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Ankle weakness after Extracorporeal Membrane Oxygenation: CASE SERIES

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Backgrounds

- Peripheral neuropathies have been reported as rare complications of extracorporeal membrane oxygenation (ECMO) therapy, even without compressive nature.
- We report three cases of **common peroneal or sciatic neuropathy following ECMO support.**

Case Presentation

- **CASE1** **A 42-year-old male** was admitted after cardiopulmonary resuscitation for ventricular fibrillation arrest, which was later attributed to hypersensitivity myocarditis. Following emergency Veno-arterial-ECMO insertion, the circuit was relocated due to **left lower extremity ischemia**. **One week later, the patient developed left foot drop (Table 1)**. Electrophysiologic studies confirmed l**eft common peroneal neuropathy (Table 2)**, and a one-month follow-up revealed **partial regression of the neuropathy (Table 1)**.

- **CASE2** **A 23-year-old male** was transferred for respiratory failure caused by chronic pulmonary thromboembolism and right heart failure. He previously had 10 days of **ECMO via the left femoral artery**. Seventeen days after the initial ECMO insertion**, right ankle weakness was noted (Table 1)**. Electrophysiologic studies confirmed **right sciatic neuropathy (Table 2)**, and lumbosacral plexus magnetic resonance image (MRI) showed increased **T2 signal intensity and loss of fat planes around the right sciatic nerve (Figure 1)**, suggesting compressive neuropathy. **Nearly complete regression** was observed at a 3-month follow-up (Table 1).

- **CASE3** **A 61-year-old female** was hospitalized for cardiorespiratory failure due to interstitial lung disease, later contributed to dermatomyositis with muscle biopsy and anti-MDA5 antibody. Veno-venous-**ECMO** was initiated upon admission, and **bilateral ankle dorsiflexion failure was noted six weeks later (Table 1)**. Following lung transplantation, the patient was successfully decannulated. Electrophysiologic studies confirmed **bilateral common peroneal neuropathy and generalized myopathy (Table 2)**, and neuromuscular MRI revealed **denervation edema in the anterior and lateral compartment muscles of the left lower leg, as well as the deep posterior compartment muscles of both lower legs (Figure 1)**. **No regression** was noted at 3-month (Table 1).

Table 1. Serial physical examinations of the patients

			Case 1		Case 2		Case 3	
			Initial	F/U 4mo	Initial	F/U 3mo	Initial	F/U
Lower Extremity Motor strength (MRC grade)	Hip	Flexor	4/3	5/4	4/4	N/A	2/2	2/2
		Abductor	4/3	5/4	3/5	N/A	N/A	N/A
	Knee	Flexor	4/3	5/4	3/5	N/A	3/3	3/3
		Extnesor	4/3	5/4	4/5	N/A	3/3	3/3
	Ankle	Dorsiflexor	4/1	5/4	0/5	5/5	0/0	0/0
		Plantarflexor	4/3	5/4	0/5	5/5	3/3	3/3
		Invertor	4/3	5/4	0/5	5/5	3/3	3/3
		Evertor	4/2	5/4	0/5	5/5	1/1	1/1
	Long toe	Dorsiflexor	4/0	5/3	0/5	5/5	0/0	0/0
Sensory			Pinprick anesthesia, both peroneal nerve territory		Allodynia, Rt. peroneal nerve territory	Intermittent paresthesia, Rt. 1st toe	Hypesthesia, both lateral lower leg and 1st/2nd toe web	
DTR	Knee jerk		0/0	N/A	1/1	N/A	0/0	0/0
	Ankle jerk		0/0	N/A	0/1	N/A	0/0	0/0

Abbreviations: F/U=Follow up, MRC=Medical Research Council, Rt.=Right, DTR=Deep Tendon Reflexes, mo=months

Table 2. Results of the electrophysiologic studies

		Case 1	Case 2	Case 3
Sensory NCS		Loss of Lt. superficial peroneal SNAP response	Loss of Rt. sural SNAP response Decreased Rt. Superficial peroneal, Lt. sural SNAP amplitude	Loss of both superficial peroneal SNAP response
Motor NCS		Decreased Lt. common peroneal CMAP amplitude	Decreased Rt. common peroneal, Rt. Tibial CMAP amplitude	Loss of Lt. common peroneal CMAP response, Decreased Rt. common peroneal CMAP amplitude
Needle EMG	Spontaneous Activity	Reduced insertional activity at Lt. EHL	Denervation potential at Rt. BFS, ST, TA, TP, PL, GCM	Denervation potential at both TA, Lt. PL
	MUAP morphology	Within normal limits	Within normal limits	Polyphasic: Rt. TA, Rt. PL, both FDI Short polphasic: both TP, both TFL, both BFS, Lt. ST, both BB
	MUAP recruitment	Reduced: Lt. TA, TP, PL, GCM Nill: Lt. EHL	Reduced: Rt. TFL Single: Rt. BFS, ST, TA Nill: Rt. TP, PL, GCM	Reduced: Rt. TA / Discrete: Rt. PL Nill: Lt. TA, Lt. PL Early: both TP, both TFL, both BFS, both ST, both BB

