

# Isolated Contralateral Mydriasis following Traumatic Intraparenchymal Hematoma: A Case Report

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## Abstract

Pupillary dilation is a localizing sign for ipsilateral intracranial space occupying lesion with uncal herniation. However, this may not always be true and further evaluation may be needed before localizing a lesion in case of unilateral mydriasis. There is limited literature supporting the occurrence of isolated contralateral pupillary dilation in traumatic intraparenchymal hematoma. We report a case of pupillary dilation on the contralateral side in a patient with temporal hematoma following traumatic brain injury. The available literature is reviewed and possible mechanisms discussed. The patient presented after 5 hours of road traffic accident with temporal contusion. Emergency craniotomy was done and contusion evacuated. The patient recovered well, but mydriasis persisted. Unilateral fixed dilated pupil might act as a false localizing sign in patients with supratentorial intra-axial lesion. Physicians managing critically ill neurologic and neurosurgical patients must be aware of such an occurrence.

## Keywords

- ▶ mydriasis
- ▶ false localizing sign
- ▶ traumatic brain injury
- ▶ temporal hematoma
- ▶ uncal herniation

Pupillary dilation has long been considered as a definitive localizing sign for ipsilateral intracranial space occupying lesion with uncal herniation. However, literature suggests that it may not always be true, especially in extra-axial lesions.<sup>1,2</sup> Here, we report a case of unilateral fixed, dilated pupil on the side contralateral to traumatic temporal intraparenchymal hematoma. The case report, available literature, and possible mechanisms are discussed.

## Case Report

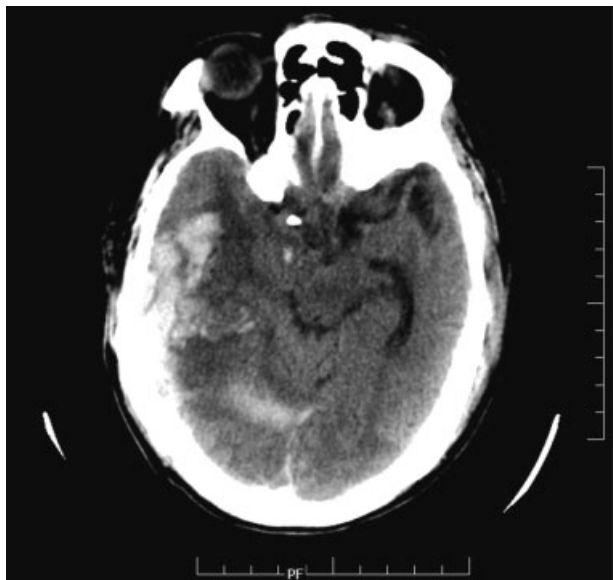
A 58-year-old man, with no previous surgical or medical illness, presented to the emergency department 5 hours following a road traffic accident, under the influence of alcohol. On examination, he was hemodynamically stable; Glasgow Coma Scale (GCS) score was 9/15 (E<sub>2</sub>M<sub>5</sub>V<sub>2</sub>) with

left hemiparesis. His left pupil was dilated and not reacting to light and the right pupil was mid-dilated and briskly reacting to light. There were no associated injuries. Because of left pupillary dilation and left sided hemiparesis, *Kernohan's notch* phenomenon was suspected and pathology/lesion was clinically localized to the left side. An urgent noncontrast computed tomography (CT) of the head was obtained, which surprisingly revealed a large contusion in the **right temporal** region with midline shift to left and uncal herniation (→ **Fig. 1**). He was taken up for emergency craniotomy and hematoma was evacuated. The patient recovered well and was discharged to a rehabilitation hospital with a GCS of 13/15 (E<sub>3</sub>M<sub>6</sub>V<sub>4</sub>) and no motor weakness. However, mydriasis of left pupil persisted till discharge.

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**Fig. 1** Noncontrast CT of the brain (axial view) showing right temporal hematoma with uncal herniation.

## Discussion

In spite of the phenomenal recent advances in neuroimaging, clinical examination remains invaluable in localizing the lesion in neurologic patients. However, one of the pitfalls in clinical examination, especially in an unconscious patient, is the “false localizing signs.”<sup>3</sup> This refers to incoherence between the prediction of the site of lesion based on clinical signs and anatomical knowledge, and the actual location of the lesion. Although many such false localizing signs are known in neurology, it is more or less an unwritten rule that unilateral mydriasis, the so-called “Hutchinson’s pupil,” indicates mass effect on the ipsilateral oculomotor nerve. This is most commonly due to herniation of the uncus secondary to a supratentorial space-occupying lesion—*transtentorial herniation*. It is widely accepted that the reason for ipsilateral mydriasis is compression on the parasympathetic fibers of the oculomotor nerve by the posterior cerebral artery (PCA). With further herniation, the opposite pupil also gets involved in the same manner.

Another phenomenon that has been described in transtentorial herniation is “*Kernohan’s notch*.” Here the contralateral cerebral peduncle gets compressed against the tentorial notch, causing hemiparesis on the same side as that of the lesion. It is one of the popularly recognized false localizing signs and hence hemiparesis is considered inferior to pupillary dilation for lesion localization.

However, the reliability of pupillary dilation as a localizing sign has been questioned by reports of contralateral mydriasis in space-occupying lesions. Browder<sup>1</sup> reported that in 38 out of 289 cases of subdural hematoma, the contralateral pupil was larger than the ipsilateral pupil. Pevehouse et al<sup>4</sup> reported similar findings in 9 out of 389 cases. Gassel<sup>2</sup> studied 250 patients with meningioma and found 12 cases with contralateral pupillary

dilation. Also, it has been shown that 20% of the general population has anisocoria without any etiology.<sup>5</sup>

It is clear from these reports that contralateral mydriasis is not unexpected in **extra-axial lesions**. However, till now only two such cases have been reported when the pathology is intraparenchymal. In both these instances,<sup>6,7</sup> pupillary dilation was secondary to spontaneous frontal hematomas with transtentorial herniation. However, it has been seen in experimental models that frontal hematomas can produce bilateral transtentorial herniation,<sup>8</sup> even when the lesion is restricted to one side of the midline. This may explain the dilation of contralateral pupil in these cases.

Many mechanisms have been proposed for occurrence of contralateral mydriasis.<sup>6,9</sup> They include (1) agenesis of ipsilateral PCA, hence sparing the ipsilateral oculomotor nerve, (2) associated rotation of the midbrain in the coronal plane such that the ipsilateral nerve is slackened and contralateral nerve is stretched, causing ischemia of the opposite oculomotor nerve, and (3) direct pressure on the opposite oculomotor nerve by an abnormally prominent tentorial notch. However, there is no substantial radiologic evidence to back these postulated mechanisms. In our case, because of financial constraints, CT angiography could not be done to study the anatomy of the circle of Willis.

## Conclusion

In this case report, we have shown that in a patient with supratentorial intra-axial lesion, unilateral fixed dilated pupil may act as a false localizing sign. The exact mechanism is not known. Physicians managing critically ill neurologic and neurosurgical patients must be aware of such an occurrence.

### Conflicts of Interest

None.

### Funding

None.

### Consent for Publication

Written informed consent has been taken from the patient for publication of details as case report.

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