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Case Report

Case report: Multiple sclerosis diagnosis after anterior lumbar interbody fusion and presumed COVID-19 infection

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ABSTRACT

Background: Multiple sclerosis (MS) is an autoimmune demyelinating disease of the central nervous system that may present with a wide variety of clinical presentations. However, there can be substantial overlap between symptoms from MS and those caused by lumbar spondylosis and/or postviral plexopathies.

Case Description: A 33-year-old female with a history of an L5-S1 anterior lumbar interbody fusion and exposure to the SARS-CoV-2 virus developed postoperative worsening of her symptoms interpreted as "radiculopathy." Despite a subsequent L5-S1 fusion, she continued to neurologically deteriorate and was ultimately diagnosed with MS.

Conclusion: The initial symptoms/signs of MS may mimic lumbar radiculopathy and or postviral plexopathy (i.e., due to recent COVID-19). This report should serve as a warning to future spinal surgeons to better differentiate between radicular and other "complaints," sufficient to avoid unnecessary repeated spinal surgery.

Keywords: Anterior lumbar interbody fusion, COVID-19, Lumbar, Multiple sclerosis, Myelopathy, Spine, Radiculopathy

INTRODUCTION

Because multiple sclerosis (MS) can produce a wide array of neurological symptoms, it can mimic a variety of other conditions. These include myelopathy attributed to vertebral disc herniation, spinal stenosis, or spondylosis, and more recently COVID-19-related viral plexopathy.[9] Further, there is increasing evidence that viral infections such as COVID-19 (i.e., with neuroinvasive potential leading to a pro-inflammatory state) can trigger MS exacerbations.[1,6] Here, we report a 33-year-old female who underwent lumbar surgery (anterior lumbar interbody fusion [ALIF]) and subsequently had COVID-19. Her postoperative symptoms/signs led to a revision of her lumbar spinal surgery, but were ultimately attributed to MS.

CASE

History

A 33-year-old female with a medical history of hypothyroidism, polycystic ovarian syndrome, pseudotumor cerebri, pacemaker placement for bradycardia, a gastric sleeve, and a C6-7 cervical

disc replacement (1 year prior for myelopathy), presented with 2 years of low back pain/radiculopathy. On examination, she exhibited significant isolated weakness in her right lower extremity without sensory or reflex abnormalities [Table 1]. Lumbar X-rays and an MRI showed moderate degenerative disc disease at the L5-S1 level, a 3 mm minimal degenerative retrolisthesis, and a right paracentral L5-S1 disc protrusion causing moderate lateral recess narrowing [Figures 1 and 2]. She underwent an L5-S1 ALIF without complication [Figure 3].

Postoperative course

One week postoperatively, she had fevers, but a postoperative CT of the abdomen and laboratory studies were normal. Shortly thereafter, her husband tested positive for COVID-19; she was not tested at that time. Two weeks postoperatively, she complained of new left leg paresthesias (i.e., note her prior deficits were right-sided) with weakness and diffusely decreased sensation to light touch. She was given a steroid taper and sent for a lumbar CT scan that "suggested" encroachment on the left L5-S1 neural foramen by the L5-S1 ALIF [Figure 4]. Of interest, the MRI showed an intramedullary "lesion" at the L1-2 level in the area of the conus medullaris of unclear significance [Figure 5].

Revision surgery followed by diagnosis of MS versus polysensory neuropathy

She then underwent a revision ALIF for cage repositioning. Postoperatively, her symptoms continued to worsen. MRIs of the cervical, thoracic spine, and brain were all normal along with multiple lab tests. She was sent home, but was now wheelchair bound. Repeat X-rays showed good location of the

Table 1: Summary of clinical data.

