
12

Chapter Twelve

CHRONIC PELVIC PAIN

“The same nerve that can cause pain in the anus, vagina and clitoris is also responsible for the sensation of an orgasm.”

CHRONIC PELVIC PAIN:

PUDENDAL & CLUNEAL NERVES,

GROIN PULL & HAMSTRING PULL

INTRODUCTION

In October 2010 I gave the C. Paul Perry, MD memorial lecture for the International Pelvic Pain Society (IPPS) at the invitation of its then president, Richard Marvel, MD, an obstetrician and gynecologist at Johns Hopkins University, with whom I had been working in Baltimore. This gave me the opportunity to learn much more about **CHRONIC PELVIC PAIN**, an area in which my work on **GROIN PAIN** (see chapter 4) clearly overlapped.

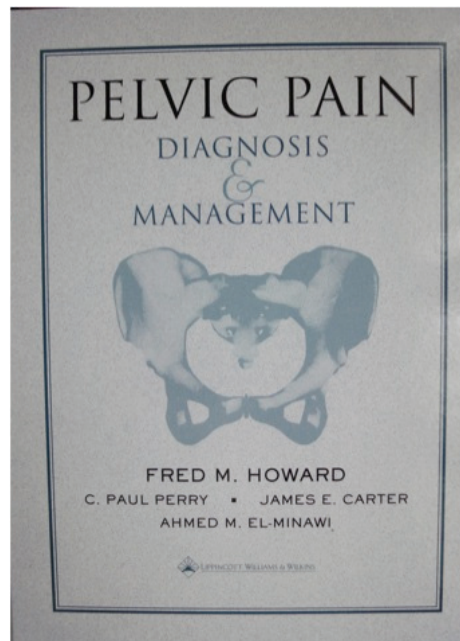


Figure 12-1. The classic textbook in **CHRONIC PELVIC PAIN**.

In preparing for that lecture, I learned that Dr Perry, along with Fred M. Howard, MD, an obstetrician and gynecologist, now professor at the University of Rochester in New York, and James E. Carter, MD, an Obstetrician and Gynecologist, now deceased, had begun the IPPS in 1996. These pioneers in **CHRONIC PELVIC PAIN** published their classic textbook in the year 2000. Dr Elminawi, a research fellow with Dr. Howard, was also a co-author.

In my lecture to the International Pelvic Pain Society, I presented the concept that my surgical approach to treating chronic pelvic pain came from my successful approach to treating chronic GROIN pain (SEE CHAPTER 4 in PAIN SOLUTIONS). My previous experience had been with pain related to the front side of the human body, the anterior abdominal wall. I have come to learn that pain on the backside of the body is not just the “flipside” of the pain on the front side of the body, but involves a much more complex set of anatomy and functional interactions. This chapter deals with pain symptoms related to the lower back that are not due to spinal disc disease, pain from the buttock, the rectum/anus, and from the perineum (the area you sit upon when on a bicycle). Furthermore, at least one of the nerves that causes pain in the rectum and perineum can continue forward to cause pain in the vagina, and in women the clitoris and vulva, and in the men the penis and scrotum. More about the International Pelvic Pain Society can be learned from their website (Figure 12-2).



Figure 12-2: Logo for the International Pelvic Pain Society. (<http://pelvicpain.org/index.asp>)

For many years, I have been interested in the end branch of the pudendal nerve, the dorsal nerve to the penis, in men who had an injury to that area and in men with erectile dysfunction related to diabetic neuropathy. If there were a site of nerve compression for this nerve, similar to compression of the median nerve at the wrist (Carpal Tunnel Syndrome), then there might be hope for people who had an injury with pain or numbness in the penis.

The same concept would apply to women with pain or numbness in the clitoris. In women, injury could occur from childbirth, as a complication of surgery, such as a vaginal hysterectomy, or from a direct blunt injury.

In 2005, along with co-workers, I described a site on the front, anterior side of the pelvis, at the pubic ramus (**PUBIC RAMUS TUNNEL SYNDROME**), where this nerve could be compressed,* and reported the results in neurolysis, or releasing the entrapment of this branch of the pudendal nerve in men in 2009.** This will be discussed and illustrated for both men and women later in this chapter.

In this chapter also you will learn how the muscles that pull the knees together, the adductor muscles, can be torn not only in sports to give a groin pull, but also while a person is in the litotomy position (“up in stirrups”), or injured during a difficult childbirth (delivery). A **groin pull** produces pain at the juncture of the thigh, the pubic bone, and the scrotum/vulva. Through secondary contracture, of the adductor longus muscle, a groin pull can cause symptoms to radiate down the inside of the thigh, along the pathway of the obturator and saphenous nerves. You will also learn the “flip side” of the groin pull, the **torn hamstring**: the muscles that flex the knee, can impact the nerve (branches of the posterior femoral cutaneous nerve) beneath the “sit bone”, the ischial tuberosity, and cause pain that mimics pudendal nerve pain. Injury to these inferior cluneal nerves is one of the main causes for pain with sitting, in addition to pudendal nerve problems. Although branches to the periosteal origin of the hamstring muscles from the ischial tuberosity have not yet been identified, they almost certainly exist and are responsible for some of the pain related to sitting when there has been a torn hamstring, just as branches of the obturator nerve to the periosteal origin of the adductor muscles are responsible for the pain of a groin pull.***

- * Hruba S, Ebmer J, Dellon AL, Aszmann, OC: Anatomy of the pudendal nerve at the urogenital diaphragm: A new critical site for nerve entrapment, *Urology*, 66: 949-952, 2005.
- ** Hruba, S., Dellon, A.L., Ebmer, J., Holtl, W., Aszmann, O.C., Sensory Recovery after Decompression of the Pudendal Nerve at the Urogenital Diaphragm: anatomical review and neurosensory data of a prospective clinical study, *Microsurgery*, 29:270-274, 2009.
- *** Dellon, AL, et al, Denervation of the periosteal origin of the adductor muscles in conjunction with adductor fasciotomy in the surgical treatment of refractory groin pull, *Plastic and Reconstructive Surgery*, in print 2011

In this chapter you will learn also about small nerves that leave the spine, and travel to specific regions of the back, causing pain in localized areas related to the thoracic vertebra, where their entrapment is called *notalgia paresthetica*.^{*} Similarly, you will learn about what happens to those same nerves from the lumbar vertebra and sacrum that can become entrapped causing pain in regions of the buttocks. These nerves are called the cluneal nerves and are responsible for many forms of buttock pain. One of these nerves can overlap the pudendal nerve, causing painful sitting.^{**}

The good news is that with an understanding of anatomy and of nerve compression, the suffering from the problems in this chapter can be helped greatly. The challenge for me has been to design operations based upon the principles that have been successful for treating nerve problems in the arms and legs, and for treating problems in the abdominal wall, as you have seen from the earlier chapters in PAIN SOLUTIONS, and applying them to the problems of the “flip side”. As we go through the rest of this chapter, you will learn the *surgical* approaches that have proven successful in relieving pain and restoring function safely to those with chronic pelvic pain.

CHRONIC PELVIC PAIN

The International Chronic Pelvic Pain Society has defined **chronic pelvic pain as pain that can be located from the umbilicus (belly button) to the mid-thigh**. As mentioned in the INTRODUCTION to this chapter, my approach to the region of the abdomen and front of the thigh is given in Chapter 4, **GROIN PAIN**. Figure 12-3, an illustration from that chapter, demonstrates the color patterns related to injury or compression of the nerves of this region. It is important to note the spinal origin of the iliohypogastric and, ilioinguinal nerves originate primarily from the first and second lumbar dorsal nerve roots, L1 and L2.

* Williams, EH, Rosson, GD, Elsaminoudi, I, Dellon, AL, Surgical Decompression for Notalgia Paresthetica, Microsurgery, 30:70 -72, 2010.

** Dellon, AL, Hashemi, S, Williams, EH, Rosson, GD, Diagnosis and treatment of cluneal nerve injury/entrapment, Journal of Reconstructive Microsurgery, in press 2011.

CHRONIC PELVIC PAIN

This is from the same area that gives rise to the sympathetic nerve innervation of the pelvic organs, the uterus, ovaries, bladder and rectum, and referred pain from these anterior abdominal wall nerves can be referred to the pelvis, so that injuries to the abdominal wall nerves can give chronic pelvic pain symptoms. Similarly, the parasympathetic nerves originate from S2 to S4, the same nerve roots that give origin to the pudendal nerve, so that pudendal nerve pain can be referred to the bladder, uterus, ovaries, and lower intestine. (Referred pain will be discussed in more detail later in this chapter.)

Cutaneous Nerves of the Thigh and Groin Regions

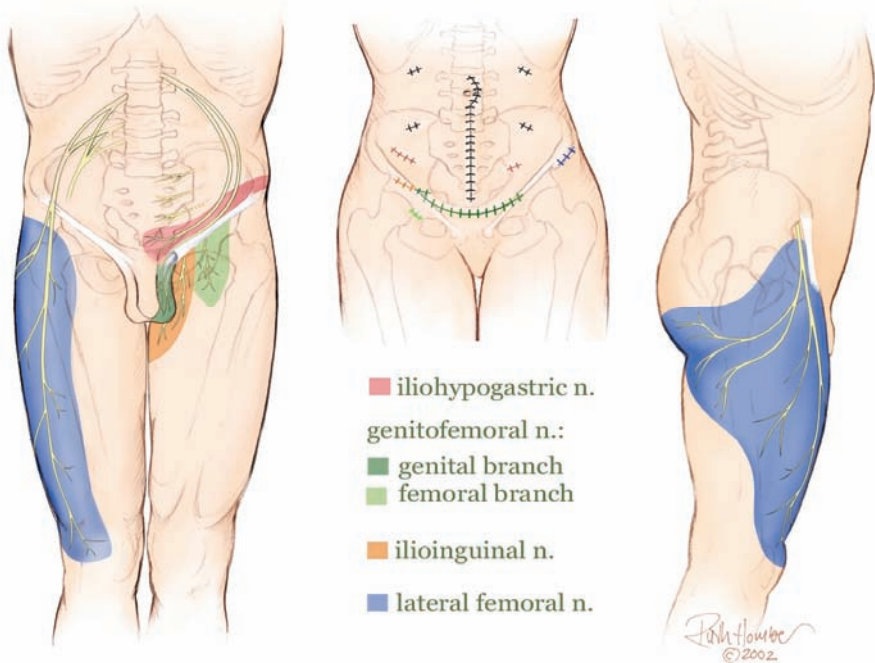


Figure 12-3. Color patterns of cutaneous nerves that can be injured or compressed to give symptoms over the anterior abdominal wall and thigh. (<http://dellon.com/publications/ipns.brochure.4.05-2010.update.2pp.pdf>)

A NATURAL OVERLAP: GROIN PAIN AND PELVIC PAIN.

AN INJURED ILIOHYPOGASTRIC NERVE WITHIN THE ABDOMINAL WALL MAY PRESENT AS PELVIC PAIN: THE OPERATIVE APPROACH TO TREAT A PELVIC PROBLEM, LIKE OVARIAN CYST OR ENDOMETRIOSIS, MAY DAMAGE ONE OF THE NERVES OF THE ABDOMINAL WALL.

PELVIC NERVE TERMINOLOGY & ANATOMY

CLUNEAL NERVES:

“Cluneal” is Latin for “buttock”. The cluneal nerves are nerves that represent a branch of the spinal nerve, and innervate skin, not muscle, over the buttock. The superior cluneal nerves arise from the dorsal cutaneous branches L1, L2, and L3, get to the skin by traveling between the bone (transverse process) of the lumbar vertebra, travel through muscles alongside the spine, and then exit through the thick connective covering (fascia) near the posterior superior iliac crest to innervate the upper portion of the buttock Figure 12-4).

The middle cluneal nerves are the dorsal branches of S1, S2 and S3, which innervate the skin of the buttock close to the sacrum and coccyx (tail bone) (Figure 12-4).

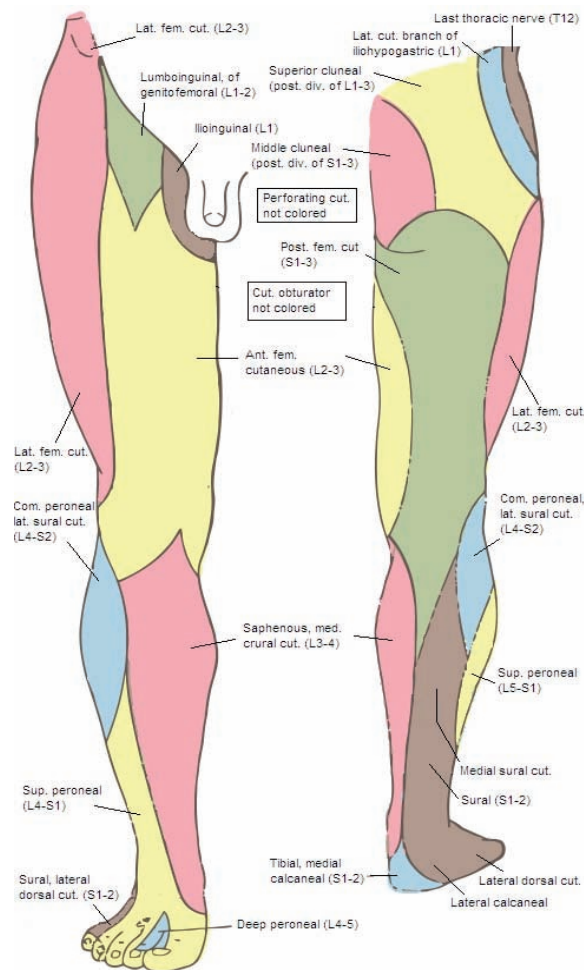


FIGURE 12-4. Cluneal nerves in color diagram. Note superior (upper) cluneal nerves in yellow, middle cluneal nerves in pink, and lower (inferior) cluneal nerves in green (part of the posterior femoral cutaneous nerve). <http://upload.wikimedia.org/wikipedia/commons/b/bf/Gray826and831.PNG>

Finally, there are the inferior cluneal nerves that arise from the posterior femoral cutaneous nerve of the thigh. This nerve is itself made up of sensory branches from S2, 3 and 4, traveling through the sciatic notch, with the sciatic nerve, and the pudendal nerve, and then branch off at the gluteal fold to innervate the lower part of the buttock. One of these inferior cluneal nerves has a name change to the perineal branch and it goes to innervate the skin of the perineum, next to the buttock, and in this location overlaps an area innervated by the pudendal nerve(Figure 12-4).

