

Quadrantic Homonymous Defect

—A Case Report—

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INTRODUCTION

The visual tract which follows a long pathway in the skull develops characteristic visual field defects at various regions along its course for various causes due to its length. Furthermore, a checkup on this kind of visual field defect makes local diagnosis of intracranial lesion possible to some extent.

However, there are few cases in which only the visual tract is involved¹⁻³⁾. The temporal lobe, parietal lobe, occipital lobe and a part of the thalamus are also usually impaired, which, together with focal signs at respective regions, makes it difficult to take clinical measurement of the visual field defect in many instances. Anatomical details of the visual tract reportedly remain unaccounted for even today.

In the present report, one case of quadrantic homonymous defect is introduced, in which observations were made on the intracranial lesion by a CT scan.

CASE REPORT

Male, 50 years of age.

Family history: No hereditary history of this condition.

Past history: From 20 years of age he has been drinking heavily. Partly because of this, and partly because of his poor work performance, he has changed jobs about 10 times.

At approximately 20 years of age, he contracted syphilis, and received pyretotherapy. At age 37, he was seen at the Psychiatric Clinic of the Yamaguchi University for treatment of chronic alcoholism, and was

hospitalized for six months. Soon after his discharge, he started drinking again. Eccentric behavior, and irritative mood changes appeared, and he received two, six months hospital treatment.

Present illness: Soon after he turned 49, the patient began complaining of occipital pain, and received a medical examination at the Yamaguchi University, Psychiatric Clinic. There he was diagnosed as having right greater occipital neuralgia and spondylosis deformans at the fifth cervical vertebra.

The blood test for syphilis was positive (1+) and the cerebrospinal fluid test for syphilis, negative. Thereafter he received orthopedic treatment.

One night during that year, he suddenly became restless and uttered some meaningless words, but remained in bed. From the following morning on his orientation toward time, space, and people around him began to deteriorate, and he developed a partial paralysis on the right side of his body.

Afterward, he was administered conservative therapy, and his symptoms slightly improved. However, depressive moods and suicidal thoughts arose, and he received another medical examination at the Yamaguchi University, Psychiatric Clinic and was diagnosed as having quadrantic hemianopsia.

Neurological findings: The right palpebral fissure was narrow, the right corner of his mouth drooped, and the right nasolabial sulcus was shallow. The tongue and pendulous palate were not remarkable. The

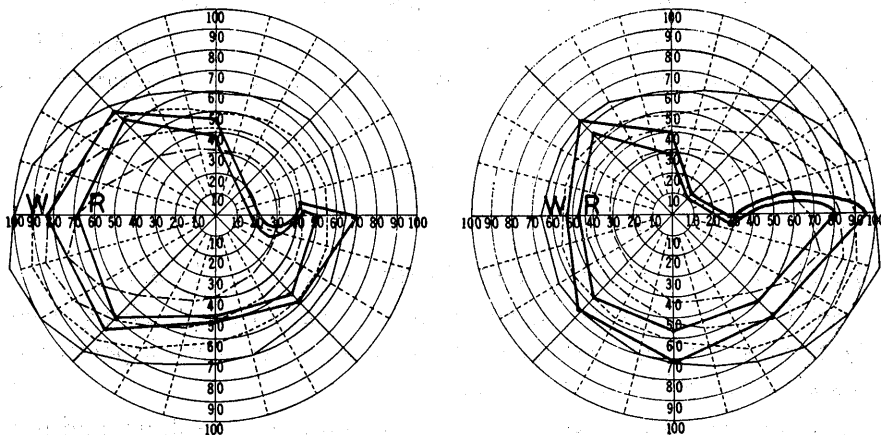


Fig. 1. Right upper quadrantic hemianopsia with macular sparing
The letters of W and R for white and red respectively.

right pupil was more miotic than the left, and reacted sluggishly to light. Ocular movement was normal. Vision on the right was 0.6 (1.2), and on the left 0.5 (1.2).

Aside from tortuous venules, the fundus was normal.

Right upper quadrantic hemianopsia with macular sparing was noted (Fig. 1), and he was unable to knit his left brow.

A coarse tremor of the upper extremity was also noted. Physiological tendon reflexes of the right lower extremity was depressed. There was both paresis and mild superficial hypesthesia in the right extremities. Pathological reflexes were negative.

Psychiatric symptoms: The patient's consciousness was clear, but during consultation, his sitting posture was characterised by a marked leaning to one side. In reply to questions on his personal history, his voice was flat, soft spoken, and perseverant. His understanding was somewhat poor, and his feelings unemotional. Slow mental reactions and a mild indifference were noted.

