

[ CASE REPORT ]

## Monocular Oculomotor Nerve Disorder Manifesting as Cranial Neuropathy in Systemic Lupus Erythematosus

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### Abstract:

We herein report the case of a patient who developed peripheral neuropathy of the bilateral lower legs that later became complicated with isolated oculomotor nerve disorder and was finally diagnosed as systemic lupus erythematosus (SLE). Based on the findings for oculomotor nerve paralysis and contrast-enhanced magnetic resonance imaging findings for the oculomotor nerve in the prepontine cistern, the isolated oculomotor nerve disorder was considered to be a manifestation of peripheral neuropathy. This oculomotor nerve disorder may contribute to the diagnosis of SLE and can be effectively treated with steroid pulse therapy. Reports of SLE manifesting as isolated oculomotor nerve paralysis are rare.

**Key words:** oculomotor nerve paralysis, pupillary dilatation, blepharoptosis, ophthalmalgia, systemic lupus erythematosus, cranial neuropathy

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### Introduction

Systemic lupus erythematosus (SLE) is known to present as peripheral neuropathy, such as polyneuropathy, mononeuropathy, and cranial neuropathy. Cranial neuropathy is present in 7-12.7% of SLE patients with peripheral neuropathy (1, 2), and the diagnosis of unusual cranial neuropathy in some cases is difficult but important for obtaining an accurate SLE diagnosis. Isolated oculomotor nerve palsy is one type of cranial neuropathy seen with SLE (3). Peripheral neuropathy develops in 0.1% of patients during the period before SLE is diagnosed (1). In such cases, peripheral neuropathy, such as oculomotor nerve palsy, is difficult to diagnose and treat.

We herein report the case of a patient who developed peripheral neuropathy of the lower legs that later became complicated by isolated complete oculomotor nerve paralysis, which contributed to the final diagnosis of SLE as cranial neuropathy.

### Case Report

Beginning in 2015, a 61-year-old woman developed hypesthesia manifesting from the external side of the lower right leg to the right fourth and fifth toes. After several days, the muscular strength of the lower right leg decreased. After three months of walking with a cane and four months from the onset, the patient was hospitalized for the first time at our hospital. On hospitalization, the nearly symmetrical loss of sensation was evident in both legs, and muscle weakness and decreased tendon reflexes were apparent. She had a manual muscle testing score (out of a possible 5) of 5/5 for the iliopsoas, 5/5 for the quadriceps, 3/3 for the tibialis anterior, 3+/3 for the gastrocnemius, 2+/1 for the extensor hallucis longus, and 2+/1 for the flexor hallucis longus. The patient was unable to walk independently and used a wheelchair. In nerve conduction tests, the bilateral peroneal nerves, tibial nerves, and sural nerves were undetectable. The left sural nerve was biopsied. The densities of the large

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and small myelinated fibers were severely decreased. Myelin ovoids were frequently observed. No small myelinated fiber cluster, onion bulb, or vasculitis was observed. The teased-fiber method revealed numerous myelin ovoids with findings suggestive of severe axonal damage. Based on the subacute progressive clinical course and findings of axonal peripheral neuropathy, and given the possibility of immune-mediated neuropathy such as acute motor sensory axonal neuropathy, two courses of immunoglobulin therapy were administered; however, the effects were limited, and the gait disturbance persisted.

Six months after the onset, right eye pain suddenly manifested. The next day, the patient was unable to open her right eye, and she was hospitalized again. At that time, right eyelid ptosis was noted. Her eye movement was characterized by impaired adduction and upward and downward rotation. Her corrected visual acuity was normal. The right pupil was also dilated, and both the direct and indirect light reflexes had disappeared (Fig. 1A). These findings resulted in a diagnosis of right-eye oculomotor paralysis. Magnetic resonance imaging (MRI) of the head showed a contrast effect at the right oculomotor nerve in the prepontine cistern (Fig. 1C).