The superior cluneal nerves may be injured by a fall or surgery on the spine or posterior iliac crest (to harvest a bone graft). The middle cluneal nerves may be hurt by a fall or by spine surgery. The inferior cluneal nerves are hurt either by a fall on to the buttock, by a hamstring injury, sometimes it is not clear what caused cluneal nerves to be symptomatic. In some people, it maybe a variation in the anatomy itself that has pre-disposed them to have compression or stretch/traction problems with the cluneal nerves.

Later in this chapter more illustrations of these nerves will be given in relation to the surgical procedures to help relieve their symptoms.

PUDENDAL NERVE:

“Pudendal” is Latin for “shameful, disgraceful”. The pudendal nerve arises from the nerve roots of spinal nerves S2, S3 and S4 within the pelvis. The formed pudendal nerve then exits the pelvis through the greater sciatic notch (Figure 12-5). This notch is formed by two ligaments the sacrospinous ligament, connecting the sacrum with the spinous process of the ischium, and the sacrotuberous ligament, connecting the sacrum and the ischial tuberosity (Figure 12-6). The pudendal nerve crosses over the sacrospinous and under the sacrotuberous ligament to the region of the buttock where it is covered by the gluteus maximus muscle.

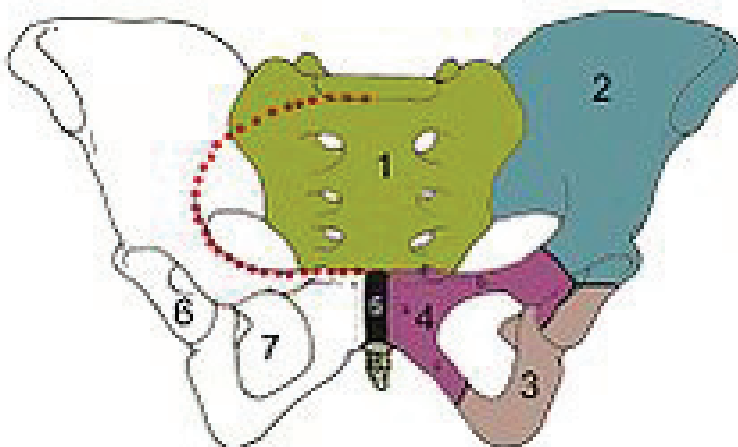


Figure 12-5. Pelvis highlighting component bones: 1) sacrum, 2) ilium, 3) ischium, 4) pubis, 5) pubic symphysis, 6) acetabulum (for femoral head, hip joint), 7) obturator foramen.

<http://en.wikipedia.org/wiki/Pelvis>

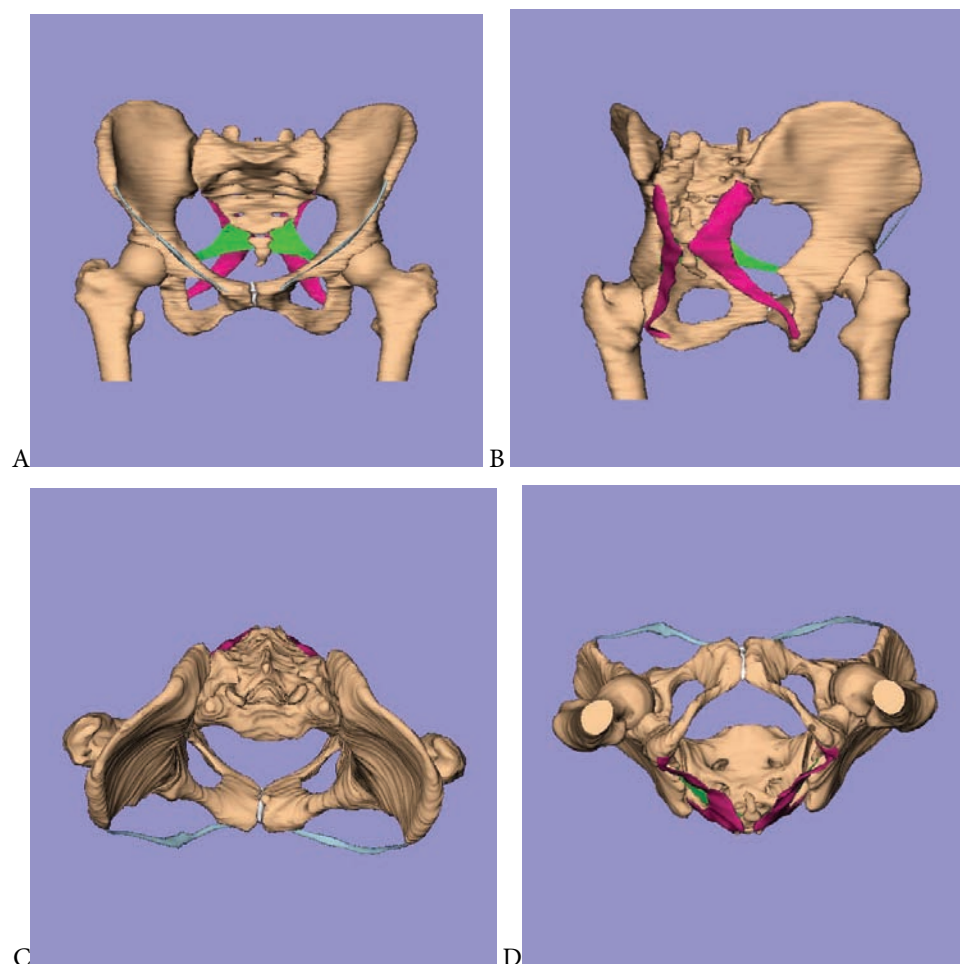


Figure 12-6. Pelvic structure with ligaments. Green is the sacrospinous ligament. Pink is the sacrotuberous ligament. Pale Blue is the inguinal ligament. A) Posterior View. B) Right lateral oblique view. C) Top view. D) Bottom view. (Davis 3d Dynamic Anatomy; McGill University)

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The pudendal nerve then travels in the ischiorectal fossa for a brief distance before traveling from posterior (buttock) to anterior (pubis) through a space formed by the connective tissue (fascia) that covers the pudendal artery. This was first described by Alcock and is termed Alcock's canal.* Therefore there exists the posterior or entrance to the canal, and the anterior or exit from the canal (Figure 12-7).

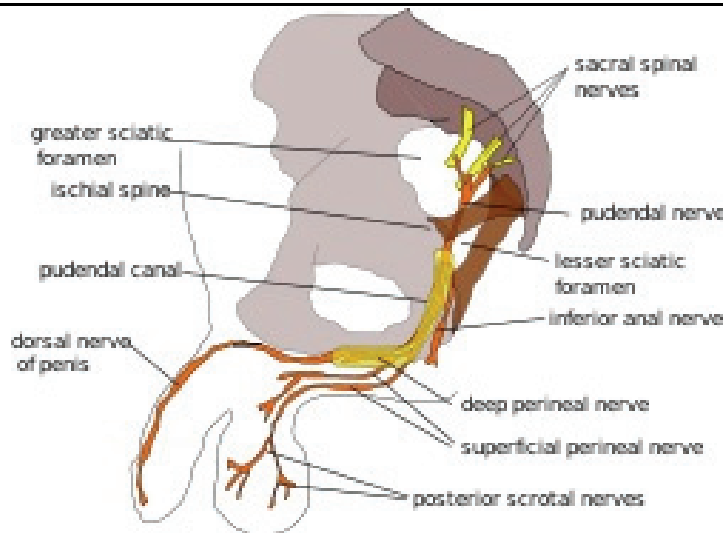


Figure 12-7. The pudendal nerve (light brown) originating in the pelvis from sacral nerve root S2, S3 and S4 (yellow) crosses over the sacrospinous ligament (dark brown) and under the sacrotuberous ligament (also dark brown), travels a short distance, giving off the rectal branch at a variable location, and then enters Alcock's canal, depicted here as the yellowish tube. Perineal branches shown here occur after the pudendal nerve exits Alcock's canal, where it becomes the dorsal nerve to the penis. (http://en.wikipedia.org/wiki/Pudendal_nerve)

The pudendal nerve may give off its **rectal branch(es)** beneath the sacrotuberous ligament, or through the ligament, or it may travel with the rest of the pudendal nerve to exit through the fascial covering in Alcock's canal. The rectal branch gives motor function to the sphincter muscle of the anus and sensory branches to the rectum and anus. The pudendal nerve gives off its **perineal branch(es)** within Alcock's canal and these innervate the perineum (the area of skin one uses to sit on a bicycle), the vagina and vulva in

* Colebunders, B, Matthew, MK, Broer, N, Persing, JA, Dellon, AL, Benjamin Alcock and the pudendal canal, J Reconstr Microsurg, 27:349-355, 2011.

women and the posterior aspect of the scrotum in men. The perineal branches also leave Alcock’s canal through its anterior opening, or exit (Figure 12-8, 12-9).

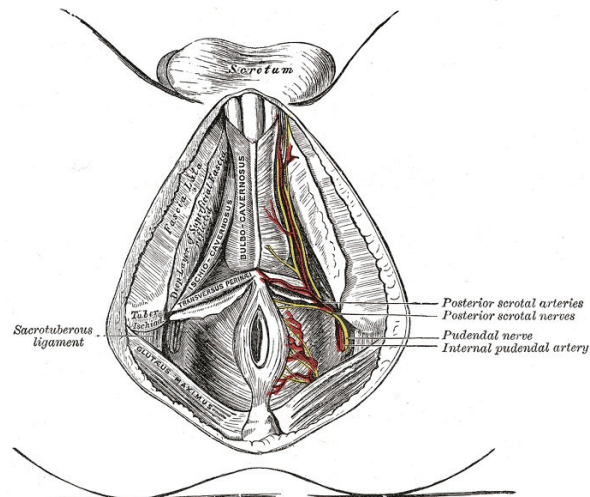
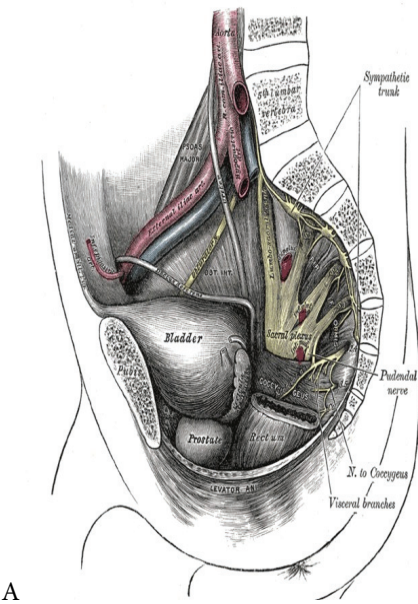


Figure 12-8. Perineum, male. (**SIMPLIFIED**) Note yellow pudendal nerve branches exiting Alcock’s canal to innervate the perineum and then travel along the ischiocavernosus to the base of the penis as the dorsal nerve to the penis. Note the rectal branches exiting more posteriorly and not from Alcock’s canal. (<http://en.wikipedia.org/wiki/File:Gray542.png>)



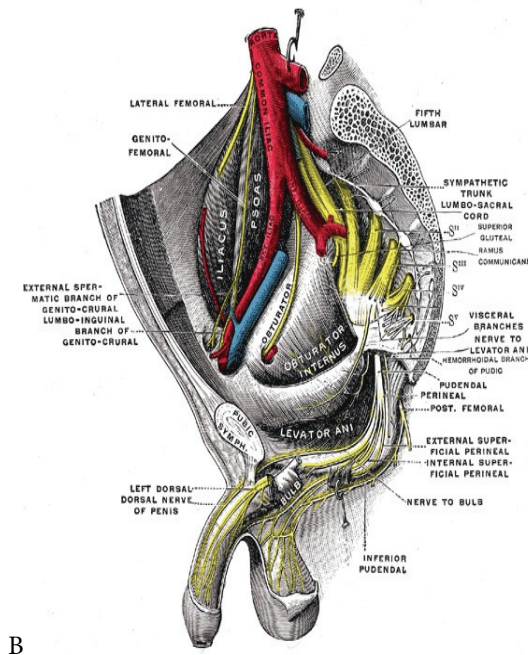


Figure 12-9. Hemisection of the male pelvis. A [previous page]) Bladder, prostate and rectum are present, with sacral plexus forming pudendal nerve in the background.

(<http://en.wikipedia.org/wiki/File:Gray829.png>)

B) Bladder, prostate, and rectum have been removed to demonstrate the course of the pudendal nerve, from its passage beneath the sacrotuberous ligament until it reaches the glans penis.

(<http://en.wikipedia.org/wiki/File:Gray837.png>)

The final branch of the pudendal nerve, the **dorsal nerve of the clitoris** in women or the **dorsal nerve to the penis** in men exits Alcock's canal to enter a fibrous tunnel with the pubic ramus on one side of the tunnel and the ischiocavernosus muscle in women (and the corpora cavernosa in men) on the other side of the tunnel. The dorsal nerve then exits this fibrous canal beneath the fibrous arcade just beneath the pubic symphysis to innervate the clitoris or the penis (Figure 12-13).

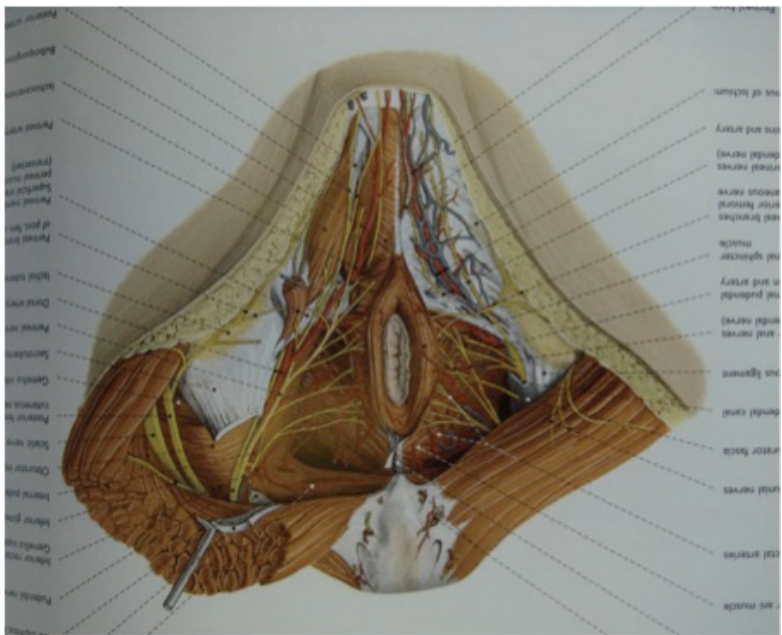


Figure 12-10 A: Perineum in the male

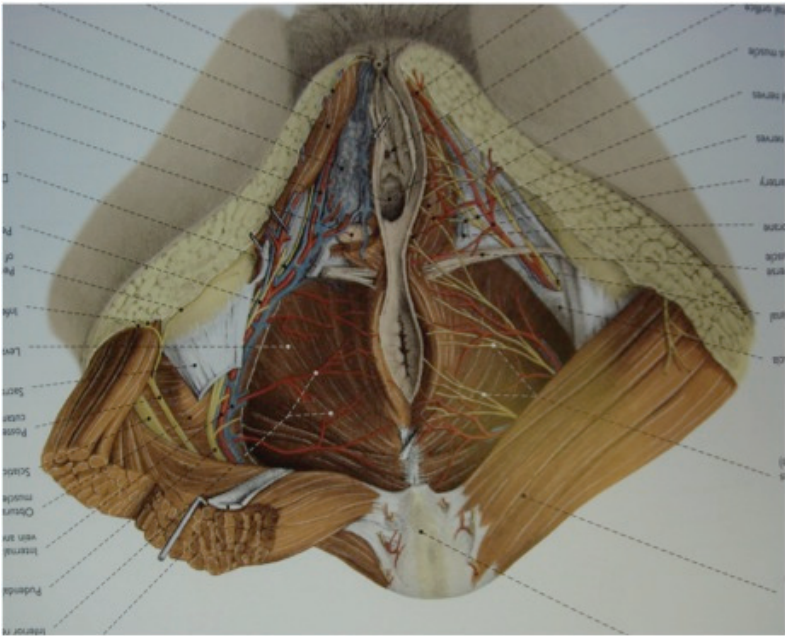


Figure 12-10B: Perineum in the female. (The Color Atlas of Human Anatomy, Wolf Heidegger & Petra Kopf-aier, editors, 2006)

The anatomic, natural variations in the location and branching of these critical pudendal nerve branches can be observed in these illustrations from different anatomy books in Figures 12- 7 thru 12.