Time Point	Symptoms	Examination	Imaging	Labs	Treatment
Presentation	BLE radiculopathy, paresthesias	RLE quad, TA, EHL 3/5 Sensation intact Normal reflexes	X-rays: moderate degenerative disc disease, 3 mm retrolisthesis L5-S1 MRI: right paracentral L5-S1 disc protrusion, moderate lateral recess narrowing		L5-S1 ALIF
1 Week Postoperative	Fever 102˚F	Unchanged	CT abdomen negative	WBC 2.7/mm^3 ESR 40 mm/h CRP 1.23 mg/dL	Symptomatic
2 Weeks Postoperative	LLE paresthesias	RLE unchanged LLE IP, quad, ham, EHL 4/5; TA, GS 3/5 LLE globally numb Normal reflexes	CT: suggestive of encroachment of ALIF implant on left neural foramen MRI: T2 hyperintense lesion in conus medullaris L1-L2		Steroid taper Revision L5-S1 ALIF
1 Week Post Revision	LLE weakness	RLE unchanged LLE 1/5 throughout LLE globally numb	X-rays normal MRIs brain, cervical and thoracic spine normal	TSH, T3/T4, vitamin B12, folate, ANA, syphilis, Lyme all normal	IV steroids AFO brace, wheelchair
1 Month Post Revision	Unchanged	Unchanged	EMG: global loss amplitude, severe reduction recruitment LLE motor units L2-S1		Unchanged
4 Months Post Revision	BUE weakness Urinary urgency	BLE unchanged BUE extremities 4/5 globally Sensation intact Normal reflexes	CT-Myelo negative	Lumbar puncture: • Protein 46 mg/dL • Glucose 47 mg/dL • WBC (8/mm^3) • Culture negative • KFLC 0.371 mg/dL • 4 oligoclonal bands • MBP<2.0 mcg/L	MS disease modifying medication

RUE: Right upper extremity, LUE: Left upper extremity, BUE: Bilateral upper extremities, RLE: Right lower extremity, LLE: Left lower extremity, BLE: Bilateral lower extremities, IP: Iliopsoas, quad: Quadriceps, ham: Hamstrings, TA: Tibialis anterior, EHL: Extensor hallucis longus, GS: Gastrocsoleus, KFLC: Kappa free light chains, MBP: Myelin basic protein

L5-S1 ALIF cage [Figure 6]. A neurologist performed an EMG of the left lower extremity and determined that her deficit was likely consistent with transverse myelitis and/or a poly-sensory neuropathy (i.e., bilateral superficial peroneal and sural nerves).

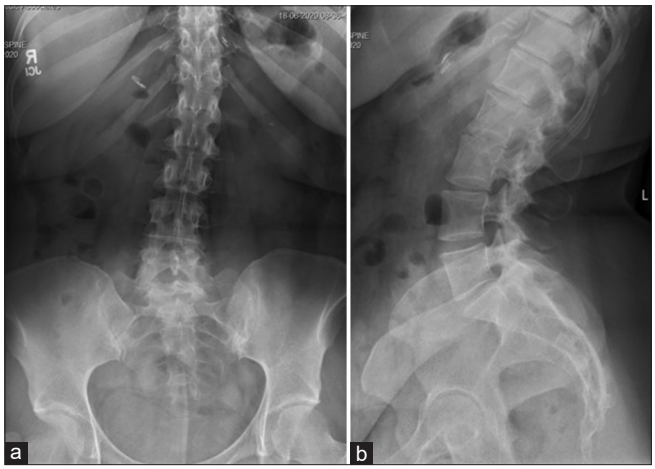

Figure 1: (a) Anteroposterior radiographs of the lumbar spine. (b) Lateral radiographs of the lumbar spine.

