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Cervical spine surgery complicated by postoperative Guillain-Barré syndrome

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ABSTRACT

Guillain-Barré syndrome (GBS) is an idiopathic, immune-mediated attack of the peripheral nervous system, with patients most commonly presenting with bilateral, ascending weakness, and loss of deep tendon reflexes. Considered an extremely rare post-operative complication, particularly in cervical spine patients, we report a unique case of GBS following anterior cervical spine surgery. The patient is a 65-year-old male with no relevant prior medical or surgical history who presented with right arm weakness and stiffness. After decompression and fusion via an anterior approach, the patient was discharged two days later without incident. On post-operative day 8, the patient returned to the hospital with profound weakness in the bilateral lower extremities. Subsequent cerebrospinal fluid analysis and nerve conduction studies revealed albuminocytologic dissociation and axonal polyneuropathy, respectively. The patient was diagnosed with GBS and was promptly treated with intravenous immunoglobulin (IVIG). At 5-month follow-up, the patient returned to his pre-operative baseline and exhibited full strength in the lower extremities. GBS is an extremely rare post-operative complication of cervical spine surgery and needs to be identified quickly in patients presenting with post-operative sensorimotor changes to improve the natural history of the disease.

1. Introduction

Guillain-Barré syndrome (GBS) is a group of immune-mediated neuropathies consisting of a variety of subtypes with the unifying characteristics of rapid ascending bilateral weakness with loss of deep tendon reflexes. It typically has a monophasic course with symptom nadir within four weeks of presentation. GBS subtypes are classified according to several factors including symptomatic presentation, nerve conduction velocities and immunologic findings. Its typical form is caused by demyelination and is known as an acute inflammatory demyelinating polyradiculoneuropathy (AIDP). Axonal forms exist and are known as acute motor axonal neuropathy (AMAN) and acute motor and sensory axonal neuropathy (AMSAN), which are more severe. Diagnosis is supported by CSF albuminocytologic dissociation as well as abnormalities in nerve conduction studies such as prolonged F-wave and distal latencies, slowing of motor conduction velocities and increase dispersion. In conjunction with supportive care, treatment with either 5 days of IVIG (0.4 g/kg/day) or five sessions of plasma exchange treatments over a 10-day course is considered standard treatment. Close respiratory monitoring is also necessary as the disease may progress to respiratory failure.

Although the syndrome has been well described in a variety of clinical contexts, the occurrence of GBS following spinal surgery is considered rare [1–3]. In this report, we present a case of Acute Motor-Sensory Axonal Neuropathy variant GBS presenting one week following cervical spine surgery with no preceding or suspected infection. There is a paucity of literature describing GBS in the post-operative setting, as this is the fifth documented case of GBS following cervical spine surgery. One previously published case report described Acute Motor-Sensory Axonal Neuropathy following surgery for cervical chondroma, but in the setting of acute colitis, and there is a case series describing three patients with GBS following cervical spine surgery [1,4].

2. Case report

The patient is a 65-year-old right-handed male who initially

Abbreviations: GBS, Guillain-Barré syndrome

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presented with one year of difficulty ambulating. Although he had always been unassisted, his symptoms progressed the past two months necessitating the use of a walker with ambulation. The patient also complained of stiffness of the entire right upper extremity, and weakness of the right hand. The patient had no relevant prior medical or surgical history. Imaging revealed cervical spondylosis with disc herniations at C3–4, C4–5, and C5–6. On examination, the patient exhibited weakness of the right hand, and generalized hyperreflexia with bilateral Hoffman's sign, and clonus of the right foot. Sensation in all dermatomes was intact. The patient underwent three level decompression and fusion via an anterior approach. Postoperatively, the patient reported modest improvement in strength, ambulation and coordination. The patient was discharged on postoperative day 2 without incident.

On post-operative day 8, the patient returned to the emergency room with profound weakness in the bilateral lower extremities, which had a gradual onset beginning the evening prior. On examination, patient was afebrile with stable vital signs. Neurologic examination revealed flickers of movement in the bilateral lower extremities, but inability to lift against gravity. He no longer exhibited Hoffman's sign or clonus, and reflexes were absent in the lower extremities. Sensation in all dermatomes remained intact. Labs showed no electrolyte abnormalities or leukocytosis. CT of the cervical spine demonstrated appropriate position of the hardware. Subsequently, complete spinal MRI showed no signs of hematoma. MRI of cervical spine showed mild residual cervical stenosis (Fig. 1), greatest at the level of C4–5, which was improved compared to preoperative imaging. There was no cord signal change. There were no physical exam findings suggestive of cortical involvement. As such, no brain imaging was ordered. Bilateral duplex of the lower extremities was ordered to assess for potential clot burden and was negative. Even though the patient's clinical picture was not indicative of a typical cervical spondylotic myelopathy exacerbation, there was concern that the patient's residual cervical stenosis could be contributing to the acute presentation. As a result, the patient underwent urgent C4-C6 laminectomies (Fig. 2).

