Pain Medicine Case Reports

ISSN 2768-5152
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Volume 7, Number 5, pp. 239-243

Treatment of Low Back Pain Elicited by Middle Cluneal Neuralgia: Case Report and Literature Review of Interventional Treatments

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Background: Cluneal neuralgia is increasingly becoming recognized as an etiology of low back pain. The majority of the literature on cluneal nerve interventions describes modalities targeting the superior cluneal nerves with little emphasis on the middle cluneal nerves.

Case Report: A 21-year-old woman with a medical history of congenital myelomeningocele with tethered cord at L5-S1, status post 3 decompressive releases, presented to the clinic with chronic low back pain and associated sacroiliac paresthesia. Over 11 months, she underwent 7 ultrasound-guided bilateral middle cluneal nerve blocks, without corticosteroid, resulting in significant, immediate pain relief sustained for 4 to 6 weeks.

Conclusions: A nerve block with local anesthetic has proven to be therapeutic for middle cluneal neuralgia, but with varying long-term efficacy. The use of radiofrequency ablation, peripheral nerve stimulation, regenerative medicine, and alcohol neurolysis have shown promise as long-term therapeutic options and as a substitute for invasive surgical release.

Key words: Alcohol neurolysis, cluneal nerve block, middle cluneal neuralgia, peripheral nerve stimulation, prolotherapy, radiofrequency ablation, tethered cord

BACKGROUND

Low back pain (LBP) is one of the most common medical ailments in pain management. According to a 2017 global study, LBP is the leading cause of years lived with disability, with an estimated 7.5% of the population suffering from chronic LBP (1). One overlooked cause of LBP becoming increasingly recognized is dysfunction of the cluneal nerves (CN). The CNs are sensory nerves innervating the posterior lumbar and buttocks region and named (superior, medial/middle, lateral, and inferior) per their distribution in the genitourinary region (Fig. 1) (2). The clinical syndrome describing irritation of the CNs is cluneal neuralgia (CNa), which includes LBP that radiates to the genitourinary region, often with paresthesias. CNa is becoming an increasingly described contributor to LBP in the pain management literature; however, the majority of interventional treatment literature summarizes the superior cluneal nerves (SCN). The authors of this study present a clinical report of LBP involving a patient with myelomeningocele with tethered cord at L5-S1, refractory to pharmacological and conservative management. She was treated with

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Disclaimer: There was no external funding in the preparation of this manuscript.
Conflict of interest: Each author certifies that he or she, or a member of his or her immediate family, has no commercial association (i.e., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted manuscript.
Patient consent for publication: Consent obtained directly from patient(s).
Authors adhere to the CARE Guidlines for writing case reports and have provided the CARE Checklist to the journal editor.
Accepted: 2023-05-18, Published: 2023-09-30

bilateral middle cluneal nerve (MCN) blocks without corticosteroid, resulting in profound improvement in her LBP and ability to participate in activities of daily living (ADLs).

CASE

A 21-year-old woman with a medical history of Crohn's disease, epilepsy, Ehlers-Danlos syndrome, and congenital myelomeningocele with tethered cord at L5-S1 status post 3 spinal cord decompressive releases (most recent performed one year prior to assessment) presented to the clinic with a chief complaint of LBP in the bilateral lumbar region that had started 11 months prior. The pain was rated as an 8 of 10 to 10 of 10 on the Numeric Rating Scale (NRS-11) and exacerbated with prone positioning. She also reported generalized numbness and weakness in the sacroiliac region with severe limitations in ADLs.

Fig. 1. Labeling of T12-S3 of the spinal cord as well as distributions of the SCN), medial/middle cluneal nerves (MCN), inferior cluneal nerves (ICN), and lateral cluneal nerves. From Dallas-Prunskis T, Trescot AM. Part VIII Low back pain. *Peripheral Nerve Entrapments: Clinical Diagnosis and Management*. Switzerland, Springer, 2016: pp. 555-588.

On physical examination, she exhibited altered sensation in the genitourinary area with urinary urgency elicited by pressure to the lumbar-iliac region of the back. Magnetic resonance imaging (MRI) was significant for previously repaired myelomeningocele and tethered cord at the L5 and S1 vertebral levels with dural ectasia throughout the lumbosacral region without worsening structural changes following decompression (Fig. 2). Multiple interventions had previously been pursued without relief, including physical therapy, muscle relaxants, nerve pain analgesics, opioids, and topical analgesics. Following this assessment, the patient was scheduled for a one-month follow-up to pursue bilateral MCN blocks under ultrasound guidance for pain relief. Approach and ultrasound landmarks for injection incorporated findings from "Sonographic peripheral nerve topography: A landmark-based algorithm" by Gruber et al (3) for reference (Fig. 3).

Over 11 months, the patient underwent 7 ultrasound-guided bilateral MCN blocks without corticosteroid with approximately 6 weeks between injections. She reported subjective pain relief between 70% to 85% immediately following the procedure, with 6 of the 7 injections resulting in greater than 80% immediate pain relief. Furthermore, pain relief was sustained 4 to 6 weeks following each injection, with 50% to 60% pain relief during this period.

