

Ophthalmologic aspects of subdural hematoma

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The patients included in this report were studied at University Hospitals of Cleveland.

Jonathan Hutchinson,¹ in 1867, described ipsilateral fixed and dilated pupil in a patient with subdural hematoma (SDH). At that time SDH was called "arachnoid hematoma." Since then, numerous ophthalmologic abnormalities in patients with SDH have been reported. The pathogenesis of ophthalmologic signs in an expanding lesion in a hemisphere was more clearly understood in 1920 when Adolph Meyer² reported on the importance of pathologic findings in cerebral herniation. There is, however, no complete agreement among authors concerning the reliability of ophthalmologic signs in predicting the laterality of unilateral SDH. In 1960 Pevehouse et al³ studied the ophthalmologic aspects of SDH based upon a large number of patients. These authors concluded that pupillary dilatation, abducens palsy, and homonymous hemianopsia (HHA), if present, assisted in lateralizing SDH more than 90% of the time. HHA was noted in only 3% of patients in that study.

In this retrospective study of SDH, the ophthalmologic signs were often observed.⁴ It was also found that many confusing elements in

diagnosing and lateralizing SDH were often based upon the interpretation of ophthalmologic findings. Because of this, it was decided to analyze the data derived from the neuroophthalmologic examination in 115 consecutive patients with SDH. This was done in an effort to clarify the diagnostic reliability, prognostic worth, and pathologic correlation of abnormal findings related to vision, pupillary function, lid posture, and ocular motility in patients with SDH.

Seventy-one patients in this series had abnormal ophthalmologic signs at the time of hospital admission. Additional oculovisual signs subsequently developed in 13. Ophthalmologic signs developed during the hospital course in five patients who had normal ophthalmologic examinations on admission and in two whose eye findings were not initially recorded. Seventy-eight patients, 68% of the entire series of patients with SDH, had abnormal ophthalmologic findings. Abnormalities of oculovisual function were the most frequent neurologic abnormalities in this series, with the exception of disorders of mental status. Ophthalmologic signs occurred in varying frequencies, depending on the type of SDH. The frequencies of the major ophthalmologic abnormalities are summarized in *Table 1*.

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Visual field defects

Visual fields were tested in more than 50% of the patients and 16 patients were hemianoptic. Patients whose visual fields were not tested were often comatose or severely stuporous and, hence, could not be examined in this regard. Two patients were excluded from analysis because of a history of HHA. The frequency of HHA in acute SDH may be artificially high because of the small number of patients with acute SDH whose visual fields could be examined. Most of the hemianoptic field defects were present in patients with chronic SDH. Of 13 patients with unilateral SDH, 9 had contralateral and 4 had ipsilateral visual field defects relative to the side of the SDH. Therefore, 30% of the patients with HHA were on the "wrong side" if one regards the abnormal visual field phenomenon as a result of direct cortical impairment. HHA was frequently associated with other hemispheric signs; hemiparesis was common and hemihypesthesia was not uncommon. These findings were always ipsilateral to the hemianopsia regardless of the laterality of SDH. Three patients

Table 1. Frequency of major ophthalmologic findings in SDH

	Acute		Subacute or undetermined		Chronic		Total	
	No.	%	No.	%	No.	%	No.	%
HHA	2/3	66	2/5	40	12/54	22	16/59	27
Papilledema	1/26	4	1/9	11	8/66	12	10/101	10
Anisocoria	20/36	56	2/12	17	16/67	24	38/115	33
Third nerve palsy	6/18	33	3/8	38	4/61	5	13/87	15
Abducens palsy	2/18	11	1/8	12	2/61	3	5/87	6

The percentage is shown by patients with sign/examined patients.

with left hemispheric SDH were aphasic and had right HHA and other hemispheric signs.

Papilledema

Nine patients had papilledema on admission. In one patient it developed during the hospital course. The frequency of papilledema was one in every 10 of the 101 patients examined specifically for this abnormality. Papilledema has been said to occur frequently in patients with chronic SDH,⁵ but in our study the overall frequency was only 12% in patients with chronic SDH (*Table 2*).

Pupillary abnormalities

Examination of the pupils was performed in all patients. Twenty-six patients had significant anisocoria on admission, and in 12 it developed after admission. Therefore, one of three patients with SDH had anisocoria. Of the patients with unilateral lesions, 81% of the hematomas were ipsilateral and 19% were contralateral to the side of the dilated pupil. In six patients with unilateral pupillary dilatation, SDH was bilateral. The prevalence of anisocoria was highest in the patient with acute SDH.

At the time of the initial neurologic examination, the observation of pupillomotor responses in patients with anisocoria could be used to predict the type of SDH. If pupillary re-

sponses were absent either in the dilated pupil or in both pupils, SDH was most often the acute type; if pupillary responses were normal in the presence of anisocoria, the SDH responsible for it usually was the chronic type. These statements were not applicable when anisocoria developed in the course of in-hospital observation.

