



A case of motor and sensory polyneuropathy induced by primary hyperparathyroidism

Mina Lee¹, Hye Jeong Kim², Hakjae Roh¹

¹Department of Neurology, Soonchunhyang University Seoul Hospital, Soonchunhyang University College of Medicine, Seoul, Korea

²Division of Endocrinology and Metabolism, Department of Internal Medicine, Soonchunhyang University Seoul Hospital, Soonchunhyang University College of Medicine, Seoul, Korea

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Correspondence to

Hakjae Roh

Department of Neurology, Soonchunhyang University Seoul Hospital, Soonchunhyang University School of Medicine, 59 Daesagwan-ro, Yongsan-gu, Seoul 04401, Korea
Tel: +82-2-709-9224
Fax: +82-2-795-3687
E-mail: newroh@schmc.ac.kr

ORCID

Mina Lee

<https://orcid.org/0000-0002-5971-3633>

Hye Jeong Kim

<https://orcid.org/0000-0003-1010-9803>

Hakjae Roh

<https://orcid.org/0000-0002-0979-4279>

Primary hyperparathyroidism (PHP) is a disease in which excessive amounts of parathyroid hormone (PTH) are secreted and calcium levels in the blood increase. Hypercalcemia caused by PHP has a major influence on the peripheral nervous system and produces symptoms such as muscle cramps, paresthesia, and proximal muscle weakness. Here we report a rare case of sensory-dominant polyneuropathy caused by PHP, which improved after surgery.

Key words: Primary hyperparathyroidism; Polyneuropathy; Hypercalcemia

Parathyroid hormone (PTH) is a major hormone involved in maintaining the calcium and phosphate concentrations, and is produced primarily by the parathyroid gland. Primary hyperparathyroidism (PHP) is a disease in which excessive amounts of PTH are secreted and calcium levels in the blood increase.^{1,2} Hypercalcemia caused by PHP also has major influences on both the central and peripheral nervous systems.^{1,2} Symptomatic PHP can be treated with medications and parathyroidectomy, but this does not improve the symptoms in all cases.^{1,3} Here we report a rare case of sensory-dominant polyneuropathy caused by PHP, which improved after surgery.

CASE

A 69-year-old female presented with progressive paresthesia and mild weakness in all distal limbs that had first appeared about 1 year previously. She used a cane because she could not keep her balance, and recently her hands had become numb and she had started to drop objects. She had a history of osteoporosis. She had undergone a left thyroid upper lobectomy for a thyroid mass 40 years previously and lumbar fusion surgery for spi-

nal stenosis 3 years previously. A neurological examination revealed that the patient's motor strength was Medical Research Council grade 4 in all distal limb muscles with no atrophy or fasciculation. Position and vibration sensations were decreased. The response levels of the deep tendon reflexes of all limbs were decreased, but there were no pathological reflexes including the Babinski sign. Bilateral falling tendencies were observed in the Romberg test. Routine laboratory

findings were unremarkable, including for blood sugar, albumin, tumor markers, creatine kinase, protein electrophoresis, vitamin levels, and renal and thyroid function tests. However, the serum concentrations of calcium and phosphorus were 12.2 mg/dL (reference range, 8.6-10.2 mg/dL) and 2.5 mg/dL (reference range, 2.5-4.5 mg/dL), respectively. The serum PTH level was 148.57 pg/dL (reference range, 8-76 pg/dL), which was considered to indicate PHP. Bone mineral density (BMD)