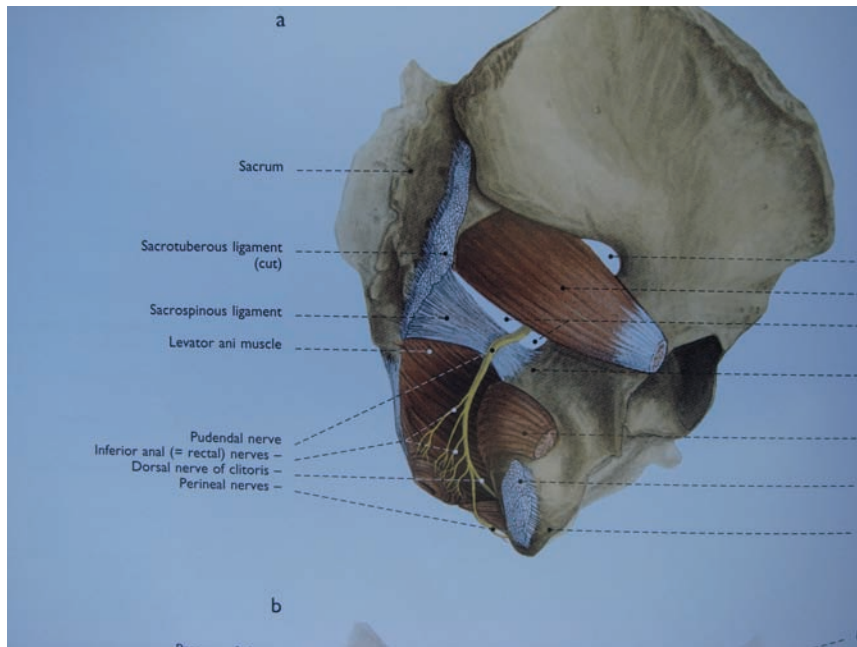


Figure 12-11: Perineum in the female. ***Note that in this illustration, all branches of the pudendal nerve come from one trunk that is located across the sacrospinous ligament, and the divided sacrotuberous ligament, and that the multiple rectal branches diverge from the main trunk in a location that would be in the posterior part of Alcock's canal.*** (The Color Atlas of Human Anatomy, Wolf Heidegger & Petra Kopf-Maier, editors, 2006)

Especially note the variation where the rectal branch leaves the main trunk of the pudendal nerve, and how many perineal and rectal branches there can be. This accounts for variations in symptoms in people with pudendal nerve entrapment.

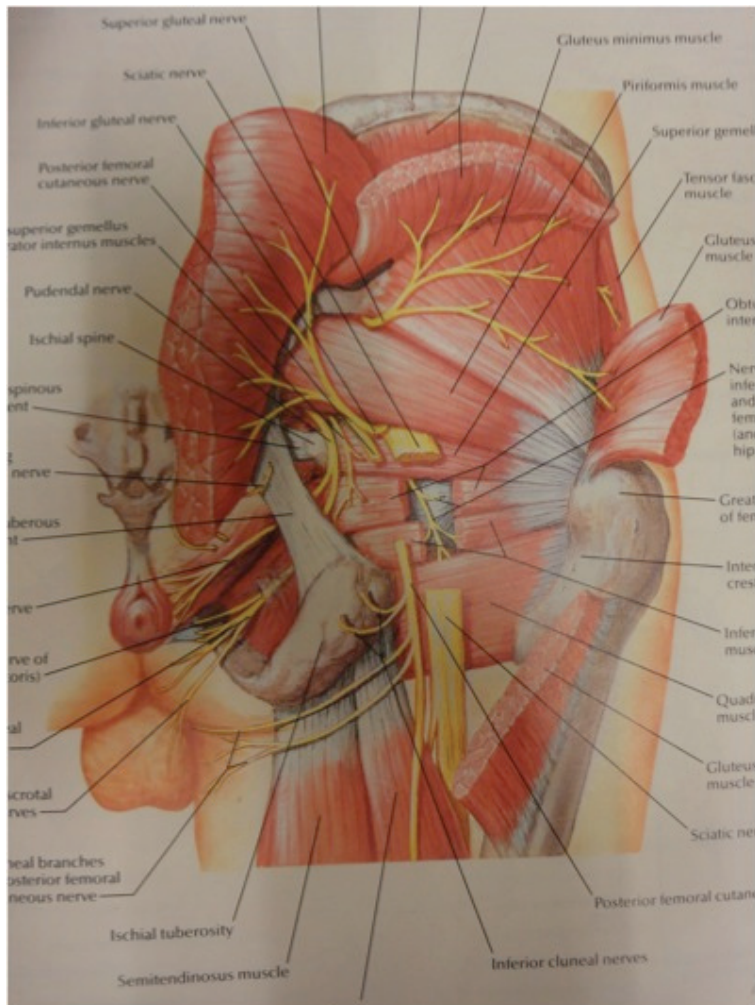


Figure 12-12. Posterior view in a male. Note that rectal and combined perineal/dorsal nerve branches have separated before the pudendal nerve even travels beneath the sacrotuberous ligament. Note that these are medial (closer to the rectum) on the inside of the ischial tuberosity and that the posterior femoral cutaneous nerve and its inferior cluneal and perineal branches are lateral, or outside of the ischial tuberosity ("sit bone"). From Netter, FH, Atlas of Anatomy, Hoechstetter Printing Co., Ciba-Geigy Corp, plate 473, 1989.

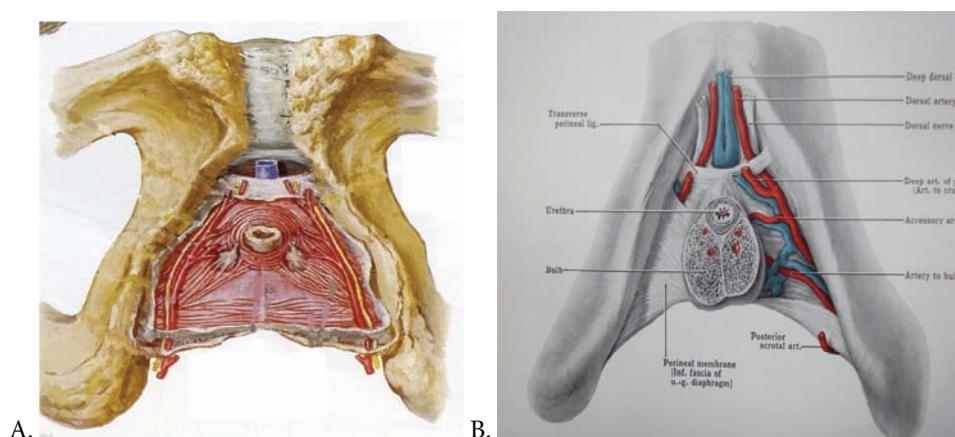


Figure 12-13. The dorsal nerve without the corpora cavernosa and the ischiocavernosus muscle. The nerve can be seen adjacent to the inferior pubic ramus. Entrapment of the nerve in this location causes symptoms related to the **PUBIC RAMUS TUNNEL SYNDROME**. A) Dorsal nerves go through the transverse perineal ligament, while in B) they go over it. (Grant, JCB, Grant's Atlas of Anatomy, 5th edition, p.201, 1962)

Entrapment of the dorsal nerve along the pubic ramus will give numbness or pain in the penis or the clitoris without other pudendal nerve symptoms. This entrapment should be called the **PUBIC RAMUS TUNNEL SYNDROME** to distinguish it from the other sites of pudendal nerve entrapment that can give symptoms related to the vagina, the perineum, and the rectum. The **PUBIC RAMUS TUNNEL SYNDROME** requires a surgical approach that is anterior, directly over this entrapment site. It cannot be helped by a transgluteal approach. Note in Figure 12-13 that the dorsal nerve does not always follow the same path. It may (A) exit through the transverse perineal ligament just below the pubic symphysis or (B) it may travel between this ligament and the pubic symphysis. In this case it may be necessary to divide this ligament in addition to opening the pubic ramus canal.



Figure 12-14. Human cadaver dissected to show pudendal nerve at the sacrospinous process, #23. In this specimen, the rectal nerve is already a separate nerve (rectal branches labeled #25). The dorsal nerve to the penis, #10, and the perineal branches (here posterior scrotal branches), #11, are seen with the covering of Alcock's canal removed. Other structures in this region are #4, the femoral nerve, #5, the lateral femoral cutaneous nerve, #6, the obturator nerve, #7 the obturator internus muscle, #9 the levator ani muscle, and #12, the adductor magnus muscle (see the groin pull section), and #21, the S2,S3 and S4 roots that are the sacral plexus. (Rohen, JW, Yokochi, C, Lutjen-Drecoll, E, Color Atlas of Anatomy: A Photographic Study of the Human Body, 6th edition, Lippincott-Williams & Wilkins, p. 470, 2006)

ALCOCK'S CANAL

Benjamin Alcock was born in 1801 in Kilkenny, Ireland. He studied anatomy and medicine in Trinity College in Dublin and in 1827 became a member of the Royal Academy of Medicine of Ireland. He became the first professor of anatomy and physiology at Queen's College in Cork in 1849. He described the canal that bears his name in the *Cyclopaedia of Anatomy and Physiology* (1836-1839), a six-volume text edited by Dr. Robert B. Todd. Although Alcock's canal is often referred to in pudendal nerve entrapment pathology, Alcock described the canal while writing about the course of the **pudendal artery**, mentioning briefly that the pudendal nerve accompanies the artery during its course, without giving a detailed description of the anatomy of the nerve in relation to the canal. In the chapter "Iliac Arteries", Alcock states that the course of the pudendal artery can be divided into three

stages, starting from its origin at the internal iliac artery until it becomes the dorsal artery of the penis/clitoris. The First Stage is the pudendal artery's course from its origin until it leaves the pelvis at the sacrospinous ligament. The Second Stage is the pudendal artery's course, its shortest, between the sacrospinous and the sacrotuberous ligament, when it is outside the pelvis. The Third Stage, he writes, is the "longest and most important portion of its anatomic course". During this stage the artery "situates within the pelvis and lies along the inside of the tuberosity of the ischium and the rami of the ischium and pubis". As the posterior and anterior parts of its course are different Alcock mentions them separately. He describes how the posterior course of the artery lies within a canal in the obturator fascia, which ends when the artery emerges from this canal at the origin of the "triangular ligament of the perineum" (now termed the transverse perineal membrane, see figure 12-13). As the artery proceeds anteriorly, it becomes more superficial. It is enclosed in a sheath from this triangular ligament that attaches to the ramus of the pubis at the anterior border of the ischial tuberosity, and finally emerges from this triangular ligament, beneath the "subpubic ligament" (now termed the transverse perineal ligament" see figure 12-13), as the dorsal artery of the penis.* The pudendal nerve is typically drawn with Alcock's canal surrounding both the anterior and posterior portions of the Third Stage of the pudendal artery course (Figure 12-7).

* Colebunders, B, Matthew, MK, Broer, N, Persing, JA, Dellon, AL, Benjamin Alcock and the pudendal canal, J Reconstr Microsurg, 27:349-355, 2011.

Throughout this chapter, the entrance to Alcock's canal is the site where the pudendal nerve and artery enter the obturator internus fascia, in the ischiorectal fossa, which is after it has left the covering of the sacrotuberous ligament. The pudendal nerve and artery exit Alcock's posterior portion of his third stage of the artery's description, and this is the point where they enter the region of the pubic ramus, anteriorly. With regard to the pudendal nerve, Alcock's canal is the length when the nerve is within the obturator internus fascia, alongside the ischial ramus, leading to the ischial tuberosity. When the pudendal nerve exits this canal anteriorly, it will then enter a separate anatomic region in which it can be entrapped, and, as described above, this is termed the pubic ramus canal. Symptoms related to the pubic ramus canal syndrome relate only to the dorsal branch of the pudendal nerve, whereas those related to entrapment can be due to both the dorsal branch and the perineal branch. One of the rectal branches may enter Alcock's canal and then leave through the fascia shortly thereafter.

REFERRED PELVIC PAIN PATHWAYS

Referred pain is best understood as a nerve signal coming into the spinal cord at one level with the brain interpreting the signal as coming from some other structure that is also innervated at that same spinal level. The commonest example of referred pain is when someone is having a heart attack and the brain perceives the jaw, or the arm, or hand is painful. The brain usually gets so few signals from the heart, that when one appears forcefully, suddenly, the brain interprets the signal as coming from another structure that it receives information from more often.

To understand the **referral pathways related to PELVIC PAIN**, consider that the nerves of the skin of the abdominal wall and groin that overlap in the pelvis come from T12 through L2, and these are the ilioinguinal, iliohypogastric, genitofemoral, and lateral femoral cutaneous nerves (see Figure 12-2). The nerves that carry sympathetic innervation to the pelvic structures – the bladder, uterus (prostate), ovaries and rectum – come from T12 through L2 and pass through a plexus (think railroad track switchyard) called the superior hypogastric plexus. These sympathetic nerves are motor nerves and control contractions in the muscles of the ureter for urinary function. In men, these nerves control ducts of the epididymis and prostate, and therefore are critical for ejaculation. See Figure 12-15.

