

MOTOR STRENGTH RECOVERY FOLLOWING UNILATERAL MILD® PROCEDURE IN A PATIENT WITH SEVERE SPINAL STENOSIS AND ASSOCIATED FOOT DROP

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Background: Lumbar spinal stenosis (LSS) is a prevalent degenerative condition, particularly in individuals over 65, and is a leading cause of disability and spinal surgery in this population. The hallmark symptom is neurogenic claudication, but severe cases may present with focal motor deficits, such as foot drop. While open decompressive surgery remains the standard for patients with progressive neurological deficits, minimally invasive techniques, like the minimally invasive lumbar decompression (MILD®, Stryker Medical, Kalamazoo, MI) procedure, have emerged as alternatives, especially for patients with ligamentum flavum hypertrophy. However, the efficacy of MILD in cases with motor weakness remains underexplored.

Case Report: A 70-year-old woman with prediabetes, osteopenia, and depression presented with 9 months of frequent falls, progressive unsteady gait, and left ankle dorsiflexion weakness. Imaging revealed severe central canal stenosis at L2-L3 and L4-L5, with significant ligamentum flavum hypertrophy. Despite recommendations for open decompression, the patient declined surgery due to anesthesia concerns. She was managed conservatively with a walker and ankle-foot orthosis (AFO), but developed a heel pressure ulcer. Four months after symptom onset, she underwent a left-sided, image-guided MILD procedure at L4-L5. The procedure was completed without complications. At 2 weeks postprocedure, she discontinued AFO use, with marked improvement in ambulation and muscle strength. By 6 weeks, left ankle dorsiflexion had normalized, and at 12 weeks, she was nearly symptom free. At one-year follow-up, she maintained full motor recovery and did not require open surgery.

Conclusions: Our case demonstrates that early use of the MILD procedure may facilitate rapid and durable motor recovery in selected patients with LSS and focal motor weakness due to ligamentum flavum hypertrophy. The MILD procedure offers a lower-risk alternative to open surgery, with significant improvements in function and quality of life. Larger studies are warranted to further validate its role in this patient population.

Key words: MILD®, MILD, spinal stenosis, foot drop, lumbar spinal stenosis

BACKGROUND

Lumbar spinal stenosis (LSS) is a common degenerative condition characterized by the narrowing of the spinal canal at one or more lumbar levels, frequently attributed to multifactorial etiologies, such as disc herniation, hypertrophy of the ligamentum flavum, and facet joint arthropathy. Additional contributors

include degenerative spondylolisthesis, synovial cysts, congenitally short pedicles, epidural lipomatosis, and, more rarely, intradural or extradural masses. Unlike foraminal stenosis—which typically results in isolated nerve root impingement—central canal stenosis causes diffuse compression of the thecal sac and its contents. These include the conus medullaris, cauda equina, spinal

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vasculature, and both traversing and exiting nerve roots at the affected level (1). Although definitions vary, an anteroposterior canal diameter of < 10 mm is often used to classify absolute or severe stenosis (2,3).

The clinical presentation of LSS is heterogeneous. The hallmark symptom is neurogenic claudication, manifesting as bilateral or unilateral leg pain, paresthesia, and heaviness exacerbated by walking or standing and alleviated by lumbar flexion. Functional positions, such as sitting, stooping, or leaning forward (e.g., over a shopping cart or while walking uphill), often provide symptomatic relief. Conversely, walking downhill or descending stairs may worsen symptoms due to increased lumbar extension. Sensory disturbances usually follow a nondermatomal distribution, and motor weakness is present in approximately 43% of patients (2). Importantly, symptom severity and functional impairment are not always proportionate to radiographic findings (2).

LSS is a leading cause of disability in individuals over the age of 65 and represents the most common indication for lumbar spinal surgery in this population (2). First-line management includes conservative therapies, such as physical therapy, nonsteroidal anti-inflammatory drugs, and epidural steroid injections. Surgical intervention—typically in the form of decompressive laminectomy, with or without fusion—is generally reserved for patients with structural instability, such as spondylolisthesis, or those with refractory symptoms despite maximal conservative treatment (1,2).

In recent years, minimally invasive techniques have gained traction for the management of LSS. Among them, the minimally invasive lumbar decompression, i.e., MILD®, procedure (Stryker Medical, Kalamazoo, MI), has emerged as a percutaneous option for patients with moderate stenosis and neurogenic claudication, particularly when imaging demonstrates ligamentum flavum hypertrophy exceeding 2.5 mm (4). While laminectomy remains the standard for decompressing the canal in patients with motor deficits, such as foot drop, the MILD procedure offers a lower-risk alternative for selected patients. However, current studies (4) evaluating the efficacy of MILD have largely excluded patients with focal motor weakness, and its utility in these cases remains uncertain. As such, early surgical decompression remains the recommended approach for patients with progressive neurological deficits to mitigate long-term morbidity (2).

