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Narrative Review

Review of Interventional Treatments for Cluneal Neuropathy

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Background: The most common presentation of cluneal neuropathy is ipsilateral low back and gluteal pain. Cluneal neuralgia has been described historically in surgical contexts, with much of the description and treatment related to entrapment and decompression, respectively. Treatment options for addressing axial low back pain have evolved with advancements in the field of interventional pain medicine, though clinical results remain inconsistent. Recent attention has turned toward peripheral nerve stimulation. Nonsurgical interventions targeting the superior and medial cluneal nerve branches have been performed in cases of low back and buttock pain, but there is no known review of the resulting evidence to support these practices.

Objectives: In this manuscript we provide a robust exploration and analysis of the available literature regarding treatment options for cluneal neuropathy. We provide clinical manifestations and recommendations for future study direction.

Study Design: Narrative review.

Methods: This was a systematic, evidence-based narrative, performed after extensive review of the literature to identify all manuscripts associated with interventional treatment of the superior and medial cluneal nerves.

Results: Eleven manuscripts fulfilled inclusion criteria. Interventional treatment of the superior and middle cluneal nerves includes blockade with corticosteroid, alcohol neurolysis, peripheral nerve stimulation, radiofrequency neurotomy, and surgical decompression.

Limitations: The supportive evidence for interventions in cluneal neuropathy is largely lacking due to small, uncontrolled, observational studies with multiple confounding factors. There is no standardized definition of cluneal neuropathy.

Conclusion: Limited studies promote beneficial effects from interventions intended to target cluneal neuropathy. Despite increased emphasis and treatment options for this condition, there is little consensus on the diagnostic criteria, endpoints, and measures of therapeutics, or procedural techniques for blocks, radiofrequency, and neuromodulation. It is imperative to delineate pathology associated with the cluneal nerves and perform rigorous analysis of associated treatment options.

Key words: Cluneal neuropathy, superior cluneal nerves, medial cluneal nerves, peripheral nerve stimulation, low back pain

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Cluneal neuralgia has historically been documented as a possible etiology for ipsilateral low back and gluteal pain. There are superior, middle, and inferior cluneal nerve complexes. The first reports of surgical outcomes related to release of the superior cluneal nerve (SCN) and middle cluneal nerves (MCN) were published in the 1950-60s (1,2). Many cadaveric studies have described the locations of SCN and MCN (3-6). The SCN and MCN are purely sensory cutaneous nerves. The SCNs branch posteriorly from the

dorsal rami of lower thoracic and upper lumbar spinal nerve roots, usually from the T11-L3 levels. The MCNs originate at dorsal rami of the upper sacral nerves (S1-S3). Other studies suggest that the MCN originates from the posterior sacrococcygeal plexus dorsal rami S1-S3. The inferior cluneal nerves are typically not discussed in relation to the superior and middle cluneal nerves, as they are responsible for cutaneous sensitivity along the inferior part of the buttock and are not usually associated with low back pain symptoms.

Entrapment of the SCN and MCN around the iliac crest and sacral ligaments may elicit symptoms of low back or sciatica pain. The reported incidence of SCN entrapment (SCN-E) in patients with low back pain is 1.6%–14%. SCN-E and MCN entrapment (MCN-E) produce symptoms in 47%–84% of patients with leg pain and 82% of patients with low back pain (7). Overall, there are varying reports on the prevalence in certain populations, which is likely attributed to a vague diagnosis or previous lack of clinical recognition (7-9).

The etiology of cluneal neuropathy may be insidious in nature but has often been associated with mechanical nerve compression. Cluneal neuropathy has also been implicated in patients following spinal surgery or in conjunction with other spinal disorders (herniation, compression fracture, lumbar spinal stenosis); postpartum sequelae; status post iliac crest bone harvesting; and in rare cases of intragluteal injection (10-12).

The involvement of SCN and MCN in low back pain syndromes has become an increasingly prevalent focus of interventional pain physicians over the past decades. As interventional techniques targeting these purely sensory nerves have developed, the question arises as to the evidence associated with treatments. Based on this need, the authors performed a review of the present literature for the treatment of cluneal neuropathy. As a prelude to discussion of treatment options, we also present the clinical manifestations of cluneal neuropathy.

