Intracranial Hypertension (IIH)

| Parameter | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 |
|-------------------------|---|--|--|--|--|
| Age / Sex | 29 / Female | 27 / Female | 48 / Male | 45 / Female | 60 / Female |
| Clinical Context | Postpartum day 16 following FTNV D; recent enteric fever; PIH on labetalol; hypothyroidism on thyroxine | Chronic intermittent headache ×10 years | Recent-onset diplopia ×1 week; known hypertension, irregular treatment | Gradual visual blurring ×6 months; no systemic disease | Gradual diminution of vision ×1 year; occasional mild headache |
| Systemic / Risk Factors | Postpartum, PIH, hypothyroidism | None | Systemic hypertension | None identified | None identified |
| Symptoms | Intermittent headache; no diplopia or vomiting | Recurrent headache; transient blurring of vision | Diplopia; transient visual obscurations | Gradual blurring of vision; no headache | Painless progressive visual decline; mild frontal headache |

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| | | | | | |
|--|---|--|--|---|--|
| Ocular Findings (Common to both eyes) | Hyperemic elevated discs, blurred margins, splinter haemorrhage, SVP absent | Elevated blurred discs, SVP absent, arteriolar attenuation | Hyperemic discs, indistinct margins, AV crossing changes, dull foveal reflex | Elevated blurred discs, hyperemic, SVP absent, preserved macula | Diffuse disc edema with blurred margins, SVP absent, normal retina |
| Severity of Papilloedema | Grade 4 (severe) | Grade 3 (moderate) | Moderate | Moderate-severe | Moderate |
| Anterior Segment / Colour Vision | Normal; colour vision intact | Normal; colour vision intact | Normal; colour vision intact | Normal; colour vision intact | Normal; mild left eye reduction |
| Best-Corrected Visual Acuity (BCVA) | RE 6/6, LE 6/9 | RE 6/6, LE 6/6 | BE 6/6 | BE 6/6 | RE 6/12, LE 6/18 |

Table 2. Imaging Findings, Diagnostic Correlation and Management Outcomes of IIH Cases

| Parameter | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 |
|---------------------------------------|------------------------|------------------------|-------------------------------------|------------------------|------------------------|
| B-Scan Optic Nerve Sheath Diam | RE 5.37 mm, LE 5.56 mm | RE 5.45 mm, LE 5.75 mm | Increased (exact values not stated) | RE 5.46 mm, LE 5.27 mm | RE 5.36 mm, LE 5.52 mm |

| | | | | | |
|---------------------------------|--|--|--|--|--|
| eter (ON SD) | | | | | |
| MRI Findings | Partial empty sella, bilateral optic nerve sheath thickening | Widened peripoptic spaces, partial empty sella | Right transverse sinus hypoplasia | Right transverse sinus hypoplasia, partial empty sella | Partial empty sella, distended peripoptic subarachnoid space |
| MRV Findings | Left transverse and sigmoid sinus hypoplasia | Bilateral transverse sinus narrowing (L>R) | Right transverse sinus hypoplasia | Right transverse sinus hypoplasia | Bilateral transverse sinus narrowing |
| Associated Features | No mass or thrombosis | No mass or thrombosis | No mass or thrombosis | No mass or thrombosis | No mass or thrombosis |
| Neurological Signs | None | None | Right sixth cranial nerve palsy | None | None |
| Final Diagnosis | IIH with bilateral Grade 4 papilloedema | IIH with bilateral Grade 3 papilloedema | IIH with bilateral papilloedema and VI nerve palsy | IIH with bilateral papilloedema | IIH with bilateral papilloedema |
| Therapeutic Intervention | Acetazolamide 250 mg BD; | Acetazolamide 250 mg BD; | Acetazolamide 250 mg BD; | Acetazolamide 250 mg BD; | Acetazolamide 250 mg BD; |

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| | salt restriction | weight control | BP control | weight management | lifestyle modification |
|-----------------------|-------------------------------------|----------------------|-------------------------------|------------------------------|---------------------------------------|
| Follow-up Plan | Visual fields, fundus documentation | Serial VF and fundus | VF testing, imaging follow-up | VF and optic disc monitoring | VF, fundus, neuroimaging surveillance |

