

Significance of identifying the location and nature of lesion in imaging diagnosis of diplopia

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Abstract: Objective: Identifying the lesion location and nature and selecting appropriate imaging methods for early diagnosis of diplopia and treatment. Methods: The data of 3 patients with diplopia were collected, including basic information and clinical features, anatomical location and imaging examination, treatment and effect. Results: Three cases of diplopia were diagnosed by head CT and MRI. Based on gender, age, symptoms, signs and disease development, the location and nature of the lesions were inferred. It had an important impact on imaging diagnosis, treatment and prognosis. Conclusion: Identifying the location and nature of lesions can guide image selection for diagnosis of diplopia. It is helpful for early treatment and prognosis.

Keywords: Location; Nature, Imaging diagnosis; Diplopia.

1. Foreword

Diplopia is a common symptom of neurological diseases. It is easy to miss and misdiagnose by relying on common head CT scan or one-time imaging examination. Identifying the location and nature of lesions can guide the selection and monitoring of images, which can not only avoid missed diagnosis and misdiagnosis, but also facilitate early diagnosis and treatment.

2. Clinical data and methods

2.1. Basic information

The first patient was a 37-year-old female with recurrent headaches and dizziness, presented to the doctor 5 days after onset. The second patient, a 66-year-old female with no special medical history, presented to the doctor 2 months after onset. The third patient, a 73-year-old male with hypertension, diabetes, and thyroid disease, presented to the doctor 4 months after onset.

2.2. Diagnostic methods:

History included changes in clinical symptoms. Neurological examination revealed abnormal signs and identified the involved nerve. According to the possible lesion location and nature, select the appropriate image to assist the diagnosis.

2.3. Treatment and follow-up

The first patient received pulse therapy with methylprednisolone. The second patient underwent aneurysm surgery. The third patient was treated with glucocorticoids. Follow-up for changes in disease.

Table 1. Basic information

	Gender	Age	Medical history
1	Female	37 years old	Repeated headaches and dizziness
2	Female	66 years old	Nothing
3	Male	73 years old	Hypertension, diabetes, thyroid disease

Table 2. Changes in clinical symptoms

	First	Development	Last	Time
1	Dizziness	Numbness of left face	Diplopia	5 days
2	Diplopia	None	None	2 months
3	Diplopia	Left eye pain	Left forehead pain	4 months

Table 3. Neurological signs and Affected nerve

	Neurological signs	Affected nerve
1	Left facial hypoesthesia	Left trigeminal nerve
	Left peripheral facial palsy	Left facial nerve
2	Limited abduction of the left eye	Left abducens nerve
	Left eye abduction limitation	Left abducens nerve
3	Left eyelid drooping	Left abducens nerve
	Left eye fixation	Left oculomotor nerve
	Left pupil dilated	Left trochlear nerve

Table 4. Imaging and lesions

	Imaging	Location	Nature
1	Head MRI DWI and Enhancement	Left bridge arm	Demyelinating disease
2	Head MRI Head CTA	Left internal carotid artery siphon	Giant aneurysm
3	Head MRINasopharyngeal MRI	Occipital clivus and sella	Placeholder

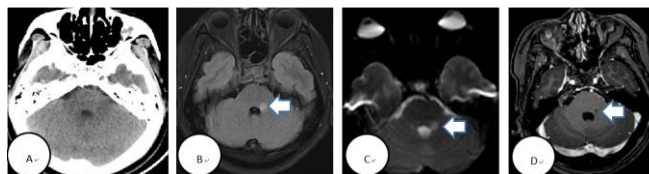


Figure 1 (Case 1) (white arrow): A: Head CT was normal. B: Head MRI showed round lesion with long T1, long T2 and T2-flair high signal in left bridge arm. C: Head DWI showed no obvious limited diffusion. D: Head MRI showed annular enhancement.

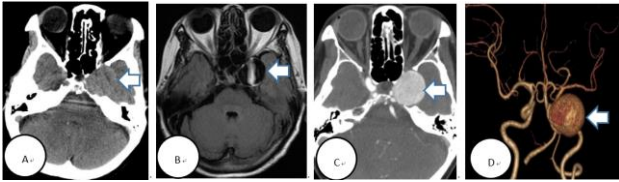


Figure 2. (Case 2) (white arrow): A: Head CT scan showed abnormal lesion in the left cavernous sinus. B: Head MRI showed round lesion with long T1 and short T2 signals, the size was about 25*24mm, the internal signal was uneven with short T1 and long T2, the sella was compressed and displaced, the left lateral rectus muscle decreased in size (atrophy). C, D: Head CTA showed a giant aneurysm in the siphon of the left internal carotid artery.

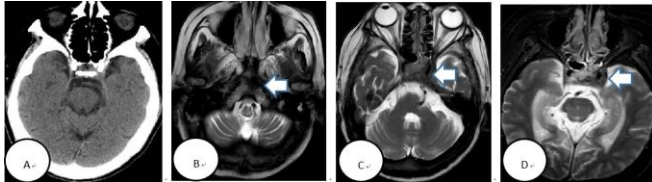


Figure 3. (Case 3) (white arrow): A: Head CT (in the early stage of the disease) was normal. B, C, D: MRI of the head and nasopharynx (in the advanced stage) showed bone destruction of the clivus. Irregular iso-T1 and mixed T2 signals with unclear boundaries in the occipital clivus and sella area, the floor of the saddle and the bilateral cavernous sinuses were involved upward, and the left sphenoid sinus and left retro nasal foramen were involved anteriorly. Normal pituitary structure was not shown.