Postoperative neurologic exam revealed no improvement of his bilateral paraplegia. With no symptomatic improvement by hospital day 2, an EMG was performed with evidence suggesting generalized axonal and demyelinating sensorimotor polyneuropathy (Tables 1-3). A lumbar puncture was performed and CSF analysis revealed albuminocytologic dissociation (Glucose 110 mg/dl, Prot 122 mg/dl, RBC 10 cells/mm^3, WBC 2 cells/mm^3). CSF cultures were negative and West Nile immunoglobulins were negative. The EMG/nerve conduction study results, albuminocytologic dissociation and clinical presentation lead to a diagnosis of GBS, Acute Motor and Sensory Axonal Neuropathy subtype. The patient was started on IVIG treatment at 0.4 g/kg for 5 days. Following therapy, patient exhibited improved strength, as he was now antigravity in both lower extremities, but unable to resist. There was return of patellar and Achilles reflexes bilaterally. Sensation was intact in all dermatomes. With mild symptomatic improvement, the patient was discharged to inpatient rehabilitation on hospital day 8.

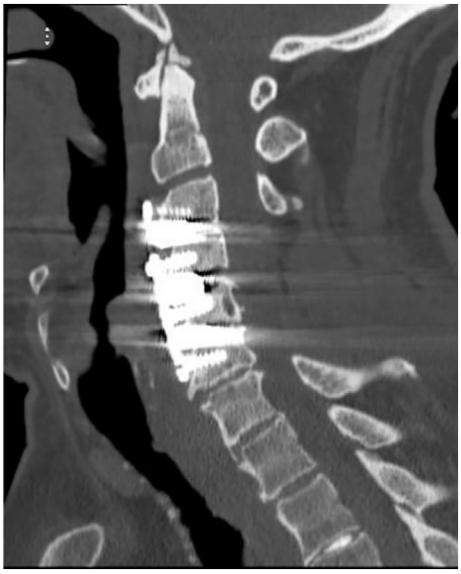

Fig. 2. Sagittal post-laminectomy CT.

At 5-month follow-up, the patient exhibited full strength in the lower extremities, and ambulated independently with a walker. He continued to have residual weakness of the right hand. He was hyperreflexic throughout with bilateral Hoffman's sign, and clonus of the right foot. This exam was the patient's baseline prior to his anterior cervical spine surgery.

3. Discussion

While the exact cause or mechanism of GBS has yet to be elucidated, prevailing theory highlights physiologic triggers or antigen exposure leading to the autoimmune response. Although classically associated with a preceding *C. jejuni* infection, GBS has also been documented

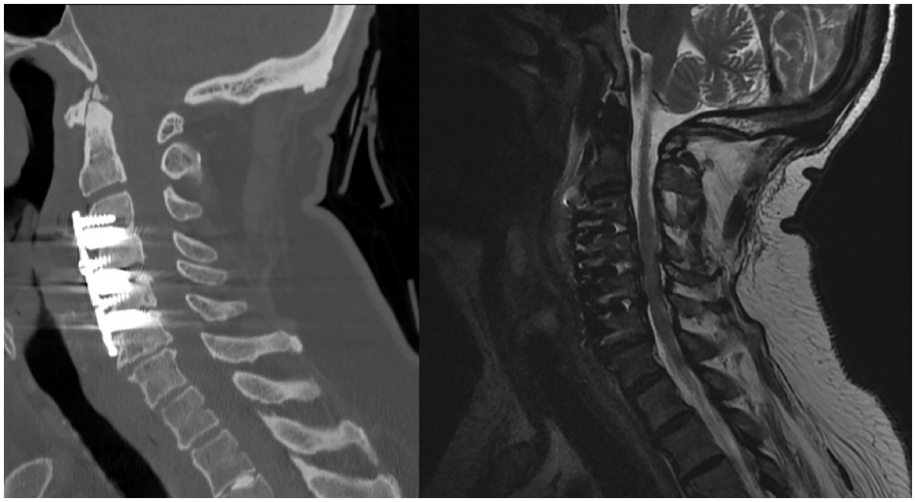

Fig. 1. Sagittal CT and cervical MRI following re-admission for bilateral lower extremity weakness.

