

Terri Dallas-Prunskis

## Introduction

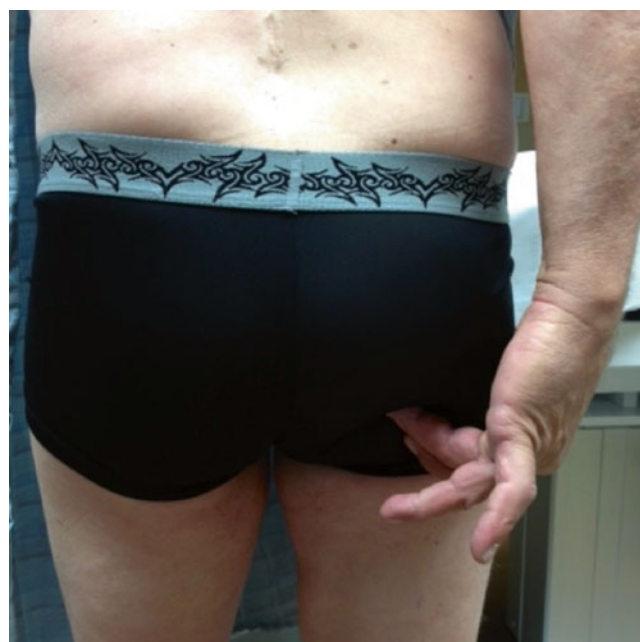
Neuropathic gluteal pain is usually associated with sciatic entrapment or radiculopathy. However, some patients present with pain located at the caudal and medial parts of the buttocks and the upper part of the posterior thigh, as well as in the perineal area (including the scrotum or the labia majora). These pains do not match the pattern of a *sciatic nerve* entrapment (see Chap. 65) but rather may represent entrapment of the *inferior cluneal nerve*, which emerges from the *posterior femoral cutaneous nerve* (PFCN) (see Chap. 62), innervating the buttocks and upper posterior thigh, as well as the perineum. Careful attention to the description of the pain, combined with a directed physical exam, is necessary for accurate diagnosis and treatment.

## Clinical Presentation (Table 63.1)

Patients with inferior cluneal nerve (ICN) entrapment complain of a burning, tingling, or numbness sensation along the inferior and medial aspects of the buttocks (Fig. 63.1) and/or along the dorsal and proximal thigh, as well as the lateral anal margin and the skin of the scrotum or labia majora (Fig. 63.2). Pain will increase with sitting on hard surfaces, such as chairs or bicycle seats, and it may mimic or be triggered by piriformis spasm. As a branch of the PFCN, the ICN is entrapped by the same mechanisms and may present in a similar way.

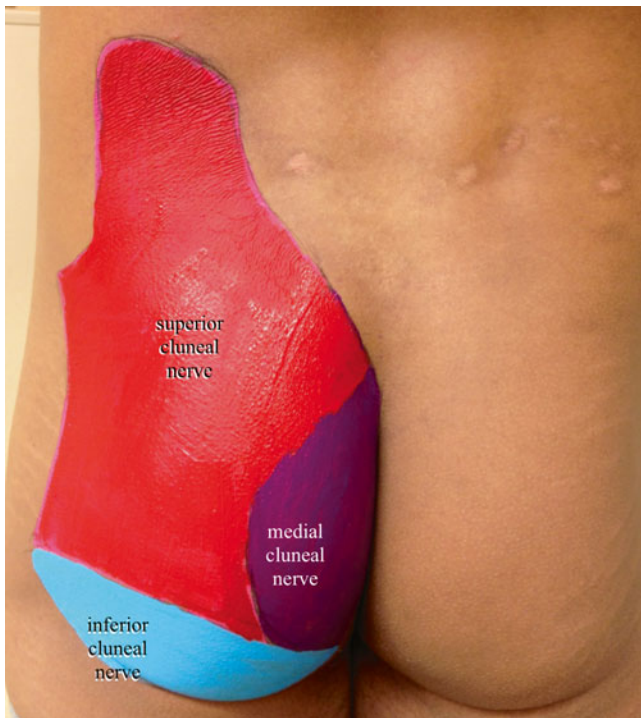
**Table 63.1** Occupation/exercise/trauma history relevant to inferior cluneal entrapment

Trauma	Fall onto buttocks, hamstring injury, intramuscular injection into gluteal muscle, piriformis trauma or injury
Direct compression of nerve	Sitting on a hard seat, bicycle riding
Myofascial compression	Piriformis spasm, gluteal muscle spasm