The present case met a number of Systemic Lupus International Collaborating Clinics criteria (4). These included neurological abnormalities in the form of peripheral and cranial nerve disorders as well as leukopenia and lymphopenia. Immunological tests also showed positive results for antinuclear antibodies, double-stranded DNA antibodies, hypocomplementemia, and a direct Coombs test. Systemic lupus erythematosus was diagnosed based on those findings. The patient had no organ damage except for peripheral neuropathy and nephropathy; a urinalysis showed albuminuria (135.2; normal range <30 mg/g·Cre), elevated N-acetyl- $\beta$ -D-glucosaminidase (NAG) (25.9; normal range <15.0 U/g·Cre), and elevated  $\beta$ -2 microglobulin (567; normal range <230  $\mu$ g/L).

Based on the diagnosis of SLE, 3 courses of steroid pulse therapy (methylprednisolone 1,000 mg/day for 3 days) were administered at 1-week intervals. Eye pain was the first symptom to disappear after starting this treatment; this was followed by improvements in the pupil dilation, light reflexes, and ptosis. The oculomotor nerve palsy also gradually improved, in the order of ocular upward/downward rotation and then adduction. Two weeks after completion of the third course of pulse therapy, the patient's ptosis and pupil abnormality had nearly recovered; however, her eye movement was still impaired. Following the completion of pulse therapy, oral prednisolone was continued at 30 mg/day. MRI performed three months after starting steroid therapy showed attenuation of the earlier contrast effect at the right oculomotor nerve (Fig. 1D). Nine months after starting steroid therapy, the right oculomotor nerve palsy had completely resolved (Fig. 1B).