3. Results

3.1. Basic information and clinical features

All 3 patients had diplopia. Past medical history was different. The first patient was a young and middle-aged woman with acute onset, rapid progression, and other cranial nerve injuries. The second patient was an elderly woman with a slow onset. The third patient was an elderly male with a slow onset, progressive development, other cranial nerve damage, headache and eye pain. See Table 1, Table 2 and Table 3.

3.2. Diagnosis of diplopia

In the first patient, the left lateral cranial nerve was injured in a short period of time, head CT showed no abnormality, and head MRI showed demyelination of the left pontine arm. In the second patient, the left abducens nerve was involved and gradually worsened, head CT showed abnormal lesions of the left cavernous sinus, MRI and CTA of the head showed a siphon aneurysm of the left internal carotid artery. In the third patient, the left cranial nerve was gradually damaged, head CT showed no abnormality in the early stage and MRI of the head and nasopharynx showed the occipital clivus and sella space-occupying lesions in the late stage. See Table 3, Table 4, Figure 1, Figure 2, Figure 3.

3.3. Treatment and effects

The first patient's condition improved after treatment with glucocorticoids, and head MRI showed that the lesion shrunk without enhancement. The second patient had no intracranial hemorrhage after surgical treatment of the aneurysm. In the third patient, some symptoms improved after glucocorticoid treatment in the early stage of the disease, but as the disease progressed, the anti-inflammatory treatment was ineffective. The third patient refused to use radiotherapy.

4. Conclusion

4.1. Brain demyelinating diseases

The first patient was a young and middle-aged woman who had recurrent headaches and dizziness, and was admitted to the hospital with recurrent dizziness. The onset was acute and the progression was rapid. In a short period of time, the left abducens nerve, facial nerve, and trigeminal nerve were damaged. Based on anatomy, the lesion was localized in the left bridge arm. According to age, gender and disease development, the nature of the lesion may be cerebrovascular disease. [1] or demyelinating disease [3][4], etc.

Head CT showed no obvious abnormality. Head MRI showed abnormal signal in the left bridge arm. Head DWI showed no obvious diffusion restriction, which does not support cerebral infarction [2]. Head MRI showed circular ring enhancement with clear borders, supporting demyelinating disease [3] [4]. The condition improved after methylprednisolone pulse therapy. Head MRI showed that the lesion became smaller and no enhancement appeared again.

Due to the transformation of some brainstem demyelinating lesions into multiple sclerosis or neuromyelitis Optica spectrum disorder [3][4], it is necessary to monitor changes of clinical manifestations and CNS imaging. Timely adjustment of diagnosis and treatment can help improve prognosis.

4.2. Aneurysm

The second patient was an elderly woman with no special medical history. She had progressive limited abduction of the left eye. There was no trauma and fever, no eye pain or headaches, no mild in the morning and severe in the evening. Based on anatomy, the lesion was localized in the left cavernous sinus region. According to age and disease development, the aneurysm remained to be identified.

Head CT, MRA, CTA and DSA have different sensitivities to aneurysms of different sizes [5]. Appropriate cerebral vascular imaging should be selected to detect aneurysms in the early stage, and timely surgical treatment should be performed to reduce the incidence of bleeding after aneurysm rupture [6].

Head CT of the second patient showed abnormal lesions in the left cavernous sinus. Head MRI and head CTA showed a large aneurysm in the siphon of the left internal carotid artery. After surgical treatment of the aneurysm, the patient had no intracranial hemorrhage.

4.3. Intracranial space-occupying lesions

The third patient was an elderly male with previous hypertension, diabetes, and thyroid disease. The onset was slow and the left oculomotor nerve was damaged. As the disease progressed, left side headache and eye pain gradually appeared. Anti-inflammatory treatment was ineffective. Based on anatomy, the lesion was localized in the left cavernous sinus area. According to age and disease development, the space-occupying disease remained to be identified.

Elderly patients need to identify tumor-related neuromuscular disease [7], especially in patients with progressive clinical symptoms and signs. Although no early imaging abnormalities were detected, dynamic examination of head MRI is still required.

The third patient's early head CT and MRI showed no obvious abnormality. Diabetes and thyroid-related eye

disease were initially diagnosed, and some symptoms improved after glucocorticoid treatment. As the disease progresses, the scope of nerve damage expanded, and anti-inflammatory treatment was ineffective. A re-examination of the head MRI revealed abnormal lesions in the occipital clivus and sellar region [8].

5. Concluding remark

Pay attention to age and possible related diseases, follow up disease changes, and master neurological signs. Depending on the possible location and nature of the lesion, different images are selected for diagnosis and monitoring. Early diagnosis and treatment of diplopia can help improve prognosis.

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