Clinical Manifestation

Low back pain due to cluneal neuropathy typically manifests as low back pain that is exacerbated with lumbar movements such as extension, lateral flexion, and rotation, as well as positions with prolonged standing, sitting, and walking (5). Cluneal neuropathy symptoms can be divided into pain arising from the SCN or MCN. Both etiologies may present with pain and numbness radiating down the leg.

SCN neuropathy may involve pain over the iliac crest and buttock. A Tinel-like sign is detected at the site of nerve penetration, i.e., 3–4 cm (superior branch) and 7–8 cm (middle branch) from the midline (7). In the presence of MCN neuropathy, a Tinel-like sign is found 35 mm caudal to the posterior superior iliac spine (PSIS) at a point slightly lateral to the edge of the iliac crest (13).

The diagnosis of cluneal neuropathy is a multifaceted process that involves a careful assessment, including differentiating other pain generators in the region. This involves careful history taking, appropriate physical examination, and diagnostic injections. For SCN neuropathy, a diagnostic block can be performed at the trigger point at the posterior iliac crest. For MCN neuropathy, a diagnostic trigger point can be performed 35 mm caudal to the PSIS at a slightly lateral point at the edge of the iliac crest.

Key Physical Exam Components

1. Localization of pain to the spine or radiating pain into the lower extremities with a positive straight leg raise may suggest a spinal or spinal nerve pathology.
2. Concomitant anterior and posterior hip pain with a FABER (hip flexion, abduction, and external rotation) test producing pain localizing in the groin area may point towards femeroacetabular pathology.
3. Tenderness to palpation over the body of the piriformis muscle with a positive FADIR (hip flexion, adduction, and internal rotation) test may suggest piriformis syndrome.
4. Axial low back pain that is worse with lumbar extension and positive for lumbar facet loading may be indicative of lumbar facet arthropathy.
5. Pain localized over the inferior sacrum and coccygeal region may represent sacrocoxalgia or coccydynia.
6. Localization of pain at the PSIS with a positive FABER test producing pain localizing to the low back may indicate sacroiliac joint pathology.

Because the SCN and MCN are very thin (diameter 1–3 mm), computed tomography and magnetic resonance imaging studies are not diagnostically informative. High-resolution computed tomography may help to detect the bony groove at the osteofibrous tunnel (3). Magnetic resonance imaging of the lumbosacral spine should be considered to rule out other pain generators.

Methods

This study reviewed the literature to appraise the rationale, efficacy, and safety of interventional treatments for cluneal neuropathy. To maintain transparent and detailed standards, PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines were followed throughout the search and review (14). The search was performed with the electronic databases PubMed, Cochrane Library, Scopus, and MEDLINE for manuscripts indexed from the inception of each database through August 2021. The initial search term was simply "cluneal" to provide the broadest possible inclusion of articles. Selection criteria were then applied by 2 independent reviewers (BG, DL). Discrepancies were resolved by a third author (DC) (Fig 1.).

Criteria for Study Selection

Inclusion Criteria

Criteria for study selection were established prior to the search and review process. The following inclusion criteria were applied: studies written in English with living patients, including randomized trials, meta-analyses, observational studies, case series, and case reports. All included studies were independently evaluated by at least 2 separate authors in a standardized, unblinded fashion. Book chapters, commentaries, letters to the editor, and review articles were excluded. All relevant studies were summarized, with subsequent discussion emphasizing the primary endpoints and study outcomes.

The population of interest was patients diagnosed with pain from the superior and/or middle cluneal nerves. As there are no universal diagnostic criteria, improvement in symptoms following a diagnostic block to the superior or middle cluneal nerves was adopted for determination of relevant pathology. Articles were included if treatment included nerve blocks, radiofrequency ablation or equivalent denervation techniques, or neuromodulation. Outcome measures included validated pain metrics without specification (e.g., Visual Analog Scale [VAS], Numeric Rating Scale [NRS-11]), or validated functional outcome metrics (e.g., Oswestry Disability Index [ODI], Japanese Orthopaedic Association, Roland-Morris Disability Questionnaire).

Exclusion Criteria

As the inferior cluneal pathology has significant overlap with pudendal neuralgia and other pelvic syndromes, articles were excluded if the inferior cluneal nerve was the only branch evaluated. Anatomical and purely surgical studies were excluded. Review articles and expert opinion articles were excluded, in addition to studies which did not include objective measurements of patient pain or functional outcomes.