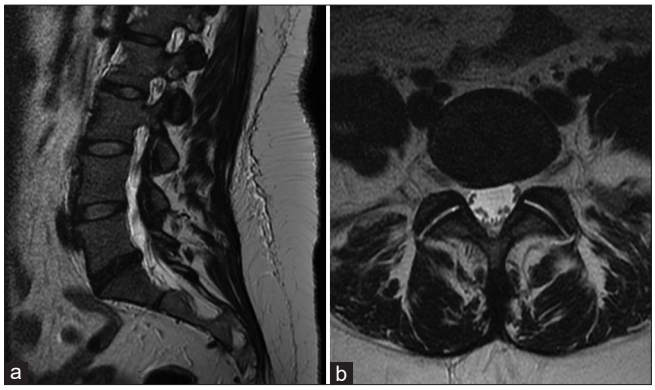

Figure 2: (a) Sagittal T2-weighted MRI image of the lumbar spine. (b) Axial T2-weighted MRI image of the lumbar spine.

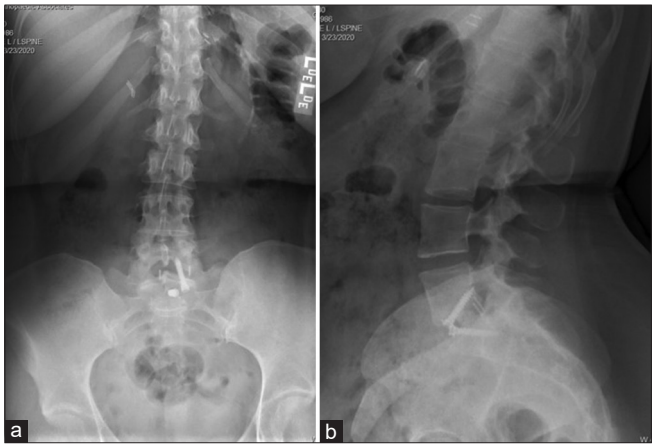

Figure 3: (a) Postoperative anteroposterior radiograph of the lumbar spine demonstrating anteriorly placed interbody cage at the L5-S1 level. (b) Postoperative lateral radiograph of the lumbar spine demonstrating anteriorly placed interbody cage at the L5-S1 level.

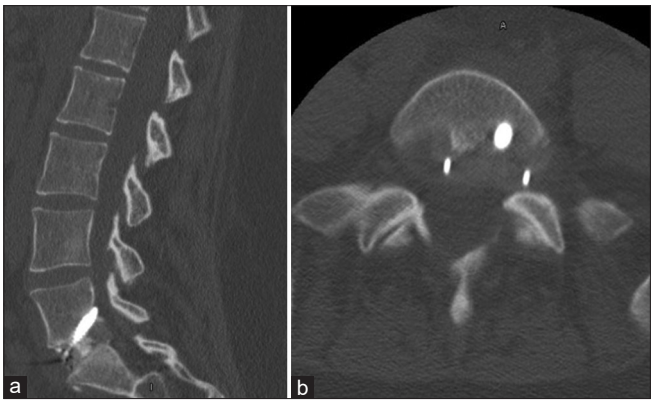

Figure 4: (a) Sagittal CT image demonstrating alignment of L5-S1 interbody cage. (b) Axial CT image demonstrating alignment of L5-S1 interbody cage.

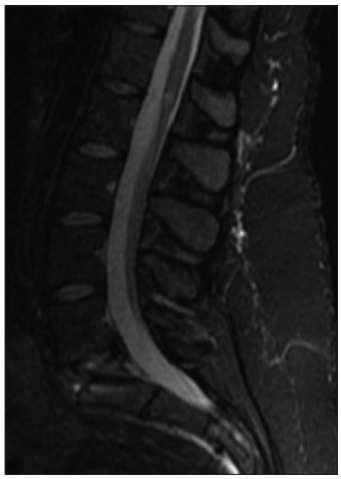

Figure 5: Sagittal T2-weighted MRI image of the lumbar spine.

