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Lumbar stenosis syndrome due to hypertrophy of nerve roots in chronic inflammatory demyelinating polyneuropathy: A case report and literature review

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Abstract

Chronic inflammatory demyelinating polyneuropathy (CIDP) is an acquired, immune-mediated neuropathy, characterized by a relapsing-remitting or progressive course. CIDP patients may manifest lower back and leg pain or intermittent claudication mimicking a lumbar stenosis syndrome. We report here one case of CIDP patients with manifestations of the lumbar stenosis syndrome from our database and summarize similar cases previously preported. We found there may be obvious mismatches between clinical symptoms and electrophysiological studies/neuroimaging in CIDP patents. For refractory CIDP patients with a long course of disease, regular imaging may be necessary to monitor the dynamic changes of nerve roots. Decompressive operation may also be an option for CIDP patients with thickening of nerve roots that has caused lumbar stenosis syndrome.

Keywords: CIDP, lumbar stenosis syndrome, review

CASE REPORT

A 58-year-old man presented with symmetrical numbness and weakness of distal limbs for 11 years. Nerve conduction studies (NCS) in 2008 showed generalized slow conduction velocities (25-35 m/s) with prolongation of distal CMAP duration in bilateral median, ulnar, tibial and common peroneal nerves, consistent with demyelinating polyneuropathy. Sensory nerve action potential (SNAP) was not elicited in all tested nerves. The diagnosis of CIDP was considered. He experienced a 5-year clinically stable phase between 2012 and 2016, and NCS in 2014 showed improvement of conduction velocity in motor nerves (50-60m/s). In 2017, the range of numbness began to extend to proximal limbs. Nerve ultrasound (NUS) examination in 2020 showed segmental thickening of peripheral nerves [mean (range) of cross-sectional area (CSA) for bilateral median: 38.5 (25.4-60.0); ulnar: 29.1 (8.0-42.4); C5-8 nerve roots: 25.5 (17.6-38.7) mm^2] (Figure 2). Oral prednisone (60 mg per day, gradual taper to 15mg per day) was given. The patient reported remarkable improvement of limb numbness and weakness while no significant change was found in NCS (Figure 1). In 2022, he experienced acute onset of weakness of lower extremities resulting in difficult to stand, accompanied by back pain, radiating to lower limbs. The pain improved spontaneously in around 2 days. Lumbar MRI showed diffuse thickening of the lumbar nerve roots that filled the entire intervertebral foramen, even extending to the paravertebral space (Supplementary Figure 1). Prednisone was increased to 40mg per day and cyclophosphamide (CTX) (500mg bid) was added. Two months later, he experienced another attack of radiating pain in lower limbs, which relieved in one week. Repeated NCS showed a further decline of motor conduction (10-15m/s) in all tested nerves. NUS showed larger cervical nerve roots and peripheral nerves [mean (range) of CSA for bilateral median: 44.9 (25.1-65.4); ulnar: 29.3 (8.7-52.4); C5-6 nerve roots: 30.2 (18.8-44.4) mm^2] than before (Figure 2). Lumbar puncture was conducted, and the patient suffered from acute and severe hip and lower limb pain again. Elevated tendon reflexes were detected in lower limbs. Cerebrospinal fluid presented typical Froin phenomenon, and routine tests showed 6 white cells/μL and >3.00g/L level of protein. Treatment with CTX (750mg bid) were given and he showed mild improvement in pain. His symptoms were stable in a 3-month follow-up.

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Date		2014.04	2014.12					2020.09	2021.12	2022.09
CV (m/s)		30.8	52.4					27.6	22.8	18.7
DL (ms)		22.9	3.6					21.0	18.8	20.7
CMAP (mv)		1.94	16.4					0.9	0.97	0.9

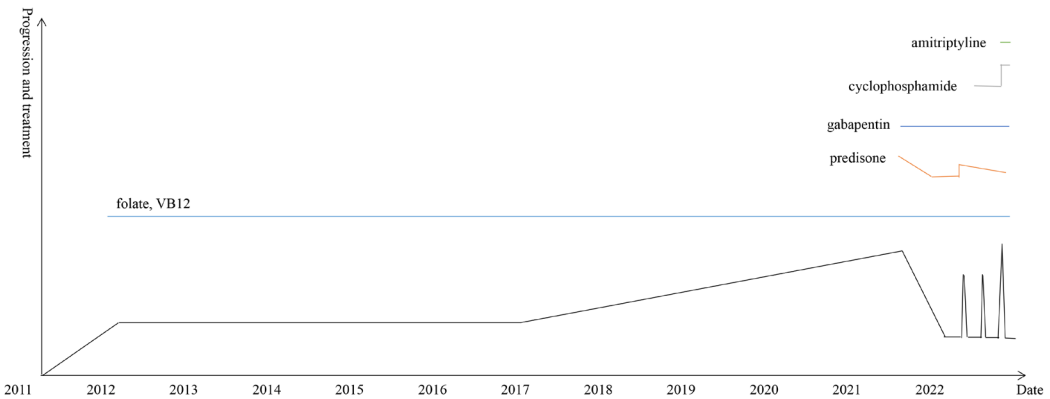

Figure 1. The clinical course of the patient.

