Severe ulnar and median neuropathies in critically-ill COVID-19 patient

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ABSTRACT

Patient: 39-year-old female presenting for NCS/EMG for evaluation of right hand weakness and numbness in the setting of a recent ICU admission for respiratory distress related to COVID-19 pneumonia and brief use of wrist restraints. Exam was notable for claw hand.
Results: Electrodiagnostic evidence was most consistent with severe right median (distal to the innervation of FCR and proximal to FDS) and ulnar (distal to FDP and proximal to dorsal ulnar cutaneous branch) neuropathies.
Discussion: In this case, it is notable that the NCS/EMG was not suggestive of a generalized myopathy or polyneuropathy that would support a picture of CIM/CIP. Instead, the cause of nerve injury remains unclear as it localized proximal to the wrist restraints and was unilateral. Other possibilities include retrograde denervation or compression during a proning session, or potentially, the SARS-CoV-2 infection increased the risk for developing this neuropathy.
Conclusion: The neurologic implications of SARS-CoV-2 infection remain incompletely defined and the ongoing accumulation of this knowledge continues to have significant implications in the treatment of COVID-19 patients.

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REFERENCES

1. García-Moncó JC, Cabrera-Muras A, Collía-Fernández A, Erburu-Iriarte M, Rodrigo-Armenteros P, Oyarzun-Irazu I, Martínez-Condor D, Bilbao-González A, Carmona-Abellán M, Caballero-Romero I, Gómez-Beldarrain M. Neurological reasons for consultation and hospitalization during the COVID-19 pandemic. Neurol Sci. 2020 Nov;41(11):3031-3038.
2. Costello F, Dalakas MC. Cranial neuropathies and COVID-19: Neurotropism and autoimmunity. Neurology. 2020 Aug 4;95(5):195-196.
3. Amanda C. Guidon, Anthony A. Amato. COVID-19 and neuromuscular disorders. Neurology. 2020 Jun;94 (22) 959-969.

INTRODUCTION

- Neurologic implications of SARS-CoV-2 infection remain incompletely defined [1].
- Possible pathophysiology [2]:
  - Direct viral interaction with neurologic ACE2 receptors
  - Autoimmune response due to cross-reactivity between SARS-CoV-2 gangliosides and peripheral nerve glycoproteins
- Other considerations [1]:
  - Critical illness itself can increase risk of neurologic complications
  - COVID-19 patients with severe illness often suffer from multi-organ failure, prolonged immobility, increased use of paralytics, use of high-dose steroids, and restrictive positioning (proning and use of restraints), all factors that increase the risk for nonspecific critical illness polyneuropathy/myopathy

CASE PRESENTATION

- HPI:
  - 39-year-old right-handed female with prior right MCA CVA (residual left hemiparesis)
  - Suffered from critical illness from Covid-19 pneumonia requiring intubation
  - Received dexamethasone, sedation, brief paralytics
  - Required bilateral, soft wrist restraints for < 48 hours
  - Developed right hand weakness and numbness including right medial forearm during her ICU stay
- Physical Exam (right upper extremity):
  - Marked atrophy of thenar eminence and intrinsic hand musculature
  - 5/5 strength of shoulder abduction, elbow flexion/extension, wrist flexion/extension, pronation, finger extension, and DIP/PIP flexion
  - 1/5 strength of thumb abduction/opposition, finger abduction, and MCP flexion
  - Diminished sensation to light touch and pinprick to entire right hand (all fingers, palm, and dorsum of hand) and medial forearm.
  - Tinel's negative at the wrist and elbow.
  - Froment's sign positive
  - 1+ reflexes