DISCUSSION

The MCN originates at the posterior rami of S1-S4, passing below and sandwiching the long posterior sacroiliac ligament (LPSL) between the posterior superior and inferior iliac spines before traveling over the posterior iliac crest to the buttocks, closely approximating the sacroiliac joint (SIJ) (4,5). Strong et al (6) reported the first description of CNa in 1957 following successful surgical decompression on 30 patients experiencing entrapment of the SCN and/or MCN. In 2016, Aota (7) reported the first case in the English literature of pure MCN entrapment in a 48-year-old woman who experienced LBP resolution following surgical excision of the long LPSL. Fujihara et al (8) estimated the prevalence of middle cluneal neuralgia (MCNa) to be 13.1% based on a population of 383 LBP patients in Japan. A comprehensive review in 2022 by Anderson et al (9)

Fig. 2. Magnetic resonance imaging (MRI) was significant for previously repaired myelomeningocele and tethered cord at the L5 and S1 vertebral levels and dural ectasia throughout the lumbosacral region without worsening structural changes following decompression.

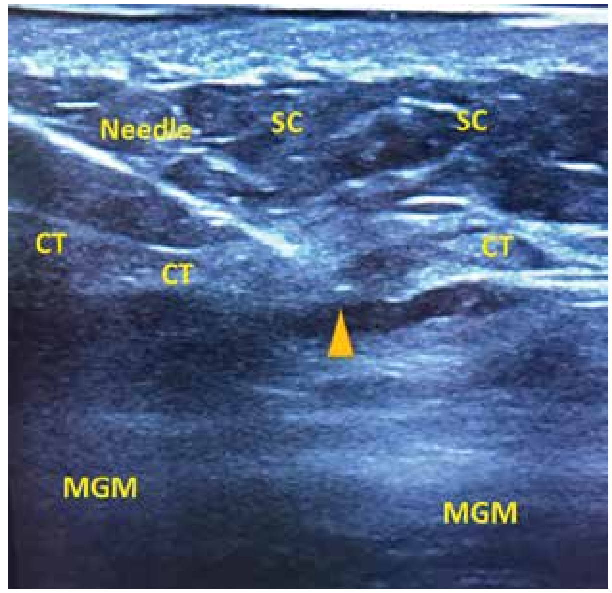

Fig. 3. Arrow denotes middle cluneal nerve (MCN). Underneath the MCN lies the musculus gluteus maximus (MGM). Above the nerve lies an echoic band of connective tissue (CT) spanning horizontally, and lying superficial to the connective tissue is the deepest lobe of the subcutis (SC). Labeling incorporated landmarks from Gruber H, Loizides A, Moriggl B. *Sonographic Peripheral Nerve Topography: A Landmark-Based Algorithm*. Switzerland, Springer Nature, 2019.

outlined basic clinical parameters seen in MCNa. This involves low back and/or leg pain located in the buttock region exacerbated with movement, a buttock tender point located 4.5 cm caudal to the posterior superior iliac spine, and sensory changes along the distribution of the CN (2,7,9,10). In regard to our patient, tethered cord syndrome can present with weakness, sensory and coordination changes but is often nonsegmental and nondermatomal (11). Segmental and dermatomal paresthesias in addition to tenderness on physical exam keyed in the diagnosis of MCNa. The MCN are very thin nerves, limiting the diagnostic yield of computed tomography (CT) and MRI, which were unrevealing of MCN pathology in our patient (4,9).

When the assessment suggests MCNa, the next step is a nerve block with local anesthetic and/or corticosteroid. Both injectates are diagnostic and therapeutic for MCNa over a duration of days to weeks. Unlike local anesthetics, considerations for a corticosteroid injection include glycemic control, immunity, and body habitus (12). A 2021 study by Fujihara et al (8) confirmed MCNa in 50 of 83 (59%) patients suspected of having MCN based on diagnostic criteria via nerve block with 2 mL of 1% lidocaine. Over a long-term follow-up of 18 months, 22 of the 50 (44%) hospitalized patients required no additional treatments after 2 to 5 blocks; 19 (38%) required only conservative treatment, and 9 (18%) underwent microsurgical release of the MCN due to intractable pain of over 3 months' duration (8,10). However, a limiting factor of this study was the finding that 21 of the 50 (42%) patients had associated SCN entrapment, 9 of 50 (18%) had SIJ pathology, and 13 of the remaining 23 had other comorbidities contributing to LBP (8,10).