CASE PRESENTATION

A 70-year-old woman with a medical history of

prediabetes, osteopenia, and depression presented after experiencing 9 months of frequent tripping and falls. Approximately 10 months after symptom onset, she developed an unsteady gait and difficulty standing. She subsequently reported low back pain radiating down the left lateral leg, accompanied by bilateral shin paresthesia, without bowel or bladder dysfunction or saddle anesthesia. The patient was admitted to the hospital for evaluation of progressive left leg neurogenic claudication, unsteady gait, and left ankle dorsiflexion weakness, which had persisted for 3 months. Neurology consultation was obtained. Physical examination revealed mild right extensor hallucis longus (EHL) weakness (4+/5), marked left ankle dorsiflexion weakness (2/5), left EHL weakness (3/5), and weakness in left ankle inversion and eversion (3/5). Muscle strength was assessed using the Medical Research Council (MRC) 0–5 grading scale, where 0 indicates no muscle contraction, 3 indicates active movement against gravity but not against resistance, and 5 indicates normal strength against full resistance. Extensive laboratory testing—including hemoglobin A1c, erythrocyte sedimentation rate, creatine kinase, SARS-CoV-2, antinuclear antibody, vitamin B12, Lyme serologies, folate, thiamine, thyroid-stimulating hormone, copper, HIV, and serum immunofixation—was unremarkable. Brain magnetic resonance imaging (MRI) was normal. Cervical MRI demonstrated a 2-level foraminal stenosis; thoracic MRI showed a mild disc bulge without significant canal compromise. Lumbar spine MRI revealed severe central canal stenosis at L2-L3 and L4-L5 and severe foraminal stenosis at L4-L5 (Figs. 1 and 2). Spine Surgery was consulted and recommended decompression, but the patient declined due to concerns regarding general anesthesia and surgical risks. Oral corticosteroids were avoided due to her prediabetic status. She was provided with a walker and an off-the-shelf ankle-foot orthosis (AFO). Electromyography (EMG) was recommended postdischarge, but was not completed. The patient was discharged home, with 10 sessions of home-based physical therapy.

She visited our outpatient spine center for consultation 4 months after developing foot drop. She continued to experience low back pain with neurogenic claudication in the left distal leg, exacerbated by standing and walking. There was no associated proximal or anterior thigh pain, and her symptoms remained consistent with L4-L5 stenosis. The patient was using an AFO, ambulated with a rollator, and continued with a dense foot drop. AFO use had resulted in a heel pressure ulcer detected

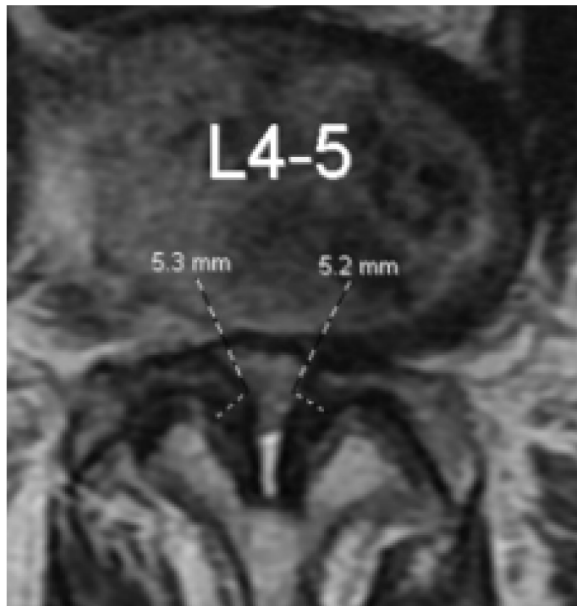


Fig. 1. Sagittal and axial views of the lumbar spine in our patient with L2 and L4 spinal stenosis. Ligamentum flavum measurement of 5.2 mm on the left side, which was symptomatic side with left foot drop.

on physical examination. We presented the patient with treatment options, which included a laminectomy. She continued to be resistant to traditional surgical solutions, citing the potential complications. She was well informed that the longer she delays a decompressive



Fig. 2. Left paramedian L4/L5 epidurogram. Anterior displacement of the dura compatible with posterior element degeneration and ligamentum flavum thickening consistent with MRI findings. MRI, magnetic resonance imaging.

option, the higher the chance of permanent motor strength deficit and impairment. We then offered the patient the option of the MILD procedure. This was a much more appealing option for the patient, and she opted to move forward.

