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Case Report

Electrophysiological findings in a family with Hereditary Neuropathy and Liability to Pressure Palsies

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ABSTRACT

Hereditary neuropathy with liability to pressure palsies is an autosomal dominant and demyelinative peripheral neuropathy which characterized by reversible episodes of sensorimotor deficits after neural compression injuries. Their clinical hallmarks are recurrent and painless focal neuropathies maintly preceded by minor trauma or compression at entrapment sites of peripheral nerves. We describe multiple compression mononeuropathies in an individual who presented with left sided ulnar palsy after drilling for a period of 8 hours and report neurophysiologic findings in two clinically asymptomatic family members. We believe that this entity may be clinically and neurophysiologically underdiagnosed by orthopaedic surgeons and electromyographers. Electrophysiological abnormalities can be detected even in asymptomatic patients and it should be considered in differential diagnosis of patients with atypical presentations of compression neuropathies.

Key Words: Hereditary Neuropathy with liability to Pressure Palsies- Electrodiagnostic tests

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Hereditary neuropathy with liability to pressure palsies (HNPP) is an autosomal dominant peripheral neuropathy which is clinically characterized by transient recurrent painless episodes of focal neuropathy, often precipitated by minor trauma or compression of peripheral nerves at common entrapment sites [1, 2]. Electrophysiological examination is very important for its diagnosis [3]. Nerve conduction studies frequently reveal a characteristic pattern of mildly decreased motor nerve conduction velocities, prolonged distal motor latencies predominantly at nerve entrapment sites, and altered sensory nerve action potentials, even in clinically non-affected nerves or in asymptomatic at-risk individuals [4,5]. Hence electrophysiological examination serves as a simple screening test for HNPP.

We report electrophysiological findings in members of a family with suspected HNPP.

Case report

History & physical examination

The first member of family was a 22 year old man worker referred us from a orthopedic clinic for electro diagnostic evaluation. He had developed left sided ulnar nerve palsy one month prior to presentation after a period of 8 hours drilling. At the age of 8 years, he had an episode of wrist drop following falling on right wrist, several episodes of transient weakness and paresthesia in left hand (4th and 5th fingers) and less pronounced in right hands during past 14 years and an episode of left wrist drop one year ago without any triggering factors. The previous attacks had gain complete recovery. In physical examinations there was significant atrophy in left hypothenar and interosseii muscles. In sensory examinations he noted hypoesthesia in right ulnar, right lateral leg and foot; and hyperesthesia in ulnar side of left hand. Deep tendon reflexes (DTR) were absent in both upper limbs in except of left biceps tendon, but they were normal in lower extremities. He had no cranial nerves or cerebellar dysfunction.

Family History

The patient mentioned complaints of recurrent episodes of foot drop in his paternal grandfather who suffered from limp feet in his 8th decades of life before his death.

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The patient's father, a 46-year-old man was completely asymptomatic but in physical examinations his DTRs were reduced in left biceps and absent in bilateral brachioradialis tendons. He noted some hypoesthesia in the first three fingers of left hand, lateral aspect of right forearm, both feet and legs.

The patient's sister (the only sibling), an 18-year-old girl had history of prolapsed mitral valve but no history of neurological disorders. She had reduced DTR in upper extremities but other neurological examinations were normal.

The patient's mother had a history of carpal tunnel syndrome without any surgical treatments. She had some hypoesthesia in right median nerve domain but otherwise was completely normal upon clinical examination. The parents are unrelated.

Electroneurodiagnostic findings

Nerve conduction study was performed on the patient and his family and confirmed carpal tunnel syndrome in his mother. In the patient, focal slowing of both median nerves at wrist segment, left ulnar nerve over the elbow segment, left radial nerve at spiral groove and right peroneal nerve across the fibular head was demonstrated (Table 1).

