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# **SUPERIOR CLUNEAL NEURALGIA FROM ILIOCOSTAL IMPINGEMENT TREATED WITH PHENOL NEUROLYSIS: A CASE REPORT**

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**Background:** Superior cluneal neuralgia (SCN) is an increasingly recognized yet still frequently overlooked cause of chronic lumbosacral and buttock pain. While historically attributed generally to iatrogenic iliac crest injury (bone marrow biopsy or bone graft harvest), more recently it is recognized as occurring in the absence of any trauma, with idiopathic entrapment resulting in compression neuropathy. Iliocostal impingement syndrome (IIS) is an even less commonly considered condition whereby the lower costal margin repetitively contacts and irritates the iliac crest, primarily occurring unilaterally and owing to severe scoliosis, but also in the context of severe vertebral column height loss.

**Case Report:** We report here a case of an elderly woman with a 3-inch reported height loss over the decades who had suffered with chronic and intractable right lumbosacral and gluteal pain, and whom, on the basis of physical examination, we diagnosed presumptively with both SCN and with IIS as the underlying pathophysiologic mechanism. After undergoing successful diagnostic fluoroscopically guided superior cluneal nerve block, she was offered phenol denervation and enjoyed 9 months of reported 90% improvement in her symptoms, with gradual return to baseline over the next couple months. She has subsequently undergone repeat phenol denervation twice, with similarly good results. We believe this to be the first documented application of phenol neurolytic technique to SCN, and in the case of iliocostal impingement we argue that surgical release/resection or even peripheral nerve stimulation may not be effective owing to underlying compression/irritation diathesis from the inevitable pressure of the costal margin upon the iliac crest.

**Conclusion:** In this case report, we also briefly summarize the current literature on SCN and compare phenol neurolysis to other therapeutic modalities.

**Key words:** Superior cluneal nerves, neuralgia, iliocostal impingement, phenol, denervation

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## **BACKGROUND**

Lumbosacral and posterior pelvic pain is a highly prevalent condition responsible for considerable health care expenditure, and one which is frequently recalcitrant to both conservative and aggressive surgical or interventional treatment. One infrequently but increasingly recognized cause of chronic pain in this region is superior cluneal neuralgia (SCN). Initially thought to be a complication of iliac crest bone graft harvesting or bone marrow biopsy, SCN is now recognized as occurring in the absence of trauma, as a result of mechanical entrapment (1,2) perhaps responsible for at least 10% of chronic low back pain (3). Reported treatment options for SCN beyond conservative care include neural blockade with or without corticosteroids, percutaneous neurolysis by thermal (including cryoablation) or chemical means (alcohol), neurostimulation, and surgical neurolysis or release.

Iliocostal impingement syndrome (IIS), also known as iliocostal friction or costoiliac impingement syndrome, is an even less recognized entity (4) whereby the lower costal margin repetitively or continuously contacts the iliac crest, usually unilaterally on account of scoliosis but occasionally bilaterally from severe kyphosis or height loss.

This is to our knowledge the first reported case of SCN from IIS, and also the first reported case of phenol SCN ablation. Only one chemical neurolysis report (5) currently exists in the literature and comprises 4 cases denervated by alcohol.

## **CASE REPORT**

A 74-year-old woman who consented to this report was referred to us by her primary physician for consultation regarding chronic and intractable right lumbosacral and gluteal region pain that had failed previous conservative therapeutic attempts including physiotherapy, chiropractic and other manipulative treatments, acupuncture, and multimodal pharmacotherapy. She reported severe "aching, burning, sharp, stabbing" pain in the lumbosacral and gluteal regions exacerbated primarily by prolonged sitting but also by movement, with consistent relief found only by recumbency. Of note, she also reported a 3-inch height loss over the years, along with multiple thoracolumbar vertebral compression fractures in the past.

Physical examination was reassuring for no significant neurologic deficits other than subtle weakness of the right iliopsoas, and examination of the spine and pelvis

were unrevealing for discogenic, facetogenic, sacroiliac or hip pathology with only some concordant point tenderness over the dorsal iliac crest on the right, and increased pain with ipsilateral lateral bending (rather than contralateral bending as might be expected with an iliolumbar syndrome). The most prominent finding, however, was apparent approximation of the cost of margins bilaterally to the iliac crests, with inability to get even one finger-breadth between the 2 structures.

