

THE LANCET Neurology

Supplementary appendix

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Supplement to: Todisco M, Alfonsi E, Arceri S, et al. Isolated bulbar palsy after SARS-CoV-2 infection. *Lancet Neurol* 2021; **20**: 169–70.

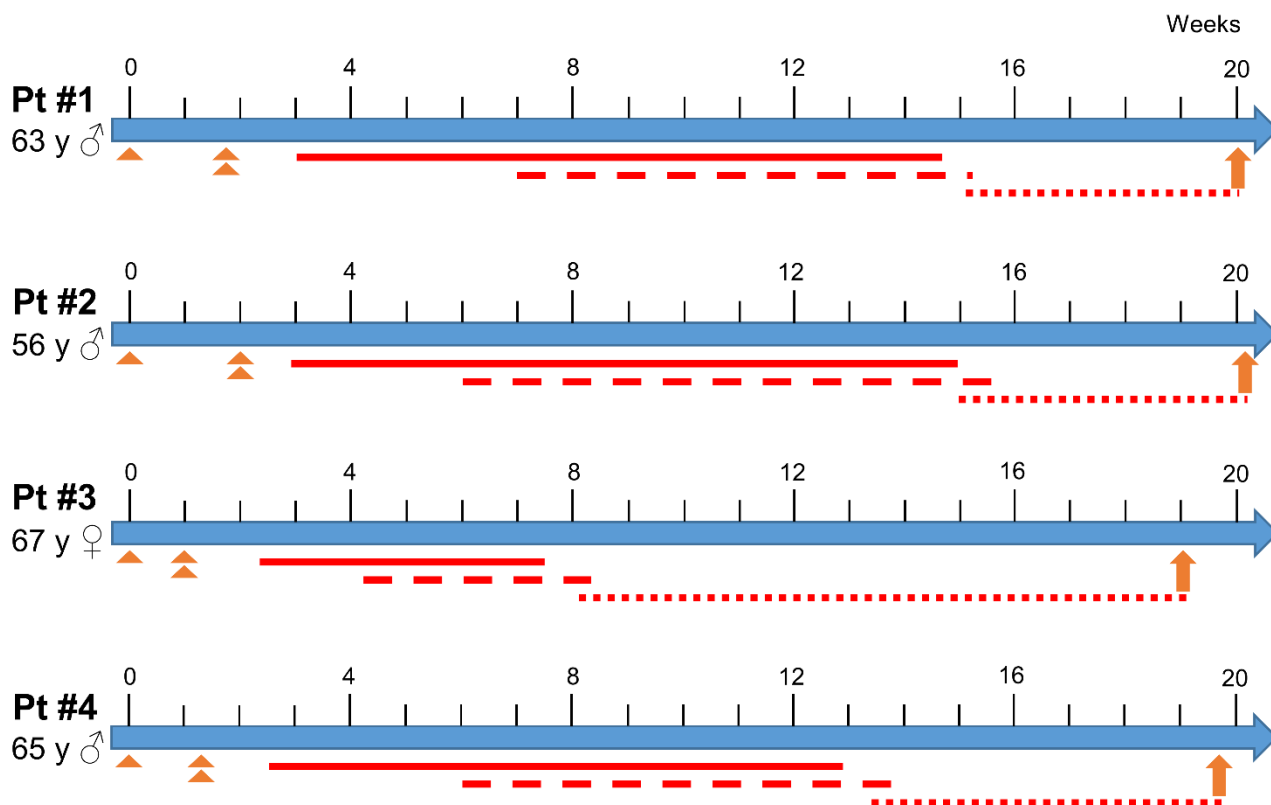


Figure 1: Timelines of the clinical course before baseline electrophysiological assessment. The single and double arrowheads indicate the onset of respiratory symptoms and the hospital admission because of respiratory failure, respectively. The solid and dashed lines denote stay in the Intensive Care Unit and positioning of tracheostomy, respectively. The dotted lines point out the evidence of neurological symptoms. The arrows show the date of baseline electrophysiological evaluation. Between week 2 and 3, therapy with hydroxychloroquine and high-flow oxygen was started, and patient #3 was also treated with remdesivir. Within week 20, nasogastric tube was removed in patient #3 and #4, whereas the persistent severe dysphagia in patient #1 and #2 required insertion of percutaneous endoscopic gastrostomy. Baseline neurological examination showed breathy voice in all subjects, soft palate weakness (bilaterally in patient #1 and #4, left-sided in patient #2 and #3), tongue deviation toward the left side on protrusion in all subjects, and weakness of trapezius and sternocleidomastoid muscles (right-sided in patient #1 and #2, bilaterally in patient #3, left-sided in patient #4).