**Fig. 63.1** Pain location from inferior cluneal neuralgia (Image courtesy of Terri Dallas-Prunskis, MD)

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**Fig. 63.2** Cutaneous distribution of the cluneal nerves (Image courtesy of Terri Dallas-Prunskis, MD)

**Table 63.2** Inferior cluneal nerve anatomy

Origin	Posterior rami S1 to S3 (but may include up to L4 and down to S4)
General route	The PFCN exits the pelvis anterior to the piriformis but posterolateral to the sciatic nerve and gives off inferior cluneal nerve and perineal branch of the PFCN
Sensory distribution	Provides cutaneous innervation to the inferior part of the buttocks, lateral anus region (but not the anus), and the lateral region of the labia majora
Motor innervation	None
Anatomic variability	Only a few variations are noted in the literature, giving a description of the inferior cluneal nerves going through the gluteus maximus muscle; other sources indicate that the nerves reach the caudal edge of the gluteus maximus then circumvent it at various levels

## Anatomy (Table 63.2)

The cluneal nerves are divided into three groups: the *superior cluneal nerve* (see Chap. 51), the *middle cluneal nerve* (*sacral nerves*), and the *inferior or lateral cluneal nerves* (Fig. 63.3). The ICN arises from the inferior portion of the *posterior femoral cutaneous nerve* (PFCN) (see Chap. 62). This nerve is made up of sensory branches of S1, S2, and

S3, traveling parallel with the sciatic nerve and the pudendal nerve through the sciatic notch (Fig. 63.4). After reaching the subgluteal area, the PFCN gives rise to the *inferior cluneal branch* and the *perineal branch* (Fig. 63.5). These nerves then go to the inferior edge of the gluteus maximus muscle and follow a recurrent course behind the muscle (Fig. 63.6). The ICN provides cutaneous innervation to the inferior part of the buttocks (Fig. 63.7), the lateral anal region (but not the anus), and the lateral region of the labia majora (but not the labia minora or the vagina) [1]. It also does not innervate the penis or clitoris (Fig. 63.2) [2].

Tubbs et al. [3] dissected 20 cadavers to study the PFCN and its branches. The perineal branch of the PFCN arose directly from the PFCN in 55 % of the dissections and from the ICN in 30 %. It was absent in 15 % of the bodies studied (Table 63.3).