RESULTS

- NCS/EMG performed about 4 months after onset of weakness

Sensory

Nerve / Sites	Rec. Site	Distance mm	Onset Vel m/s	Onset Lat ms	Peak Lat ms	Amp µV	Temp. °C
R Median - Digit III (Antidromic)							
Wrist	Dig III	140	NR	NR	NR	NR	33.1
R Ulnar - Digit V (Antidromic)							
Wrist	Dig V	140	NR	NR	NR	NR	30.3
R Sural - Ankle (Calf)							
Calf	Ankle	140	42.7	3.3	4.4	4.9	30.3
L Sural - Ankle (Calf)							
Calf	Ankle	140	38.4	3.6	4.3	10.4	29.8
L Median - Digit III (Antidromic)							
Wrist	Dig III	140	56.0	2.5	3.2	42.3	30.1
L Ulnar - Digit V (Antidromic)							
Wrist	Dig V	140	52.7	2.7	3.3	31.1	30.1
R Dorsal ulnar cutaneous - Hand dorsum (Forearm)							
Forearm	Hand dorsum	100	NR	NR	NR	NR	

Motor

R Ulnar - ADM						
Wrist	ADM	80		NR	NR	31.3
B.Elbow	ADM			NR	NR	31.3
R Peroneal-Fibular - EDB						
Ankle	EDB	80		3.6	3.1	32.2
Fib head	EDB	340	50.6	10.3	3.0	32.4
L Peroneal-Fibular - EDB						
Ankle	EDB	80		4.5	3.5	29.4
Fib head	EDB	320	47.6	11.3	3.5	30.3
L Median - APB						
Wrist	APB	80		4.0	9.7	29.4
Elbow	APB	300	72.0	8.2	9.7	29.4
L Ulnar - ADM						
Wrist	ADM	80		3.2	6.3	29.2
B.Elbow	ADM	230	61.3	6.9	7.1	29.2
A.Elbow	ADM	70	74.7	7.9	6.7	29.2
						29.2
R Median - APB						
Wrist	APB	80		NR	NR	30.4
Elbow	APB			NR	NR	30.8

EMG

	Spontaneous				MUAP				
Muscle	**IA**	**Fib**	**PSW**	**Fasc**	**Effort**	**Recruit**	**Dur**	**Amp**	**Polys**
R. Deltoid	Normal	0	0	None	NI	NI	NI	NI	None
R. Biceps brachii	Normal	0	0	None	NI	NI	NI	NI	None
R. Triceps brachii (Lateral head)	Normal	0	0	None	NI	NI	NI	NI	None
R. Pronator teres	Normal	0	0	None	NI	NI	NI	NI	None
R. Flexor carpi ulnaris	Normal	0	0	None	NI	NI	NI	NI	None
R. Extensor indicis proprius	Normal	0	0	None	NI	NI	NI	NI	None
R. Flexor carpi radialis	Normal	0	0	None	NI	NI	NI	NI	None
R. Flexor digitorum profundus	Normal	0	0	None	NI	NI	NI	NI	None
R. Abductor digiti minimi (manus)	Incr	1+	3+	None	NI	NO MUAP	--	--	--
R. Flexor pollicis longus	Normal	0	0	None	NI	Reduced	NI	NI	Few
R. Flexor digitorum superficialis	Normal	0	0	None	NI	Reduced	NI	NI	Few
R. First dorsal interosseous	Incr	2+	2+	None	NI	NO MUAP	--	---	---
R. Abductor pollicis brevis	Incr	2+	3+	None	NI	Discrete	NI	NI	None
L. Abductor pollicis brevis	Normal	0	0	None	NI	NI	NI	NI	None
L. First dorsal interosseous	Normal	0	0	None	NI	NI	NI	NI	None

DISCUSSION

- NCS/EMG was not suggestive of a generalized polyneuropathy or myopathy that would support a picture of nonspecific critical illness myopathy or polyneuropathy.
- Additionally, the data were not consistent with a cervical radiculopathy or brachial plexopathy and injury was localized to the forearm for both ulnar and median nerves
- The cause of such an injury remains unclear:
  - There may have been inadvertent compression of the right arm during a proning session
  - There may have been significant compression of the forearm with the wrist restraints with retrograde denervation.
  - Potentially, the SARS-CoV-2 infection may have increased the patient's risk for developing neuropathy. [3]

CONCLUSIONS

With the ongoing SARS-CoV-2 pandemic, there has been a growing number of reports of neurologic complications. The ongoing accumulation of these data remains important for improving our knowledge of this novel virus and can have significant implications in the treatment of these patients.