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Spinal Cord Injury Following Minimally Invasive Spinal Decompression

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Background: Minimally invasive lumbar decompression (MILD) is an interventional procedure for the treatment of patients with symptomatic lumbar spinal stenosis. Spinal cord injury after MILD has not yet been reported in literature.

Case Report: We describe a case of a 95-year-old woman who underwent the MILD procedure at the L1-L2 level for symptomatic lumbar spinal stenosis. Following the procedure, the patient noticed lower extremity weakness and numbness, suprapubic numbness, groin pain, and urinary retention. Emergent magnetic resonance imaging of the lumbar spine exhibited new cord signal change at T12-L1. She subsequently underwent emergent L1-S1 decompression with gradual improvement of symptoms.

Conclusions: Direct trauma to the cord or increased pressure in a severely stenotic canal from injectate volume may have contributed to this patient's injury. Consideration of the severity and location of stenosis is critical as these results may pose additional risk factors for injury with the MILD procedure.

Key words: MILD, spinal stenosis, spinal cord injury, interventional procedure

BACKGROUND

Minimally invasive lumbar decompression, or "MILD," is a relatively recent interventional procedure for the treatment of patients with symptomatic lumbar spinal stenosis. The technique uses a rongeur to remove a portion of the lamina at the affected level of stenosis, followed by a "tissue sculptor" to debulk the ligamentum flavum and decompress the narrow region (1,2). A number of studies have evaluated the efficacy and long-term outcomes of the procedure, most notably the MiDAS (MILD Decompression Alternative to Open Surgery) clinical trials (3-5). To date, this procedure has been performed on over 30,000 patients according to manufacturer data. The procedure has shown promising therapeutic benefit with minimal adverse events and theoretical risks comparable to epidural steroid techniques (3,6). We present a case of a major complication in a patient who had undergone the MILD procedure.

CASE

This case involves a 95-year-old woman with a long-standing history of lower back and lower extremity pain secondary to multilevel thoracolumbar spinal stenosis, severe at L1-L2. She was previously managed with NSAIDs, gabapentin, and 2 transforaminal injections at T12-L1 and L1-L2. Additional history was notable for a microdiscectomy at L4-L5 8-years prior, type 2 diabetes mellitus with neuropathy, and myasthenia gravis. Her baseline function was at a modified independent level with a rollator. The patient continued to experience

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lower extremity pain despite conservative care and was evaluated by a surgeon at our group. Due to her advanced age and the multilevel nature of the stenosis, she was deemed to be a poor surgical candidate. She subsequently saw an outside pain management practitioner who suggested the MILD procedure at the L1-L2 level. The patient ultimately underwent this procedure and was discharged home.

Post-procedure, the patient developed progressive lower extremity weakness, groin pain, bilateral lower extremity and suprapubic numbness, and urinary retention. She presented to the hospital 2 days later and was noted to have severe weakness in the entire left lower extremity and diminished sensation to light touch below the knee in her left leg. She was afebrile. The patient was afebrile. She was then bladder scanned and catheterized for 1 L of urine. An emergent magnetic resonance imaging (MRI) of the lumbar spine was performed and demonstrated T11-S1 stenosis, severe at L1-L2 with a new cord signal change at T12-L1 compared to an MRI from 3 months prior; there was no hematoma or fluid collection (Figs. 1A and 1B). Complete blood count with differential was within normal limits. She was evaluated by Orthopaedic Spine Surgery in the emergency room and underwent emergent L1-S1 decompression.

Postoperatively, she was evaluated by a physiatrist who found three-fifth strength in the left iliopsoas and quadriceps, but one-fifth strength in the tibialis anterior, extensor hallucis longus, and gastrocsoleus. Pinprick sensation was diminished below the dermatomal level of T10. The physiatrist performed an American Spinal Injury Association: International Standards for Neurological Classification of Spinal Cord Injury assessment of Impairment Scale (AIS) grades (7) and determined it to be T10 AIS D. The following day, she experienced increasing weakness in the left lower extremity. A repeat lumbar MRI was ordered, which showed no new athology. Over the course of her hospitalization, she had slight improvement in her left lower limb strength with physical and occupational therapy. The patient was ultimately discharged to a comprehensive inpatient rehabilitation facility.

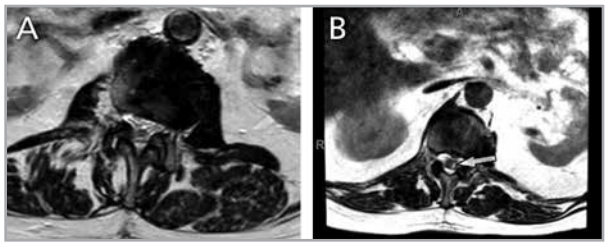

Fig. 1: Pre- and post-MILD procedure MRI of the lumbar spine. A: Premorbid axial MRI of the lumbar spine at L1-L2 demonstrating severe stenosis. B: Axial MRI of the lumbar spine with cord signal change at L1.
MRI, magnetic resonance imaging.

DISCUSSION

To date, there have been no reported spinal cord injuries secondary to the MILD procedure (3-6). Unfortunately, we were unable to obtain operative pictures from the physician who performed the procedure. While the cause of this patient's injury is not definitively clear, several mechanisms may be considered. Direct trauma from the rongeur or sculptor is one possible means for injury. Increased pressure in a severely stenotic canal from the copious amounts of contrast injected during the procedure may also have contributed. Epidural hematoma and infection were respectively ruled out by the emergent lumbar MRI (Fig. 1) and normal bloodwork, as well as the absence of a fever.

Rarely, spinal cord injury can occur with interlaminar epidural injections from direct trauma with a needle, hematoma formation, or injectate volume causing compression on the cord in a severely stenotic canal. While there are no specific guidelines, severe stenosis with effacement of the epidural fat, especially at L1-L2 or above, is a typically accepted contraindication for interlaminar epidural injections (8). Consideration of the severity and location of spinal stenosis may be applicable to the MILD procedure as well.

MILD is typically considered a relatively safe and effective procedure. The most significant reported procedural events have been intraoperative oozing, sinus bradycardia, and transient post-procedural pain (3,5,6). However, this case demonstrates an example of a major complication after undergoing the MILD procedure. The severity of this patient's stenosis, along with the location of the stenosis being at the spinal cord level, may have increased her risk of spinal cord injury with this procedure.

CONCLUSIONS

This case highlights the importance of considering the severity and location of spinal stenosis, particularly if located at the spinal cord level, as these results may be additional risk factors for injury with the MILD procedure.

Author Contributions

Roger Liu, DO: Evaluated patient in hospital, edited paper; Marya Ghazzi, BS: Editing, references, write-up; Tomasz Chec, MD: Editing, references, write-up; Derek Ju, MD: Surgeon taking care of patient, provided clinical information, editing; Jeffrey Gehret, DO: Editing; Kristin Gustafson, DO: Clinical care and evaluation of patient, provided clinical information; Jeremy I. Simon, MD: Editing, write-up, supervision of paper, correspondence.

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