## Entrapment

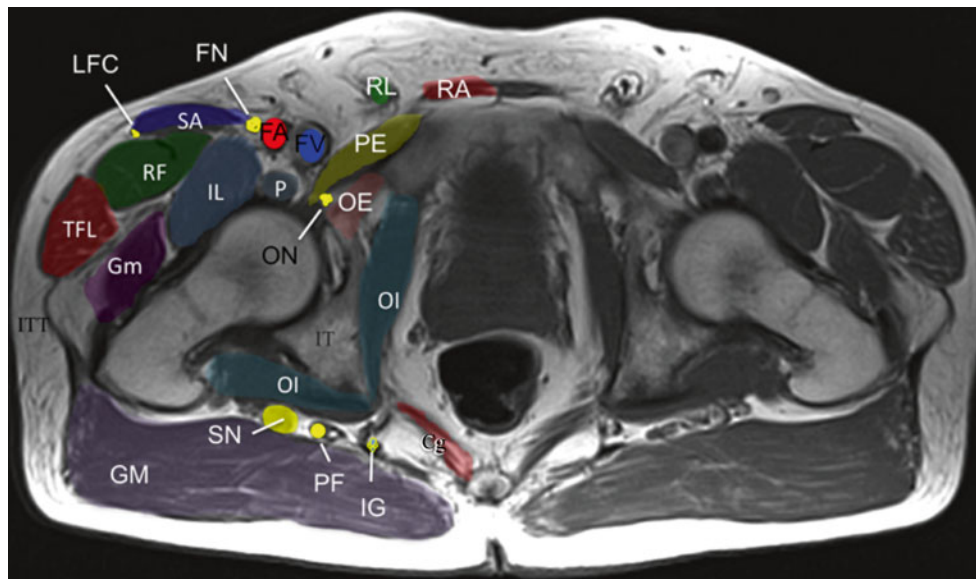
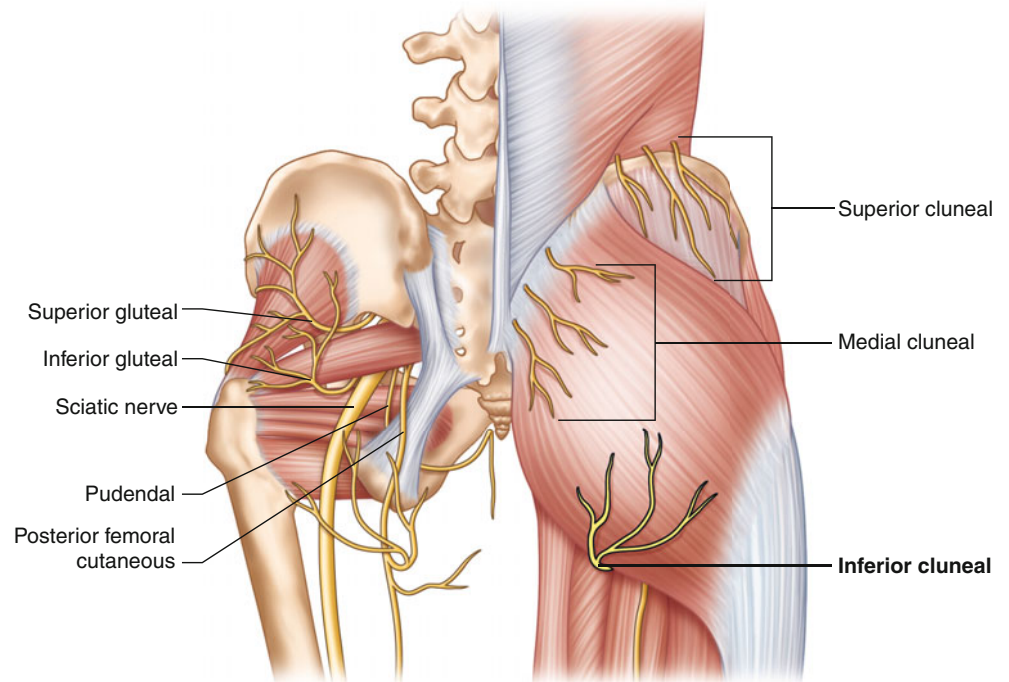
There are two common areas where entrapment may occur. The first one would extend from the passage of the perineal ramus under the ischium to the perineum (Fig. 63.6, site A). This entrapment may be due to nerve compression by the ischium on the gluteus maximus and the hamstring muscles in a sitting position and stretching of the perineal ramus with internal rotation of the thigh.

The second site of entrapment is more proximal, at the level of the sciatic spine and the piriformis. At this point, the roots of the PFCN, which gives rise to the ICN, may be encircled by the piriformis against the sciatic notch (Fig. 63.6, site B). However, whatever the etiology, it is the sitting position that triggers the entrapment, giving the *inferior cluneal entrapment syndrome* the same general appearance as a *pudendal syndrome* or *ischial bursitis* [4].