Horner's syndrome

The series included two patients with Horner's syndrome. The first, a 33-year-old woman, was brought to the emergency ward at night. She had a right-sided Horner's syndrome, right hemiparesis, and bilateral extensor plantar responses. On the following day, her right pupil became enlarged and a right external oculomotor palsy subsequently developed. Although the right-sided oculomotor palsy improved after immediate evacuation of a right-sided SDH, a recurrence of the clot caused neurologic impairment and the patient required custodial care.

The second instance of Horner's syndrome occurred in a 36-year-old man with a history of intermittent headaches. Right-sided Horner's syndrome and mild left hemiparesis were found at admission. Within a day, the Horner's syndrome spontaneously disappeared. His signs and symptoms abated after surgical evacuation of a chronic right-sided SDH. In the first case, the Horner's syndrome might have signalled impending uncal herniation because it preceded unequivocal uncal herniation on the same side. Pupillary constriction shortly preceding pupillary dilatation on the side of "pressure" was observed by Kocher in 1901,⁶ and its clinical importance was stressed by

Table 2. Inaccuracy of ophthalmologic signs in localizing SDH

HHA	1:3
Abducens palsy	1:4
Pupillary dilatation	1:5
Hemiparesis	1:6
Focal seizure	1:9

Foley⁷ in 1956 as the earliest sign of impending uncal herniation. The combination of constricted pupil and ptosis, however, has not generally been considered a sign of impending uncal herniation. The presence of Horner's syndrome in SDH is unusual and can be misleading; this possibility should be kept in mind. We can offer no adequate explanation for its presence.

Extraocular movements

Extraocular movements were examined in 87 patients (*Table 1*); 10 of the 87 had external oculomotor palsy, and three had isolated ptosis (two patients with Horner's syndrome are excluded); five patients had abducens palsies. In our study, the side of ophthalmoplegia was of limited use in correctly lateralizing SDH. Conjugate ocular deviation was observed in nine patients and often associated with HHA. Other abnormal ocular signs included nine instances of abnormal oculocephalic phenomenon, skew deviation in a small number of patients, and one instance of conjugate upward gaze paresis.

Dependability of ophthalmologic signs

The ophthalmologic signs were inaccurate in localizing unilateral SDH (*Table 2*). SDH was found on the "wrong side" to HHA in a ratio of 1:3, to abducens palsy in a ratio of 1:4, and to dilated pupil in a ratio of 1:5. Among several focal, neurologic signs, focal seizure was found to be the most reliable in lateralizing SDH correctly. If the diagnostic use of ophthalmologic abnormalities in lateralizing SDH was limited, the prognostic value of oculovisual abnormali-

ties was not. The simple presence of ophthalmologic signs was related to an unfavorable prognosis in patients with SDH. Grave functional impairment and death occurred more often in patients with ophthalmologic signs in both acute and chronic SDH than in patients without such signs. On the contrary, patients in our series without ophthalmologic signs more frequently had full functional recovery. Among all the ophthalmologic signs, anisocoria and HHA were significantly related to poor outcome in patients with SDH.

Postmortem examinations were done in 10 patients who had appropriate signs of uncal herniation during life. The autopsies proved six instances of uncal herniation on the side predicted clinically and two were found on the opposite side. In two patients there was no evidence of uncal herniation at autopsy to explain the *in vivo* oculovisual signs. Five other cases of uncal herniation were found at autopsy, but in these patients no correlative clinical signs consistent with uncal herniation were found during life. Five patients with presenting symptoms of HHA had postmortem examinations. Autopsy confirmed only two cases of cerebral infarct in the region of an appropriate posterior cerebral artery and in which compartmental shift and arterial compression could be invoked as a causative mechanism.

Summary

Ophthalmologic abnormalities were the most frequently encountered abnormal physical finding in the neurologic examination of patients with SDH with the exception of mental status aberrations.

Contrary to general belief, visual

field defects were frequently present in patients with SDH. The presence of HHA cannot exclude SDH on a clinical basis. The reliability of this particular finding in unilateral SDH was found to be limited in terms of establishing disease laterality. Papilledema was found in only 10% of patients.

Anisocoria was the most frequent abnormality among the various ophthalmologic signs. Its value in lateralizing unilateral SDH was correct in 80% of instances, making it diagnostically the most definitive of the ophthalmologic signs. Other extraocular palsies had a more limited value. The presence of ophthalmologic signs was correlated with poor prognosis. Among the various ophthalmologic abnormalities, anisocoria and visual field defects were significantly related to death or to grave, permanent disability.

Acknowledgment

We thank Dr. Joseph M. Foley, Chair-

man, Division of Neurology, University Hospitals of Cleveland, for his support of this study.

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