Lumbar radiography showed no significant scoliosis, and some generalized spondylosis with degenerative spondylolisthesis, but more notably fairly significant general disc height loss and also a remote L1 compression fracture.

Initially, a diagnostic and prognostic local anesthetic-only fluoroscopically guided SCN block was performed as follows: her skin was first marked at a point 7 cm lateral to the midline and 5 cm from the posterior superior iliac spine (PSIS), and then the area was palpated. She reported maximal tenderness at almost exactly the marked site, and a radiopaque marker was placed over it. Fluoroscopy showed the marker to overlie the iliac crest, and the C-arm was then adjusted to a somewhat caudad and contralaterally oblique orientation of the image intensifier to provide a trajectory more parallel to the dorsal iliac crest. After sterile prep and drape, and cutaneous/subcutaneous local anesthetic infiltration, a 22-gauge 5-inch spinal needle was directed in coaxial fashion under intermittent spot fluoroscopy until contact with the external aspect of the dorsal iliac crest was made, and the needle was then "walked" along the periosteum with intermittent application of more local anesthetic as well as when she complained of severe pain from periosteal insult. When the needle tip reached the area indicated by the superimposed radiopaque marker, she complained of severe concordant pain, and at this point 2 mL of low-osmolarity iodinated contrast was injected, showing primarily an ascending thoracolumbar fascia or quadratus lumborum pattern; the needle was then directed slightly more inferiorly along the exterior edge of the crest until subsequent contrast showed a descending pattern more consonant with the aponeurosis of the gluteus medius. At this point, 4 mL of preservative-free 0.5% bupivacaine was injected slowly as the needle was withdrawn roughly 2 cm. There were no evident complications. She subsequently reported a little over 6 hours of complete relief of her usual symptoms followed by 4 hours of waning benefit until return to baseline.

We thus offered her phenol neurolysis, which she eagerly pursued; the procedure was carried out in the same fashion with the exceptions of intermittent contrast medium application while advancing the needle, and of course the administration of 3 mL of 3.3% phenol (diluted in a 2:1 ratio from an aqueous 10% solution, using low-osmolarity iodinated contrast 240 as the diluent to add viscosity and visibility). The anteroposterior (AP) fluoroscopic image from this procedure is shown in Fig. 1.

The patient reported 9 months of 90% relief of her typical pain, followed by gradual return of pain over the course of the next 2 to 3 months, and underwent repeat denervation again using the same technique. Once again, she reported 9 months of 90% relief, with a more rapid return to baseline at this time and a desire to pursue repeat denervation once again. This was performed 3 months prior to the time of this report using the same

technique, except a 4% phenol solution, diluted from a 6% phenol stock bottle, was used this time. At present, she reports 100% relief of her typical pain.

## DISCUSSION

### Anatomic Variation

The superior cluneal nerves have been classically described as arising from the lateral branches of the dorsal rami of the L1-3 nerves; more recently it has been shown that contributions from the lower thoracic and lower lumbar segments may augment the typical upper lumbar network (1,6). The nerves pass lateral to the multifidi and through the erector spinae group with varying configurations (7) before piercing the thoracolumbar fascia and draping over the iliac crest, as shown in Fig. 2, generally described as 3 distinct medial, intermediate, and lateral branches. A recent anatomic study (6), however, has shown that as many as 5 distinct



Fig. 1. Phenol (in low-osmolarity iodinated contrast medium) denervation of superior cluneal nerves.

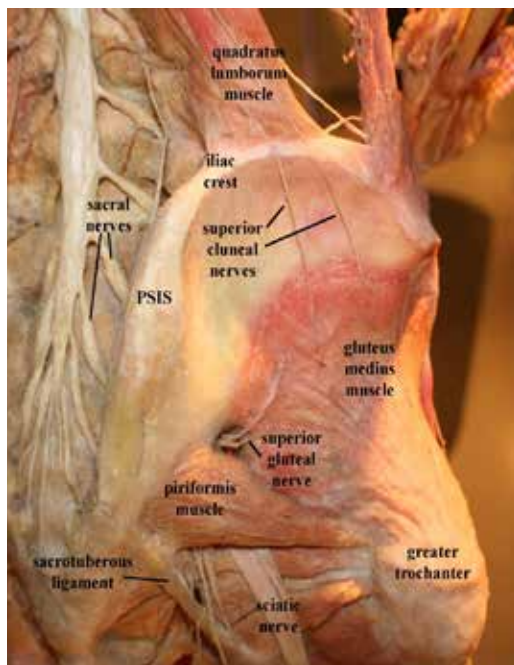


Fig. 2. Anatomy of the superior cluneal nerves. From Bodies, The Exhibition, with permission. (Image courtesy of Andrea Trescot, MD)