## Physical Examination

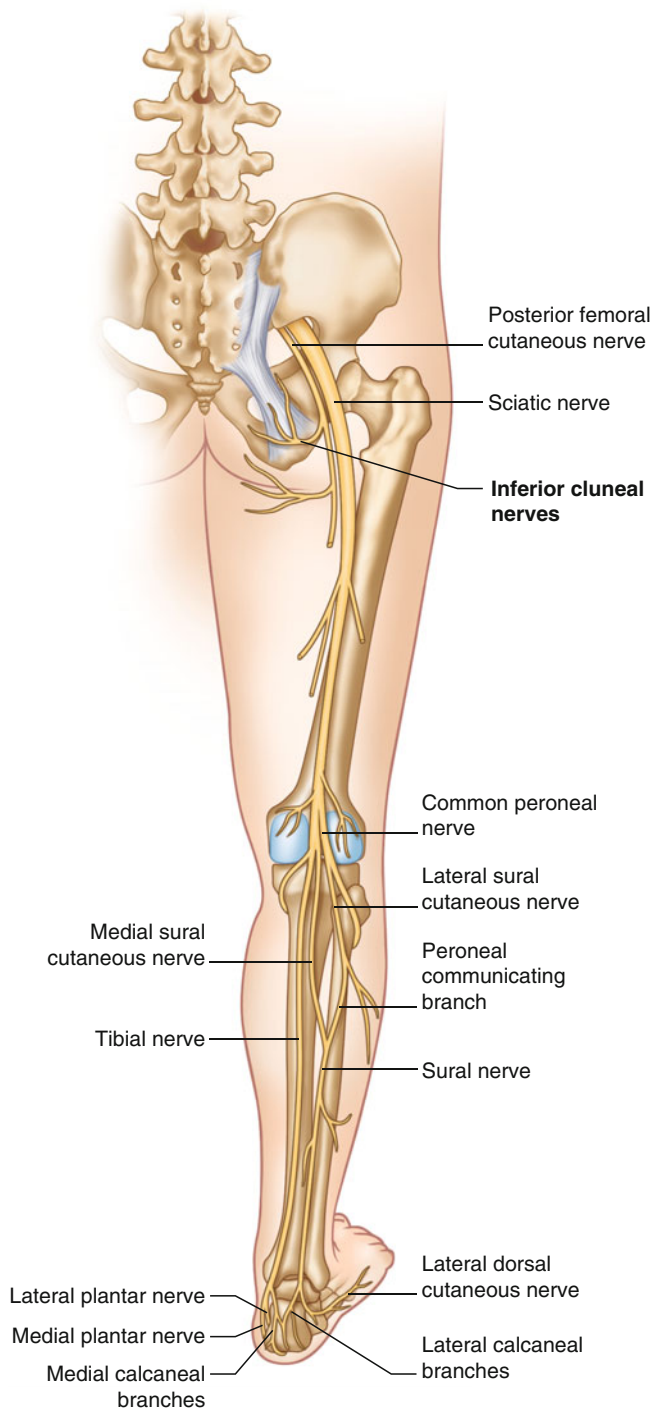
The examination should begin by evaluating the entire back to rule out other causes for the pain. Palpation should elicit non-radiating pain increasing with deep pressure over the sciatic notch. Palpate the inferior edge of the gluteus maximus between the ischium and the greater trochanter (Fig. 63.8). Hyperesthesia to pin scratch and decreased sensation to touch over the inferior buttocks corresponding to the distribution of the inferior cluneal nerve will also be noted (Fig. 63.7); no evidence of motor involvement should be appreciated. Pain may be induced on digital rectal examination of the ischium more superficial than that associated with pudendal canal syndrome (at the pelvic head of the obturator internus) [5].

**Fig. 63.3** Anatomy of the buttocks nerves (Image courtesy of Springer)



**Fig. 63.4** MRI axial image of the pelvis. *Cg* coccygeus muscle, *FA* femoral artery, *FN* femoral nerve, *FV* femoral vein, *GM* gluteus maximus muscle, *Gm* gluteus medius, *IG* inferior gluteal nerve, *IL* iliopsoas muscle, *IT* ischial tuberosity, *ITT* iliotibial tract, *LFC* lateral femoral cutaneous nerve, *OI* obturator internus

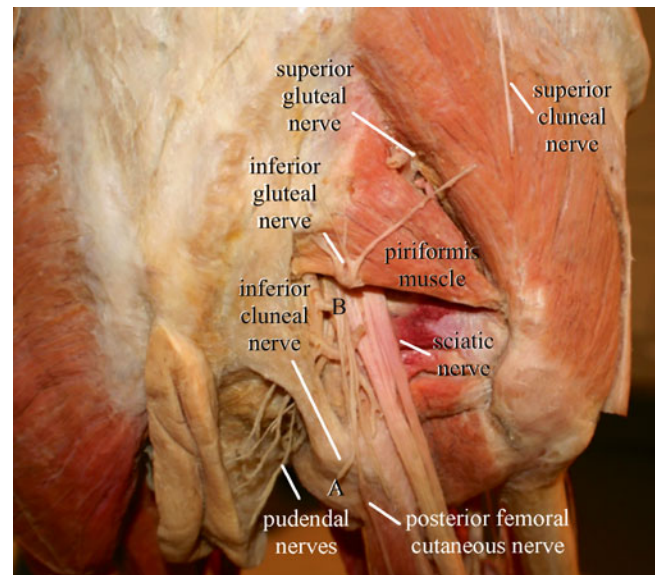
muscle, *P* psoas muscle, *PE* pectineus muscle, *PF* posterior femoral cutaneous nerve, *QF* quadratus femoris muscle, *RA* rectus abdominis muscle, *RF* rectus femoris muscle, *RL* round ligament, *SA* sartorius muscle, *SN* sciatic nerve, *TFN* tensor fascia lata muscle (Image courtesy of Andrea Trescot, MD)



