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Traumatic Paraplegia: Spine is not always the Right Answer

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ARTICLE INFO	ABSTRACT
Published Online: 28 April 2022 Corresponding Author: **Salma Mrichi**	Paraplegia is rarely reported as a consequence of isolated blunt head trauma. We report a case of a 28-years old patient admitted to our department after a traumatic brain injury. On admission he presented a paraparesis without sensory disturbance in both legs. Spine CT (Computed Tomography) scan and MRI (Magnetic Resonance Imaging) scan of the spine were both normal. Brain CT scan and MRI showed bilateral precentral gyri contusion. Early rehabilitation was key to quick motor recovery. Our case highlights traumatic brain injury as a differential diagnosis of paraplegia.

KEYWORDS: Head trauma, Traumatic paraplegia, precentral gyrus contusion, early rehabilitation.

I. INTRODUCTION

In emergency care contexts, you are trained to think fastest to do good. You are taught to look at the big picture and cover most common clinical presentations when a detailed oriented way of thinking delves into the specifics, and one may lose sight of the whole problem. It doesn't mean that one thinking modality is the most accurate and another wrong, but the chances of being misleading are high. When we talk about paraplegia, common sense would suggest that one must consider spinal cord injury straight away as the first diagnosis.

Paraplegia seems to be rarely reported as a result of blunt head trauma. The purpose of our analysis is to emphasize it as a differential diagnosis of traumatic paraplegia secondary to isolated brain injury without spinal cord lesion.

II. CASE PRESENTATION

A 28 years old male was brought to the emergency room after being a victim of blunt trauma. He sustained a head injury. On examination, he was fully alert and orientated, his Glasgow Coma Scale score was 15. No scalp laceration was found but rather subcutaneous hematomas in the parietal and occipital region. Full physical examination didn't show any bruises or injuries. Neurological examination revealed pure motor paralysis of both legs. Manual muscle testing revealed scores of 3/5 for the lower limbs. There were no sensory disturbances. Initially, he displayed normal bowel function but experienced urinary retention that led to urinary catheter placement. The very next day, motor deficit worsened to total flaccid paraplegia. Sensitivity remained intact. CT scan of the thoracic and lumbar spine was normal showing no sign of any vertebral fracture, dislocation, or epidural hematoma (Figure 1).

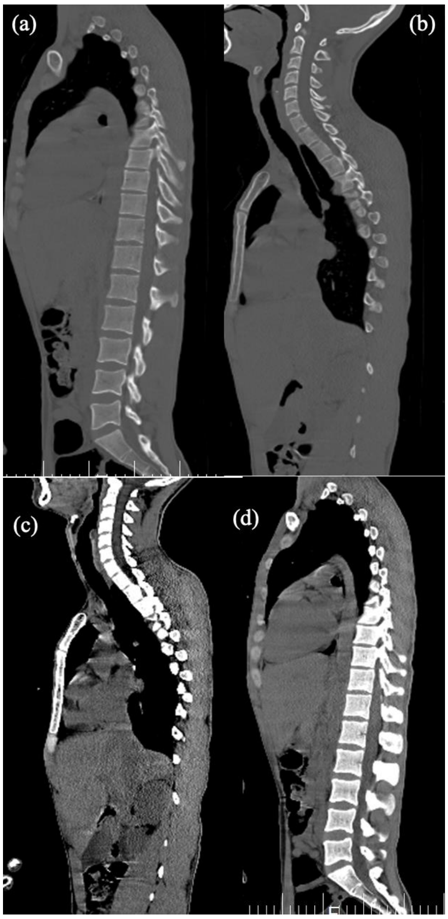

Figure 1. Initial spine CT scan. (a), (b) Sagittal plan images show normal spinal alignment and bony structures. (c), (d) soft tissue window shows normal spinal canal without any evidence of epidural hematoma.

Brain CT scan found a contusion of the left precentral gyrus (Figure 2).