superior cluneal nerves may exist in an individual. While the literature and textbooks generally indicate that the medial-most nerve is usually found at 7 cm (or 7-8 cm) lateral to the midline, considerable variation in these distances actually exist (8-11) as shown in Table 1. Besides intersubject variance, suggested factors contributing to these ranges include both gender (11) and also size and race/ethnicity (6).

Most cadaveric dissections report a pattern whereby more lateral branches tend to pierce the thoracolumbar fascia (TLF) rostral to the iliac crest prior to draping over it, while more medial branches may travel through an osteofibrous tunnel (with the roof comprised of TLF elements and the floor being the iliac crest). The prevalence of obvious entrapment within this tunnel varies significantly between studies but is generally low (10) with more proximal compression by the erector spinae complex or quadratus lumborum suggested as a more common etiology (2,12,13).

Vertebral compression fractures seem to be associated with an increased incidence of SCN, and various proposed mechanisms include stretching of the nerve from increased kyphosis or simply paraspinous muscle

spasm, or perhaps a more proximal insult leading to a “double crush” phenomenon (3,13). While such factors may certainly have played a role, we propose that impingement of the lower costal margin on the iliac crest in this case is a significant if not sufficient contributor. This patient had unusually dramatic height loss owing to both vertebral compression fractures and degenerative disc disease leading to bilateral impingement (but only unilateral symptoms). Such bilateral impingement is rare; unilateral impingement from severe scoliosis is more common and an elevated index of suspicion for SCN from iliocostal impingement is warranted when patients with scoliosis complain of lumbosacral pain contralateral to lumbar convexity.

### Neurolytic Technique

As with any situation involving proposed neurolysis, a presumptive diagnosis must be confirmed with anesthetic blockade prior to ablation. The scant clinical criteria proposed in the literature sometimes include history elements that are so vague as to not be helpful (e.g., pain in the lumbosacral region exacerbated by extension) and physical exam findings that are also nonspecific (local tenderness, exacerbation with range of motion testing); by consensus, positive response to low-volume targeted injection is accepted as diagnostic as a matter of necessity. Such injection may be either surface anatomy landmark-guided, based upon palpation with concordant tenderness, or image-guided. Sonographic imaging is certainly an option (12) but requires advanced skill levels given the small size of these nerves, no proximate vascular structures to aid identification, not-infrequent depth of the structures in question from the surface, and relatively homogeneously echodense tissues involved. We use fluoroscopic guidance for superior cluneal nerve intervention, both diagnostic and therapeutic (neurolytic).

Use of a peripheral nerve stimulator (the preferred practice of Dr. Andrea Trescot) to augment accuracy of needle tip placement as close as possible to the superior cluneal nerve(s) is very beneficial if the interventionalist has both the device and the skill to use it. Whether or not nerve stimulation is used, however, the technique described in this case report takes into account the variability in anatomy and the uncertainties that may accompany palpation-based approaches. By angling the fluoroscope to achieve a so-called “trajectory view” as parallel as possible to the angle of the dorsal iliac crest, the needle may be advanced in a coaxial fashion along

the exterior lip of the crest (preferably with a slight curvature introduced into the needle; we prefer a 5-inch spinal needle to achieve an appropriate arc) to maximize the likelihood of intercepting the nerve(s) in question. Unless periosteal stimulation pain is severe, we prefer to minimize local anesthetic administration on needle entry once past the subcutaneous tissues so as to preserve patient report of concordant pain when the needle approaches the target nerve(s). In addition, we administer iodinated contrast medium (if not allergic) while advancing to better understand the fascial plane we are in so that administration of phenol while withdrawing the needle doesn't inadvertently spread to undesirable regions (e.g., proximally along the quadratus lumborum which could theoretically intercept the lumbar plexus with devastating consequences).