DISCUSSION

Hypertrophy of peripheral nerves and enlargement of nerve roots was believed to be a characteristic of CIDP[1], although the underlying pathological mechanisms remained unclear. Repeated segmental demyelination and remyelination along with onion-bulb formations due to the chronic inflammation might be one of the causes.[2] Although rare, CIDP patients can manifests lumbar stenosis syndrome due to relative narrowing of lumbar canal and intervertebral foramen has been reported, which were summarized in Supplementary Table 1. All patients experienced years of duration, and presented symptoms mimicking lumbar foraminal stenosis, such as episodic lower back pain and indirect claudication. Manifestations of myelopathy, such as positive pathological signs or sensory level were less common.

We noticed that there might be obvious mismatches between clinical symptoms and electrophysiological studies/neuroimaging in CIDP patents. Our patient experienced long lasting of clinical remission before the onset of intermittent pain. NUS suggested progressive enlargement of cervical nerve roots, even when the clinical symptoms were stable or improvement. Indicators of NCS also presented different trends with manifestations among our case. Similar phenomena had been described in our previous studies.[3] Therefore, for patients with long-lasting CIDP, it was necessary to pay attention to the problem of continuous nerve

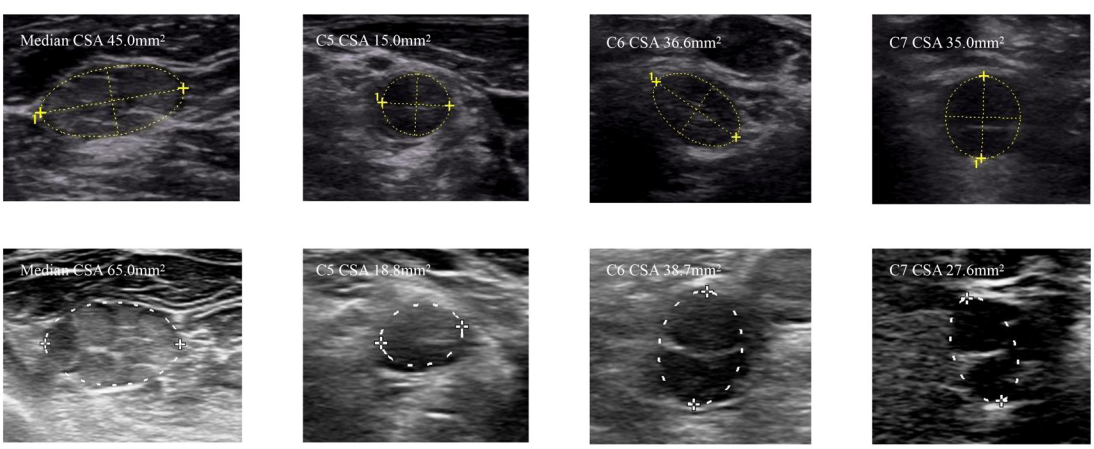

Figure 2. Marked enlargement of cervical nerve roots and right median nerve of the patient.

thickening for early intervention. The effects of common immunosuppressive drugs were far from satisfactory among these patients. Steroids could alleviate inflammation and reduce swelling of nerve roots but might have poor effects in inhibiting the myelin hyperplasia in CIDP patients.[3,4]

For CIDP patients with thickening of nerve roots that has caused lumbar stenosis syndrome, decompressive operation may be an option of treatment.[5] In our patient, we noticed the elevated tendon reflexes in lower limbs at back pain attack which indicated the potential compression of spinal cord causing upper motor neuron involvement. Preventive decompressive operation might be a considerable option for him to avoiding acute spinal cord compression in the future. However, since the nerve roots were continuously and widely thickened, a second operation might be needed.

In conclusion, CIDP patients might suffer from secondary lumbar stenosis syndrome caused by hypertrophy of nerve roots and cauda equina. There might be obvious mismatches between clinical symptoms and electrophysiological studies/ neuroimaging in CIDP patents. Decompressive operation might be an option for these patients.