Abbreviations: NCS=Nerve Conduction Study, SNAP=Sensory Nerve Action Potential, CMAP=Compound Muscle Action Potential, MUAP=Motor Unit Action Potential, Lt.=Left, Rt.=Right, EHL=Extensor Hallucis Longus, TA=Tibialis Anterior, TP=Tibialis Posterior, PL=Peroneus Longus, GCM=Gastrocnemius Medial head, BFS=Biceps fermoris short head, ST=Semitendinosus, TFL=Tensor Fasciae Latae, FDI=First Dorsal Interossei, BB=Biceps brachii

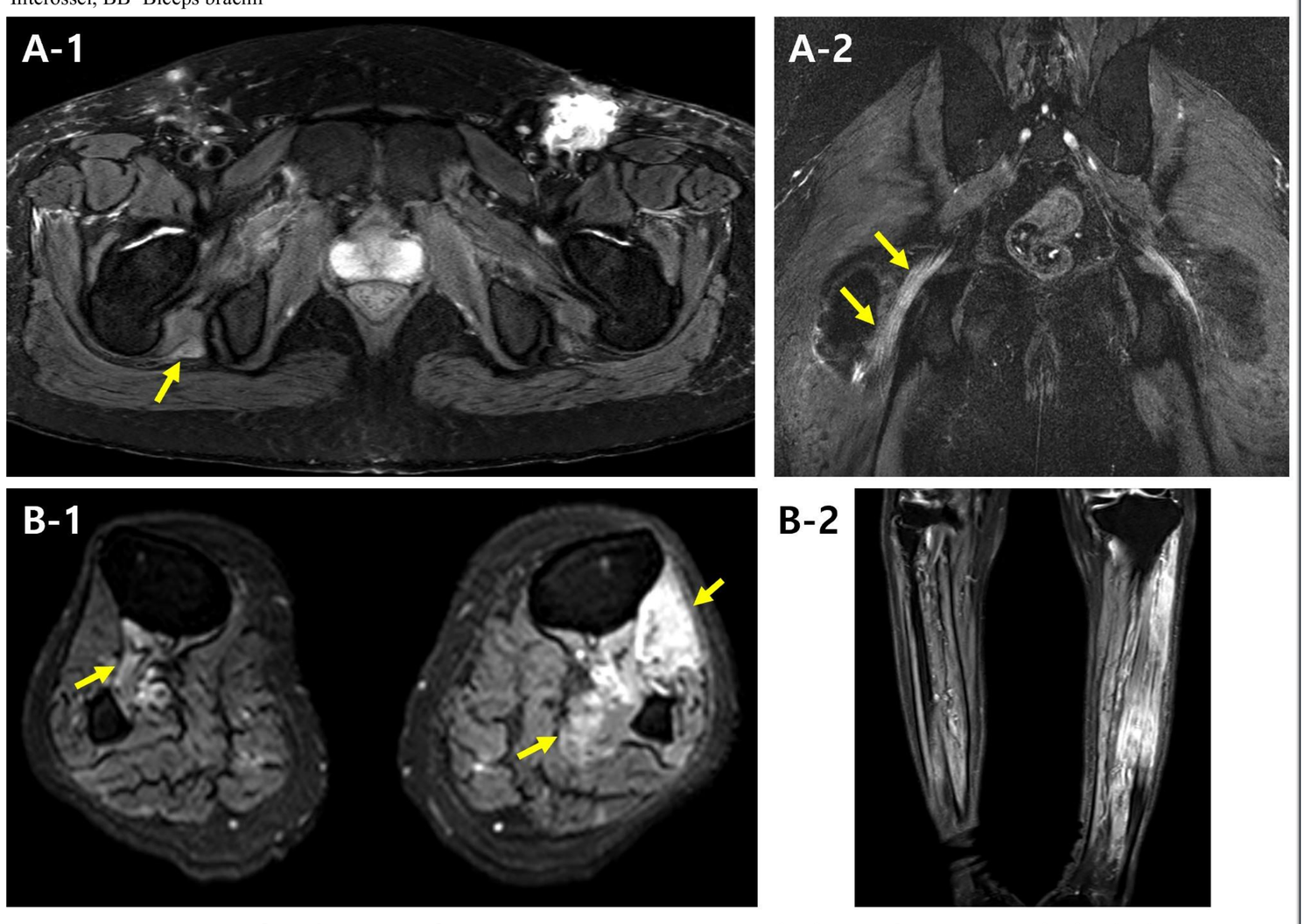

Figure 1. MRI findings of patients in Case 2 (A) and Case 3 (B). (A) Increased T2 signal intensity of the right sciatic nerve in Case 2 is shown in axial (A-1) and coronal (A-2) images. (B) Denervation edema in the anterior and lateral compartment muscles of the left lower leg, as well as the deep posterior compartment muscles of both lower legs, were noted in axial (B-1) and coronal (B-2) images.

Conclusions

- Previous studies show ECMO-related neuropathies primarily affect femoral nerve (34%) in compressive cases, but **lumbosacral plexus (50%), peroneal (25%), and sciatic (12.5%) nerves in non-compressive cases.**
- Injuries are mostly ipsilateral (75%), though **contralateral (17%) and bilateral (8%) cases occur.**
- **Possible non-compressive mechanisms include distal limb ischemia and microcirculatory dysfunction.**
- Given these rare but significant complications, **continuous monitoring of ankle strength is vital in ECMO patients**, and electrophysiologic studies should be considered when necessary.