Prone to Injury: A Case Report on Brachial Plexopathy in the setting of Prolonged Prone Ventilation from SARS-CoV-2

Andrew Harb, DO, MPH., Yusef Bazzy MS-IV, MBA., Santosh Madhavan, MD

Wayne State University School of Medicine and Detroit Medical Center

Background

The world was taken by storm in early 2020, due to the SARS-CoV-2 Pandemic. Respiratory involvement from the virus has led to a large cohort of patients requiring prolonged mechanical ventilation. Many of these cases are being managed for long periods of time in a prone position. While shown to be beneficial for respiratory function, there are many inherent risks of proning patients, such as injuries sustained inadvertently from the positioning. One such injury, described as Prone Position Plexopathy (PPP) is a severe complication from positioning during ventilation, and has only been reported in a few cases.

Case History

A 56 year old female with a past medical history significant for hypertension, asthma, diverticulosis and obesity presented to the inpatient rehabilitation unit with a chief complaint of left upper extremity motor paresis and sensory loss. During the patient's acute hospitalization for viral pneumonia and COVID-19 infection, she was ultimately placed on ventilatory support, which required prolonged prone positioning for 16 hours per day for 31 days. The patient also presented with debility secondary to prolonged hospital course.

Figure 1: Initial Physical Exam Findings 09/24/2020

Sensory	R	L
C5	Intact	Decreased light touch
C6	Intact	Decreased light touch
C7	Intact	No sensation to touch
C8	Intact	Decreased light touch
T1	Intact	Decreased light touch

Manual Muscle Testing	R	L
Elbow Flexion	5	1
Elbow Extension	5	3
Wrist Flexion	5	2
Wrist Extension	5	1
Finger Flexion	5	1
Finger Abduction	5	1

Diagnosis

As a result of the ventilatory positioning, the patient developed sensorimotor deficits of her left upper extremity; diagnosed as a brachial plexopathy via Electrodiagnostic testing in inpatient rehabilitation (IPR).

Figure 2: Nerve Conduction Studies

Nerve Conduction Studies

Anti Sensory Summary Table

Stim Site	NR	Peak (ms)	Norm Peak (ms)	O-P Amp (μV)	Norm O-P Amp	Site1	Site2	Delta-P (ms)	Dist (cm)	Vel (m/s)	Norm Vel (m/s)
Left Median Anti Sensory (2nd Digit)											
Wrist		9.1	<3.6	4.0	>10	Wrist	2nd Digit	9.1	14.0	15	
Right Median Anti Sensory (2nd Digit)											
Wrist		4.4	<3.6	25.8	>10	Wrist	2nd Digit	4.4	14.0	32	
Left Radial Anti Sensory (Base 1st Digit)											
Wrist		6.0	<3.1	0.6		Wrist	Base 1st Digit	6.0	0.0		
Left Ulnar Anti Sensory (5th Digit)											
Wrist		3.6	<3.7	5.7	>15.0	Wrist	5th Digit	3.6	14.0	39	
Right Ulnar Anti Sensory (5th Digit)											
Wrist		3.4	<3.7	21.3	>15.0	Wrist	5th Digit	3.4	14.0	41	

Motor Summary Table

Stim Site	NR	Onset (ms)	Norm Onset (ms)	O-P Amp (mV)	Norm O-P Amp	Site1	Site2	Delta-0 (ms)	Dist (cm)	Vel (m/s)	Norm Vel (m/s)
Left Median Motor (Abd Poll Brev)											
Wrist		13.8	<4.2	0.1	>5	Elbow	Wrist	0.0	0.0		>50
Elbow		13.8		0.0							
Right Median Motor (Abd Poll Brev)											
Wrist		6.2	<4.2	2.5	>5	Elbow	Wrist	3.9	21.0	54	>50
Elbow		10.1		2.1							
Left Ulnar Motor (Abd Dig Min)											
Wrist		2.8	<4.2	2.7	>3	B Elbow	Wrist	3.7	17.0	46	>53
B Elbow		6.5		2.4		A Elbow	B Elbow	1.9	9.0	47	>53
A Elbow		8.4		2.4							
Right Ulnar Motor (Abd Dig Min)											
Wrist		3.0	<4.2	5.2	>3	B Elbow	Wrist	2.8	17.0	61	>53
B Elbow		5.8		5.3		A Elbow	B Elbow	1.7	9.0	53	>53
A Elbow		7.5		5.2							

Figure 3: EMG

Side	Muscle	Nerve	Root	Ins Act	Fibs	Psw	Fasc	Other	Amp	Dur	Poly	Recrt	Int Pat
Left	Cerv Para Low			Nml	None	None	None	None	Nml	Nml	0	Nml	Nml
Left	Cerv Para Mid			Nml	None	None	None	None	Nml	Nml	0	Nml	Nml
Left	Cerv Para Up			Nml	None	None	None	None	Nml	Nml	0	Nml	Nml
Left	Deltoid	Axillary	C5-6	1+	None	None	None	None	Nml	Nml	0	Nml	Nml
Left	Opp Pollicis	Median	C8-T1	2+,3+	2+	2+	None	None	Nml	Nml	0	Reduced	Nml
Left	PronatorTeres	Median	C6-7	2+,3+	2+	2+	None	None	Nml	Nml	0	Nml	Nml
Left	Biceps	Musculocut	C5-6	2+,3+	2+	2+	None	None	Nml	Nml	0	Nml	Nml
Left	Triceps	Radial	C6-7-8	2+,3+	2+	2+	None	None	Nml	Nml	1+	Reduced	Nml
Left	Ext Digitorum	Radial (Post Int)	C7-8	2+,3+	2+	2+	None	None	Nml	Nml	0	Nml	Nml
Left	1stDorInt	Ulnar	C8-T1	2+,3+	2+	2+	None	None	Nml	Nml	0	Reduced	Nml
Right	Cerv Para Mid			Nml	None	None	None	None	Nml	Nml	0	Nml	Nml
Right	Cerv Para Low			Nml	None	None	None	None	Nml	Nml	0	Nml	Nml
Right	Deltoid	Axillary	C5-6	Nml	None	None	None	None	Nml	Nml	0	Nml	Nml
Right	Opp Pollicis	Median	C8-T1	1+	2+	2+	None	None	Nml	Nml	0	Nml	Nml

Discussion

Major causes of closed nerve injury are compression and traction, which is understood from principles of tissue biomechanics and injury mechanisms studied in animal and cadaveric models. In addition, direct nerve injury is understood as damage to different anatomical regions of the brachial plexus, such as supra-clavicular, retro-clavicular and infraclavicular areas. Combining these mechanics and anatomic regions allows for recommendations to avoid such positional injuries seen in prolonged prone posturing, (Figure 4).

Conclusion

Brachial plexopathies, although rare, can occur as a result of prolonged prone positioning during intubation. While the COVID-19 Pandemic continues, demand for ventilatory support will remain high, as well as the potential for more brachial plexopathies. In order to prevent PPP from occurring it is vital that preventive measures are understood and taken. These include, but are not limited too, alternating swimmer position every 2 hours with the head facing the abducted arm [1][2]. More positions can be seen in Figure 4, below.. It is reported that within 6 months from brachial plexopathy, recovery is to be greater than 90% when proper rehabilitation and care is given [3].

References

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