The advantages of percutaneous neurolysis over surgical resection or release include markedly less morbidity potential from general or neuraxial anesthesia, decreased risk of infection and other surgical complications, and significantly lower complexity of procedure with greater potential application in office-based or other ambulatory settings. While peripheral nerve stimulation is another option, it does confer some similar risks to surgical approach such as infection (perhaps even increased due to implanted foreign body) and also carries significantly greater cost.

The advantages of chemical neurolysis as compared to other modalities such as thermal radiofrequency or cryoablation include relative procedural simplicity, cost savings, and the opportunity to denervate a much larger area via volume spreading, which is particularly useful in the case of the SCN complex which may span a considerable and unpredictable distance along the iliac crest. Conversely, the disadvantages of chemical neurolysis lie in the relatively uncontrollable (compared to thermal or cryoablation) spread of the agent. This has tempered enthusiasm for chemical neurolysis in regions such as the orbit or axial skeleton, where proximity to central nervous system structures could result in catastrophic neurologic injury with unintended spread.

In this somewhat unique case of iliocostal impingement we argue that surgical release/resection or even peripheral nerve stimulation may not be effective owing to underlying compression/irritation diathesis from the inevitable pressure of the costal margin upon the iliac crest. In other words, in order to alleviate the culprit mechanism, rib resection may be necessary.

In general we believe that phenol is preferable over alcohol for chemical neurolysis owing to increased patient comfort (alcohol is intensely painful upon injection), the

Table 1. Distances between superior cluneal nerves and surface landmarks.

	Distance (cm) from midline to:			Distance (cm) from PSIS to:								
	Medial branch	Intermediate branch	Lateral branch	Medial branch	Intermediate branch	Lateral branch	L1 branch	L2 branch	L3 branch	L4 branch	L5 branch	T12 branch
Lu et al (8) n = 15 cadavers	8.1 ± 0.92			6.47 ± 0.53								
Tubbs et al (9) n = 10 cadavers				5 (range 4-5.8)	6.5 (range 4-8.2)	7.3 (range 5.5-8.5)						
Kuniya et al (10) n = 109 hemipelvis	7.1 ± 0.79 (range 5.0-8.75)	7.67 ± 0.76 (range 5.26-9.33)	8.26 ± 0.82 (range 5.52-10.6)	4.57 ± 0.93 (range 1.3-8.2)	5.09 ± 0.92 (range 2.84-9.0)	5.65 ± 0.98 (range 3.31-9.4)						
Loubser et al (11) *n = 32 hemipelvis; †n = 38 hemipelvis	*7.32 ± 1.09 (men); 7.08 ± 0.78 (women)			†7.48 ± 1.16 (men); 6.39 ± 1.76 (women)								
Konno et al (6) n = 23 hemipelvis	6.24 ± 2.22	7.15 ± 1.39	7.88 ± 1.34	4.08 ± 1.81	4.29 ± 1.14	5.07 ± 0.99	6.06 ± 1.65	6.60 ± 1.34				

Abbreviation: PSIS, posterior superior iliac spine

commonly held belief that anesthesia dolorosa incidence is lower compared to alcohol, and phenol's greater precision/control over spread compared to alcohol (phenol is typically compounded in glycerin, and may also be diluted in viscous contrast media as we choose to do). The limited comparison data suggest no significant difference in efficacy or duration (14).

Historically, chemical neurolysis has been discouraged in the "routine care of patients with chronic noncancer pain" (15). The risk of uncontrolled spread to proximate unintended targets (e.g., motor nerves or the neuraxis) renders its universal use untenable, and it should be

reserved for severe and refractory pain that has failed more conservative approaches mediated by structures distant from the central nervous system or motor nerves. However, given the recent increased interest in opioid-sparing modalities for chronic pain, and also in view of its widespread availability and affordability, we agree with Mayo Clinic practitioners that "while no consensus guidelines or indications exist, phenol neurolytic injections may be utilized for persistent and intractable pain conditions" (16) and with Weksler et al (17) that this well-established modality still deserves a place in the modern interventional pain armamentarium.

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