**Fig. 63.5** Anatomy of the lower extremity nerves (Image courtesy of Springer)

### Differential Diagnosis (Table 63.4)

Inferior cluneal nerve entrapment must be differentiated from other lower limb pain disorders such as entrapment of the *sciatic nerve* (see Chap. 65), the *posterior femoral cutaneous nerve* (see Chap. 62), or the *obturator nerve*



**Fig. 63.6** Gluteal muscle dissection showing sites of entrapment of the inferior cluneal nerve, modified from an image from *Bodies, The Exhibition*, with permission. A distal entrapment, B proximal entrapment (Image courtesy of Andrea Trescot, MD)

(see Chap. 64), caused by muscle spasms of the piriformis and obturator internus muscles. This entrapment is also misdiagnosed as *pudendalgia* (*pudendal canal syndrome*) (see Chap. 47) [6]. Table 63.5.

### Identification and Treatment of Contributing Factors

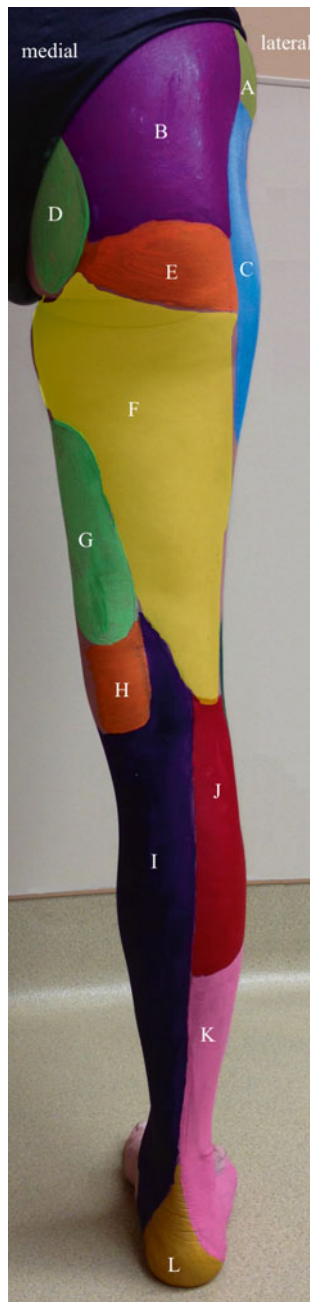
The inferior cluneal nerves typically may be injured by a fall onto the buttocks or by a hamstring injury, but sometimes it is not clear what caused the cluneal nerves to be symptomatic. Intramuscular injections into the medial inferior quadrant of the buttocks leading to muscle spasm, myositis, and entrapment of nerves within the muscle have also been reported.

Sitting on a hard seat will increase the compression of the nerves in the buttocks or underneath the ischium, and there is the possibility of a subischial tunnel syndrome where the nerves can be trapped at the insertion of the hamstring muscles [8]. Mechanical damage to the inferior cluneal nerves can occur during their course through the piriformis [7].

### Injection Technique

#### Landmark-Guided Technique

The procedure may be difficult to perform blindly and will depend on the ability to adequately palpate the patient's anatomy. The patient should be placed either in the prone position



**Fig. 63.7** Pain pattern from nerves of the posterior leg. *A* lateral branch iliohypogastric nerve, *B* superior cluneal nerve, *C* lateral femoral cutaneous nerve, *D* middle cluneal/sacral nerve, *E* inferior cluneal nerve, *F* posterior femoral cutaneous nerve, *G* obturator nerve, *H* femoral nerve, *I* saphenous nerve, *J* lateral sural cutaneous nerve, *K* superficial peroneal nerve, *L* medial calcaneal nerve (Image courtesy of Terri Dallas-Prunskis, MD)

**Table 63.3** Origin of the perineal branch of posterior femoral cutaneous nerve (PBPFCN)

From PFCN directly	55 %
From inferior cluneal nerve	30 %
Absent	15 %

Table was constructed using results of data from Tubbs et al. [3] study of 20 dissected adult cadavers (40 sides)



**Fig. 63.8** Physical exam of the inferior cluneal nerve, showing palpation over the inferior cluneal nerve near the sciatic notch (Image courtesy of Terri Dallas-Prunskis, MD)