Table 1. Nerve conduction studies

Nerve conduction study		Latency (m/s)	Amplitude (mV)	Velocity (m/s)	Latency (m/s)	Amplitude (mV)	Velocity (m/s)
Motor NCS							
	Segment						
Left median	APB-Wrist	8.39	2.8		7.9	2.9	
	Wrist-Elbow	12.71	2.1	46.3	12.7	2.6	44
Right median	APB-Wrist	7.81	2.6		6.6	3.5	
	Wrist-Elbow	11.93	2.0	48.6		3.5	52
Left ulnar	ADM-Wrist	4.64	8.8		4.2	9.4	
	Wrist-Elbow	8.39	7.7	50.7	8.0	8.2	52
Right ulnar	ADM-Wrist	4.02	11.4		3.1	15.3	
	Wrist-Elbow	6.77	10.7	64.0	6.7	13.4	56
Left deep peroneal	EDB-Ankle	-	-	-	-	-	-
	Ankle-Head of the fibula	-	-	-	-	-	-
Right deep peroneal	EDB-Ankle	5.47	1.3		4.9	1.3	
	Ankle-Head of the fibula	13.18	1.0	36.3	12.2	1.2	37
Left tibial	Abductor hallucis-Ankle	3.59	15.4		5.0	5.5	
	Ankle-Pop. fossa	12.08	12.2	37.7	12.3	6.0	47
Right tibial	Abductor hallucis-Ankle	3.91	12.1		5.5	7.8	
	Ankle-Pop. fossa	12.66	9.1	36.6	12.6	9.6	49
Sensory NCS							
	Segment						
Left median	Index-Wrist	-	-	-	-	-	-
Right median	Index-Wrist	-	-	-	-	-	-
Left ulnar	Finger-Wrist	3.70	13.0	37.9	4.5	6	25
Right ulnar	Finger-Wrist	3.65	18.4	38.4	3.9	6	30
Left sural	Ankle-Calf	-	-	-	4.5	7	30
Right sural	Ankle-Calf	-	-	-	4.1	8	32
Left superficial peroneal	Ankle-Calf	-	-	-	-	-	-
Right superficial peroneal	Ankle-Calf	-	-	-	-	-	-

Initial NCS shows motor and sensory polyneuropathy. After 4 months, follow-up NCS showed slight improvement.

NCS, nerve conduction study; APB, abductor pollicis brevis; ADM, abductor digiti minimi; EDB, extensor digitorum brevis; Pop, popliteal.

measured at the lumbar spine and femur neck showed T scores of -2.9 and -3.1, respectively, indicating osteoporosis. Computed tomography (CT) of the abdomen and pelvic identified one renal stone in the right kidney. A nerve conduction study (NCS) and electromyography identified sensory-dominant sensorimotor polyneuropathy (Table 1). Brain and lumbar spine magnetic resonance imaging produced no significant findings other than the usual postoperative findings. Thyroid CT showed an enhanced nodule at the posterior aspect of the left thyroid lower pole (Fig. 1A). A parathyroid metaiodobenzylguanidine scan showed increased uptake at the lower pole of the left thyroid gland and suspected parathyroid adenoma or hyperplasia (Fig. 1B). Parathyroidectomy was performed 1 month later, and postoperative pathology confirmed parathyroid adenoma. Six months after surgery, the patient was able to walk without a cane and her numbness was greatly improved. Serum calcium and PTH levels normalized, but the follow-up NCS findings were only slightly improved (Table 1).

DISCUSSION

PHP can be diagnosed by elevated levels of PTH along with hypercalcemia.^{1,2} Most cases of PHP are caused by a single adenoma.^{1,2} Most patients are asymptomatic, but symptoms such as nausea, constipation, osteoporosis, and renal stones are possible.^{1,2} Previous studies found neurological symptoms in 52% of PHP patients,⁴ with symptoms such as cognitive decline, depression, muscle cramps, paresthesia, and proximal muscle weakness.^{1,2,5,6} Delbridge et al.⁷ reported that more than 40% of PHP patients complained of neurological symptoms, and 88% of patients showed improvement after parathyroidectomy. An evaluation of 17 patients with PHP found that the mean SNAP conduction velocity was decreased in the sural nerve and followed a length-dependent pattern.⁸ The mechanism via which PHP influences the nervous system remains to be clarified. It is hypothesized that the observed effects are due to the neurotoxicity of PTH itself. It has also been suggested that PHP increases the concentration of calcium, since calcium maintains the transmembrane potential and plays a role as a neurotransmitter.⁵ Increased calcium influx into the cytoplasm increases in ax-