Results

A total of 349 publications were identified from the initial search. After the duplicates were removed, 134 remained. Of these 134 articles, only 11 met inclusion criteria. The literature search yielded no randomized controlled trials; all were either case reports or case series. These results are displayed in Tables 1 and 2 and organized primarily by the targeted nerve and the treatment modality.

Superior Cluneal Nerve

Nerve Block with Corticosteroid

Akbas (15) describes a case of a patient with a prior history of sacrogluteal decubitus ulcer who developed ipsilateral buttock pain years later. The diagnosis was made clinically. Palpation of tender points along the iliac crest reproduced characteristic buttock pain. The patient subsequently underwent an injection of 3 mL of 0.2% ropivacaine with 20 mg triamcinolone. Complete pain relief was achieved but returned by one week. The patient then underwent a second injection, consisting of 2 mL of 0.2% ropivacaine with 10 mg triamcinolone. The patient continued pain-free at 3 months.

Ermis (9) presented a case series with 25 patients with suspected medial superior cluneal nerve entrap-

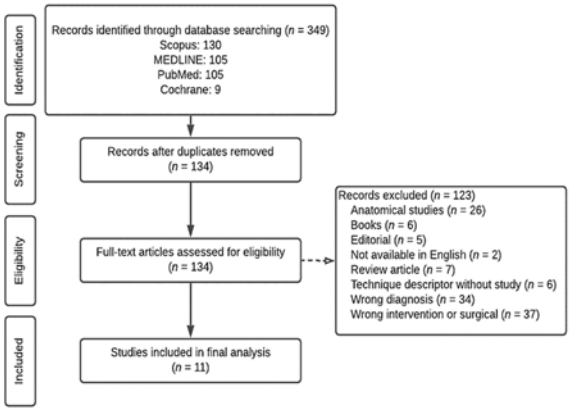

Fig. 1. *Flow chart of article search and inclusion process.*

Table 1. *Evidence table for superior cluneal nerve.*

Source	Design	Sample Size	Targeted Nerve	Diagnostic Injection Technique	Imaging Guidance	Diagnostic Criteria	Treatment
Akbas 2005 (15)	Case report	1	SCN	N/A	Fluoroscopy	Diagnosed by tender points on palpation	6.5, 7.5, and 8.5 cm lateral to L4 spinous process, at the level of the iliac crest: 3 mL of 0.2% ropivacaine with 20 mg triamcinolone
Ermis 201 (19)	Case series	25	SCN, medial	1 mL 2% prilocaine into the trigger point	Ultrasound	Relief of pain in 5 minutes	1 mL 2% prilocaine with 1 mL methylprednisolone
Abd-Elsayed 2020 (18)	Case series	2	SCN	3 points, medial 1/3, middle 1/3, and lateral 1/3 of iliac crest: 1-2 mL of 0.25% bupivacaine	Fluoroscopy	50% pain reduction, unclear duration	Wireless PNS - two 8-contact leads placed medial to lateral over the cluneal nerve
Iwamoto 2017 (11)	Case series	8	SCN	2 mL of 1% lidocaine at the trigger points in the buttock	None	75% pain reduction within 2 hours	Surgical decompression
Kokubo 2017 (8)	Case series	3	SCN	2 mL of 1% lidocaine at trigger point over PSIS	None	75% pain reduction within 2 hours	Surgical decompression
Kuniya 2014 (5)	Case series	113	SCN	Diagnostic injection technique not described	None	Palpation of maximal tender point over the posterior iliac crest (70 mm from the midline and 45 mm from the posterior superior iliac spine) reproduced pain	Nerve block injection - injectate, technique not described
		19	SCN				Surgical decompression
Mahli 2002 (17)	Case series	4	SCN	3 mL of 0.5% lidocaine at PSIS	None	100% pain reduction for 1-2 hours	1 mL of 100% alcohol

ment. The diagnosis was established via an ultrasound-guided diagnostic trigger point injection of 1 mL of prilocaine over the posterior iliac crest. Relief of pain in 5 minutes was considered diagnostic. For treatment, one mL of prilocaine was combined with 1 mL of methylprednisolone. The exact dosage of the corticosteroid was not specified. At one month, 20 patients had one therapeutic injection, 3 had 2 therapeutic injections, and 2 had a total of 3 therapeutic injections. With a mean follow-up period of 12 months, there was a statistically significant improvement in the Short Form Health Survey (SF-36) of 39.16 and ODI of 55.76 ($P < 0.05$). These outcome improvements well exceed the accepted (minimal clinically important difference in the treatment of lumbosacral spinal pain of 4.9 points for the SF-36 and 12.8 for the ODI (16).