Now realize that the skin that covers the buttocks and perineum is innervated by S2, S3 and S4, and these are the pudendal nerve and posterior femoral cutaneous nerves, and

that the parasympathetic innervation of the pelvic structures – the bladder, uterus (prostate), ovaries and rectum – comes also from S2, S3 and S4, which pass through the inferior hypogastric plexus (Figure 12-4, 12-12, and 12-14). The parasympathetic nerves are motor nerves that make the bladder empty, and relax smooth muscles so more blood flows to the penis (corpora) and to the vaginal wall, and they also transmit sensory information from those structures. See Figure 12-15 and 12-16.

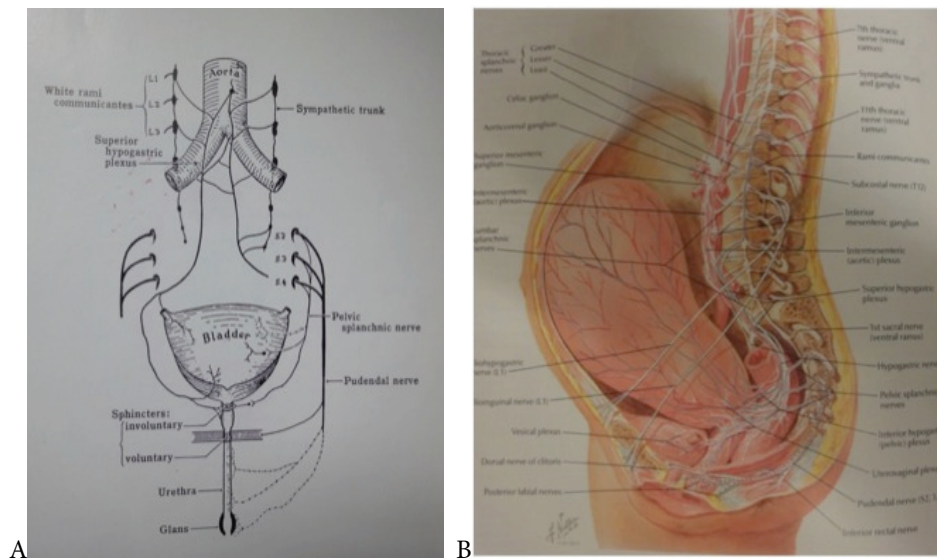


Figure 12-15. Referred Pelvic Pain Pathways. A. From vertebral levels T12 thru L2, sympathetic nerves form ganglion and the superior hypogastric plexus, while from levels S2 thru S4 parasympathetic nerves form the inferior hypogastric plexus. Nerves from these pelvis plexi innervate bladder, uterus, prostate, and rectum providing sensory and motor function. Nerves to the skin from those same vertebral levels occur. When the sensory nerves to the skin are involved with pain signals, the brain may interpret those signals as coming from the pelvic structures. This is perhaps part of the mechanism involved in Interstitial Cystitis and Chronic Prostatitis, as well as Irritable Bowel Syndrome. (A: Grant, JCB, Grant's Atlas of Anatomy, 5th edition, p.214, 1962. B: Netter, FH, Atlas of Anatomy, Hoechstetter Printing Co., Ciba-Geigy Corp, plate 389, 1989)

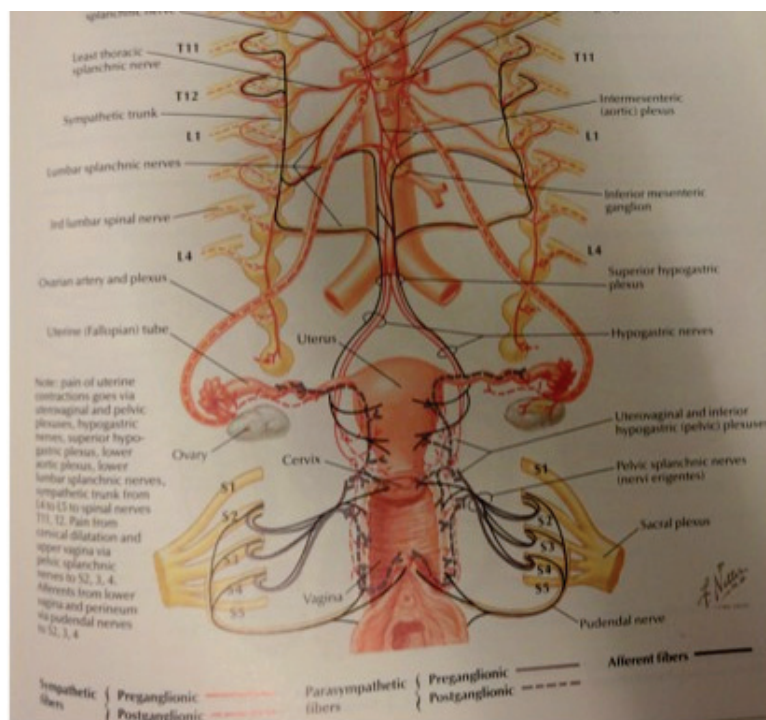


Figure 12-16. The innervation of the female pelvic organs. Sensory nerves from the uterus, Fallopian tubes, and vagina follow the same pathways as the sympathetic nerves from T12 to L2 (the hypogastric nerves) to enter the spinal cord, as the ilioinguinal, iliohypogastric and genitofemoral nerves do. The sensory nerves from the uterus, Fallopian tubes, and vagina follow the same pathways as the parasympathetic nerves from S2 to S4 (pelvic splanchnic nerves) to enter the spinal cord, as the pudendal nerve. (Netter, FH, Atlas of Anatomy, Hoechstetter Printing Co., Ciba-Geigy Corp, plate 389, 1989)

Laura had referred pain. She had pain in her left lower quadrant due to an ovarian cyst, and had emergency laparoscopic cyst removal. This required scope portals, small incisions and puncture wounds, at her umbilicus and left lower quadrant (Figure 12-17A). Afterwards, she continued to have pain in her left lower quadrant, and was re-operated on laparoscopically, to remove “adhesions” but no real problem was found there. Her symptoms became **chronic pelvic pain**. Her gynecologist had heard my lecture at the International Pelvic Pain Society meeting, and now was able to recognize that the pelvic pain might be referred from a nerve in the abdominal wall, and asked me to see this patient.

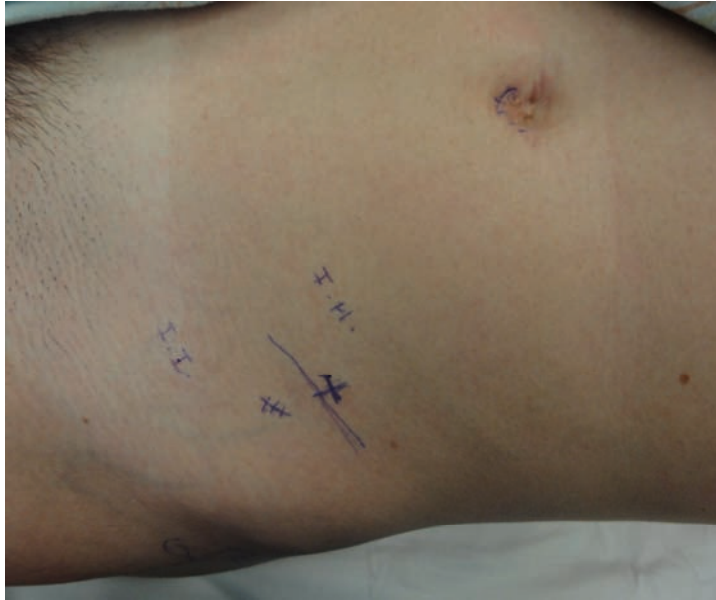


Figure 12-17A. Left side of woman who had endoscopic left ovarian cyst removed 2 years previously. The curved, blue ink, incision at upper right is at the umbilicus ("belly button"), and the blue X and hatched lines represent the left lower quadrant first and second endoscopic portals, the second one for her repeat laparoscopy exploration for chronic pelvic pain. The IH and II are the trigger spots for her pain over the iliohypogastric and ilioinguinal nerves. The long straight line is the proposed incision for the surgery by Dr Dellon to remove these nerves that are the source of referred pelvic pain.

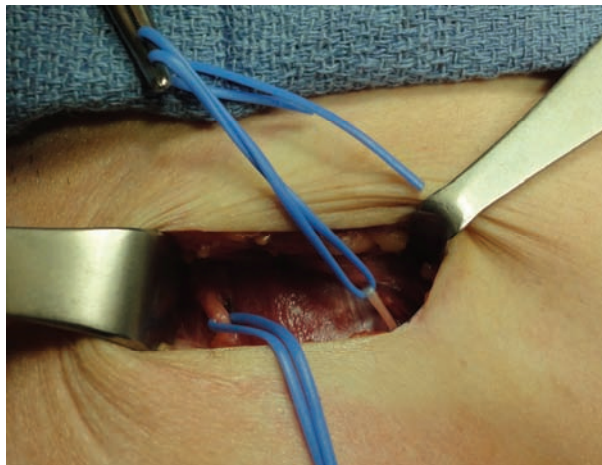


Figure 12-17B. The proposed incision in Figure 12-17A has been opened. A blue soft rubber "loop" is around each white nerve, which can be identified against the underlying red color of the internal oblique muscle. The iliohypogastric is the smaller nerve and the ilioinguinal is the larger nerve. Each nerve is underneath one of the endoscopy portals.



Figure 12-17C. The iliohypogastric nerve has been resected (removed) and is lying on the abdominal skin. The rounded thickening on the side of the otherwise straight nerve is the injury site of the endoscopy trocar (needle). The ilioinguinal nerve is held by the clamp, and its still intact end is being dissected through the abdominal muscle layer so it can be disconnected and left in the retroperitoneal space (inside the belly, but outside the intestines) where it will remain quiet and not grow back to cause further pain.

When I first saw this patient, who was 27 years old and had suffered for two years from pain, her abdominal wall was tender over both the iliohypogastric nerve and the ilioinguinal nerves. This meant that there was hope for her if I could remove these two nerves. In Figure 12-17 B and C you can see the nerves that I found at surgery. They were involved with scar from her endoscopic surgery. *Entrapment of these nerves by scar from surgery is a common complication and one that can be helped with an 80% success rate in my experience.** After removal of these two nerves, her chronic pelvic pain is now gone. Technically, the nerves are identified in tissue that is not scarred, and then they are followed till they are no longer within the muscles of the abdominal wall. They are then cut to lie below the abdominal muscles, where they cannot grow back to cause pain any longer.

The complex pattern of overlapping nerves supplying bladder, rectum and prostate permit “intermixing” of neural signals: the brain may interpret signals coming from the sensory nerves to the skin as coming from the sensory nerves from these pelvic structures. Such pathways of referred pain may be involved in the complex problems known as *interstitial cystitis, irritable bowel syndrome, and chronic prostatitis.*

* Lee CH, Dellon AL: Surgical management for groin pain of neural origin. Journal of the American College of Surgery, 191:137-142, 2000.

“TO OPERATE OR NOT TO OPERATE?”

THAT IS NOT THE QUESTION.

Then what is the question?

Let us try to put this into perspective for the pudendal nerve. The first question is “What are your symptoms?” The second question is “What is the diagnosis?” The third question is “How can we treat this problem in the safest, most effective way?” And that way does not begin with surgery, nor does it end with surgery.

PUDENDAL NEURALGIA VERSUS PUDENDAL NERVE COMPRESSION or NEUROMA. Throughout this book, I have consistently used the term “compression” when a nerve has pressure applied to it. The treatment of nerve compression is decompression or neurolysis, removing any structure that is the source of pressure, and, in addition, any scarring within the nerve. If a nerve has been directly injured, then it will have a damaged area or ending that is called a “neuroma”. The treatment of a neuroma is to remove, or resect, the damaged part, and place the “live end”, the proximal end, the end still attached to the spinal cord, somewhere away from pressure and movement, and preferably into a muscle, so that the nerve does not grow back and form a new neuroma. This is covered in detail in Chapter 1, “WHY NERVES CAUSE PAIN”. “Neuralgia” just means a painful nerve, and does not imply anything about why the nerve hurts. Since “neuralgia” does not define a type of nerve pathology, it does not have a specific treatment. Therefore, in this chapter, although “pudendal neuralgia” is the term in common usage today by patients, often by doctors, and almost always on the internet, I will use the term “pudendal nerve compression” or “neuroma” if this cause is known.

From the anatomy discussion above, it is clear that the pudendal nerve is directly responsible for certain sensory and motor functions, and these have to be present for a person to have the problem come from the pudendal nerve. These symptoms include some or all of these anatomic areas; the anus, the rectum, the perineum, the vagina, the scrotum, the labia (vulva), the penis, and the clitoris. It is possible from the discussion of referred pain above that pudendal nerve problems can cause referred pain that is interpreted as coming from the urethra, the bladder, the rectum or other pelvic structures, and visa versa

(the other way around, too). *In my experience, the symptoms must be related to those areas directly innervated by the pudendal nerve for anyone to have surgery upon the pudendal nerve.* Pudendal nerve surgery, in my view, should not be offered to patients with symptoms related only to those sites of referred pain, i.e, the pudendal nerve should not be operated upon if the only complaints are those of interstitial cystitis, prostatitis, or irritable bowel syndrome. Following this line of reasoning, if symptoms of interstitial cystitis, prostatitis, or irritable bowel syndrome co-exist with pudendal nerve symptoms, operating upon the pudendal nerve may achieve relief of symptoms in the penis/clitoris, vagina/scrotum, perineum, rectum/anus but yet not relieve the symptoms of the bladder, prostate or bowel itself. The statistics of these interrelated success/failure areas remain to be determined by future research.

Prior to any surgery, the *diagnosis of pudendal nerve problems* should be confirmed to the best extent possible. Traditionally this has involved **electrodiagnostic** tests of the pudendal nerve, during which a needle is put into certain muscles in the perineal region. *Electrodiagnostic tests can be painful, and do not always show that there is a pudendal nerve problem (there are false negatives) if just the sensory nerves are compressed. The good news is that I do not require this test to be done in the evaluation of my pelvic pain patients.* Electrodiagnostic testing is critical to me if there is a consideration that the patient's symptoms might be coming from a lumbosacral spine (disc) problem or spinal stenosis, or if there is an underlying neuropathy with numbness and tingling in the feet.