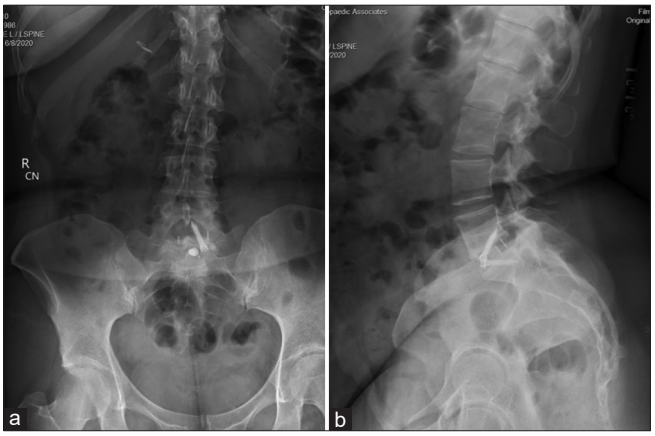

Figure 6: (a) Postoperative anteroposterior radiograph of the lumbar spine demonstrating anteriorly placed interbody cage at the L5-S1 level. (b) Postoperative lateral radiograph of the lumbar spine demonstrating anteriorly placed interbody cage at the L5-S1 level.

Table 2: Summary of the literature reporting on surgical outcomes in patients with concomitant MS and spinal pathologies.

Author	# Patients (Male/Female)	Pre-operative Spine Diagnosis	MS Diagnosis Pre-operative versus post-operative	Procedure	Outcomes
Arnold *et al*., 2011	15 (5/10)	Cervical myelopathy	Pre-operative	Decompression and fusion	13/15 improved strength, pain, paresthesias
Banit *et al*., 2003	1 (0/1)	Lumbar stenosis	Post-operative 6 weeks	Decompression	Severe neurologic decline, non-ambulatory
Lubelski *et al*., 2014	77 (33/44)	Cervical stenosis	Pre-operative	Decompression	Lower rate improvement compared to controls
Tan *et al*., 2014	18 (12/6)	Cervical stenosis	Pre-operative	Decompression and fusion	Symptom improvement or stabilization in 93% No effect on urinary symptoms
Youssef *et al*., 2021	19 (3/16)	Cervical stenosis	Pre-operative	Decompression and/or fusion	MS led to 12.7 month delay in presentation 89% improved

Delayed diagnosis of MS

Four months later, now with additional bilateral upper and lower extremity weakness/sensory loss, and worsening urinary urgency with incomplete bladder emptying, she underwent a complete spinal Myelo-CT; it was negative. However, the cerebrospinal fluid obtained from the lumbar puncture showed findings consistent with MS (i.e., primary progressive subtype). She then began MS modifying therapy.

DISCUSSION

Diagnosis of MS versus spinal pathology and risks of spine surgery precipitating demyelinating events

The diagnosis of MS can easily be missed when patients present with myelopathic symptoms misinterpreted as "radiculopathy" secondary to spinal pathology/spondylotic disease. In these cases, patients' failures to improve with surgery were ultimately attributed to the underlying diagnosis of MS and may result in unintended exacerbation of MS (i.e., precipitate demyelinating events).[2] Further studies have shown that patients with known MS and significant spinal pathology may experience symptom improvement postoperatively, although the existing data are of low quality and conflicting [Table 2].[8]

Increase in MS diagnoses related to COVID-19

Some have observed an increasing relationship between COVID-19 and the onset of MS (i.e., a spike in MS diagnoses).[4,5,7] Further, MS patients taking anti-CD20 disease modifying therapies may be the most at risk for developing COVID -19 infections (i.e., they generate a less robust immune response to the virus).[3,10] In this case, the patient's lumbar surgeries and presumed infection with the SARS-CoV-2 virus may have directly triggered the onset/flare of MS.

CONCLUSION

The diagnosis of MS can easily be missed when patients present with myelopathic symptoms misinterpreted as "radiculopathy" secondary to spinal pathology. Further, recent COVID-19 infections may pose triggers that potentiate the development of MS.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflict of interest.

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