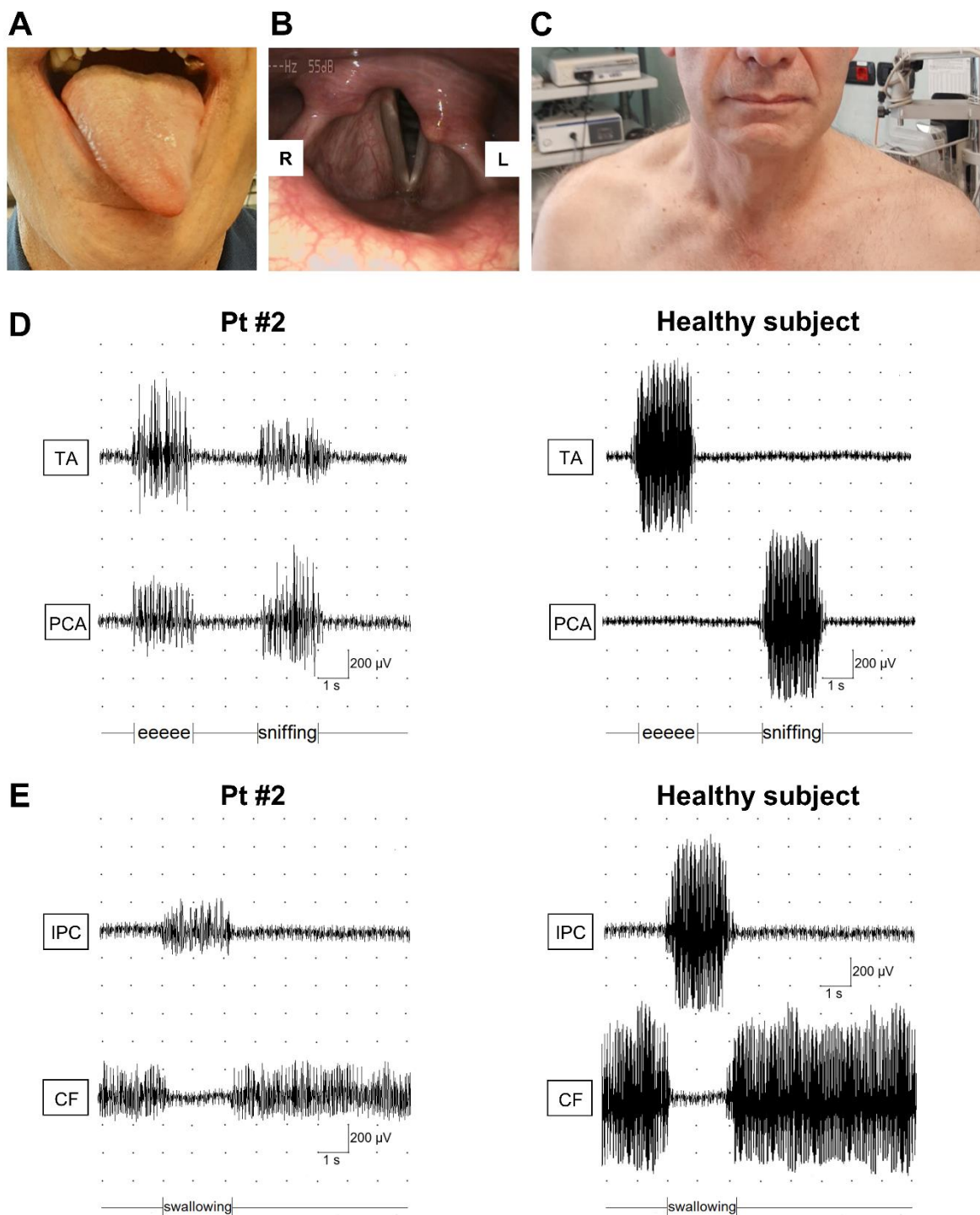


Figure 2: Illustrative pictures and EMG traces at baseline. (A-C) Illustrative pictures from patient #4. (A) Tongue deviation toward the left side on protrusion. (B) Endoscopic view of the larynx showed a reduced glottic opening during forced inspiration, caused by left vocal cord paralysis in paramedian position and scarce abduction of the right vocal cord. (C) Hypotrophy of the trapezius and sternocleidomastoid muscles on the left side. (D, E) Illustrative EMG traces of vocal cord and pharyngeal muscles from patient #2 and a healthy subject. As compared to the healthy subject, patient #2 showed a reduced spatial recruitment of MUAPs of vocal cord muscles (TA during a prolonged “eeeeee” and PCA during sniffing) and of pharyngeal muscles (activation of IPC during the pharyngeal phase of swallowing and basal tone of CP) on the left side. (D) In patient #2, co-contraction between TA and PCA during a prolonged “eeeeee” and sniffing was evident. This finding can be interpreted as a synkinesis, a sign of aberrant nerve regeneration of the anterior and posterior branches of the recurrent laryngeal nerve for TA and PCA, respectively. (E) Both patient #2 and the healthy subject disclosed a physiological relaxation of CP during the pharyngeal phase of swallowing. CP=cricopharyngeal muscle. IPC=inferior pharyngeal constrictor muscle. MUAPs=motor unit action potentials. PCA=posterior cricoarytenoid muscle. TA=thyroarytenoid muscle.

Table 1: Nerve conduction and EMG findings at baseline

Nerves/muscles	Side	ENG/EMG parameters	Patient #1	Patient #2	Patient #3	Patient #4
Hypoglossal nerve	Right	Distal latency	Normal	Normal	Normal	Normal
		CMAP amplitude	↓	Normal	↓	Normal
	Left	Distal latency	Normal	Normal	Normal	Normal
		CMAP amplitude	↓↓	↓↓	↓↓	↓↓
Thyroarytenoid and posterior cricoarytenoid muscles (innervated by the recurrent laryngeal branch of the vagus nerve)	Right	Spontaneous activity	No	No	No	No
		Neurogenic MUAPs	++	No	No	+
		Recruitment	↓↓	Normal	Normal	↓