DISCLOSURE

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Conflict of interest: None

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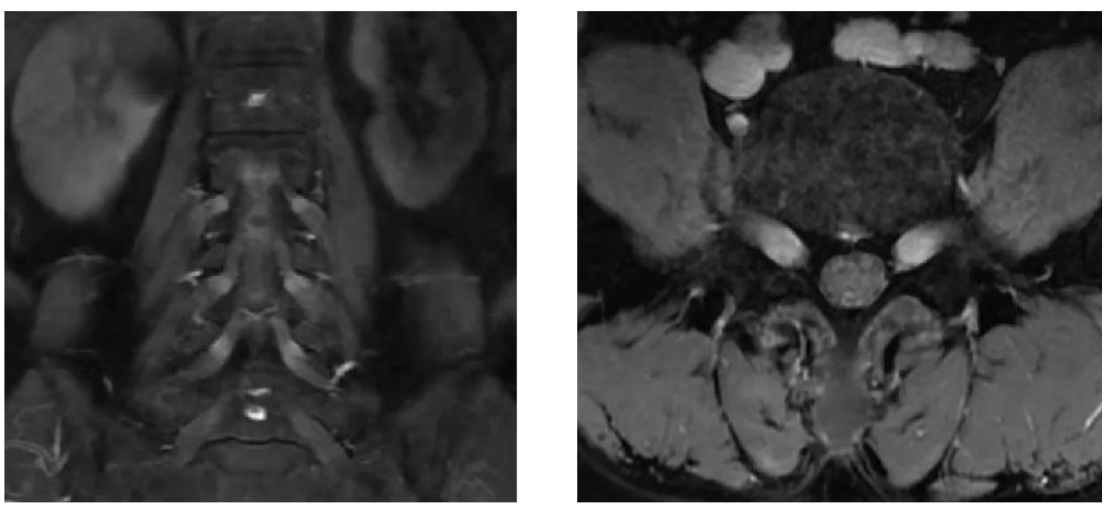

Supplementary Figure 1. Lumbar spinal MRI of the patient.

Supplementary Table 1: Summary on CIDP patients mimicking a lumbar stenosis syndrome

Author	Year	Region	Age	Gender	Years between onset and manifestations of lumbar stenosis syndrome	Clinical symptoms and signs							
						Weakness	Tendon reflex in lower limbs	Pathological signs	Distribution of sensory deficits	Sensory ataxia	Bowel and bladder dysfunction	Back pain with radiating	Straight leg raising testing
Hu (present study)	2024	China	47	M	11	all limbs (distal > proximal)	absent (elevated when there was radiating pain to lower limbs	-	stocking-glove	+	-	+	+
			21	F	12	all limbs (distal > proximal)	absent	-	long stocking	-	+	+	+
Ye[1]	2021	China	12	M	7	lower limbs (proximal > distal)	absent	-	below the hip	+	-	+	+
Lee[2]	2014	Korea	34	M	24	lower limbs	absent	-	below the L2 segment	+	+	+	+
Diederichs[3]	2007	Germany	59	F	years	lower limbs (proximal > distal)	decreased	-	in the L5/S1 segment	+	-	+	+
Ishida[4]	2005	Japan	63	M	19	lower limbs (proximal > distal)	absent	-	long stocking	+	-	+	+
Kretzer[5]	2004	America	54	F	30	lower limbs (proximal > distal)	absent	-	long stocking	-	-	+	+
Pytel[6]	2003	America	62	M	4	all limbs	absent	-	stocking-glove	+	-	+	+
Midroni[7]	1996	America	38	M	4	all limbs (distal> proximal)	absent	+	stocking	+	+	+	+
Goldstein[8]	1996	America	38	M	10	all limbs (distal> proximal)	absent	-	stocking-glove	+	-	+	+
Schady[9]	1996	England	58	M	8	lower limbs (proximal > distal)	decreased	+	stocking, patchy	+	+	+	+