Table 1: Electrophysiological findings in the patient

Nerve	DML (msec.)	DSL (msec.)	S-amp. (μV)	M-NCV (m/s)	S-NCV (m/s)
Rt. Median	**5.5**	**6.1**	24	49 (forearm)	**33** (wrist)
Lt. Median	**5.7**	**5.4**	**17**	56 (forearm)	**30** (wrist)
Rt. Ulnar	4.0	3.6	48	60 (forearm) 58 (elbow)	63
Lt. Ulnar	**4.9**	**Absent**	**Absent**	48 (forearm) **28** (elbow)	**Absent**
Rt. Radial		2.6	35		66
Lt. Radial	3.8	**Absent**	**Absent**		**Absent**
Rt. Sural		2.8	14		44
Lt. Sural		3.0	16		47
Rt. Tibial	5.8			42	
Lt. Tibial	4.9			49	
Lt. DPN	4.8			47(leg) 42(knee)	
Rt. DPN	5.3			43(leg) **27** (knee)	

DML= distal motor latency, DSL= distal sensory latency, S-amp= sensory amplitude, M-NCV= motor nerve conduction velocity, S-NCV= sensory nerve conduction velocity. **Bold numbers** indicate abnormal values.

His sister and father although were clinically asymptomatic, showed a conduction block in median nerve at wrist and ulnar nerve at elbow segments (Table 2,3 respectively).

Table 2: Electrophysiological findings in the patient sister

Nerve	DML (msec.)	DSL (msec.)	S-amp. (μV)	M-NCV (m/s)	S-NCV (m/s)
Rt. Median	**4.4**	**4.8**	33	55 (forearm)	**37** (wrist)
Lt. Median	**5.8**	**5.3**	41	51 (forearm)	**35** (wrist)
Rt. Ulnar	3.8	2.9	46	59 (forearm) **43** (elbow)	54
Lt. Ulnar	3.6	3.2	49	52 (forearm) 47 (elbow)	55
Rt. Radial		2.3	38		64
Lt. Radial		2.6	33		60
Rt. Sural		2.6	21		49
Lt. Sural					
Rt. Tibial	4.6			46	
Lt. Tibial	4.5				
Lt. DPN	4.6			48(leg) 52(knee)	
Rt. DPN	4.3			50(leg) 56 (knee)	

DML= distal motor latency, DSL= distal sensory latency, S-amp= sensory amplitude, M-NCV= motor nerve conduction velocity, S-NCV= sensory nerve conduction velocity. Bold italic numbers indicate abnormal values.

Table 3: Electrophysiological findings in the patient father

Nerve	DML (msec.)	DSL (msec.)	S-amp. (μV)	M-NCV (m/s)	S-NCV (m/s)
Rt. Median	**4.4**	**4.7**	32	59 (forearm)	***38*** (wrist)
Lt. Median	**4.0**	**4.2**	37	45 (forearm)	45 (wrist)
Rt. Ulnar	3.0	**3.8**	45	65 (forearm) ***45*** (elbow)	60
Lt. Ulnar	**4.6**	**4.0**	35	63 (forearm) 57 (elbow)	62
Rt. Radial		2.9	40		62
Lt. Radial		2.6	36		65
Rt. Sural		3.0	21		
Lt. Sural		2.7	18		49
Rt. Tibial	5.4			44	
Lt. Tibial	5.8			47	
Lt. DPN	**6.2**			46(leg) 50(knee)	
Rt. DPN	**8.4**			51(leg) 59 (knee)	

DML: distal motor latency, DSL: distal sensory latency, S-amp: sensory amplitude, M-NCV: motor nerve conduction velocity, S-NCV, sensory nerve conduction velocity. Bold italic numbers indicate abnormal values.

Needle EMG on the patient showed spontaneous activity (1+) in the left first dorsal interosseous and abductor digiti minimi muscles with polyphasic potentials and decreased interference pattern. Left wrist extensor muscles had long duration and high amplitude potentials with incomplete interference pattern. EMG of right upper limb was normal.