Alcohol Neurolysis

Mahli (17) described 4 patients with buttock pain following iliac crest bone graft harvesting for spinal fusion surgery. Superior cluneal neuralgia was diagnosed through a diagnostic injection of 3 mL of 0.5% lidocaine at the posterior superior iliac spine. A 100% pain reduction for one to 2 hours was considered diagnostic. For treatment, 1 mL of absolute alcohol (100%) was injected. All 4 patients were pain-free at one month and remained pain-free throughout 4 years.

Peripheral Nerve Stimulation

Abd-Elsayed (18) published a case series of 2 patients with cluneal neuropathy whose diagnosis was confirmed with 1-2 mL of 0.25% bupivacaine at 3 separate locations along the iliac crest. A positive diagnostic block was defined as 50% pain reduction. However, there was no delineation of the required duration of analgesia. Wireless peripheral nerve stimulation was used for treatment. A 90% pain reduction was seen at one month for the patient awaiting a stimulator

Table 1 (cont). *Evidence table for superior cluneal nerve.*

Source	Before Treatment	After Treatment	Follow-up Intervals	Adverse Events	Conclusions	Comments
Akbas 2005 (15)	VAS 8-9/10	VAS 0/10	7 days (pain returned), 3 months (complete relief)	NR	SCN-E, potentially related to decubitus surgery 8 years prior, resolved with SCN block	There was no diagnostic injection
Ermis 201 (19)	SF36 PH 31.72 ± 4.43	SF36 PH 70.88 ± 4.79	12 months	NR	MSCN injection with steroid/ analgesic may significantly improve low-back/buttock pain in military personnel (average age 23.1 years) after 1-3 injections	No NRS-11/VAS. Five patients had recurrent pain at the same area, required a second injection and 2 patients required a third one (15 days apart)
Abd-Elsayed 2020 (18)	NRS-11 2-10/10	NRS-11 0-1/10	13 months (implant); one month (trial)	NR	PNS may be effective for refractory SCN neuralgia after one month and sustained more than a year thereafter	
Iwamoto 2017 (11)	NRS-11 8.38 ± 0.86	NRS-11 0.38 ± 0.70	Mean 28 months	NR	SCN block (and potentially surgical neurolysis) effectively treats persistent LBP after lumbar fusion surgery	8/8 had transient improvement after nerve block and required neurolysis. 50% NRS-11 reduction seen in 8/8 patients on final follow-up, mean 28 months
Kokubo 2017 (8)	NRS-11 8.3 ± 1.25	NRS-11 1	Mean 24 months (15-35)	NR	SCN entrapment can be treated with local block or minimally invasive surgery in elderly patients.	15 patients (5 patients SCN single block without need for further intervention, 9 patients had repeat SCN block, 12 SCN surgical neuroloysis. • SCN block an average of 5.1 times (range 2-16 times) at one site. 50% NRS reduction in 3/3 patients on final follow-up, mean 24 months. 12/15 patients were simultaneous treated for gluteus medius muscle pain.
Kuniya 2014 (5)	VAS 68.6 ± 19.2	VAS 45.2 ± 28.8	One week	Erectile dysfunction (2 cases)	Repeat SCN block seems to provide nominal increase in rate of success	
	VAS 73.6 ± 15.7	VAS 33.3 ± 29.4	Mean 15 months (5-47)	NR		50% NRS-11 reduction in 12/19
Mahli 2002 (17)	VAS 7.5	VAS 0	4 years	NR	SCN alcohol neurolysis completely eliminated pain associated with lumbar surgery and iliac crest bone graft harvest when performed on average 5.5 months (SD 1.29 months) after index surgery	50% NRS reduction 4/4 at 4 years

SCN = superior cluneal nerve; PNS = peripheral nerve stimulation; VAS = visual analog scale; NRS = numeric rating scale; SF-36 = 36-item short form health survey; PSIS = posterior superior iliac spine; NR = none reported; SD = standard deviation

implant. For the second patient, the pain resolved at one month and he remained pain-free at 13 months. No complications were noted.