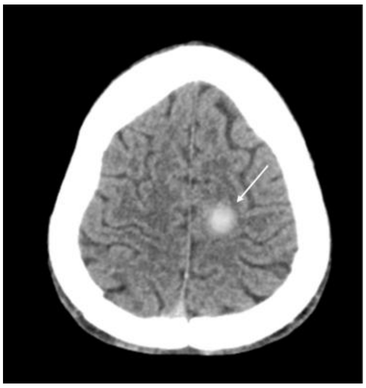

Figure 2. Initial non-contrast brain CT scan. Axial CT image in soft tissue window shows left precentral gyrus contusion (arrow).

Spine and brain MRI were performed. Spine MRI was normal whereas axial T2*and Sensitivity Weighted Imaging (SWI) brain MRI showed traumatic cerebral microbleeds on bilateral precentral gyri (Figure 3).

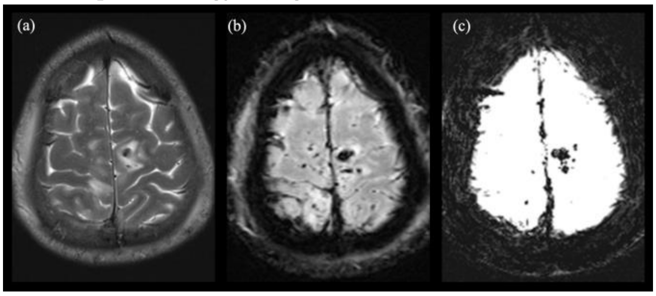

Figure 3. (a) Axial T2-weighted turbo spin-echo shows hyperintense contusion in bilateral precentral gyri with a central low intensity signal within the left contusion. (b, c) Axial T2* SWI shows bilateral cerebral microbleeds.

The patient was kept under clinical observation and treated conservatively. He received daily rehabilitation with slow improvement. After three weeks, he was able to raise both legs. At discharge, the manual muscle test of his lower limbs was 3/5 in both legs, but he remained unable to walk. At one month follow-up he was fully able to walk with a walker, and follow-up brain CT scan showed low signal density at the site of previous hemorrhage (Figure 4).

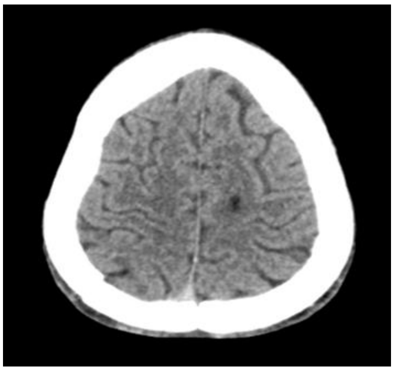

Figure 4. One month follow-up non-contrast brain CT scan. Axial image shows low density at the site of previous hemorrhage.

III. DISCUSSION

Brain injuries caused by mild to moderate head trauma are typically undetectable by conventional imaging methods. Their diagnosis is based primarily on the patient's medical history and his or her clinical presentation being at odds with CT scan findings. For this particular reason, underdiagnosed lesions require more advanced imaging methods that would provide a microscopic insight into the actual condition. This can be assessed by MRI through Diffusion Tensor Imaging (DTI) and SWI [1], [2]. Spine CT scan came back clear. At that point of the investigation, we considered the hypothesis of SCIWORA and decided to do a spinal cord MRI in order to look for injury that would match our patient's clinical condition. Once again, we were unable to detect any abnormality. The fact that our patient suffered from pure motor weakness without sensory involvement alerted us to the possibility of the intracranial cause of weakness. Brain CT scan abnormalities were not accountable for the symptom he displayed. Therefore, performing cerebral MRI was indeed the right call.