Tables 1-3
Nerve conduction studies indicating generalized axonal and demyelinating sensorimotor polyneuropathy.

Sensory nerve conduction study					
Nerve/sites	**Onset lat ms**	**Peak lat ms**	**NP amp μV**	**PP amp μV**	**Velocity m/s**
L median - digit II					
Wrist	**NR**	**NR**	**NR**	**NR**	**NR**
R median - digit II					
Wrist	**NR**	**NR**	**NR**	**NR**	**NR**
L ulnar - digit V					
Wrist	**NR**	**NR**	**NR**	**NR**	**NR**
R ulnar - digit V					
Wrist	**NR**	**NR**	**NR**	**NR**	**NR**
L sural - lat mall					
Calf	**NR**	**NR**	**NR**	**NR**	**NR**
R sural - lat mall					
Calf	**NR**	**NR**	**NR**	**NR**	**NR**
R sup peroneal - ankle					
Lat leg	**NR**	**NR**	**NR**	**NR**	**NR**

Motor nerve conduction study			
Nerve/sites	**Latency ms**	**Amplitude mV**	**Velocity m/s**
L median - APB			
Wrist	3.85	**3.7**	
Elbow	10.31	2.9	**36**
R median - APB			
Wrist	4.38	**1**	
Elbow	13.54	0.2	**22**
R ulnar - ADM			
Wrist	2.66	6.1	
B. elbow	5.94	5.7	**43**
A. elbow	8.91	5.3	61
L ulnar - ADM			
Wrist	2.86	9.6	
B. elbow	5.94	8.1	55
A. elbow	8.7	7.4	54
L deep peroneal - EDB			
Ankle			
Fib head	**NR**	**NR**	
R deep peroneal - EDB			
Ankle	5	**1**	
Fib head	11.93	0.7	49
Knee	14.01	0.3	**24**
R tibial (knee) - AH			
Ankle	4.48	**0.4**	
Knee	16.25	0.1	**32**
L tibial (knee) - AH			
Ankle	3.96	**1.1**	
Knee	14,84	0.3	**35**

F-wave study		
Nerve	**Fmin ms**	
	Left	**Right**
Tibial (knee)	55.7	**59.1**
Deep peroneal		0
Median	30.4	**32.4**
Ulnar	29.2	

following various surgical procedures. GBS in the postoperative setting of cervical spine surgery is rare. Acute motor-sensory axonal neuropathy subtype in the setting cervical spine surgery is even more rare. Although rare compared to other post-operative complications, GBS should be considered in the differential diagnosis for patients presenting with post-operative sensorimotor changes. Along with intraoperative injury, cord infarction, hematoma, or infection, clinicians must consider neuropathies, particularly in patients with no significant imaging findings, who exhibited delayed but abrupt neurologic decline. This is of particular significance when DTRs are no longer present on examination.

In the patient we have presented, several factors are important to consider. First, after the initial anterior cervical decompression and fusion, the patient actually expressed symptomatic improvement. Only after discharge, one week following surgery, was there an acute onset of weakness. Thorough CT and MRI imaging of the spine showed no signs of hematoma, injury, infarction or movement of the cervical instrumentation. Conduction studies were consistent with polyneuropathy, which does not support cord injury as a cause of the patient's symptoms. Finally, the albuminocytologic dissociation of the CSF, although not specific, further supports our GBS diagnosis.

Although our patient has shown clinical improvement, there is high variability in recovery even following an adequate course of disease-modifying treatment. An estimated 40% do not recover full motor strength at one year, and 14% are left with a persistent severe disability [5].

4. Conclusion

GBS is a rare and treatable complication of cervical spine surgery. It can be identified based upon characteristic physical exam findings, including ascending weakness and loss of deep tendon reflexes, coupled with ancillary studies, such as EMG/NCS and lumbar puncture. A thorough work-up to exclude more common post-operative complications is also mandatory. When recognized promptly and treated appropriately, it is possible to significantly improve upon the natural history of the disease. As such, it is important for clinicians to consider this unusual diagnosis.

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