**Table 63.4** Differential diagnosis of buttock pain

	Potential distinguishing features
Sciatica	Weakness, numbness, or difficulty moving the leg or foot
Posterior femoral cutaneous neuritis	Innervates the lateral and lower portions of the gluteus maximus muscle and the posterior parts of the leg and thigh and the skin of the perineum
Obturator neuritis	Medial thigh or groin pain, weakness with leg adduction, and sensory loss in the medial thigh
Piriformis syndrome	Pain, tingling, and numbness in the buttocks and along the path of the sciatic nerve descending down the lower thigh and into the leg and hypertonicity of the piriformis muscle
Obturator internus muscle spasm	Difficulty with lateral rotation of the femur with hip extension and abduction of the femur with hip flexion, instability of the femoral head in the acetabulum, and hypertonicity of the obturator internus muscle

or standing while leaning securely over either a cart or a bed. Utilizing aseptic technique, prep the buttocks, then palpate the inferior aspect of the ischium, and mark the site. Next, localize the gluteus maximus muscle and the lateral edge of the hamstring muscle insertion. After local infiltration to the skin and subcutaneous tissue, insert a 22-gauge 3.5-in. needle through the gluteus maximus on the lateral edge of the hamstring muscle insertion at the lateral and inferior edges of the ischium (Fig. 63.9). Following a negative aspiration, inject 2–3 cc of a local anesthetic and steroid solution. Utilizing a

**Table 63.5** Diagnostic tests for inferior cluneal neuralgia

	Potential distinguishing features
Physical exam	Palpation should elicit non-radiating pain increasing with deep pressure over the sciatic notch; hyperesthesia to pin scratch and decreased sensation to touch over the inferior buttocks corresponding to the nerve distribution
Diagnostic injection	Utilizing landmark or fluoroscopic-guided technique local anesthetic and steroid solution may be injected through the gluteus maximus directed toward the lateral and inferior edge of the ischium
Ultrasound	The nerves are located by identifying the inferior border of the ischium, the gluteus maximus muscle, and the lateral edge of the hamstring muscle insertion; the block needle is placed on the lateral and inferior edges of the ischium
MRI	Not useful
Arteriography	Not useful
X-ray	Not useful
Electrodiagnostic studies	Not useful

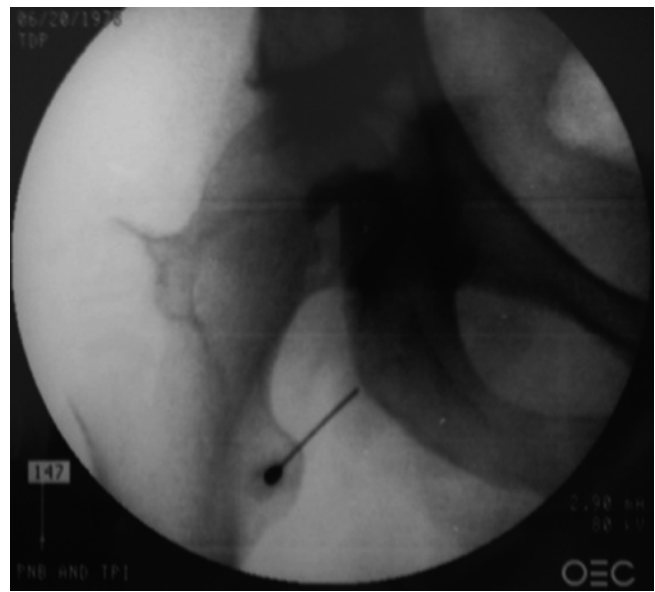


**Fig. 63.9** Landmark-guided injection of the inferior cluneal nerve; the injection is performed through the gluteus maximus, lateral and inferior to the ischium (Image courtesy of Terri Dallas-Prunskis, MD)

peripheral nerve stimulator would be appropriate for this procedure.