Neuropathological findings

The patient underwent a sural nerve biopsy which showed signs of chronic myelin loss with remyelination and onion bulb formation.The nerve fibers were markedly lost in focal areas replaced by mucoid material and fine fibrosis.

Discussion

HNPP is probably underdiagnosed because of its usually benign course [3]. The diagnosis of HNPP or tomaculous neuropathy is established in an adult with recurrent focal compression neuropathies who has a family history consistent with autosomal dominant inheritance [1,2,3,4,6]. Males and females are equally affected. The first attack is usually in the second or third decade but with a broad range of first to seventh decades (mean: 37 years; range: 2-70 years) [1, 2,3]. The most common presenting symptom of HNPP is acute painless focal mononeuropathy, occurring in 64-78% of patients [7,8]. In most cases, full recovery usually occurs within days to months, however relapses are frequent, and recurrent episodes may lead to residual neurologic symptoms although, the resulting disability is usually mild [8]. Many patients show signs of symmetrical distal neuropathy without acute nerve palsies [9]. Neurological examination reveals weakness and sensory loss in the distribution of affected nerves, tendon reflexes are often depressed or abolished, pes cavus is infrequent, scoliosis is rare and there is no nerve hypertrophy or CNS involvement[1]. Because of few clinical findings, electrophysiological examination is very important for diagnose of HNPP. A simple standardized electrophysiological examination is sufficient to identify adult gene carriers: delayed motor latency in the both median nerves, reduced sensory velocity in the palm-wrist segment, and a delayed motor latency or reduced motor velocity in the peroneal nerve are highly suggestive of the disease even in clinically non-affected nerves or in asymptomatic at-risk individuals, when there is a family history of HNPP[4]. These findings are frequently found in asymptomatic or young patients who had not yet experienced pressure palsies; hence, electrophysiological examination could serve as a simple screening test for HNPP [10].

The most common sites of focal neuropathy are**:**

1 - The peroneal nerve at the fibular head causing foot drop.

2 - The ulnar nerve at the elbow causing hypothenar and interossei muscle weakness and atrophy with sensory loss over the medial aspect of hand.

3 - The median nerve at the wrist causing carpal tunnel syndrome with thenar muscle weakness and atrophy and sensory loss over the thumb and index finger.
4 - The brachial plexus and radial nerve are also sometimes involved [3].

Unfortunately, the diagnosis may not be self-evident in many cases, especially in young patients with the first attack without known familial occurrence or with an atypical presentation.

Peripheral nerve biopsies show segmental de- and remyelination with focal sausage-shaped myelin thickenings, called tomacula[5].

DNA analysis revealed that HNPP is caused by a 1.5-Mb deletion on chromosome 17p11.2, the region where the peripheral myelin protein 22 (PMP22) is located, the same segment that is duplicated in Charcot-Marie-Tooth (CMT) type 1A[11] Thus, it was hypothesized that unequal crossing-over between chromosome 17 homologues would generate a duplication that could lead to CMT 1A, or a deletion that could result in HNPP [11]. The deletion is found in 85% of patients with HNPP [12] In addition, about 10%-15% of mutation carriers remain clinically asymptomatic, suggesting incomplete penetrance [4].

No specific treatment for underlying genetic or biochemical defect exists.Risk factors for pressure palsies activities to avoid include prolonged sitting with legs crossed, repetitive movements of the wrist, prolonged leaning on elbows and rapid weight loss[13,14] Transient bracing, such as with a wrist splint or ankle-foot-orthosis, may be useful. Controversy exists as to whether surgical decompression of nerves is of benefit.Because spontaneous recovery is common and because no systematic controlled study of surgical intervention has been done, this decision must be made on an individual basis.

Conclusion

Despite clear diagnostic criteria for HNPP, we believe that this entity may be underdiagnosed and should be considered in differential diagnosis of patients with atypical presentations of compression neuropathies. Early diagnosis saves the patient from unnecessary, often painful and costly examinations and more importantly from unnecessary operations.

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