Continued

Antibodies	CSF tests	Lumbar spinal MRI	NCS	Pathology	Gene testing	Immunosuppressive therapy	Surgery
ANA 1:80 (+)	6 white cells/μL; protein >3.00g/L	diffuse thickening of the lumbar nerve roots filled the entire intervertebral foramen, even extending to the paravertebral space	demyelinating sensorimotor neuropathy	-	-	prednisone (slow improvement); cyclophosphamide (slow improvement)	-
-	no cell; protein 3.20g/L	progressively diffused enlargement of cervical, thoracic and lumbar nerve roots, part of which were enhanced with gadolinium	demyelinating sensorimotor neuropathy	sural nerve: marked loss of large, myelinated fibers, endoneurial edema, thinly remyelinated axons, Schwann cell onion skinning, and T cell inflammatory infiltrates; L4 nerve root: hypertrophic demyelinating neuropathy with onion-bulb formation with focal lymphocytic or macrophage infiltrates	-	methylprednisone (improvement but relapse); IVIG (improvement but relapse); PE (nil effects); tacrolimus (nil effects); rituximab, (nil effects); mycophenolate mofetil (nil effects)	-
-	normal cells; protein 0.55g/L	diffuse thickening of the cauda equina nerve roots filled the entire spinal canal, even extending to the intervertebral foramen and the paravertebral space	axonal and demyelinating sensorimotor neuropathy	nerve root: a remarkable reduction in the density of myelinated fibers and hyperplasia of the schwann cells, forming onion bulb wrappings of myelinated fibers and blood vessels, and a small population of perivascular macrophages; positivity for the S-100 protein antibody and negativity for epithelial membrane antigen	-	IVIG+prednisone (improvement)	decompressive L1-5 laminectomy (improvement of weakness, pain, ataxia)
-	normal	diffuse thickening of the cauda equina; low signal intensity in both T1 and T2-weighted images, and slightly inhomogeneous high signal intensity on T1-weighted gadolinium-enhancement	demyelinating sensorimotor neuropathy	sural nerve: myelinated axon surrounded by proliferated Schwann cells, “onion bulbs”	-	IVIG (significant improvement) prednisolone (stable)	decompressive L2-5 laminectomy (improvement of pain, sensory deficits, urinary incontinence, and constipation)

Antibodies	CSF tests	Lumbar spinal MRI	NCS	Pathology	Gene testing	Immunosuppressive therapy	Surgery
-	no cell; protein 0.85g/L	pronounced enlargement of cauda equina fibers and bilateral thickening of the lumbar nerve roots	demyelinating neuropathy	-	-	methylprednisone (significant improvement)	-
-	normal cells; protein 0.95g/L	marked enlargement of the cauda equina and spinal nerve roots, occupying the spinal subdural space, with patchy gadolinium-enhancement	demyelinating sensorimotor neuropathy	sural nerve: severe depletion of myelinated fibers with onion-bulb formations, surrounded by several layers of Schwann cells	-	prednisolone (nil effects); IVIG (improvement)	-
-	-	multiple mass lesions in the thecal sac with involvement and displacement of the cauda equina roots	demyelinating sensorimotor neuropathy	C5 nerve root: diffuse, prominent "onion bulb" formation, neurofilament protein-positive axons were encircled by S-100-positive, epithelial membrane antigen-negative, Schwann cells	-	-	decompressive L1-L5 laminectomy (improvement of weakness and pain)
-	no cell; protein 4.2g/L	diffuse bilateral nerve root thickening from L3 through S3 with mid-lumbar blockade of flow of contrast	demyelinating polyneuropathy	nerve root: hypertrophic demyelinating neuropathy with onion-bulb formation with focal lymphocytic infiltrates	-	corticosteroids (slow improvement); PE (nil effects)	decompressive lumbar laminectomy & C4-T1 laminectomy (improvement of pain, weakness)
-	4 white cells/μL; protein > 10g/L	compression of the cervical cord by massively enlarged nerve roots, enlarged cauda equina roots enhanced with gadolinium	demyelinating sensorimotor neuropathy	sural nerve: a strikingly patchy hypertrophic neuropathy, with one fascicle grossly enlarged and containing many large, often denervated, onion bulbs, and other fascicles showing varying degrees of mild to moderate axonal loss	-	prednisone (nil effects); PE (improvement but relapse); azathioprine (nil effects); IVIG (nil effects)	decompressive cervical and lumbrol laminectomy (improvement of weakness, pain, ataxia)
-	5 mononuclear cells/μL; protein 1.01 g/L	intradural, extramedullary material of heterogeneous signal intensity in the low thoracic spine which filled most of the canal	-	sural nerve: marked demyelination and a perivascular, endoneurial mononuclear cell infiltrate	-	prednisone (nil effects); azathioprine (nil effects)	decompressive L1-2 laminectomy (improvement of pain, weakness and ataxia)

Antibodies	CSF tests	Lumbar spinal MRI	NCS	Pathology	Gene testing	Immunosuppressive therapy	Surgery
-	-	homogeneously increased signal from the cauda equina, with multiple areas of nodular enhancement	demyelinating polyneuropathy	nerve root: loss of myelinated axons and a few endoneurial inflammatory cells. Many large fibres had thin myelin sheaths and were surrounded by several layers of Schwann cell cytoplasm	-	prednisolone (nil effects); azathioprine (nil effects); IVIG (mild improvement)	decompressive cervical and lumbar laminectomy (no improvement)

Abbreviations: ANA anti-nuclear antibody; CIDP chronic inflammatory demyelinating polyneuropathy; CSF cerebrospinal fluid; F female; IVIG intravenous immunoglobulin; M male; NCS nerve conduction studies; MRI magnetic resonance imaging; PE plasma exchange

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