Surgical Decompression

Three case series of surgical decompression for the treatment of superior cluneal neuropathy were identified. Kuniya (5) enrolled 113 patients with clinical superior cluneal neuropathy who underwent a nerve block. No imaging guidance was described for this nerve block. No additional information was available regarding procedural technique and dosage of injectate. VAS improvement at one week was 23 mm. Of the 113 patients, 53 patients required a second injection at week 2, and 28 patients required a third injection at week 3. At week 3, 96/113 patients (85%) had more than a 20 mm pain reduction and 77/113 patients (68%) had more than a 50% pain reduction on the VAS. Of note, 2 cases

Table 2. *Evidence table for middle cluneal nerve.*

Source	Design	Sample Size	Targeted Nerve	Diagnostic Injection Technique	Imaging Guidance	Diagnostic Criteria	Treatment
Fujihara 2021[a] (22)	Case series	50	MCN	3.5cm inferior to PSIS: 2 mL of 1% lidocaine	None	50% pain reduction at 2 hours	2 blocks (median)
		9	MCN	3.5cm inferior to PSIS: 2 mL of 1% lidocaine	None	50% pain reduction at 2 hours	Surgical decompression
Fujihara 2021[b] (20)	Case series	11	MCN	Trigger point injection 3.5 cm inferior to PSIS, 2 mL of 1% lidocaine	Fluoroscopy	50% pain reduction at 2 hours	Radiofrequency 3 sites: superior, midpoint, inferior between PSIS and PIIS: 22G needle 90°C for 90 seconds
Matsumoto 2019 (21)	Case series	3	MCN	N/A	None	Trigger point caudal to the PSIS, over the edge of iliac crest; fails sacroiliac joint block	MCN block with 2 mL 1% lidocaine
		1	MCN	2 mL 1% lidocaine	None	50% pain reduction at 2 hours	Surgical decompression
Zheng 2019 (19)	Case report	1	MCN	L4 medial branch, L5 dorsal ramus, S1-3 lateral branch block with bupivacaine	Fluoroscopy	100% pain relief for 24 hours	Radiofrequency 17G, cooled RF, 60°C for 150 seconds for sacral lateral branches (multiple lesions); 18G, 100 mm active tip x 80°C for 75 seconds (2 lesions)

of erectile dysfunction were seen following these injections. Nineteen patients were unresponsive to injection therapy and underwent surgical decompression. There was a 50% VAS reduction in 12 of these 19 patients with a mean VAS improvement of 39 mm. Mean follow-up period was 15 months, ranging from 5 to 47 months.

Kokubo (8) described patients whose diagnosis was established after a trigger point injection over the PSIS with 2 mL of 1% lidocaine, that resulted in a 75% pain reduction within 2 hours. Following surgical decompression, pain reduced from a mean NRS-11 score of 8.3 to 1. All 3 patients had ≥ 50% pain reduction with a mean follow-up of 24 months, ranging from 15-35 months.

Iwamoto (11) used similar diagnostic criteria and identified 8 patients who underwent surgical decompression for superior cluneal nerve entrapment. Mean pain decreased from an NRS-11 score of 8.38 ± 0.86 to 0.38 ± 0.7 on follow-up after treatment. A 50% NRS-11 score reduction was seen in 8/8 patients. Mean duration of follow-up was 28 months.

Middle Cluneal Nerve

Radiofrequency Neurotomy

Zheng (19) detailed the treatment course of one patient with idiopathic middle cluneal neuralgia. Pain emanated from the lumbosacral junction and PSIS to the sciatic notch. Magnetic resonance imaging of the lumbar spine to the sacrum revealed no major abnormalities. Following ineffective diagnostic sacroiliac joint and facet joint injections, she underwent L4 medial branch, L5 dorsal ramus, and S1-S3 lateral branch nerve blocks with bupivacaine. Pain relief of 100% was achieved, lasting 24 hours. Finally, under fluoroscopy, using an 18G radiofrequency cannula with a 10 mm active tip, the L4 medial branch nerve and L5 dorsal ramus were ablated for 75 seconds at 80°C for a total of 2 lesions. A 17G cooled radiofrequency cannula was utilized for S1-3 lateral branch neurotomy. Lesioning was performed for 150 seconds at 60°C. Multiple lesions were created at each level.