A commonly used approach today is to have **radiographic imaging** of the pelvis. The best "x-ray" approach is actually with magnetic resonance imaging (MRI) which puts energy into the tissues and records the energy given off in response to that stimulus. Mathematical models applied to this generated energy can be used to create a photographic image, which looks like a traditional x-ray, but can be manipulated in many ways to highlight different tissues, such as bone versus muscle, primarily related to the water and fat content of that tissue. Sadly, nerve as a tissue, has been traditionally hard to image because it is similar to blood vessels in its water content. So radiologists usually assume they know where the nerve is because the nerve is related to the blood vessel or certain bone landmarks. In other words, *traditional MRI tests do not directly image the peripheral nerves.* A neurosurgeon, Aaron Filler, MD, developed a mathematical approach designed to identify nerves more easily and he has termed this "MR Neurography". There are many radiology locations in the country at which this testing using his proprietary, patented, formula can be done. Other medical institutions are developing their own mathematical approach to visualize these small nerves better. At

Johns Hopkins Hospital, we have a dedicated Musculoskeletal Unit, organized by John Carino MD and Avneesh Chhabra, MD, in the department of radiology that is currently correlating their images with intra-operative photographs that my partners in the Dellon Institute for Peripheral Nerve Surgery® are sending to them. These clinical/radiologic correlations already have enabled better understanding of the location of nerve entrapment with regard to all peripheral nerve problems in the arms and legs,^{*,**,*} and it is now being applied to the pudendal nerve. **We, doctors and patients, must bear in mind that this imaging is still in its infancy with regard to the pudendal nerve, and it is still difficult to distinguish scarring from nerve entrapment from the adjacent pudendal artery. The appearance of a nerve that is entrapped or one that is freed from entrapment may still appear abnormal due to the scar remaining from the neurolysis surgery itself.** The good news is that, at present, I do not routinely require this test to be done in the evaluation of my pelvic pain patients. If a patient has had previous surgery, or if a pelvic tumor is suspected, or if there has been a pelvic fracture, a high intensity MRI with special imaging should be recommended. An example of an MRI of the pudendal nerve using the approach developed at Johns Hopkins is given in Figure 12-18.

- * Chhabra, A, Williams, EH, Wang, KC, Dellon, AL, Carrino, JA, Magnetic resonance neurography of neuromas related to nerve injury and entrapment with surgical correlation, American Journal of Neuroradiology, 31:1363-1368, 2010.
- ** Chhabra A, Faridian-Aragh N, Chalian M, Soldatos T, Thawait SK, Williams EH, Andreisek G. High-resolution 3-T MR neurography of peroneal neuropathy. Skeletal Radiology, in press 2011.
- *** Subhawong TK, Wang KC, Thawait SK, Williams EH, Hashemi SS, Machado AJ, Carrino JA, Chhabra A., High resolution imaging of tunnels with magnetic resonance neurography, Skeletal Radiology, in press 2011.

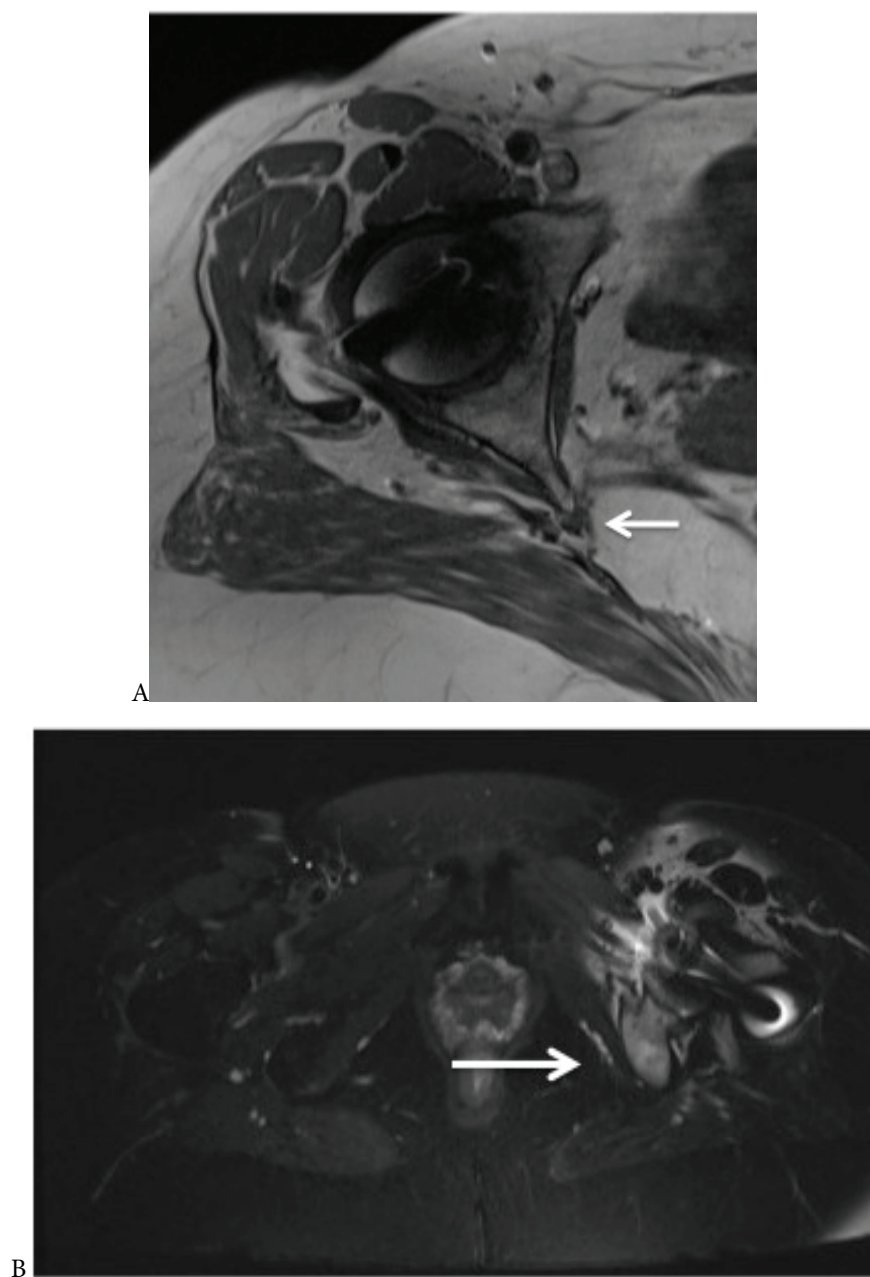


Figure12-18. MRI of the pudendal nerve in a man using a high intensity 3 Tesla protocol as developed by the Musculoskeletal Radiology Group at Johns Hopkins Hospital, Baltimore. A: Level of ischial spine. Pudendal nerve is between the sacrospinous and sacrotuberous ligaments (white arrow). B: Level of Alcock's canal, the pudendal nerve is alongside the obturator internus muscle (white arrow). Images courtesy of John Carrino MD and Avneesh Chhabra, MD.

A **nerve block** can provide the most critical information about the involvement of a nerve as the source of pain. In doing a nerve block, a local anesthetic, either short acting like Xylocaine, 1%, or longer acting like marcaine 0.5%, or a combination of the two, is injected next to (*not into*) the nerve that is thought to be the source of the pain. To know that the correct nerve has been put to sleep, anesthetized, the sensory target area affected by that nerve should become numb. Therefore, if a pudendal nerve block is being done, the rectum, perineum, vagina/posterior scrotum, clitoris/penis should go numb for several hours. If no numbness occurs then the block most likely missed the nerve. A block is considered effective if the pain you are experiencing is relieved for the time the local anesthetic is working, usually just a few hours. In some people, simply stopping the pain for this interval can be therapeutic, and the pain may not come back. In some people, repeated blocks over a period of time may be all the treatment that is needed, and surgery may not be necessary. This is related to allowing the central nervous system to “reset”. *If the pain continues when the block wears off, then it is clear the nerve that was blocked is causally related to the pain*, and if repeated blocks or non-operative forms of physical therapy or medical management are not effective, then you can expect relief by having surgery done upon that nerve. Sometimes, a nerve block does not work because the anesthetic did not reach the target nerve. In Figure 12-17A, if the injection were given at the site of the pain, the nerve block may not have worked because, as seen in Figure 12-17B, the two nerves were anatomically quite far apart, and the local anesthetic might have put only one of the two painful nerves to sleep or neither of them. This raises the question as to how to determine where to inject the anesthetic.

Should you have a **local or a regional nerve block**? For the abdominal wall, where the ilioinguinal and iliohypogastric nerves can have wide variation in location, blocking the nerve at the site of pain, a local block, may prove ineffective. Instead, knowing that both of these nerves comes from spinal nerves L1 and L2, a block of the spinal nerves, a regional block would be the better choice. For the **pudendal nerve block**, there are bony landmarks that are a great help. The block can be done by first feeling the sacrospinous process, and then injecting either intravaginally (Figure 12-19A) at that point or reaching that point through the skin (Figure 12-19B). This bone landmark can be visualized radiographically, and this is called a CT (computerized tomography)-guided nerve block (Figure 12-19C). The choice of the anatomic approach to the pudendal nerve block should be based upon the experience of the doctor doing the block and the patient’s understanding and acceptance of this procedure.

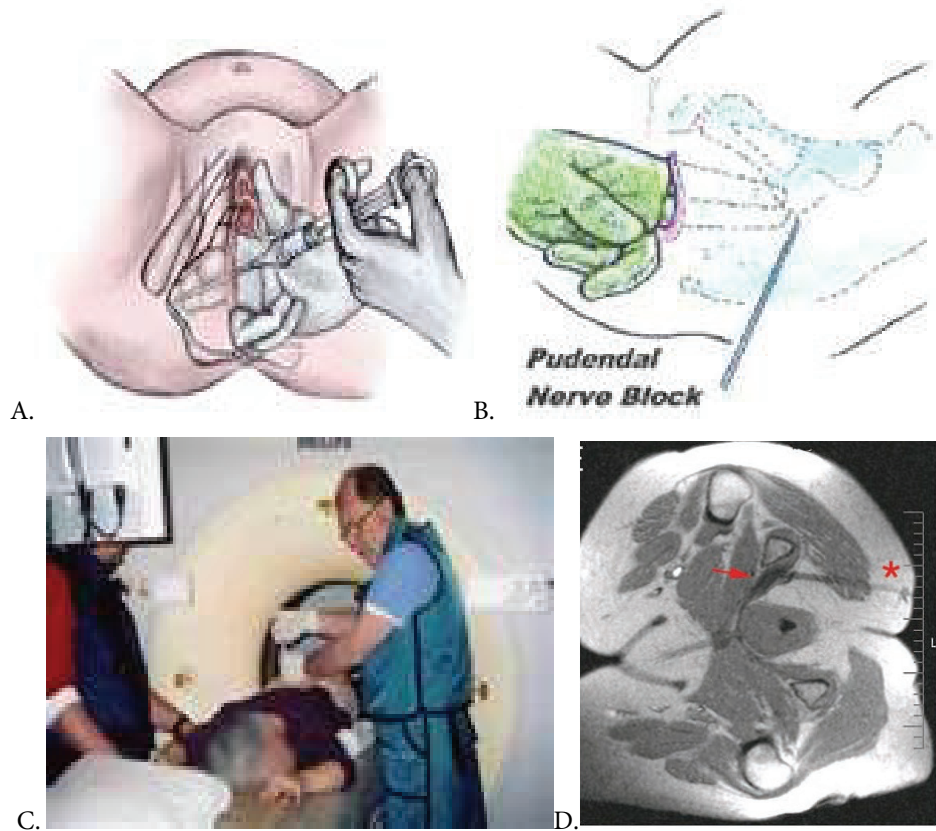


Figure 12-19. Types of pudendal nerve blocks. The ischial spine is palpated (touched with a finger) through the vagina and then local anesthetic nerve block is injected through the vagina (A, emedicine.medscape.com.aspx) or through the skin of the inner thigh (B, abc-obgyn.8m.net.aspx). The injection can be guided by radiographic imaging, C) using a CT scanner (urmc.rochester.edu.aspx) or D) MRI. * is outline of needle injecting at arrow, with anesthetic going into Alcock's canal (Filler, A, Diagnosis and Management of Pudendal Nerve Entrapment Syndromes: Impact of MR Neurography and Open MR-guided Injections, *Neurosurgical Quarterly*, 18;1-6, 2008)

Temporary relief of chronic pelvic pain by a pudendal nerve block is the best predictor of success from pudendal nerve decompression surgery.

PHYSICAL THERAPY

The doctor devoted to care of patients with chronic pelvic pain must be prepared to spend time listening to the patient's history in detail, and consider including in that care all forms of holistic, allopathic, and physical therapeutic approaches possible. Often a clinical psychologist is included in the team. Descriptions of this team approach are available now in a book published in 2010 entitled **"Secret Suffering: How Women's Sexual and Pelvic Pain affects their Relationships."** by Susan Bilheimer and Robert J. Echenberg, MD and a book coming out in late 2011, by Deborah Coady, MD and Nancy Fish, MSH, MPH, tentatively entitled **"Healing Sexual Pain: A Woman's Guide to Confronting, Diagnosing, and Treating Sexual Pain"**. Each of these books joins as co-authors, a person who has known personally chronic pelvic pain with a gynecologist skilled in caring for patients with chronic pelvic pain (see Figure 12-20).

Physical therapy is an approach to relieving symptoms using non-operative techniques. There are many published papers available to patients with chronic pelvic pain that discuss and review the benefits of physical therapy. These approaches are championed and taught at the International Pelvic Pain Society meeting, a meeting attended by both therapists and physicians. A recent book available in a reader-friendly format is **"Evidence Based Physical Therapy for the Pelvic Floor"** by a Bo, Berghmans, Merkved, and Van Kampen, published in 2009 (see Figure 12-20B). At the 2010 International Pelvic Pain Society meeting, Stephanie Prendergast, MSPT (Pelvic Health and Rehabilitation Center, San Francisco), gave a great presentation on this type of therapy (www.pelvicpainrehab.com).



Figure 12-20. Books currently available relating to non-operative approaches to treatment of chronic pelvic pain.

PHYSICAL THERAPY IS CRITICAL TO THE TREATMENT OF CHRONIC PELVIC PAIN. PATIENTS SHOULD HAVE AT LEAST 6 MONTHS OF TREATMENT BEFORE PERIPHERAL NERVE SURGERY IS CONSIDERED. *PHYSICAL THERAPY IS CRITICAL IN THE POST-OPERATIVE CARE OF PATIENTS HAVING PERIPHERAL NERVE SURGERY.*

The type of therapy I have found most helpful after decompression of the pudendal nerve, treatment of groin or hamstring pull, or decompression/resection of nerves of the abdominal wall, is what I term “water walking”. This just means going to the heated pool, in a therapy center or health club, and walking. The water holds up your weight and stimulates the skin, sending patterns of neural impulses to the brain from the anus, perineum, vagina, scrotum, vulva, and penis/clitoris. This is a form of sensory re-education. This facilitates cortical reorganization, shifting the emphasis from pain input to functional sensation.*

This is begun immediately after the sutures are removed. It is done for 10 to 15 minutes the first two days, then increased to 30 minutes. After the first week of just walking, the activity progresses to gentle swimming. This can be begun by just holding on to the side of the pool and kicking gently. Then progresses to the back and/or breast stroke, in which the legs are allowed to come into the “frog-leg position”. Do not do the crawl, which prevents water from entering the surgical area.

