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Characteristic MRI Findings of Intraneural Perineurioma : A Case Series

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Introduction

- Intraneural perineurioma is a rare benign neoplasm of perineurium, frequently misdiagnosed.
- Although targeted fascicular biopsy remains the gold standard for diagnosis of intraneural perineurioma, it carries a non-negligible risk of iatrogenic nerve injury; therefore, clinicoradiological diagnosis using magnetic resonance imaging (MRI) has been increasingly advocated as a safer alternative.
- We report three cases of intraneural perineurioma diagnosed primarily through characteristic MRI findings.

Case 1

- A 19-year-old male presented to our clinic with left lower leg atrophy since age 18. At first, he showed no definite motor or sensory deficits, but the symptoms progressed with left tibial nerve-innervated muscle weakness.
- The electrodiagnostic study (EDX) and MRI findings were consistent with left tibial neuropathy. (Table 1, Figure 1)
- Nerve biopsy revealed predominantly fibrosis and fatty infiltration with negative EMA and S-100, interpreted as false-negative findings due to end-stage fibrotic changes.
- He was diagnosed with left tibial perineurioma based on characteristic clinicoradiological features.

Case 2

- A 51-year-old male presented with progressive right wrist and finger dorsiflexion weakness. He demonstrated motor weakness in right radial nerve-innervated muscles and a positive Tinel sign at the right radial groove.
- EDX and MRI findings was consistent with right radial neuropathy. (Table 1, Figure 1)
- He was diagnosed with right radial perineurioma; however, given his age beyond the typical onset, fascicular biopsy is planned to exclude malignancy.

Case 3

- A 60-year-old female presented to the orthopedic clinic with right wrist dorsiflexion weakness. She had previously undergone surgical decompression at an outside clinic for a misdiagnosis of posterior interosseous nerve (PIN) neuropathy, without improvement.
- EDX and MRI findings were consistent with right radial neuropathy. (Table 1, Figure 1)

Table 1. Clinical findings and electrodiagnostic studies

	Case 1	Case 2	Case 3
Sex/Age	19/M	51/M	60/F
C.C	Left lower leg atrophy ▶ Left toe gait weakness	Right wrist/finger dorsiflexion weakness	Right wrist dorsiflexion weakness
Onset Age	18	51	58
Onset pattern	Chronic (over 8 years)	Subacute (over 2 months)	Chronic (over 2 years)
Pain	(-)	Rt. wrist dorsum pain observed at first, but rapidly disappeared	(-)
Physical exam			
Motor deficits observed by MMT (MRC grade)	First visit : No weakness ▶7 years later, Lt. ankle plantar flexor grade 4, Lt. ankle invertor grade 4	Rt. supinator grade 5, Rt. BR grade 5, Rt. EDC grade 2, Rt. EIP grade 2-,Rt. APL/EPL grade 3-	Rt. supinator grade 5, Rt. BR grade 4+, Rt. EDC grade 1, Rt. EIP grade 1, Rt. APL/EPL grade 1
Sensory exam	Intact by touch/pinprick	Rt. 1st hand dorsum web space, index dorsum pinprick hypoesthesia	Intact by touch/pinprick
Other Findings	1st visit Rt. / Lt. MTC 40.5cm/37cm MCC 55.5cm/54cm ▼ 7yrs later Rt. / Lt. MTC 40cm/33.5cm MCC 56cm/53cm	Tinel sign positive at Rt. radial groove	(-)
Electrodiagnostic studies			

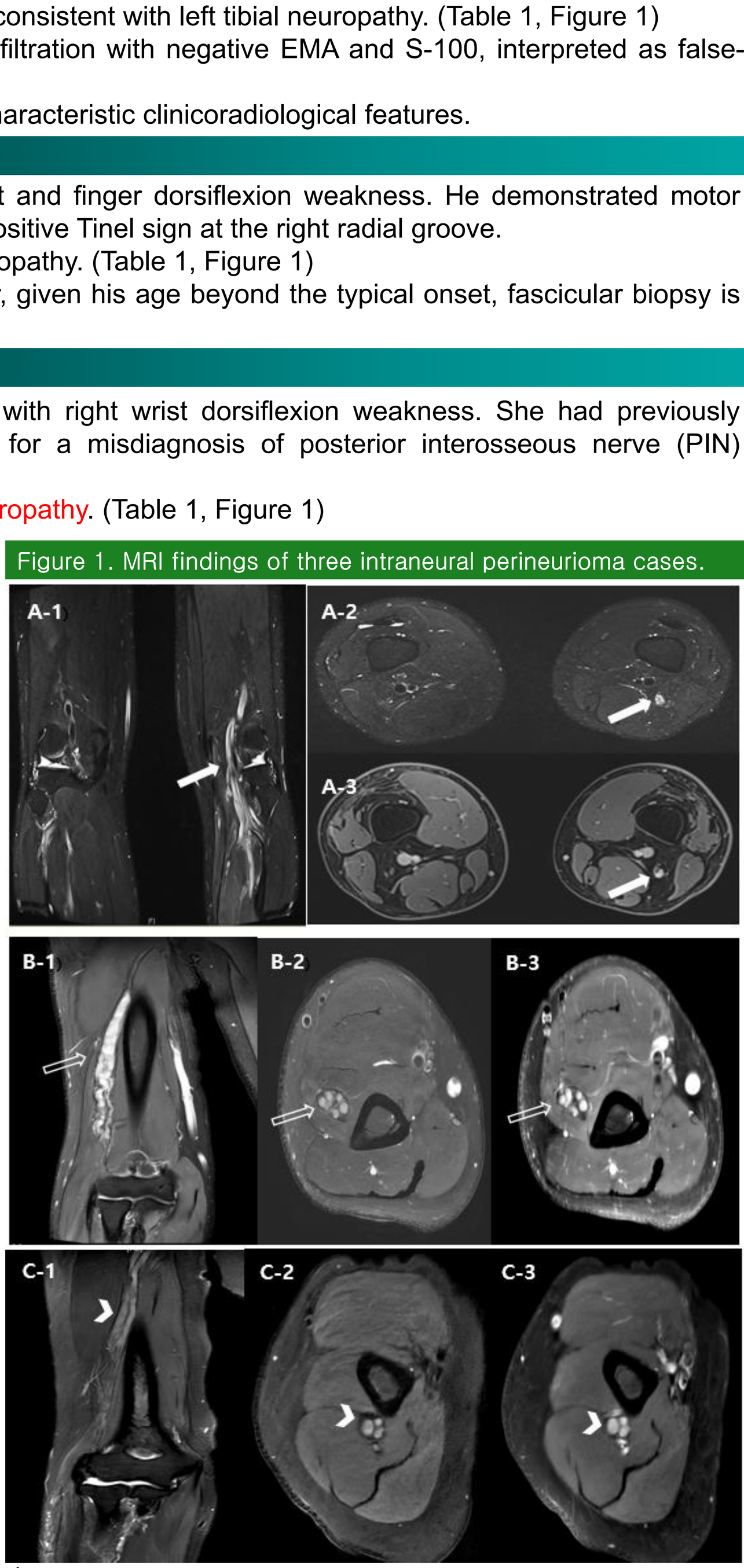
Sensory nerve conduction study	Latency(ms)	Amp.(μV)		Latency(ms)	Amp.(μV)		Latency(ms)	Amp.(μV)
Sup.peroneal	2.40/2.46	8.3/6.6	Median	2.24/2.55	36.1/45.1	Median	2.25/2.46	37.0/39.2
Sural	2.50/2.38	10.6/10.1	Ulnar	2.19/2.24	22.8/26.9	Ulnar	1.98/2.25	25.9/36.9
-	-	-	Radial	NR/1.67	NR/30.5	Radial	NR/1.63	NR/29.6