### Fluoroscopic-Guided Technique

With the patient in the prone position, the lateral and inferior edges of the ischium are identified utilizing the fluoroscopic image in an AP view. Using aseptic technique, 1% lidocaine is infiltrated in the skin and subcutaneous tissue over the targeted point. Next, a 22-gauge 3.5-in. needle is inserted 1 cm laterally from the caudal edge of the ischium, which is under the gluteus maximus and on the lateral edge of the hamstring muscle insertion (Fig. 63.10). Following a negative aspiration, inject 2–3 cc

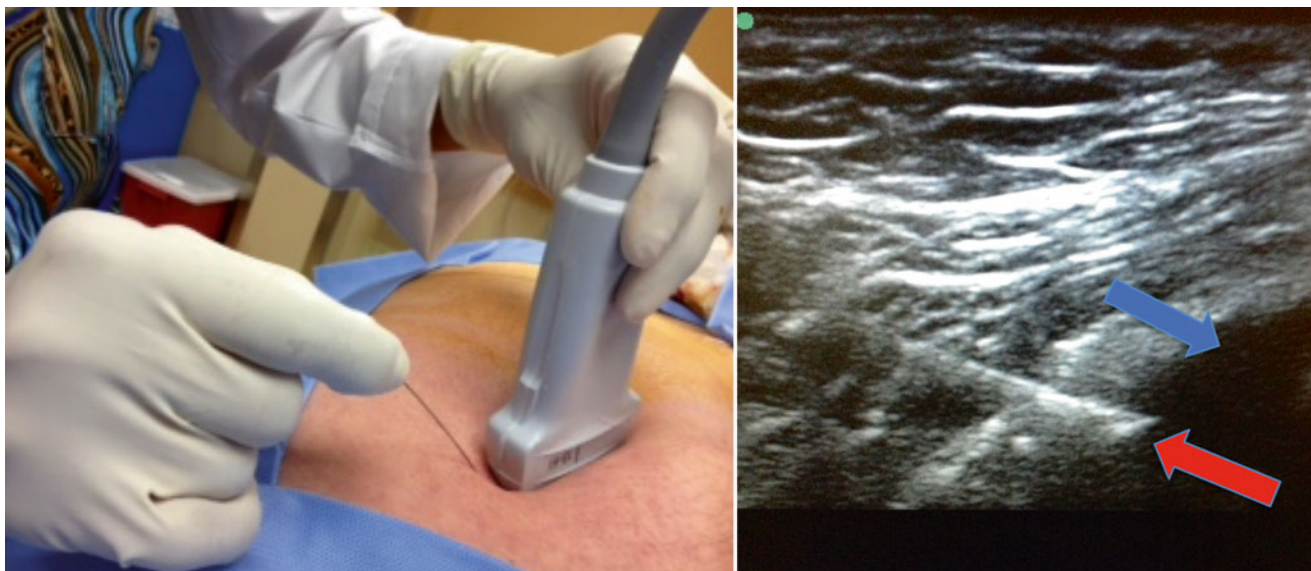


**Fig. 63.10** Fluoroscopic injection of the inferior cluneal nerve (Image courtesy of Terri Dallas-Prunskis, MD)

of a local anesthetic and steroid solution. A peripheral nerve stimulator may also be used to confirm proper needle placement.

### Ultrasound (US)-Guided Technique

For the US-guided injection, the patient is placed in the prone position. Palpate the inferior edge of the ischium. A high frequency (7–12 MHz) linear array probe is appropriate for this block, and an in-plane or an out-of-plane approach may be used. Locate the inferior border of the ischium (which casts a bony shadow on the US image), the gluteus maximus muscle, and the lateral edge of the hamstring muscle insertion. The skin is infiltrated with lidocaine, and a



**Fig. 63.11** Ultrasound image of the inferior cluneal nerve. *Blue arrow* ischium, *red arrow* injectate (Image courtesy of Terri Dallas-Prunskis, MD)

22-gauge 3.5-in. needle is inserted through the gluteus maximus on the lateral and inferior edges of the ischium (Fig. 63.11). Using US guidance, the ICN can be blocked with 2–3 cc of a local anesthetic and steroid solution. Peripheral nerve stimulation can confirm the proper needle placement.

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### Neurolytic Techniques

After the injections, if there is only temporary relief of pain, neurolytic or surgical techniques may be considered. All of the neurolytic techniques should be performed using a choice of imaging.

### Cryoneuroablation

Cryoneuroablation may be performed at the lateral and inferior edges of the ischium, with the patient in the prone position. Utilizing an aseptic technique, a small amount of local anesthetic is infiltrated subcutaneously using a 25-gauge 1.5-in. needle. A small incision is made into the skin, and an introducer needle (size 12 or 14 gauge, depending on the probe size) is advanced to the target area. The stylet is removed, and the cryoprobe is then advanced through the catheter. The tip of the probe is exposed by withdrawing the catheter back into the subcutaneous tissues. The probe placement should be confirmed with maximal sensory stimulation and negative motor stimulation. This should be followed by a series of three 2-min freezes, with a 30 s defrosting between each cycle. The patient may experience burning pain initially

during the first freeze cycle, which often replicates the pain, that should resolve within approximately 30 s.