“Dr Dellon, I woke up in significant pain. It is 4 weeks since the pudendal nerve surgery. Now I have just come home from swimming and the pain level went down tremendously. It's amazing!!!! I really don't understand it but you obviously know what you are talking about. And it's such a relief that the swimming works,” said Janet.

* Dellon AL: Somatosensory Testing and Rehabilitation. American Occupational Therapy Assoc.: Rockville, Md, 1997 . (Soft Cover) Institute for Peripheral Nerve Surgery: Baltimore, Md, 2000. (Hard Cover)

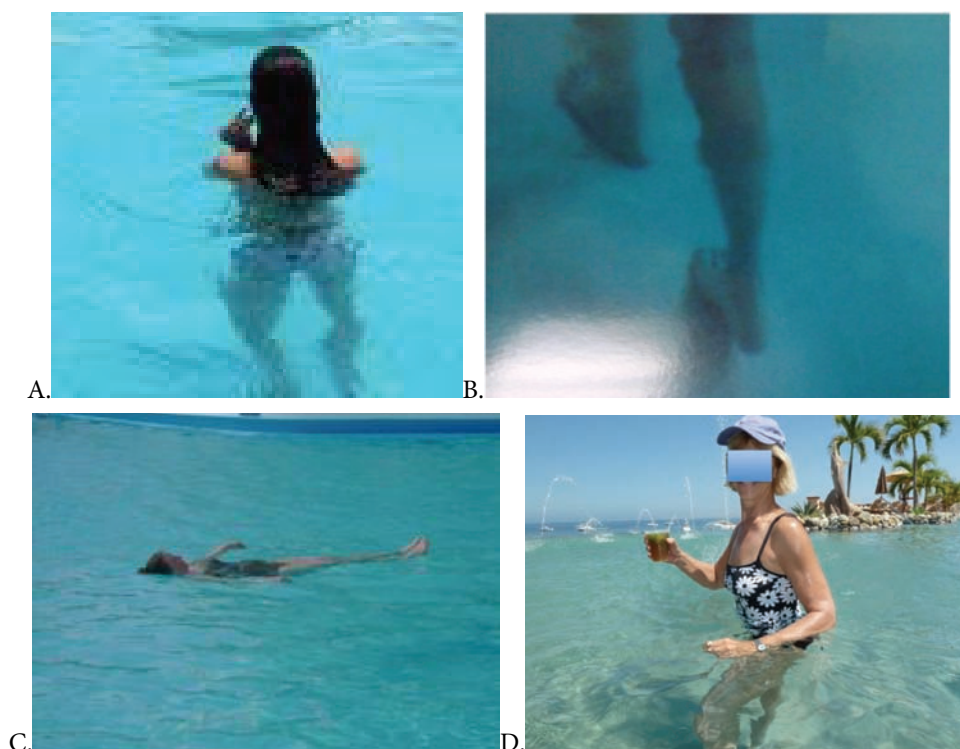


Figure 12-21. Water Therapy. Following surgery for chronic pelvic pain, therapy should consist of going to a heated pool, in either a formal therapy setting or a health club. A) Just simply walk in the water. B) The movement of the water along the legs, thighs and pelvic area sends “waves” of neural impulses that the brain can now experience as soothing instead of pain. This is not water aerobics. C) Progress to gentle floating or swimming. A prescription from the doctor should permit payment for this “water therapy”. D) Pool therapy can be great fun. Try it.

For those who have pain with sitting, therapy is begun in the pool sitting upon a sponge on the step of the pool while still having the water support the weight of the body.

I emphasize to the therapist that no actual manipulation of the surgical site or of the pudendal nerves, or of the abdominal wall should be done in the post-operative period, as the nerves can be quite sensitive following surgery. A mild skin cream or 1% hydro-cortisone cream can be applied into the scar beginning at week six. Therapy continues as long as it is helping with the recovery, which may require three months.

THE NANTES CRITERIA

In order to establish a common definition for a misunderstood problem, “pudendal neuralgia”, a group of doctors met in Nantes, France on September 23 and 24, 2006. They felt there was an “absence of pathognomonic imaging, laboratory and electrophysiology criteria”, meaning that there was no absolute medical test that could determine if a patient’s symptoms were due to compression of the pudendal nerve, and therefore they wanted to share their experience and come up with a group of symptoms that did fit with this condition, and symptoms that did not. These are given in Table 12-1.

This is similar to what the field of medicine has done for many other conditions, including Fibromyalgia and Rheumatoid Arthritis. At some point in time, as science develops, a test that is sensitive and specific for a medical problem occurs, and doctors can order that test. If that test is abnormal, they can be certain that 90% of the time the patient has that condition, but even sometimes when that test is “positive” the patient does not have that condition, and that is a “false positive”. For example, the electrodiagnostic testing for carpal tunnel syndrome has a “false negative” of 33%, that is one third of patients with symptoms that would meet the “Carpal Tunnel Criteria” have normal electrical tests. X-rays are not helpful in diagnosing carpal tunnel syndrome, although sometimes they can show a swollen or compressed nerve, and that nerve, the median nerve is 1 cm in diameter. Therefore, even with the most common nerve entrapment in the human body, the median nerve at the wrist, doctors must rely on the patient’s symptoms and the physical examination primarily. Other testing can be very helpful, but is often primarily used to be sure that no other condition is present. The Nantes Criteria establish this same approach for pelvic pain.

TABLE 12-1.

NANTES CRITERIA FOR PUDENDAL NERVE ENTRAPMENT*

Essential Criteria

1. Pain in the territory of the pudendal nerve; anus to penis/clitoris
2. Pain is predominantly experienced while sitting
3. Pain does not awaken the patient at night
4. Pain with no objective sensory impairment
5. Pain relieved with diagnostic pudendal nerve block

Complementary Diagnostic Criteria

1. Burning, shooting, stabbing pain, numbness
2. Allodynia or hyperpathia
3. Rectal or vaginal foreign body sensation
4. Worsening of pain during the day
5. Predominantly unilateral pain
6. Pain triggered by defecation
7. Presence of exquisite tenderness on palpation of ischial spine
8. Clinical neurophysiology findings in men or nulliparous women

Exclusion Criteria

1. Exclusively coccygeal, gluteal, pubic or hypogastric pain
2. Pruritis
3. Exclusively paroxysmal pain
4. Imaging abnormalities able to account for the pain

Associated Signs not Excluding the Diagnosis

1. Buttock pain on sitting
2. Referred sciatic pain
3. Pain referred to the medial aspect of the thigh
4. Suprapubic pain
5. Urinary frequency and/or pain after sexual intercourse
6. Pain occurring after ejaculation
7. Dyspareunia and/or pain after sexual intercourse
8. Erectile dysfunction
9. Normal clinical neurophysiology

* Labat, JJ, Riant, T, Robert, R, Amarenco, G, Lefaucheur, JP, Rigaud, J, Diagnostic criteria for pudendal neuralgia by pudendal nerve entrapment (Nantes Criteria), Neurourology and Urodynamics, 27:306-310, 2008

As noted in earlier chapters, I do rely on non-painful neurosensory testing to document sensory nerve problems. While the Nantes Criteria state that there is “pain with no objective sensory impairment”, neuro-sensory testing with the Pressure-Specified Sensory Device™ (PSSD) has not been previously applied for this problem except by me. It was first reported for compression of the dorsal branch of the pudendal nerve in men in 2009.* It has not been reported yet for the pudendal nerve in women. Examples of the PSSD test in men and women are given in Figure 12-22.

Non-invasive, non-painful testing with the rounded single end of the PSSD can test the clitoris, and with both prongs can test the glans penis, so that this type of testing holds promise for better diagnosis of problems related to the pudendal nerve.

* Hruby, S., Dellon, A.L., Ebmer, J., Holtl, W., Aszmann, O.C., Sensory Recovery after decompression of the Pudendal Nerve at the Urogenital Diaphragm: anatomical review and neurosensory data of a prospective clinical study, *Microsurgery*, 29:270-274, 2009.

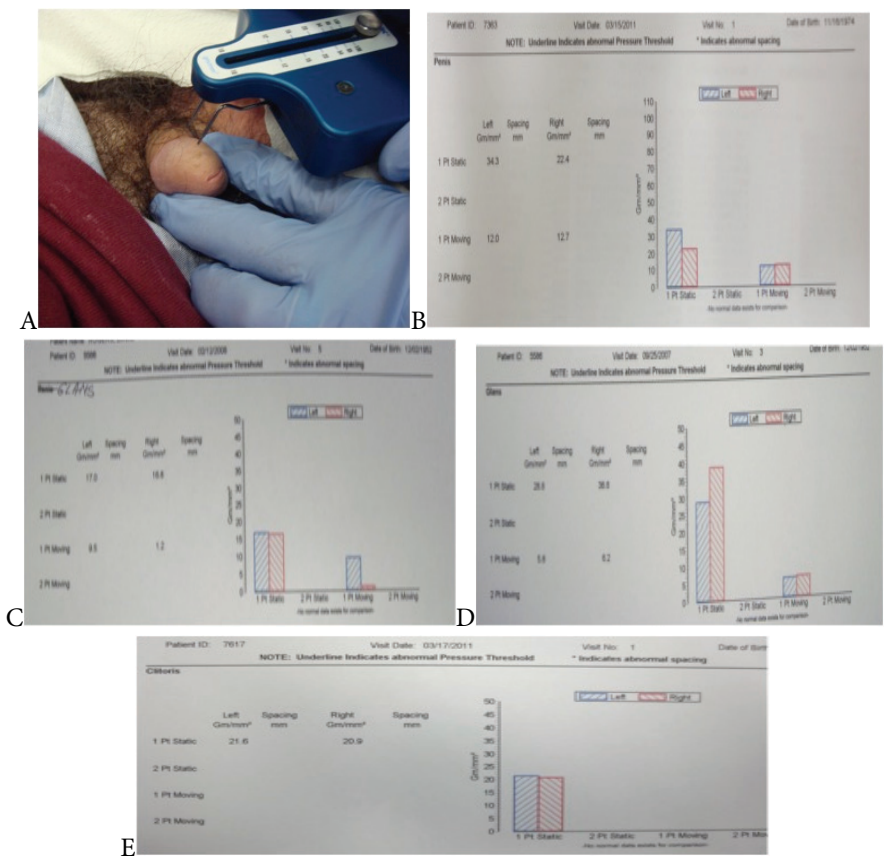


Figure 12-22. Neurosensory testing of the pudendal nerve with the Pressure-Specified Sensory Device (PSSD). A) The PSSD is applied with increasing pressure. When the touch stimulus is perceived, the person being tested presses a button and the pressure threshold is determined. For men both one-point static and one-point moving touch can be tested. Examples for the penis are given in B-D). Note red is for the right side and blue is for the left side. The higher the bar, the worse is the sensation, the more the nerve is compressed. C) & D) are the same man, whose sensation has gotten worse, and he is now ready for surgery. A normal measurement is less than 5 grams per square millimeter of pressure. All bars above are abnormal. For women, just one-point static touch can be tested for the clitoris (E).

SURGICAL APPROACHES: PUDENDAL NERVE

Historically, the first approach to decompress the pudendal nerve was by Ahmed Shafik, MD from the Department of Surgery at Cairo University in Egypt. His interest in this area was first reported in 1983 when he described “The Levator (Ani) Dysfunction Syndrome”.* In 1991 he reported the “Pudendal Canal Syndrome”, and in 1992 he described decompression of the pudendal canal for the treatment of “fecal incompetence”.** His contributions went on to include electrical stimulation for rectal problems, and concluded with his 1995 review paper.***

The surgical approach Shaifk used was **transischial**. In women, this can be done through the vagina, separating the vagina from the rectum to reach the sacrospinous ligament, and in men the incision is in the inner thigh (Figure 12-23). This surgical approach might also be called **transperineal**.



Figure 12-23. A **transischial or transperineal** incision was made in this man's medial thigh to enter the ischiorectal space, reach the sacrospinous ligament, and decompress the pudendal nerve. This patient did not get relief of the pain in his penis, because the entrapment site was along the pubic ramus, which is not decompressed with this surgical approach. **The lithotomy position is used.**

- * Shafik, A, A new concept of the anatomy of the anal sphincter mechanism and the physiology of defecation: The levator dysfunction syndrome. *Coloproctology*, 5:159-165, 1983.
 - ** Shafik, A, Pudendal canal syndrome. Description of a new syndrome and its treatment: report of 7 cases, *Coloproctology*, 13: 102-110, 1991.
 - *** Shafik, A, El-Sherif, M, Youssef, A, El-Sibai, O., Surgical anatomy of the pudendal nerve and its clinical implications, *Clinical Anatomy*, 8:110-118, 1995.
-

The transgluteal approach was popularized by Robert and Labat in Nantes, France. Their first paper in 1989 concerned the electrodiagnostic approach to diagnostic of pudendal nerve problems.* They continue to publish, with three more papers in 2010, for a total of 16 publications. Two, available in English, are important for understanding this approach to pudendal nerve entrapment diagnosis and decompression.**, ***

- * Robert, R, Labat, JJ, Lehur, PA, Glemain, P, Armstrong, O, LeGorgne, J, Barbin, JY, Relfexions cliniques, neurophysiologiques et therapeutiques a partir de donees anatomiques sur le nerf pudendal, Chirurgie, 8:515-520, 1989.
- ** Robert, R, Labat, JJ, Bensignor, M, Glemain, P, Deschamps, C, Rauol, S, Hamel, S, Decompression and transposition of the pudendal nerve in pudendal neuralgia: a randomized controlled trial and long term evaluation, European Urology, 47:403-408, 2005.
- *** Labat, JJ, Riant, T, Robert, R, Amarenco, G, Lefaucheur, JP, Rigaud, J, Diagnostic criteria for pudendal neuralgia by pudendal nerve entrapment (Nantes Criteria), Neurology and Urodynamic, 27:306-310, 2008.

Examples of “**Transgluteal**” incisions in patients coming to see me because they did not get better from surgery by their first surgeon, are shown in Figure 12-24. Each of these patients had chronic pelvic pain due to compression of the pudendal nerve.

Surgery is done with patient on their abdomen (prone), table flexed.