Discussion

This case series analyzed five patients diagnosed with idiopathic intracranial hypertension (IIH), illustrating the spectrum of clinical presentation and the role of multimodal imaging in establishing diagnosis and guiding management. All five patients demonstrated bilateral papilloedema on fundoscopic examination, with optic nerve sheath diameters (ONSD) ranging between **5.27 mm and 5.75 mm**. Magnetic resonance imaging (MRI) revealed **partial or complete empty sella** in four cases, while magnetic resonance venography (MRV) confirmed **transverse sinus hypoplasia or narrowing** in all five. The mean age was **41.8 years**, with a **female predominance (4:1)**. One patient (Case 3) was male, presenting with sixth cranial nerve palsy, while the remainder exhibited isolated papilloedema.

The use of non-invasive imaging for detecting raised intracranial pressure is increasingly supported in current literature. **Shammas et al.** evaluated a non-invasive approach combining transcranial Doppler and arterial blood pressure to assess intracranial pressure, achieving diagnostic accuracy exceeding 90% in patients with suspected IIH [12]. The mean ONSD in our cohort (**5.52 ± 0.18 mm**) corresponds well with this diagnostic threshold, confirming ultrasonography as a sensitive tool in detecting raised intracranial pressure. Cranial nerve involvement remains an infrequent but notable manifestation of IIH. **Vellingiri et al.** reported a rare case of isolated third nerve palsy in benign IIH [13]. In our series, **Case 3**, a 48-year-old male, exhibited right sixth cranial nerve palsy with bilateral papilloedema and **right transverse sinus hypoplasia**, representing the classic form of pressure-related abducens involvement due to its long intracranial course.

Neuropsychiatric manifestations are an emerging concern. **Sharma et al.** documented that 43% of IIH patients experience psychiatric symptoms, including anxiety and depression, negatively affecting quality of life [14]. Although none of our five patients demonstrated overt psychiatric disturbances, the prolonged visual disability observed in **Case 5** underscores the chronic psychosocial burden of untreated or late-diagnosed IIH, emphasizing the importance of patient counselling and regular follow-up [14].

Treatment remains predominantly medical. **Kalyvas et al.** conducted a systematic review of surgical treatments and concluded that while cerebrospinal fluid (CSF) diversion procedures and optic nerve sheath fenestration are valuable for refractory cases, medical therapy with acetazolamide remains the first-line approach [15]. Consistent with these findings, all five patients in our study were managed with **acetazolamide 250 mg twice daily**, showing stabilization of papilloedema without the need for surgical intervention.

The standardized treatment recommendations proposed in the **consensus guidelines by Mollan et al.** emphasize a stepwise management model beginning with weight reduction, sodium restriction, and carbonic anhydrase inhibitors, progressing to surgical options when visual deterioration persists [16]. Our management approach adhered closely to this protocol, with all patients demonstrating improvement in optic disc swelling and maintenance of stable visual acuity (ranging from **6/6 to 6/18**).

Ongoing monitoring is vital for long-term stability. **Chen and Mollan** highlighted that sustained intracranial pressure control depends on serial visual field analysis, imaging surveillance, and strict adherence to therapy [17]. In our cohort, all patients were followed up with scheduled perimetry and fundus documentation every 3–6 months to prevent optic atrophy and relapse.

Pathophysiologically, **Colman et al.** described the central role of venous sinus stenosis and altered cerebrospinal fluid absorption in IIH [18]. Our imaging data strongly support this mechanism, as all patients showed **bilateral or unilateral transverse sinus narrowing** on MRV, reinforcing venous outflow obstruction as a contributing factor.

Tan et al. systematically reviewed drug-induced intracranial hypertension and identified tetracyclines, retinoids, and growth hormone therapy as common triggers [19]. None of our patients reported exposure to

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such medications, supporting the idiopathic nature of their presentations.

The demographic and clinical profile in our cohort mirrors Indian observations. **Chavan and Joseph** reported that 78% of Indian IIH cases occurred in women aged 20–45 years, with headache and papilloedema as predominant symptoms [20]. Four of our five patients were women within this age range, three presenting with headache, confirming the established regional trend [20].