After reviewing the literature on paraplegia following brain injury, to the best of our knowledge, we managed to identify 13 cases somewhat comparable to ours with paraplegia (Table I). Other studies described cases with monoplegia [3] or even hemiplegia [4]. Those cases won’t be featured here. The thirty cases of acute paraplegia are secondary to isolated head trauma. Eight out of thirty originate from vertex epidural hematoma.Ramesh et al. [5] reported the largest series of vertex epidural hematoma (VEDH) of 29 cases from a retrospective study of over 17 years.

The incidence of VEDH was 0.024% of head injuries and 0.47% of all epidural hematomas (EDH). Wylen and Nanda [6] reported that VEDH account for 1.3-8.2% of all traumatic intracranial hematomas. Lower limb weakness as one of many clinical features of VEDH can be explained by direct pressure of hematoma on the motor cortex representing the leg area. Gauge [7] Matsumura [8] and Zeller [9] articles are the only three that describe paraplegia revealing cerebral contusions found on MRI as in our case.

The literature offers only a limited number of studies devoted to studying motor recovery trends [10], [11]. The recovery time may vary based on whether the injury is diffuse or focal. Brain plasticity and recovery after severe TBI both aren't fully understood yet and are often underestimated [12]. However, early rehabilitation after traumatic brain injury (TBI) has become common knowledge. Research on long-term neural plasticity-related mechanisms in TBI are yet to be carried out.

IV. CONCLUSION

Bilateral cerebral contusions of the precentral gyri can cause paraplegia. Advanced imaging techniques (such as MRI T2 and diffusion-weighted imaging) to detect even small brain injuries in the first days following head trauma can improve patient recovery.

Table I. Reported cases on the literature of traumatic paraplegia secondary to head trauma.

Author	***Year***	***Age (YO)***	***GCS***	***Motor deficit***	***Imaging***	***Imaging analysis***	***Treatment***	***Outcome***
Teddy (Teddy *et al.* 1984)	1984	35	14	Paraplegia	X-ray + CT	Bilateral parasagittal low-density areas Depressed skull fracture	Conservative	Improvement
		21	15	Paraplegia	X-ray + CT	Thrombosis of the SSS Depressed skull fracture	Surgical exploration + dural sinus repair	Slight improvement
Wylen (Wylen and Nanda 1998)	1998	NA		Paraplegia	CT	Vertex epidural hematoma	NA	NA
Liliang (Liliang *et al.* 2001)	2001	50	15	Paraplegia	CT	Vertex epidural hematoma.	Evacuation of VEH	Total recovery
Messori (Messori *et al.* 2001)	2001	41	15	Paraplegia	CT	Vertex epidural hematoma.	Evacuation of VEH	Total recovery
Gauge (Gauge *et al.* 2010)	2010	24	9	1/5 Both lower limbs	CT + MRI	Right convexity ASDH. Left parasagittal contusion. SAH.	Conservative	Improvement
Matsumura (Matsumura *et al.* 2016)	2016	72	13	Both lower limbs 0/5 Proximal + 3/5 Distal	CT + MRI	SAH. ASDH. Contusions in bilateral precentral gyri.	Conservative	Improvement (4/5)
Ramesh (Ramesh *et al.* 2014)	2017	20	13	Lower limbs weakness	CT	Vertex epidural hematoma.	Conservative	NA
		32	11	Lower limbs weakness	CT	Vertex epidural hematoma	Evacuation of VEH	NA
		34	15	Lower limbs weakness	CT	Vertex epidural hematoma	Evacuation of VEH	NA
		35	15	Lower limbs weakness	CT	Vertex epidural hematoma	Refused surgery	NA
		34	11	Lower limbs weakness	CT	Vertex epidural hematoma	Conservative	NA
Zeller (Zeller *et al.* 2020)	2020	57	14	0/5 Both lower limbs	CT + MRI	Contusions in bilateral precentral gyri.	Conservative	

YO, Years Old; NA, Not Available; GCS, Glasgow Coma Scale; SSS, Superior Sagittal Sinus; ASDH, Acute Subdural Hematoma; SAH, Subarachnoid Hemorrhage; VEH, Vertex Epidural Hematoma

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