Figure 12-24. Transgluteal incisions in patients referred to me because they did not improve from someone else's surgery. A) Incision located without any relationship to the pudendal nerve. B) Incision located overlying sacrotuberous ligament, but does not allow access to Alcock's canal. C) The long incision on the left side, the patients third surgery located where access can be achieved, but, as in D), did not result in relief due to the technique used to treat the pudendal nerve itself (see text for surgical details).

The surgical approach to the pudendal nerve, when symptoms are most severe for the **rectum and perineum, and vagina** must give access to both the region of the sacrotuberous ligament and the entrance to Alcock's canal. My preferred incision to accomplish this is a vertical incision that goes between the ischial tuberosity and the rectum, as illustrated in Figure 12-25. This incision is positioned more towards the sacrum or more towards the anus depending upon the patient's symptoms and size.

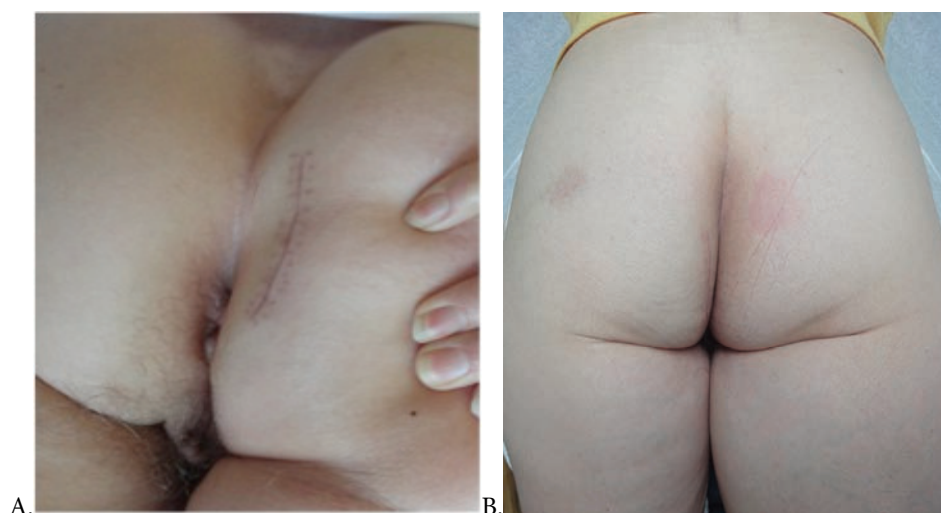


Figure 12-25. My preferred incision to gain access to the pudendal nerve both at the sacrotuberous ligament and the entrance to Alcock's canal. It is vertical, and will vary in length and location depending upon the anatomy of the individual patient. A) Incision on right buttock still healing at 6 weeks after surgery and B) Incision well healed on the left buttock, 4 months after the surgery. Surgery is done with the patient on their abdomen, prone, table flexed.

The surgical approach to the pudendal nerve, when symptoms are most severe for the ***clitoris/penis, vulva/scrotum, and/or the perineum*** must give access to the region of the pubic ramus, to approach the pubic ramus canal, and to the region of the exit to Alcock's canal. My preferred incision* is alongside the pubic ramus (Figure 12-26). It is possible that some people may need more than one approach and more than one operation.

* Hruby, S., Dellon, A.L., Ebmer, J., Holtl, W., Aszmann, O.C., Sensory Recovery after Decompression of the Pudendal Nerve at the Urogenital Diaphragm: anatomical review and neurosensory data of a prospective clinical study, *Microsurgery*, 29:270-274, 2009.

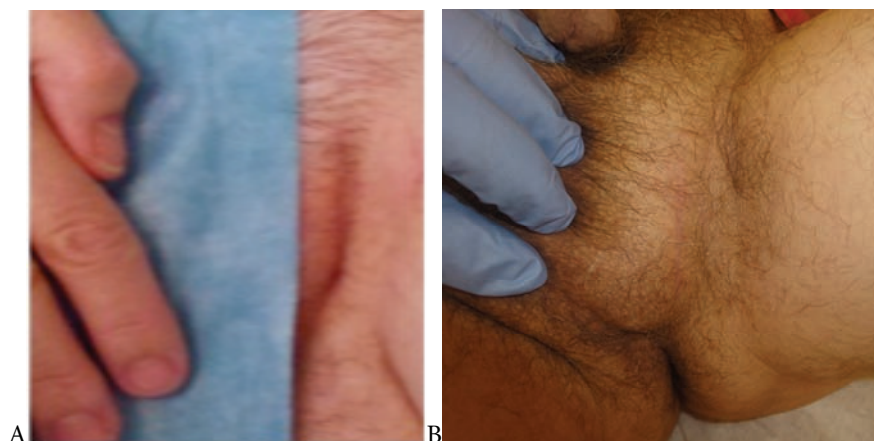


Figure 12-26. My preferred incision to gain access to the pudendal nerve both at the pubic ramus and the exit to Alcock's canal. A) Healed incision in a woman, 2 months after this surgery. B) Healed incision in a man, 3 months after this surgery. Surgery is done with the patient in the litotomy position (stirrups) for this approach developed by Dellon and Aszmann*.

PROS & CONS TO PUDENDAL NERVE SURGERY

There are **risks to all surgery**. There are the risks of anesthesia, which is a general anesthesia, and range for a sore throat, to a sore stomach or back, to death. If you have had previous general anesthesia, and are in good health, the risk of death is quite small, about 1 per 100,000 general anesthetics. While many people are bruised following surgery, especially those taking baby aspirin or other anti-clotting medication, the risk of actually having bleeding sufficient to require drainage or take back to surgery is less than 1%. So far, I have not had to take anyone back to surgery for bleeding, and just one patient needed fluid removed from an incision. While it is known that all surgery has a risk of infection, in our approach antibiotics are given before the skin is cut, and the surgical site is carefully prepared with topical solution designed to kill the skin bacteria prior to the incision being made. The general risk of infection is 1%. I allow immediate walking and sitting after surgery. The bandage is plastic so a shower the day after surgery is permitted, and the dressing is removed the third day and betadine, an iodine-containing solutions is applied twice a day to the incision site to minimize the risk of infection. The sutures are removed the 10th day. So far, I have not had any chronic pelvic pain patient requiring treatment of a post-operative infection. **In contrast, the surgical approach through the vagina must have a must higher risk of infection due to the bacteria normally found in that area that can enter the ischiorectal space during surgery.**

The risks from peripheral nerve surgery for chronic pelvic pain include injury to the pudendal nerve with resulting loss of sensation to critical areas or worsening of the pain, and, may include loss of rectal continence. So far, I have not had this occur. During my surgery, surgical “loupes” are used which magnify three and a half times, sufficient to see these nerves very well, and a bipolar coagulator, set at the lowest energy level, so the electricity that is used to stop bleeding does not damage the nerves. Sufficient time is taken to ensure a careful dissection and treatment of the nerves. This is the approach used in each Dellon Institute for Peripheral Nerve Surgery®.

THE BIGGEST RISK OF SURGERY FOR CHRONIC PELVIC PAIN IS FAILURE TO ACHIEVE PAIN RELIEF. The results of decompression of the pudendal nerve are reviewed in Table 12-2. Many patients who come to me have been told their chance of success in the United States by surgeons who have operated on them may be as low as 35% good results with a 5% chance of being made worse. Some patients have been told the results of surgery are “50:50”. Some patients have been told that the improvement they desired would take from 18 to 24 months to achieve, with wound healing over the buttock taking a “long time”. I personally would not accept those risks for any surgery. From Chapter 1 of this book, you learn that if a nerve is divided, it grows at one inch per year, so that unless the pudendal nerve were cut by an injury and then sutured back together (a nerve repair or reconstruction), nerve regeneration at one inch per month is not expected to be the determining factor in healing. A decompressed nerve can give relief in the days following surgery, while the paresthesias (buzzing, tingling, hot and cold, lightning impulses) that accompany the “waking up” or the compressed nerve, which are similar to and in some patients may represent some nerve regeneration, are usually mild and may continue for up to 3 months after surgery. These are the symptoms for which the water therapy described above are most helpful. Patients who are not better by six months after nerve decompression for chronic pelvic pain either have another nerve involved, have another cause for their pain also going on, or are not going to get better. For the patients who meet my criteria for surgery, I expect the percentage of *good to excellent results to be 80%*, with another 15% having some improvement, 5% failure, and, so far, I have not made anyone worse. These results depend upon making the correct anatomic diagnosis and using the best anatomic surgical approach to decompress the nerves.

TABLE 12-2
RESULTS OF PUDENDAL NERVE DECOMPRESSION

Author(s) (Year)	Surgical Approach	Structure Divided	No. of Patients	Excellent %	Good %	Failure %	Months to Recovery
Safik (1995)	Lithotomy IschioRectal	A	10	80*		20	NA
Safik (1996)	Lithotomy IschioRectal	A	21	60**		40	NA
Mauillon (1993)	Prone Transgluteal	SS, ST FP, AP	12	25	9	66	3-12
Bautrant (2003)	Lithotomy Ischiorectal	SS FP, AP	104	62	25	13	0-12
Beco (2004)	Lithotomy IschoRectal	AP	14	68		32	6-12
Robert (2005)	Prone TG(M)	ST SS & AP	16	(70% \geq 30% relief)			3-12
Ansell (2007)	Prone Transgluteal	58 FP, AP	44	23	33	(60% \geq 50% relief)	NA
Robert (2007)	Prone TG (M)	ST SS, AP	40	30	30		4-18
Filler (2009)	Prone TG (H)	P ST***	147 (185 ops)	20 (67% \geq 40% relief)	67	13	4-12
Anatolak (2009)	Lithotomy IschioRectal	SS AP****	42	0	10?	90?	12-18
Dellon (2009)	Lithotomy Pubic Ramus	AA	5	100			2-6
Hibner (2010)	Prone TG (M)	ST***** AP	?	33	33	34	18-24

Notes to Table 12-2:

ST, sacrotuberous ligament; SS, sacrospinous ligament; FP, falciform process of ST ligament; P, pyrimiformis muscle division; A, Alcock's Canal, either Aa, anteriorly at exit of canal, or Ap, posteriorly at entrance to canal; NA, data not available, TG, transgluteal either (H) high and lateral or (M) medial, oblique over tuberosity.

* Symptoms were erectile dysfunction with perineal hypesthesia

** Symptoms were fecal incontinence with perianal hypesthesia

*** Partial sacrotuberous ligament division was done in just 12% of surgeries

**** ST is split longitudinally, but not divided. "Adhesion barrier" placed around the nerve.

***** After ST division, pudendal nerve is wrapped in collagen tube, which is then filled with platelet rich plasma and the ST is reconstructed with a tendon from a cadaver donor

References for Table 12-2:

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- Michael Hibner, MD, PhD. Nita Desai, MD, Loretta J. Robertson, PT, and May Nour, MD, PhD, Pudendal Neuralgia: A Review, *J Minimally Invasive Gynecology*, 17:148-153, 2010, plus his Arizona Center for Chronic Pelvic Pain "Consent for Pudendal Neurolysis"

WHY I AM NOT A “WRAPPER”

Throughout this book, whether the subject has been upper or lower extremity nerves, the treatment of a compressed nerve has been to decompress that nerve *and early nerve gliding*. For compression of the median nerve at the wrist in the carpal tunnel, the roof of the tunnel, the transverse carpal ligament, is cut, and not repaired. For compression of the common perineal nerve at the side of the knee in the fibular tunnel, the roof of the tunnel is opened, and not repaired. Anything done to either close the top of the tunnel can lead to more scar and to repeat compression, that is, failure. All incisions heal by forming a scar. We cannot stop a scar from forming. The concept of enclosing a nerve in something that prevents the nerve sticking to the surroundings was begun by surgeons trying to help patients who failed to get better from a simple decompression. They wrapped the nerve with a vein, and then when products that absorbed became available, like collagen, surgeons started wrapping nerves with these. First the wrap must be attached to the nerve, and then the wrap will become stuck in scar itself, and may directly therefore hurt the nerve. **There is currently no indication for wrapping a peripheral nerve during the first attempt to decompress that nerve. Indications, even by those who are proponents of wrapping, are to use the wrap for failed previous surgery.**

It is instructive to look at the product literature website for the collagen material, NeuraWrap™ (see figure 12-27) and view their image of how the device is placed. They state that the collagen will form a rigid structural “encasement” that will protect the nerve, and then be absorbed without scar formation about the nerve.

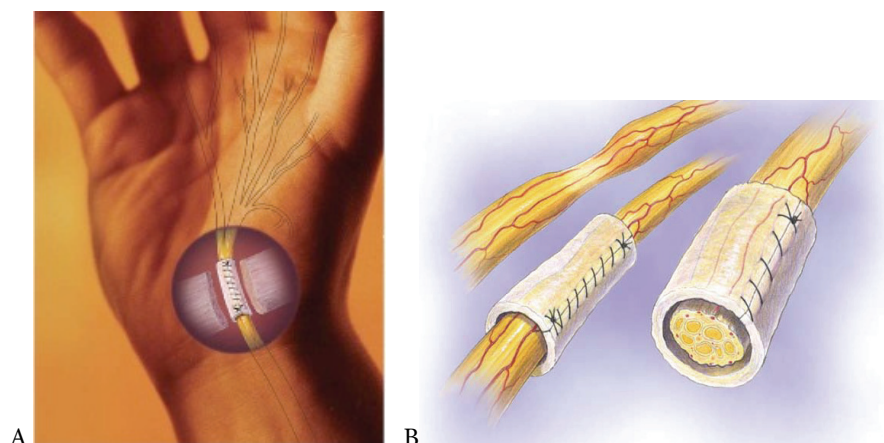


Figure 12-27. The NeuraWrap™. This is collagen taken from an animal, purified and produced in a tubular form. A. Shown around the median nerve in the carpal tunnel with the ligament divided. B. Shown sutured in place. (<http://www.ilstraining.com/NTC%20Solutions/brochures/NeuraWrapBrochure.pdf>)

My approach to decompression includes a complete decompression, because if the nerve is not released completely, surgery will fail regardless of wrapping. Following surgery, all my patients use their arms, legs, and their pelvic areas. Every two hours my patients in the immediate weeks after surgery move, and while this prevents blood clots in the legs, it also promotes nerve gliding. This permits the nerves to glide immediately after surgery with walking in the room. Following suture removal, this gliding of the nerve continues with water therapy. In Figure 12-28 you will see an example of a nerve “wrap” that I have had to remove when I re-operated on someone who had previous ulnar nerve surgery (for a nerve at the elbow), and in Figure 12-29 you will see an example of a nerve “wrap” that I had to remove when I re-operated on someone who had previous common peroneal nerve surgery (for a nerve at the knee (see Chapter 1 and 2). These patients were operated on by surgeons who were “Wrappers”. It does not matter which peripheral nerve the wrap is put on, the principles are the same. A wrapped nerve will become stuck to the wrapping material even if the product literature says the material is absorbed in 3 months. The wrapping material will be stuck to the surrounding tissues by three weeks and also to the peripheral nerve around which it is wrapped. Instead of wrapping a nerve, the surgeon must just do a complete neurolysis and permit the nerve to glide after surgery by allowing movement. I accomplish this movement by getting the patient to change chairs and walk.