Peripheral nerve stimulation (PNS) is thought to be therapeutic for those suffering from MCNa. PNS involves placing a lead near a target nerve, which works by employing electrical stimulation to the nerve to reduce pain. Rosenblum et al (13) established criteria for patients who may be suitable for implantation, including those suffering from chronic and severe pain for at least 3 months, failure of less invasive treatment modalities, and a successful trial with greater than 50% reduction in pain intensity before permanent implantation. In 2023, Abd-Elsayed et al (14) implanted PNS in 57 patients (44 women and 13 men) for treatment of chronic pain in various sites with follow-ups at one, 3, 6, 9, 12, 15, and 24 months. Seven of 57 (12%) patients had PNS targeting the MCN. Throughout this period, reduction in pain scores as reported by the group of 57 patients was statistically significant at all durations of follow-up ($P \leq 0.001$) with a significant reduction in morphine milligram equivalent (MME) use of opioids over the 24-month duration (14). Subanalysis of the groups, including the MCN group, showed similar results to the whole group comparison with a statistically significant reduction in pain scores and MME up to 24 months (14).

Radiofrequency ablation (RFA) is a type of neurolysis in targeted areas that has previously been described in case reports as a potential therapeutic solution for those with MCNa (15). In 2022, Knight et al (16) performed a prospective cohort study with RFA of CNs based on 52 patients confirmed to have CNa with symptom follow-up at 6 to 12 weeks following each phase of RFA treatment and at final follow-up from 25 to 66 months. The location of CNa was the SCN in 25 of 52 (48%) patients, followed by the MCN in 12 of 52 (23%) patients, and a combination of MCN plus SCN in 12 of 52 patients (23%). In this study, the average pain score based on the Visual Analog Score (VAS) was reduced from a pre-RFA score of 7.3 ± 1.8 to a postoperative VAS of 1.1 ± 1.0 ($P < 0.001$). Of the 52 patients, 34 (65%) experienced complete symptom resolution, 9 (17%) patients had a near-complete resolution, and another 8 (15%) patients had mild persistent residual symptoms (16). Limitations of this study include no specific comparison for the MCN group, but with 97% of patients experiencing some form of therapeutic relief, it can be inferred that the majority of these MCN patients experienced relief. In a 2022 retrospective chart review by Visnjevac et al (17) of RFA of the SCN in 46 patients, 22% reported a mean of 95% analgesia for a mean duration of 111 days. The remaining 78% of patients reported ongoing relief with a mean of 92% analgesia at the last follow-up (mean 92 days) with no serious adverse effects.

As regenerative medicine and chemoneurolysis become popular treatment options for patients with chronic pain, the authors of this paper explored possible treatment modalities addressing MCNa. Prolotherapy is a common modality in regenerative medicine involving an injection with an irritant solution (most often dextrose) into or around the damaged musculoskeletal structure to stimulate the healing cycle. Siahaan et al (18) describe a case series involving 4 participants diagnosed with SCN entrapment who underwent ultrasound-guided 10-mL D5W perineural injections repeated at a 2-week follow-up. All 4 participants reported NRS pain between 0 of 10 to 2 of 10 at the one-month, 3-month, and 6-month marks without complications (18). Another potentially effective intervention in MCNa is chemoneurolysis. Chemoneurolysis with alcohol denatures proteins and thus compromises the structural integrity of a nerve thereby decreasing pain signaling. In 2002, Mahli et al (19) described a case series involving 4 participants with chronic unilateral buttock pain in those who underwent iliac crest bone graft harvesting for spinal fusion surgery (19,20). During the treatment phase, one mL of 0.5% lidocaine was utilized to identify the area of pain, followed by one L of absolute alcohol (100%) within the same cannula. All 4 participants were pain-free at one month, 3 months, 6 months, and every 6 months for 4 years with no reported complications.

When less invasive options fail, those with MCNa can consider surgery. In a 2018 study, microscopic MCN neurolysis was performed under local anesthesia with all 11 patients enrolled displaying statistically significant therapeutic benefit. The mean NRS-11 score decreased from 7.0 to 1.4, and the mean RDQ (Roland-Morris Disability Questionnaire) score from 10.8 to 1 (20,21). Another study included surgical intervention for the SCN in 52 patients on 79 sides (21,22). All patients reported symptom improvement following surgery, and 11 of 52 (21%) patients required simultaneous MCN release during the procedure due to MCN entrapment (20).

CONCLUSION

Serial nerve blocks are viable treatment options for patients with MCNa. With other promising treatment alternatives available, MCNa nerve blocks can lay the foundation for diagnosis while also providing therapeutic benefit for patients. Future investigation into the viability of more advanced procedures such as RFA, PNS, alcohol neurolysis, and regenerative medicine will require further study, but show long-term promise.

Ethical Disclosure

The authors state that they have obtained appropriate institutional review board approval or have followed the principles outlined in the Declaration of Helsinki for all human or animal experimental investigations. In addition, for investigations involving human subjects, informed consent has been obtained from the participants involved.

Author Contributions

Colton Reeh: Case report content including conception, editing, analysis, interpretation and literature review.

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Andrea Trescot: Figure 1 image and literature review.

Emanuel Husu: Case report content including conception, editing, analysis, interpretation and literature review.

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