Zhou et al. emphasized that multimodal imaging—particularly MRI and MRV—has revolutionized IIH diagnosis by detecting optic nerve sheath distension, globe flattening, and venous sinus stenosis [21]. These findings parallel our observations, where combined MRI and MRV established the diagnosis in all five cases, underscoring the diagnostic reliability of integrated imaging.

Pregnancy and postpartum states are recognized risk factors for IIH. **Mathew et al.** described postpartum IIH presenting primarily as severe headache with preserved visual acuity [22]. This closely parallels **Case 1**, a 29-year-old woman on the 16th postpartum day who exhibited grade 4 papilloedema with preserved vision (6/6 right eye, 6/9 left eye). The imaging evidence of empty sella and left transverse sinus hypoplasia further supports the hemodynamic predisposition to postpartum IIH.

Long-term visual outcomes depend on timely diagnosis. **Baheti et al.** found that 72% of IIH patients maintained stable vision with acetazolamide therapy, while 8% progressed to visual field loss over five years [23]. Our patients demonstrated stabilization without progression during follow-up, aligning with these results.

Datta et al. reported cases of IIH developing after levothyroxine replacement in hypothyroid individuals, linking hormonal replacement and altered CSF dynamics [24]. This finding is relevant to **Case 1**, who was on regular thyroxine therapy, although no temporal relationship was identified, emphasizing the need for vigilance in such patients.

Finally, regional data from **Kumar et al.** documented that 90% of IIH patients from an Indian tertiary center exhibited optic disc edema and that MRV revealed transverse sinus narrowing in 86% [25]. These proportions closely match our findings, where **100% of cases demonstrated papilloedema and 100% had sinus hypoplasia or narrowing**, confirming comparable disease patterns in the Indian population.

Limitations and Recommendations

The present case series, though illustrative, is limited by its **small sample size** and the **single-center design**, which may not fully capture the regional epidemiological variability of idiopathic intracranial hypertension (IIH). Quantitative intracranial pressure measurements through lumbar puncture were not uniformly available, restricting direct correlation between radiological and cerebrospinal fluid pressure parameters. Moreover, **long-term visual field follow-up data** beyond the initial stabilization period were not included, limiting assessment of delayed visual outcomes or recurrence risk. Despite these limitations, the detailed clinical–radiological correlation provides valuable insights into the diagnostic performance of **non-invasive modalities**, particularly optic nerve sheath diameter assessment and venous sinus imaging. Future research should focus on **larger multicentric prospective studies** integrating neuroimaging, optical coherence tomography, and intracranial pressure monitoring to establish standardized diagnostic thresholds. Additionally, the incorporation of **neuropsychiatric evaluation and quality-of-life assessment** may broaden understanding of the disease burden. The study emphasizes that **early diagnosis through multimodal imaging**, followed by consistent visual surveillance, remains the cornerstone for preventing permanent visual disability in patients with IIH.

Conclusion

This case series reinforces the diagnostic and clinical significance of **multimodal imaging** in identifying and managing idiopathic intracranial hypertension (IIH). Across all five patients, characteristic features such as **bilateral papilloedema, increased optic nerve sheath diameter**, and **transverse sinus hypoplasia** were consistently demonstrated, highlighting the reliability of integrating **B-scan ultrasonography, magnetic resonance imaging**, and **magnetic resonance venography** in routine evaluation. The predominance of young and middle-aged females, including a **postpartum patient**, aligns with established global and Indian epidemiological trends, while the inclusion of a **male patient with abducens nerve palsy** emphasizes the condition's clinical variability.

All patients responded favorably to **acetazolamide therapy** with no progression of visual loss, reaffirming that early medical intervention and structured follow-up can prevent irreversible optic nerve damage. The observed correlation between **optic nerve sheath diameter** and imaging abnormalities underscores the

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diagnostic value of non-invasive modalities in resource-limited settings.

This study highlights that **timely recognition, comprehensive imaging, and multidisciplinary management** are essential to improving visual outcomes in IIH. Future multicentric prospective studies incorporating **quantitative imaging markers** and **long-term visual field monitoring** are warranted to refine diagnostic precision and prognostic assessment in this complex neuro-ophthalmic disorder.

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