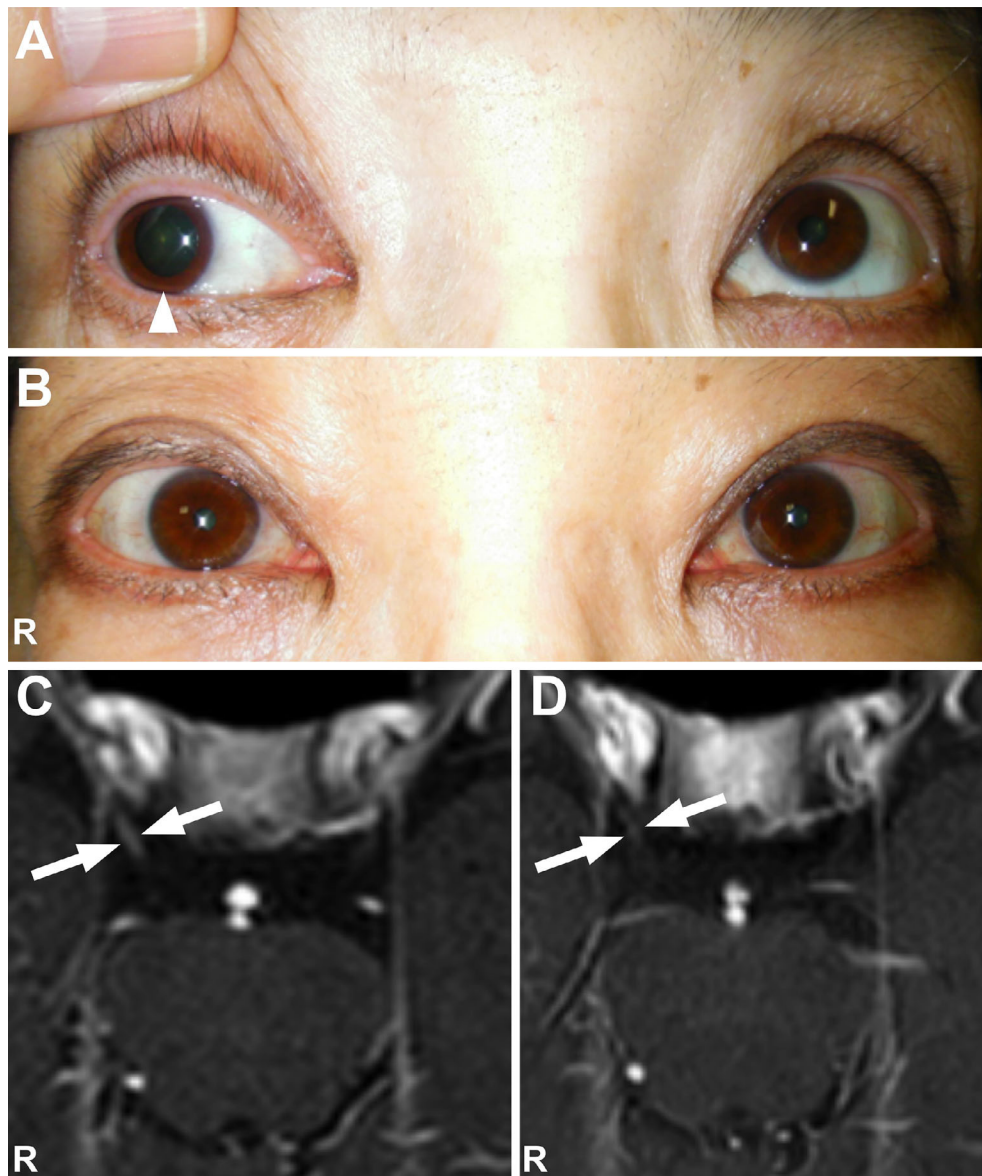
## Discussion

Reports of SLE manifesting as cranial neuropathy of isolated oculomotor nerve palsy are rare (3). Oculomotor nerve paralysis manifesting as cranial neuropathy before a diagnosis has not previously been reported in SLE patients. We suspected the diagnosis of SLE based on the patient's lymphopenia, positive results for antinuclear antibodies, double-stranded DNA antibodies, and direct Coombs test results. Peripheral neuropathy before an SLE diagnosis is rare and unusual, and we were unable to correctly diagnose SLE for the first time at our hospital (1).

Injury caused by a lesion displacing the oculomotor nerve (i.e. extramedullary neurovascular compression) is typically accompanied by pupillary abnormalities (5). The present case also showed pupil disorder, and MRI was performed on the suspicion of oculomotor nerve displacement by a blood vessel; however, no such lesion was identified. In our case, the MRI findings revealed contrast enhancement of the oculomotor nerve with pupillary abnormality, and the oculomotor neuropathy in our case can likewise be considered peripheral neuropathy. A similar case of isolated oculomotor nerve palsy was previously reported as cranial neuropathy (3). That case resembled our own in showing concomitant clinical or MRI findings, such as blepharoptosis, pupillary abnormalities, and unilateral contrast enhancement of the oculomotor nerve (3). We suspected that the mechanism of the oculomotor dysfunction, namely Vasculitis with SLE, could induce ischemia of the oculomotor nerve.

Ischemia can destroy the blood-brain barrier (BBB) of the oculomotor nerve. The MRI findings of contrast enhancement of the oculomotor nerve for several months in this case indicated the severe dysfunction of the BBB. SLE can induce microvascular arteritic ocular motor nerve palsies, such as monocular oculomotor dysfunction due to the complete paralysis of all eye movement except extorsion and inside rotation, as seen in this case. These microvascular oculomotor nerve palsies sometimes result in a complete palsy associated with an eye displaced outward and downward with ptosis and mydriasis (6, 7). Galtrey et al. discussed the pathophysiology of oculomotor nerve palsies due to microvascular non-arteritic ischemia in their paper (8). They proposed that changes in the BBB result in myelin destruction with relative sparing of axons, and remyelination allows for the functional recovery in microvascular non-arteritic oculomotor nerve palsy. Based on the clinical recovery course of our case, the oculomotor nerve palsies with SLE might spare the axons in the oculomotor nerve of the affected side.