### Radiofrequency Lesioning (RF)

Radiofrequency lesioning has also been utilized for extended pain relief of inferior cluneal neuropathies following successful infiltration. The patient is placed in a prone position, and, utilizing imaging in an AP view, the lateral and inferior edges of the ischium are identified. Using aseptic technique, the skin is anesthetized subcutaneously, followed by insertion of the radiofrequency cannula, which is advanced to the target site at the ischium. After the radiofrequency probe is advanced through the cannula appropriately, maximal sensory and negative motor stimulation is used to confirm that the tip of the probe is placed adequately. Pulsed RF may provide relief, but conventional RF should be discouraged because of the risk of neuritis.

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### Surgical Technique

Surgery may be considered after the infiltration provides improvement or temporary pain relief. Two surgical approaches have been discussed in the literature. A transgluteal approach for decompression and transposition of the ICN is described when the clunealgia is caused by a piriformis syndrome [6]. The second approach is used when there is an isolated clunealgia with an ischial entrapment. This surgical approach is from the dorsal and cranial parts of the thigh [4].

## Complications

General complications may occur, based on the location of the needle placement, including neural trauma, hematoma formation, infectious complications including abscess, and side effects related to the administration of local anesthetic and/or steroid and other drugs. Caution must be exercised when performing the procedures blindly to make sure to come into contact with bone, so as not to place the needle too deeply.

When performing cryoneuroablation, depigmentation or hyperpigmentation at the cryolesion site has been reported, though cryoneuroablation at this site is relatively deep [8].

The most common complications of radiofrequency include those related to the placement of the needle and those related to the neurolysis. The majority of problems are short lived and self limited, and they include local swelling and pain at the site of the needle insertion, as well as somatic pain from the site of insertion. Other reported complications of radiofrequency thermoneurolysis include a worsening of the usual pain, burning or dysesthesias, decreased sensation, and allodynia over the skin [9].

## Summary

The inferior cluneal nerve is a cause of pelvic pain, low back pain, and upper leg pain. It is rarely diagnosed and even more rarely treated. Understanding the clinical presen-

tation and the physical exam will perhaps increase the awareness and therefore treatment of the entrapment syndrome of this potentially debilitating problem.

## References

1. Hibner M, Desai N, Robertson LJ, Nour M. Pudendal neuralgia. *J Minim Invasive Gynecol.* 2010;17(2):148–53.
2. Netter FH. *Atlas of human anatomy.* ICON Learning Systems, 1997, pp. 468–509.
3. Tubbs RS, Miller J, Loukas M, Shoja MM, Shokouhi G, Cohen-Gadol AA. Surgical and anatomical landmarks for the perineal branch of the posterior femoral cutaneous nerve: implications in perineal pain syndromes. Laboratory investigation. *J Neurosurg.* 2009;111(2):332–5.
4. Darnis B, Robert R, Labat JJ, Riant T, Gaudin C, Hamel A, Hamel O. Perineal pain and inferior cluneal nerves: anatomy and surgery. *Surg Radiol Anat.* 2008;30:177–83.
5. Labat JJ. Pudendal neuralgia: clinical signs and diagnosis. In: *Urogenital pain in clinical practice.* First edition. London: Informa Healthcare Publishing; 2007. p. 361–372.
6. Robert R, Prat-Pradal D, Labat JJ. Anatomic basis of chronic perineal pain: role of the pudendal nerve. *Surg Radiol Anat.* 1998;20:93–8.
7. Hanson D. Intramuscular injection injuries and complications. *Gen Pract.* 1963;27:109–15.
8. Trescot A. Cryoneurolysis. In: Manchikanti L, Singh V, editors. *Interventional techniques in chronic non-spinal pain.* Paducah: ASIPP Publishing; 2009. p. 69–86.
9. Trescot A, Hansen HC. Radiofrequency neurolysis. In: Manchikanti L, Singh V, editors. *Interventional techniques in chronic non-spinal pain.* Paducah: ASIPP Publishing; 2009. p. 59–68.