Physical findings: The heart and lungs were normal, and the blood pressure reading was 136/86. The abdomen was slightly distended, while the liver was palpable, 2 fingerbreadths wide, and slightly firm. Liver function tests showed chronic disturbance of the liver parenchyma and hypercholesterolemia, but results of the renal function tests and peripheral blood tests were within the normal limits.

Neurophysiological test: Oral speech, spontaneous speech and understanding of speech were good, and no aphasia was observed.

Written language: As to his understanding of written words, he could quickly read kanji (Chinese character), but his comprehension of katakana (Japanese phonetic alphabet) was slow, and reading or auditory stimulation prompted his understanding.

He could understand portions of sentences, but found it difficult to understand complete ones. When reading aloud, he would pronounce each individual kana letter but could not separate the sounds as words, only distinct sounds.

His comprehension of material read to him by a doctor was poor unless he was allowed to spell out the words in the palm of his hand with a finger. Spontaneous writing and dictation were difficult due to his cumbersome pertinacity.

As for his copying of written material, he required much time because he did it by first reading it aloud, and then spelling it out with his finger, and then writing on the paper.

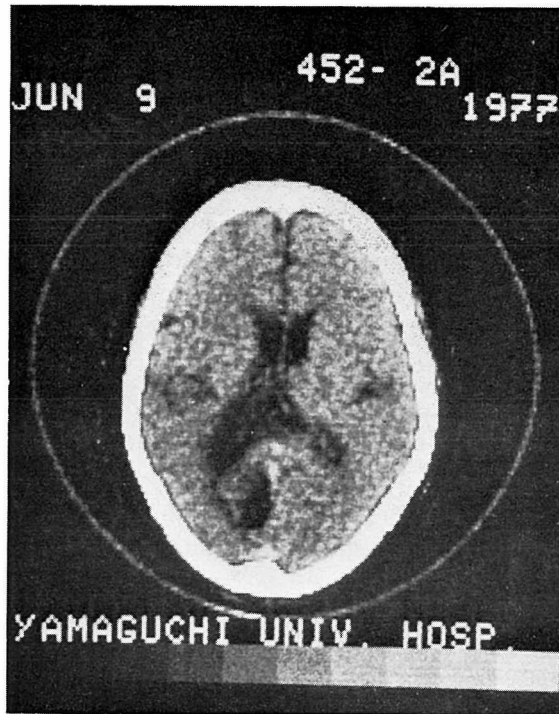


Fig. 2. Left occipital area of low Vat corresponding to left posterior cerebral artery distribution.

Neither agnosia, nor apraxia was noted.

WAIS: verbal test, IQ 86, performance test, IQ 68.

In the EEG, alpha rhythms appeared less often in the left hemisphere, were conspicuous. Due to hyperventilation, irregular slow elements appeared similar to the burst pattern followed by the appearance of small spikes in the right hemisphere.

Distinctive hypersensibility photic stimulation was not observed.

CT scan: An extensive lesion of low density extending from the nuclei laterales thalami through the pulvinar to the sulcus calcarinus was observed in the left hemisphere, and it was communicated with the paracele (Fig. 2).

DISCUSSION

There is no consensus of opinion on the role of the visual tract that runs from the optic tract through the lateral geniculate body, and optic radiation, to the visual center of the occipital lobe, in particular, the

relationship of fibers that constitute the anterior radiation and various parts of the retina.

Let us mention the points of agreement in opinion as to the relationship between the direction of the optic radiation and its constituent element, the visual field. Fibers playing a part in the central vision occupy the outside of the optic radiation, and go from a spread at position to converge in the center of the anterior radiation, while fibers concerned with the peripheral vision lie inside the optic radiation and converge in the upper part and lower part (Spalding^{4,5}).

The optic radiation arising from the lateral geniculate body passes through the internal capsule and splits into upper and lower fiber groups. The upper group passes above the temporal angle of the paracele, while the lower fiber group comes out forward once, turns around along the outer wall of the temporal angle of the paracele and goes backward (Meyer's loop), and the two rejoin in front of the visual center of the occipital lobe.

Since the resection from the tip of the temporal lobe posteriorly 6cm, hardly causes visual field defects in cases of temporal lobe epilepsy, the anterior edge of the so-called Meyer's loop is thought to lie more posteriorly^{6,7}. In this region, the fiber concerned with the macula lutea is believed to run inside the optic radiation (Van Buren et al.⁸), but opinions are varied as to the relationship in the cortical center (Area 17 of Brodman) (Walsh et al.³).