The previous SLE case of oculomotor nerve palsy was not described as involving made no mention of the involvement of eye pain; however, the present case did include headache and vomiting (3). Eye pain can be considered an important finding that may suggest microvascular extraocular palsies. Pain with microvascular extraocular palsies is



**Figure 1.** A: Ocular findings before treatment. The right eye was rotated outward due to impaired adduction, and the pupil was dilated (arrowhead). The eye movement was characterized by impaired adduction and upward and downward rotation. The corrected visual acuity was normal. The right pupil was also dilated, and both the direct and indirect light reflexes had disappeared. These findings resulted in a diagnosis of oculomotor paralysis. B: The ocular findings at nine months after starting treatment. The ptosis had improved in the right eye, and the bilateral eyes were in the primary position. C: Contrast-enhanced MRI findings before treatment (1.5 T; repetition time, 4.8 ms; echo time, 2.4 ms). Contrast enhancement was seen at the right oculomotor nerve in the prepointine cistern [facing arrows ( $\rightarrow\leftarrow$ )]. D: Contrast-enhanced MRI findings at three months after starting treatment (1.5 T; repetition time, 4.8 ms; echo time, 2.4 ms). Contrast enhancement at the right oculomotor nerve was attenuated [facing arrows ( $\rightarrow\leftarrow$ )].

most common in oculomotor nerve palsies (8, 9). Ocular pain might be induced by inflammation of a blood vessel around the oculomotor nerve.

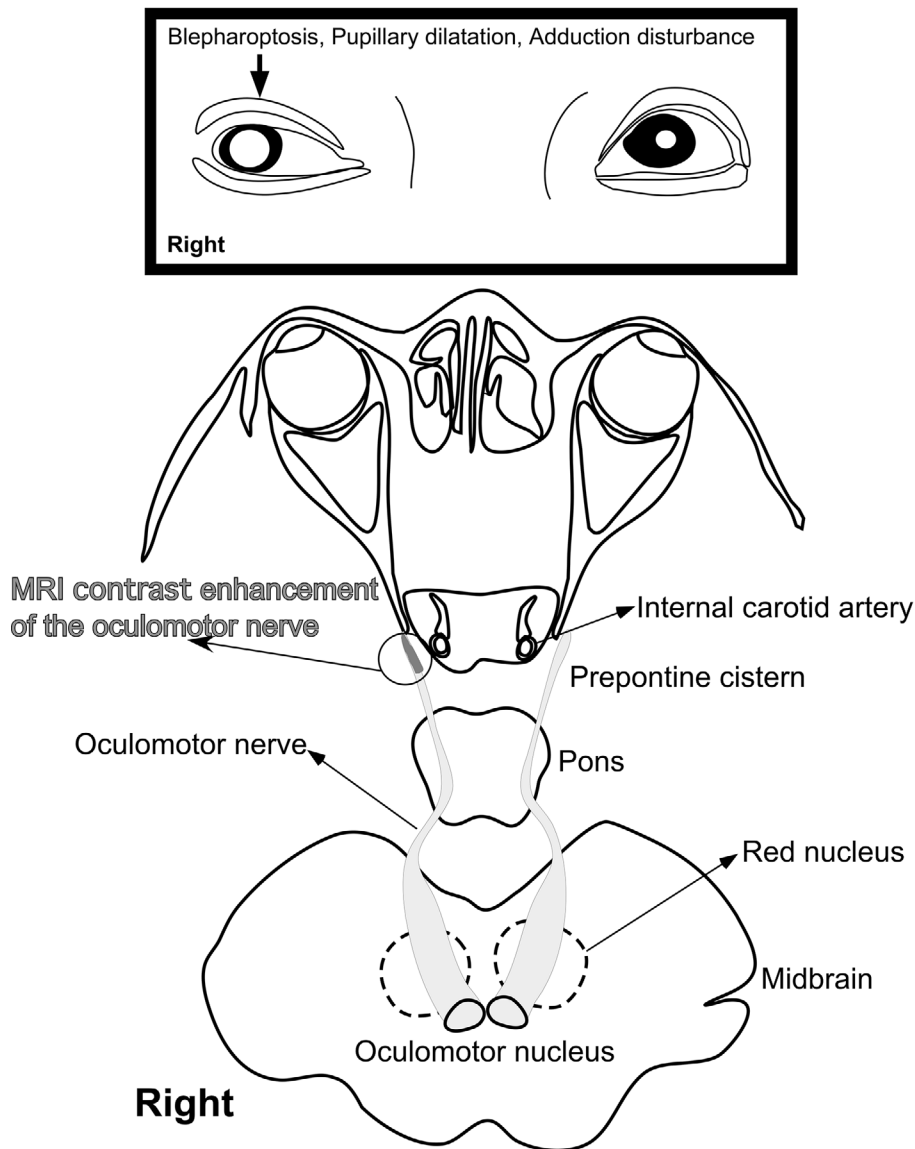
Alternatively, antiphospholipid syndrome may be associated with an isolated pupil-sparing oculomotor nerve palsy due to midbrain infarction (10).