	Left	Spontaneous activity	No	Fib, PSW	No	Fib, PSW
		Neurogenic MUAPs	++	++	++	++
		Recruitment	↓	↓↓	↓↓	↓
Cricothyroid muscle (innervated by the superior laryngeal branch of the vagus nerve)	Right	Spontaneous activity	No	No	No	No
		Neurogenic MUAPs	++	No	No	+
		Recruitment	↓↓	Normal	Normal	↓
	Left	Spontaneous activity	No	Fib	No	No
		Neurogenic MUAPs	++	++	+	++
		Recruitment	↓	↓	↓	↓
Inferior pharyngeal constrictor and cricopharyngeal muscles (innervated by the pharyngeal branch of the vagus nerve)	Right	Spontaneous activity	No	No	No	No
		Neurogenic MUAPs	+	No	No	+
		Recruitment	↓	Normal	Normal	↓
	Left	Spontaneous activity	No	No	No	No
		Neurogenic MUAPs	+	++	+	++
		Recruitment	Normal	↓↓	↓	↓
Trapezius and sternocleidomastoid muscles (innervated by the accessory nerve)	Right	Spontaneous activity	CRD	No	No	No
		Neurogenic MUAPs	+	++	+	+
		Recruitment	↓	↓↓	↓	Normal
	Left	Spontaneous activity	No	No	No	No
		Neurogenic MUAPs	No	No	+	+
		Recruitment	Normal	Normal	↓	↓
Tongue (innervated by the hypoglossal nerve)	Right	Spontaneous activity	No	No	No	No
		Neurogenic MUAPs	++	No	+	No
		Recruitment	↓	Normal	↓	Normal
	Left	Spontaneous activity	Fib, PSW	Fib, PSW	Fib, PSW	No
		Neurogenic MUAPs	++	++	++	+
		Recruitment	↓↓	↓↓	↓↓	↓

Findings from nerve conduction studies of the limbs, blink reflex, and facial nerve conduction study were not reported, since were normal in all patients. Limb electroneurography included motor conduction study of the common peroneal, tibial and ulnar nerves, F wave latency of the tibial and ulnar nerves, and antidromic sensory conduction study of the sural and ulnar nerves, bilaterally. Both upper and lower branches were assessed for motor conduction study of the facial nerve. ↓ denotes mild reduction. ↓↓ indicates severe reduction.

+ denotes mild neurogenic findings at MUAPs analysis. ++ indicates severe neurogenic findings at MUAPs analysis.

CMAP=compound muscle action potential. CRD=complex repetitive discharges. ENG=electroneurography. Fib=fibrillation potentials. MUAPs=motor unit action potentials. PSW=positive sharp waves.