Table 2 (cont). *Evidence table for middle cluneal nerve.*

Source	Before Treatment	After Treatment	Follow-up Intervals	Adverse Events	Conclusions	Comments
Fujihara 2021[a] (22)	NRS-11 7.8 ± 1.4	NRS-11 1.1 ± 1.4	Unclear; Median follow-up 18.4 months	NR	MCN injection (median 2 blocks) may offer lasting pain relief. Some patients may require additional blocks (11/50 patients) or oral medication (8/50 patients), or microsurgical release (9/50 patients).	High prevalence of coexisting superior cluneal nerve entrapment, sacroiliac joint pain, radiculopathy. Eleven underwent repeat nerve blocks; 9 microsurgical release.
	NRS-11 8.2 ± 1.5	NRS-11 1.0 ± 0.7	Unclear; Median follow-up 18.4 months	NR		
Fujihara 2021[b] (20)	NRS-11 6.7 ± 1.4	NRS-11 1.8 ± 2.3	12 weeks	NR	High-frequency thermal coagulation may offer significant benefit to pain and function in MCN-E.	50% NRS-11 reduction at 12 weeks: seen in 9/11 patients. 4/11 required re-RFTC within 24 weeks (failures?)
Matsumoto 2019 (21)	NRS-11 7 ± 2.16	NRS-11 1.33 ± 0.47	Unclear	NR	Consideration for MCN entrapment after unsatisfactory SIJ blocks allows for significant improvement in pain and function with MCN blocks.	
	NRS-11 8/10	NRS-11 0/10	Unclear	NR	Consideration for MCN entrapment after unsatisfactory SIJ blocks allows for significant improvement in pain and function with MCN blocks.	
Zheng 2019 (19)	NRS-11 7/10	Pain reduction 65-90%	2 weeks, 3 months	NR	First published case of MCN cooled RFA. MCN cooled RFA may be a feasible treatment option. This case targeted S1-3 doral ramus/lateral branches and L5 dorsal ramus, L4 medial branches due to concern for anatomical variance.	Suggests that ablating sacral branches and L4 MBB and L5 DR is equivocal to medial cluneal ablation.

MCN = middle cluneal nerve; MCN-E = middle cluneal nerve entrapment; PNS = peripheral nerve stimulation; NRS = numeric rating scale; PSIS = posterior superior iliac spine; NR = none reported; MBB = medial branch block; RFA = radiofrequency ablation; RFTC = radiofrequency thermocoagulation

Prior to the procedure her NRS-11 score was rated as 7/10. At 2 weeks and at three months, her pain had decreased by 65%-90%.

The second middle cluneal nerve radiofrequency neurotomy study from Fujihara (20) included 11 patients selected for a diagnostic block if they exhibited pain caudal to the PSIS, just lateral to the body of the sacrum (20). A 50% pain reduction at 2 hours after a trigger point injection of 2 mL of 1% lidocaine was considered diagnostic. Following a positive diagnostic injection, radiofrequency neurotomy was performed for the middle cluneal nerve. Drawing an imaginary line between the PSIS and posterior inferior iliac spine, 3 target sites were identified (superior, midpoint, and inferior). Using a 22G radiofrequency cannula under fluoroscopy, lesioning was performed for 90 seconds at 90°C. At 12 weeks, the NRS-11 score improved by 4.9 points and Roland-Morris Disability Questionnaire score improved by 5.3 points. For comparison, the minimal clinically important difference for an NRS-11 score in patients with low back pain is 2-3 points and the Roland-Morris Disability Questionnaire score is 3-5 points (2). A 50% NRS-11 score reduction at 12 weeks was seen in 9/11 patients.

Surgical Decompression

Matsumoto (21) reported 4 cases of presumptive middle cluneal nerve entrapment. Clinically these patients had trigger points caudal to the PSIS, at the edge of the iliac crest, and were minimally responsive to a sacroiliac joint block. Three of four patients underwent a middle cluneal nerve block with 2 mL of 1% lidocaine as treatment. Pain improved from an NRS-11 score of 7 ± 2.16 to 1.33 ± 0.47. One of the four patients required surgical decompression. At this patient's last visit, pain improved from an NRS-11 score of 8 to 0. No information was given regarding follow-up or duration of effect.

In Fujihara's study (22) 9 patients were identified as having middle cluneal nerve entrapment after a positive diagnostic block. This block was performed 3 cm inferior to the PSIS with 2 mL of 1% lidocaine. A diagnostic block was defined as at least a 50% pain reduction at 2 hours. The NRS-11 score prior to treatment was 8.2 ± 1.5 and 1.0 ± 0.7 at the last follow-up visit. Median follow-up was 18.4 months.