Based on the findings from the previous report (3) and the present case, the characteristics of an isolated oculomo-

tor nerve disorder as cranial neuropathy in SLE patients might be accompanied by a contrast-enhanced oculomotor nerve on MRI and clinical findings such as blepharoptosis and pupillary abnormalities (Fig. 2). Furthermore, this characteristic oculomotor nerve disorder may contribute to the diagnosis of SLE as cranial neuropathy.

The authors state that they have no Conflict of Interest (COI).

## Oculomotor nerve disorder manifesting as cranial neuropathy in systemic lupus erythematosus



**Figure 2.** Summary of this case.

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### References

- Lee JS, Roh YB, Oum BS, et al. Isolated oculomotor nerve palsy with pupillary abnormality in systemic lupus erythematosus. *J Pediatr Ophthalmol Strabismus* **37**: 241-243, 2000.
- Xianbin W, Mingyu W, Dong X, et al. Peripheral neuropathies due to systemic lupus erythematosus in China. *Medicine (Baltimore)* **94**: e625, 2015.
- Toledano P, Orueta R, Rodríguez-Pintó I, et al. Peripheral nervous system involvement in systemic lupus erythematosus: prevalence, clinical and immunological characteristics, treatment and outcome of a large cohort from a single centre. *Autoimmun Rev* **16**: 750-755, 2017.
- Petri M, Orbai AM, Alarcón GS, et al. Derivation and validation of the Systemic Lupus International Collaborating Clinics classification criteria for systemic lupus erythematosus. *Arthritis Rheum* **64**: 2677-2686, 2012.
- Blake PY, Mark AS, Kattah J, et al. MR of oculomotor nerve palsy. *AJNR Am J Neuroradiol* **16**: 1665-1672, 1995.
- Capó H, Warren F, Kupersmith MJ. Evolution of oculomotor nerve palsies. *J Clin Neuroophthalmol* **12**: 21-25, 1992.
- Sanders S, Kawasaki A, Purvin VA. Patterns of extraocular muscle weakness in vasculopathic pupil-sparing, incomplete third nerve palsy. *J Neuroophthalmol* **21**: 256-259, 2001.
- Galtrey CM, Schon F, Nitkunan A. Microvascular non-arteritic ocular motor nerve palsies-what we know and how should we treat? *Neuroophthalmology* **39**: 1-11, 2014.
- Wilker SC, Rucker JC, Newman NJ, et al. Pain in ischaemic ocular motor cranial nerve palsies. *Br J Ophthalmol* **93**: 1657-1659, 2009.
- Champion BL, Choy F, Schrieber L, et al. Isolated fascicular ocu-

lomotor nerve palsy as the initial presentation of the antiphospholipid syndrome. *J Clin Neurosci* **9**: 691-694, 2002.

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