Approximately 4.5 months after symptom onset, the patient underwent a left-sided, image-guided L4-L5 ligamentum flavum debulking using the MILD technique under intravenous sedation (Fig. 3). The procedure was completed in 20 minutes, with no intraoperative or postoperative complications. Postoperative recovery was uncomplicated, and the patient was reevaluated after 2, 6, and 12 weeks.

At the 2-week follow-up, she had discontinued use of the AFO, with resolution of neurogenic claudication and improved ambulation—doubling her standing and walking tolerance to 20 minutes. Muscle strength also improved, with left ankle dorsiflexion and EHL both tested as 4/5 on the MRC 0–5 grading scale in the 2-week

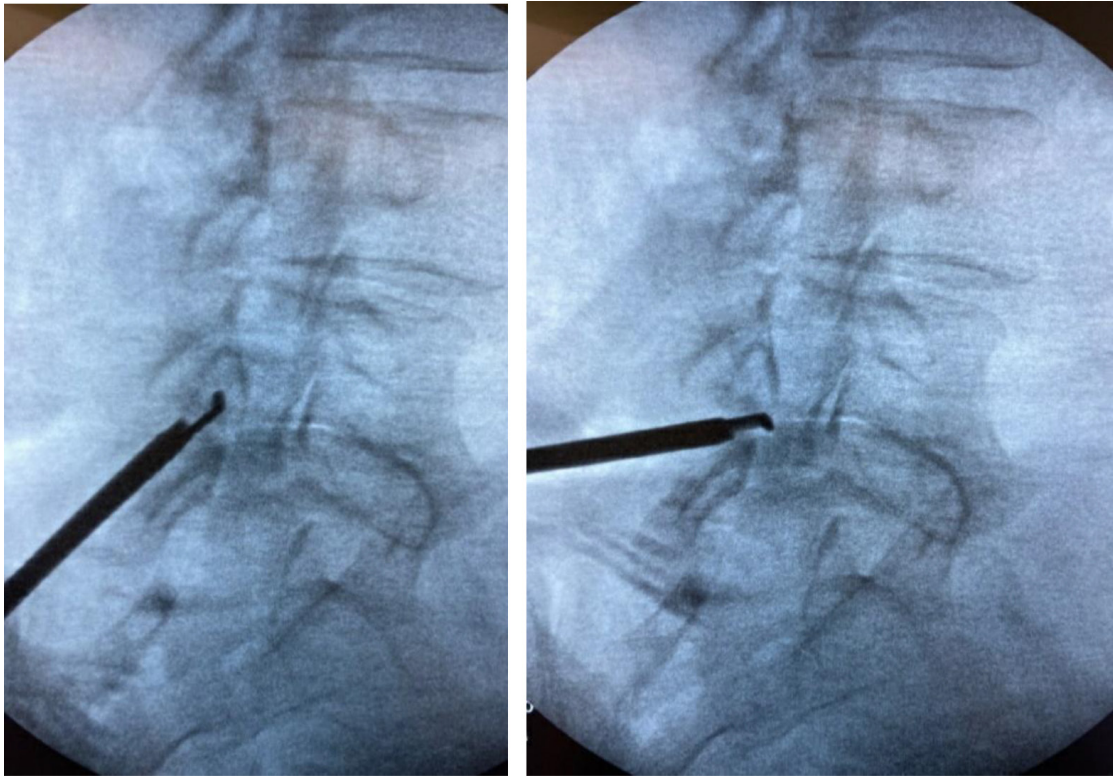


Fig. 3. Left L4-L5 MILD procedure. Removal (debulking) of ligamentum flavum from left L4-L5 epidural space to decompress the thecal sac and traversing nerve roots.

follow-up. Healing of a prior Stage I pressure ulcer on the foot also progressed due to discontinued AFO use.

By 6 weeks, her walking and standing tolerance increased to 40 minutes, and left ankle dorsiflexion had fully normalized. At 12 weeks, she remained nearly symptom free, with full strength in the left EHL and tibialis anterior muscles. Her activity was limited only by underlying knee osteoarthritis and mild paresthesia. Physical therapy evaluations corroborated these findings.