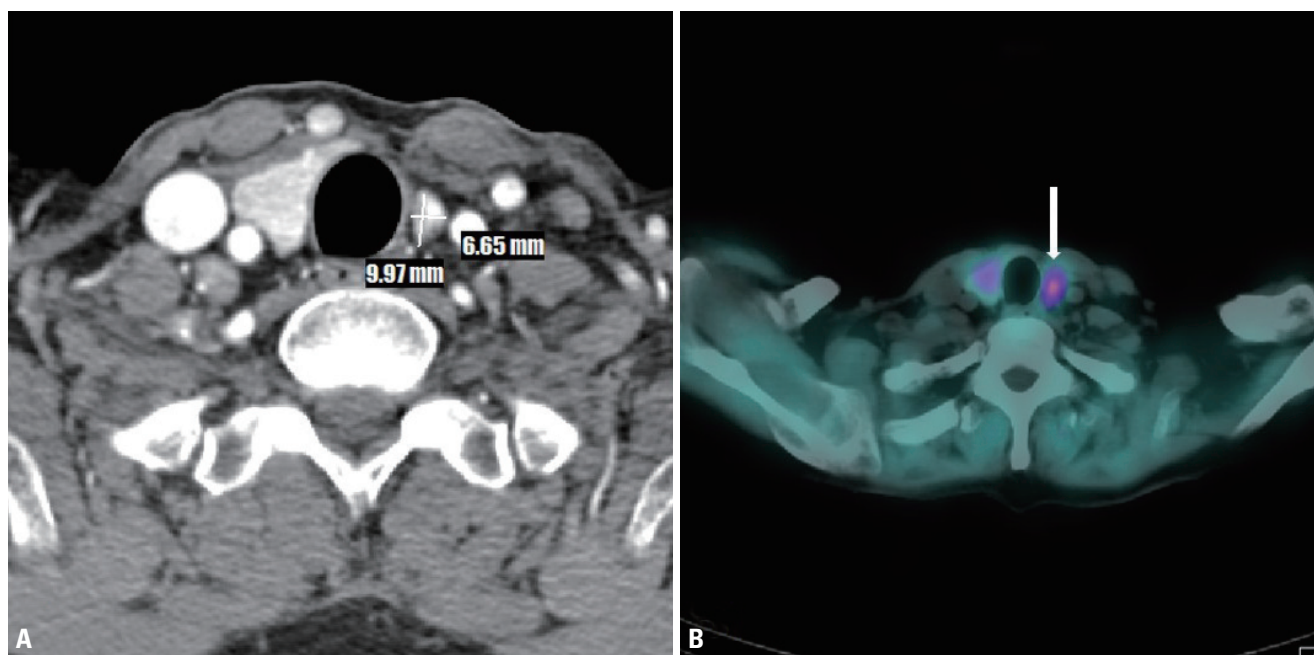


Fig. 1. (A) Thyroid computed tomography shows a 12 × 9.97 × 6.65 mm enhanced nodule at the posterior aspect of the left thyroid lower pole. (B) Parathyroid metaiodobenzylguanidine scan shows a 1.3-cm soft-tissue lesion with increased uptake of the radioactive tracer at the lower pole of the left thyroid gland (white arrow).

onal swelling and collapse and fragmentation of the myelin sheath, leading to nerve damage.^{8,9} Symptomatic PHP requires surgery, and parathyroidectomy has been reported to reduce renal stones, improve BMD, and reduce the fracture rate.^{1,2}

In summary, we have reported an unusual case of sensory-dominant polyneuropathy induced by PHP in a patient with parathyroid adenoma, which improved after surgery. By considering PHP in patients with polyneuropathy, especially when this is combined with renal stones or osteoporosis, treatable causes of polyneuropathy can be corrected.

Conflicts of Interest

The authors have no conflicts to disclose.

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