Motor nerve conduction study	Latency(ms)	Amp.(μV)		Latency(ms)	Amp.(μV)		Latency(ms)	Amp.(μV)
Com.peroneal	3.65/4.48	9.8/7.5	Median	3.02/3.23	7.3/8.5	Median	3.06/2.83	8.9/13.2
Tibial	3.65/3.83	16.1/22.4	Ulnar	2.08/2.55	8.9/8.6	Ulnar	2.25/2.27	15.3/17.3
			Radial	3.23/2.08	2.3/5.1	Radial	1.81/2.00	2.4/8.9

Needle electromyography	Denervation potential : Lt. GCM, Lt. TP, Lt. AH Neuropathic potential : Lt. TP MUAP recruitment : reduced at Lt. TP, Lt. AH No MUAP observed at Lt. GCM	Denervation potential : Rt. supinator, Rt. ECRL, Rt. EDC, Rt. EIP Neuropathic potential : Rt. supinator, Rt. ECRL, Rt. EDC, Rt. EIP MUAP recruitment : reduced at Rt. supinator, double at Rt. ECRL, Rt. EDC, Rt. EIP	Denervation potential : Rt. supinator, Rt. BR, Rt. EDC, Rt. EIP Neuropathic potential : Rt. BR, Rt. EDC, Rt. EIP MUAP recruitment : reduced at Rt. supinator, single at Rt. BR, Rt. EDC, Rt. EIP

C.C : Chief Complain, Rt. : right, Lt. : left, MMT : manual muscle test, MRC : Medical Research Council, MTC : Middle thigh circumference, MCC : Middle calf circumference, BR : Brachioradialis, EDC : Extensor Digitorum Communis, EIP : Extensor Indicis Proprius, APL/EPL : Abductor Pollicis Longus/Extensor Pollicis Longus, ECRL : Extensor Carpi Radialis Longus, Sup.peroneal : superficial peroneal, Com.peroneal : Common peroneal, Amp. : Amplitude, GCM : Gastrocnemius Medial head, TP : Tibialis posterior, AH : Abductor Hallucis, MUAP : Motor Unit Action Potential

Figure 1. MRI findings of three intraneural perineurioma cases.



(A) Case 1: Left tibial perineurioma Coronal (A-1) and axial (A-2) T2-weighted images demonstrate fusiform enlargement of the left tibial nerve (white arrow) with T2 hyperintensity and preserved fascicular pattern. Gadolinium-enhanced T1-weighted image (A-3) shows homogeneous contrast enhancement.

(B) Case 2: Right radial perineurioma Coronal (B-1) and axial (B-2) T2-weighted images demonstrate segmental enlargement of the right radial nerve (empty arrow) with T2 hyperintensity, extending from the radial groove to the elbow level. Gadolinium-enhanced T1-weighted image (B-3) shows homogeneous contrast enhancement.

(C) Case 3: Right radial perineurioma Coronal (C-1) and axial (C-2) T2-weighted images demonstrate tubular enlargement of the right radial nerve (arrowhead) at the mid-humeral shaft with T2 hyperintensity. Gadolinium-enhanced T1-weighted image (C-3) shows homogeneous contrast enhancement.

Conclusions

- These cases demonstrate that perineurioma should be considered in subacute-to-chronic progressive mononeuropathy when MRI shows T2 hyperintensity, homogeneous enhancement, and fusiform nerve enlargement with preserved fascicular pattern.
- Awareness of characteristic clinicoradiological features could spare patients from unnecessary fascicular biopsy and its associated risks.