The blood supply to the optic nerve is exclusively through the ophthalmic artery, but the optic tract receives its supply of blood mainly from the anterior chorioid plexus, and the lateral geniculate body, from the anterior and posterior chorioid plexus. The part corresponding to the macula lutea also receives its blood supply from these two arteries. The anterior half of the optic radiation receives blood from the anterior chorioid plexus, and posteriorly, the upper half is supplied by the middle cerebral artery and the lower half mainly by the posterior cerebral artery.

The convexity of the cortical center receives its supply of nutrients from the middle cerebral artery, and the medial aspect of the hemisphere, from the posterior cerebral artery. These two arteries are connected to each other at the periphery. However, it is known that there is a wide individual difference in the vascular distribution of this area.

In the second half of the optic radiation, vascular disturbance is liable to develop frequently. In this case, congruous defects of the visual field become apparent when secondary changes such as cerebral edema

have disappeared. Usually many days after the onset of the disorder (Kajikawa et al.⁹⁾).

In the case of visual field defects due to displacing lesions, consideration must be given to accompanying edema and the infiltration of tumors. In many cases, the visual field defect is not necessarily consistent with the location of the displacing lesion.

Quadrantic homonymous defects may develop in whatever area is affected; from the optic tract to the cortical center. However, congruous quadrantic homonymous hemianopsia certainly stems from the impairment of the optic radiation or cortical center, while the quadrantic defect in the upper part of the visual field arises from a lesion of the temporal or parietal lobe (Wendland et al.¹⁰⁾).

Macular sparing may develop in cases in which the fiber group, or cell group, corresponding to the retinal center remains unaffected, even if the group corresponding to the peripheral area of the retina is impaired. Clinically, macular sparing is caused by suprageniculate impairment. In the case of temporal lesions changes take place all over the optic radiation and the incidence of macular sparing is low⁹⁾.

In the present case, impairment of cerebral parenchyma due to the occlusion of the posterior cerebral artery is suspected judging from the clinical course, and also results of various examinations performed later.

Findings of the CT scan show that the impaired area is rather extensive, and it is somewhat difficult to determine which is responsible for the lesion of the quadrantic hemianopsia; the cortex of the calcarine sulcus, or the optic radiation in the occipital area. This difficulty is due to the impartiality of the lesion to develop with either change.

Occlusion of the right posterior cerebral artery is considered to develop in a region close to its root. This fully accounts for the mixture of syndromes of the thalamus, brain stem, and cerebellar symptoms, in addition to the occipital lobe syndrome presented by this case.

The posterior communicating artery branches out from the posterior cerebral artery. Occlusion localized in this area gives rise to contralateral homonymous hemianopsia, or lower quadrantic hemianopsia. In this respect, this case is slightly different.

When sensory disturbances and mild cerebellar symptoms develop, they are considered symptoms of the thalamus fed by the posterior cerebral artery. In this case, however, no typical Dejerine-Roussy syndrome is observed.

Paresis of the right upper and lower limbs, and hypesthesia on one

side are noted as symptoms of ventro-lateral thalamic nucleus. Also, lesions in the hemisphere are considered responsible for optic agnosia and aphasia, as observed in this case.

There is no established theory as to the direction in which the visual fiber of the optic radiation runs. In studying the case of brain tumor, therefore, axis deviation of the brain, concomitant edema and infiltration of the tumor itself should be taken into consideration, and the border of the lesions cannot be delineated in many cases. Therefore caution must be exercised in examining the correlation between the localization of lesion, and the visual field defect arising from it.

In this respect, a study on the relationship between the features of visual field defects and the localization of lesions will be of great significance in cases of occlusion of the posterior cerebral artery in which the border of the lesions is defined clearly, as in this case.

We would like to stress that the CT scan can be a useful means in determining the localization and scope of a lesion in such a case.

SUMMARY

A case of a man, aged 50, who developed right upper quadrantic hemianopsia has been reported.

Occlusion developing in a region near the root of the right posterior cerebral artery is considered to be accountable for his condition. The lesion is considerable, and extends from the depth of the temporal lobe to the white matter and cortex of the occipital lobe, including a part of the left nuclei laterales thalami and pulvinar.

Clinical symptoms and localization of the lesion of that case are considered very suggestive at present, when anatomical elucidation of the visual tract, particularly the optic radiation has not as yet been fully made. Furthermore, usefulness of the CT scan in elucidating such a case has been proved.

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