Ten months after the MILD decompression procedure, she had an EMG at an outside facility, which showed normal motor studies, normal H-reflex, and +1 chronic small amplitude fibrillation potentials in her left tibialis anterior with mild chronic reinnervation features. Her exam at the time of her EMG noted sustained normal left ankle dorsiflexion and EHL strength. The patient did not require open surgery in a one-year follow-up.

DISCUSSION

Lower extremity motor deficits, including foot drop, are recognized complications of lumbar disc herniation

and spinal stenosis. These cases warrant expedited imaging, conservative therapy, and often surgical decompression to prevent irreversible deficits. Traditional decompressive surgeries include hemilaminectomy, laminectomy, or fusion when instability is present (2).

Our case highlights a patient with a 2-level severe spinal stenosis, presenting with neurogenic claudication and left-sided ankle dorsiflexion weakness. While open decompression was recommended on several occasions, the patient declined surgery and was instead managed with a percutaneous MILD procedure. In our clinical experience, prolonged weakness beyond 6-12 months correlates with significantly lower odds of full motor recovery. Due to the persistence and severity of her weakness for over 4 months, we elected to bypass epidural steroid injection and proceed directly to decompression.

Our case supports potential early use of the MILD procedure in selected patients with ligamentum flavum hypertrophy and motor weakness. The patient demonstrated rapid and durable improvement in gait,

strength, and functional independence—without exposure to steroids or the risks associated with general anesthesia. In our center, over 300 patients with spinal stenosis have undergone MILD decompression, including 2 additional cases with foot drop—both of whom also noted full motor recovery. One had ligamentum flavum hypertrophy, and the other had a unilateral synovial cyst, both successfully treated with MILD.

The MILD procedure has a safety profile comparable to epidural steroid injections (1). Data demonstrate statistically significant improvement in function and pain in 74% of patients undergoing MILD for lumbar stenosis (5,6). The safety and long-term efficacy of the MILD procedure have been validated by the MiDAS ENCORE randomized controlled trial (7), which demonstrated significant functional gains at 6 and 24 months follow-up. Furthermore, long-term durability has been demonstrated, with 88% of patients avoiding open surgery at 5-year follow-up (8).

In carefully selected patients with foot drop due to ligamentum flavum hypertrophy or accessible synovial cysts, the MILD procedure may serve as a viable alternative to open decompression. Early intervention may facilitate motor recovery, improve quality of life, and reduce the need for open surgery or prolonged corticosteroid exposure (1). Larger-scale randomized studies are needed to further validate the effectiveness of the MILD procedure in patients with LSS and focal motor weakness.

CONCLUSIONS

In carefully selected patients, early integration of the MILD procedure into the treatment algorithm for LSS associated with focal motor weakness may facilitate motor strength recovery, in addition to the previously established benefits in neurogenic claudication, functional disability, and quality-of-life outcomes (7).

REFERENCES

1. Kaye AD, Edinoff AN, Temple SN, et al. A comprehensive review of novel interventional techniques for chronic pain: Spinal stenosis and degenerative disc disease-mild® percutaneous image guided lumbar decompression, vertiflex interspinous spacer, minuteman G3 interspinous-interlaminar fusion. *Adv Ther* 2021; 38:4628-4645.
2. Munakomi, S, Cruz R. Lumbar Spinal Stenosis. [Updated 2021 Aug 25]. In: StatPearls [Internet]. Treasure Island (FL): Stat Pearls Publishing; 2024 Jan 30. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK531493/>
3. Saifuddin A. The imaging of lumbar spinal stenosis. *Clin Radiol* 2000; 55:581-594.
4. Chopko B, Caraway DL. MiDAS I (mild® decompression alternative to open surgery): A preliminary report of a prospective, multi-center clinical study. *Pain Physician* 2010; 13:369-378.
5. Mekhail N, Vallejo R, Coleman MH, Benyamin RM. Long-Term results of percutaneous lumbar decompression MILD® for spinal stenosis. *Pain Pract* 2012; 12:184-193.
6. Mekhail N, Costandi S, Nageeb G, Ekladios C, Saied O. The durability of minimally invasive lumbar decompression procedure in patients with symptomatic lumbar spinal stenosis: Long-Term follow-up. *Pain Pract* 2021; 21:826-835.
7. Staats PS, Chafin TB, Golovac S, et al. Long-Term durability of minimally invasive lumbar decompression procedure for lumbar spinal stenosis with neurogenic claudication: 2-year results of MiDAS ENCORE. *Reg Anesth Pain Med* 2018; 43:789-794.
8. Kreiner DS, MacVicar J, Duszynski B, Nampiaparampil DE. The mild® procedure: A systematic review of current literature. *Pain Med* 2014; 15:196-205.