Discussion

Cluneal neuralgia or entrapment is a commonly considered diagnosis for low back and buttock pain in the absence of spinal nerve compression, referred pain secondary to lumbar spondylosis, and sacroiliac joint dysfunction or arthritis. The emphasis of the present review was to systematically analyze, in an organized fashion, the available literature on the effectiveness and safety of various treatment options for superior and middle cluneal neuralgia.

After an exhaustive review, only 11 articles were selected based on our inclusion and exclusion criteria. These 11 articles were either case reports or case studies with a small sample size, commensurate with Level V evidence. There were no universally agreed upon diagnostic criteria or treatment. Some authors used the presence of trigger points in the general vicinity of the SCN or MCN distribution as a means of clinical diagnosis. Others used diagnostic injections for this purpose. However, there was a significant variation observed in procedural technique, injectate medication and volume, use of imaging guidance, and definition of a positive diagnostic block. Moreover, there was inconsistent use of validated outcome measures and no standard follow-up period. Adverse events were not routinely recorded. For this reason, limited conclusions can be drawn from these studies. Table 3 provides recommendations for future studies on cluneal neuropathy.

For superior cluneal neuralgia, various treatments, including injection therapy, alcohol neurolysis, peripheral nerve stimulation, and surgical decompression, have all been described. These treatment options appeared to be reasonably safe and effective. For middle cluneal neuralgia, radiofrequency neurotomy and surgical decompression have been described. The 2 studies on radiofrequency neurotomy demonstrate approximately a 5-point NRS-11 score improvement, lasting 12 weeks. Surgical decompression was safe and improved NRS-11 pain scores routinely by 7-8 points. The Fujihara (22) study showed that these effects may be durable, with a median follow-up of 18.4 months (22). If therapeutic blocks are to be considered, studies indicate that one single injection is often not sufficient for long-term relief; most studies reported the need for multiple injections to achieve durable therapeutic benefit.

Table 3. *Consensus recommendations for future research.*

1. Identify patients with buttock/back/leg pain symptoms in the absence of other back pain etiologies; in particular, it is critical to rule out sacroiliac joint pain given its close anatomic proximity and similarities in the symptoms with cluneal neuropathy.
2. Perform diagnostic blocks with image guidance to confirm diagnosis.
3. Avoid reliance on trigger point injection for diagnostic purposes.
4. Choose a specific target (SCN vs MCN) based on symptoms.
5. If the block is positive, (treated as MBB, > 50% relief for duration of anesthetic used), repeat blocks may be required for long-term efficacy.
6. NRS-11/VAS should be tracked with distinct time endpoints for appropriate assessment of therapeutic options and allowing for possible meta-analysis.
7. Blocks may not provide long-term relief and may be repeated if relief is not provided with the previous injections.
8. Surgical neurolysis may be an option in the cases of both SCN and MCN with moderate evidence to support this therapy.
9. Interventional procedures are to be considered in select cases, however evidence is poor.

SCN = superior cluneal nerve; MCN = middle cluneal nerve; MBB = medial branch block; VAS = visual analog scale; NRS = numeric rating scale

Conclusion

Overall, there is a paucity of literature on interventional procedures directed for cluneal nerve neuropathy (SCN and MCN). Despite the availability of retrospective and prospective case series, there have been no controlled studies for interventional therapies for the cluneal nerves.

The literature highlights the superior and medial cluneal nerves as a source for back and buttock pain symptoms, though the true incidence of this is still yet undefined. The main limitations with this review of cluneal neuropathy interventions include 1) the lack of a gold standard for diagnosing cluneal neuralgia; 2) a lack of consensus on procedural techniques for blocks, radiofrequency, and neuromodulation; 3) inconsistent measures and endpoints across presently available studies.

Of the limited evidence that is presently available, there is moderate evidence supporting the use of surgical release for pain relief. There is evidence to support the use of diagnostic and therapeutic blocks, although there is at present no consensus as to the appropriate technique for either. Radiofrequency ablation and peripheral nerve stimulation show promise but require additional published literature going forward for efficacy and durability.

As cluneal neuropathy is recognized and diagnosed more frequently, it is imperative to identify interventional procedures that may offer pain relief prior to considering surgery. With further studies, we may be able to better recommend therapies for low back pain secondary to cluneal neuropathy.

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