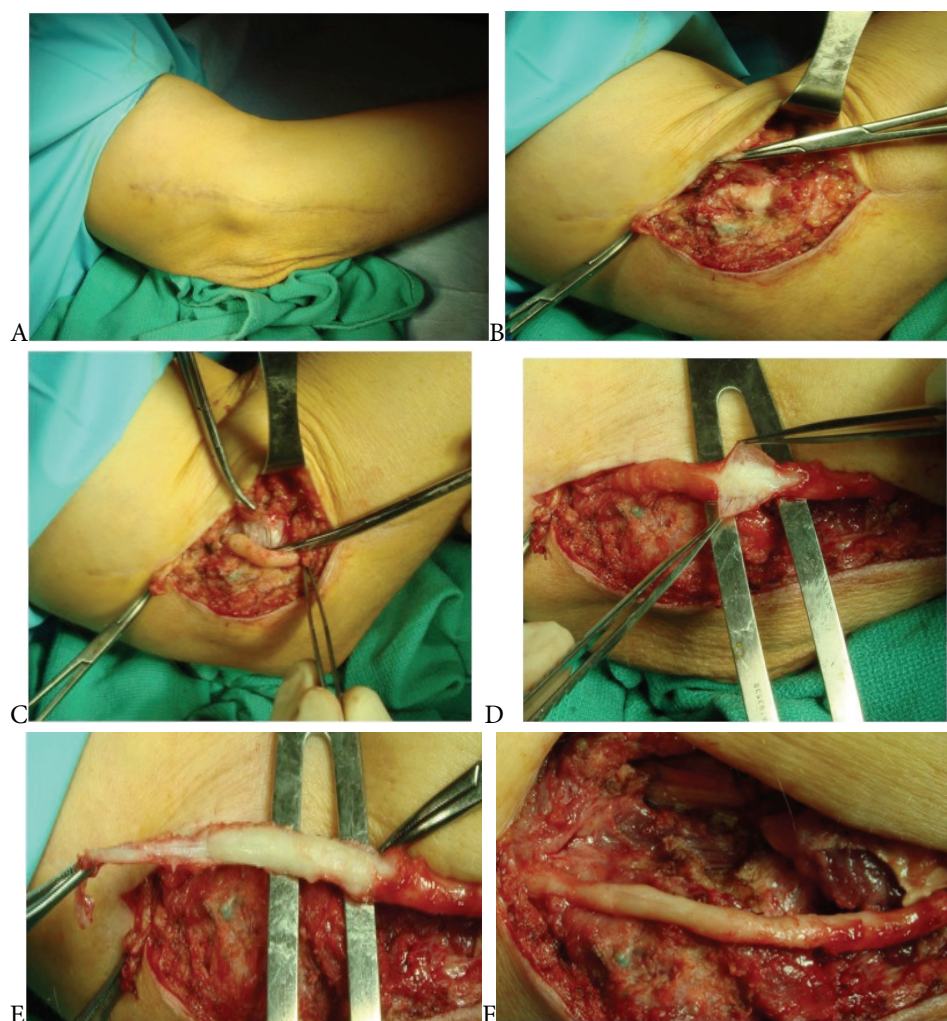


Figure 12-28. Wrap Removal. A) Elbow view showing incision where this nerve has had three previous surgeries, the last one placed a collagen wrap around the ulnar nerve to “prevent scarring”. B) White material of the wrap is seen scarred to the surrounding tissue. C) The wrap is now separated from the surrounding tissues. D) The wrap itself is opened. It is clearly stuck to the nerve. E) After extremely difficult microsurgery, the wrap is removed from the nerve. F) With the collagen wrap removed, the whitish area where it was stuck to the nerve causing continued compression can be observed. Note the nerve is narrowed where the wrap was joined to the nerve. Note that after removing the wrap, the nerve is placed into surrounding normal tissue. It glides now immediately after surgery without being wrapped.

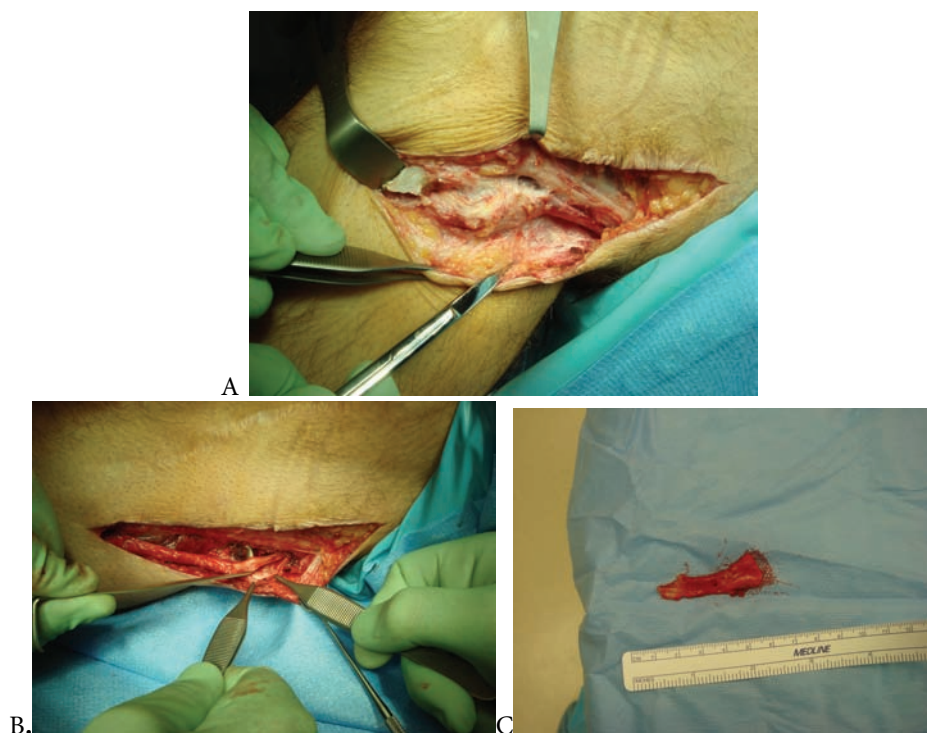


Figure 12-29. Wrap Removal. A) Knee view showing incision where this nerve has had one previous surgery. The foot is to the left, and the thigh to the right. At surgery, a collagen wrap was put around the common peroneal nerve to “prevent scarring”. The swollen nerve with its wrapping is stuck to all surrounding tissues. B) After doing the neurolysis that separates the wrap from these tissues, the wrap itself must be removed. The forceps are holding the wrapping material as it is separated from the common peroneal nerve, which is beneath the retractor. The material of the wrap is seen scarred to the nerve itself. C) The wrap after it is removed. Clearly it was not absorbed.

PELVIC STABILITY WITHOUT LIGAMENTS

In figure 12-6, the ligaments of the pelvis are illustrated from several views. The ligaments are the sacrotuberous (ST) and the sacrospinous (SS) ligaments. The pudendal nerve exits the true pelvis over the SS and then goes under the ST ligament to cross a space and enter into Alcock’s canal. In some people, the symptoms of chronic pelvic pain may come from compression of the pudendal nerve being caused to sag and pull against the SS ligament, or the nerve may be caught between the SS and ST ligaments, or be compressed just beneath the ST ligament. From the peripheral nerve point of view, any and all structures compressing a nerve must be released. *The question must be asked are either or both of the SS and ST ligaments necessary for pelvic stability, for pelvic function, and therefore need to be either not cut or be reconstructed. While some of the patients*

who see me have been told that dividing the ST ligament would lead to pelvic instability, and therefore the ST ligament needed to be reconstructed, this has not been my approach.

Therefore it is appropriate to see what the medical literature, the evidence base, says about this subject so we can incorporate that knowledge into our approach for treating chronic pelvic pain. As you will see, I have concluded that the ST & SS ligaments are **NOT** necessary for pelvic stability.

Sacroiliac Joint Disease or SIJD is the theoretical consequence of division of the sacrotuberous ligament suggested by some as a complication of division of the ST ligament during pudendal nerve decompression. Symptoms of SIJD are localized pain in either the right or left sacroiliac joint. This may exist either prior to the pudendal nerve problem, or at the same time as the pudendal nerve problem. Most patients never have an evaluation of their sacroiliac joint prior to their pudendal nerve surgery. The physical exam should include the “figure of four test” as illustrated and explained in Figure 12-30.

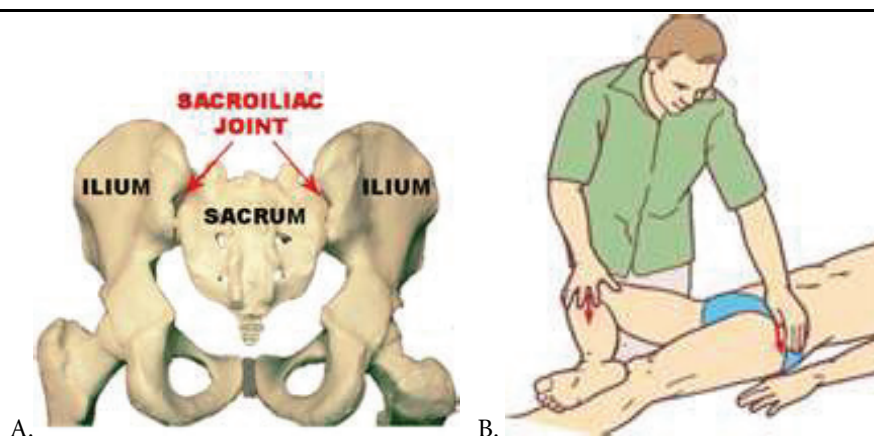


Figure 12-30. A.) The sacroiliac joint B.) The “Figure Four Test” for sacroiliac joint pain. The doctor pushes down on the flexed knee while holding the other hip against the table. If there is SIJD present, the sacroiliac joint will hurt on the same side as the knee that is being pushed down.

(wedgetail.medicine.net.au). Also called Patrick’s test or the FABER test (Flexion, Abduction, External Rotation). Safer than Gaenslen’s Maneuver, which is similar but lets the opposite hip extend off the exam table, and tests both SI joints at the same time.

Definitions of pelvic stability arose from the orthopedic surgeons who operated upon pelvic fractures, and these definitions are well established now. About thirty years ago, Marvin Tile, MD, Professor of Orthopedic Surgery at the University of Toronto in Canada, developed an approach to fractures related to the strength of the ligaments. Disruption of the pubic symphysis with or without division of the ST and ST ligaments were in his Type A group, and were stable.* These were the *weakest* of the pelvic ligaments. J.W. Young and Andrew R. Burgess, both Professors of Orthopedic Surgery at the University of Maryland, Shock Trauma Unit, in Baltimore, developed an approach related to the mechanism of the pelvic injury, either lateral (side) crush, or anterior-posterior (front to back) crush. Their stable category, Type I, included division of the ST & SS ligaments as long as the pubic symphysis disruption did not exceed 2.5 cm.** Therefore, a pelvic fracture is stable even if the ST & SS ligaments are ruptured *unless the pubic symphysis is widely separated or the ligaments related to the sacroiliac joints are disrupted. Unless a patient with chronic pelvic pain sustained a previous pelvic fracture, it is most likely they do not have pelvic instability.*

In the pelvis that has not had a fracture, such as in the typical patient with chronic pelvic pain, will dividing the ST and the SS ligament cause pelvic instability? There are four research publications done using the pelvis from human cadavers. These are reviewed in Table 12-3. See Figure 12-30.

From the review of scientific literature, I have concluded that ST & SL ligaments are not necessary for pelvic stability in the adult. Therefore, if a patient with chronic pelvic pain needs to have the ligament(s) divided to decompress the pudendal nerve, then it is safe to divide them. It is also concluded that a divided ligament does not need to be reconstructed.

* Tile, M, Helfet, DL, Kellam JF, *Fractures of the Pelvis & Acetabulum*, 3rd edition, Lippincott Williams & Wilkins, Philadelphia, 2003.

** Young, JW, Burgess, AR, Brumback, RJ, et al, Pelvic fractures; value of plain radiography in early assessment and management, *Radiology*, 160:445-451, 1986.

TABLE 12-3.
PELVIC STABILITY:
SACROTUBEROUS & SACROSPINOUS LIGAMENTS

ST & SS LIGAMENTS NEEDED FOR STABILITY	PUBLISHED SCIENTIFIC REFERENCE	TYPE OF RESEARCH STUDY	COMMENTS
NO	Simonian PT, et.al, Clinical Orthopedics & Related Research 309: 245-256, 1994	Cadaver biomechanical 7 specimens Fracture/Fixation pressure stress	“division of ST & SS ligaments produced little additional motion”
NO	Vrahas, M, et al, Orthopedics 18:271- 274, 1994	Cadaver biomechanical 12 specimens sequential cut pressure stress	“ST & SS ligaments contributed little to overall pelvic stability”
NO	Conza, NE, et al, Journal Biomechanics 40:1599-1605, 2007	Cadaver biomechanical one specimen vibration 10 to 340 Hz	“ST & SS ligaments do not play a role in pelvic dynamics as measured in this study”
NO	Varga, E, et al, Injury International Journal Of the Injured 39:858- 864, 2008	Cadaver biomechanical 8 specimens sequential cut pressure stress	“strength of the ST & SS was significantly less than was expected” & “proprioceptive role” postulated

The anatomy of the ST & SS ligaments may account for some of the variability in symptoms patients experience. In a study* done on 50 human cadavers, it was found that the length of the ST ligament varied from 65 to 121 mm (about 2.5 to 5 inches), with the average length being 86 mm (3.5 inches). The thickness of the ST ligament varied from 2.5 mm to 5.8 mm, with an average thickness being 4 mm. On average, the ST was 76 mm wide at the sacrum and 58 mm at the ischial tuberosity. At the middle of the ST ligament, it ranged from 22 mm to 45 mm, with an average width of 35 mm. While my mental concept of these ligaments has been as flat structures, they are, as seen in Figure 12-31, truncated, connected cones. Another variation is the fascial “falciform” process of the ST ligament, which is absent in 13% of cadavers. When it is present, it may compress pudendal nerve branches too.**

* Loukas, M, Louis, RGJr, Hallner, B, Gupta, AA, White, D, Anatomical and surgical consideration of the sacrotuberous ligament and its relevance in pudendal nerve entrapment syndrome, *Surgical Radiology & Anatomy*, 28:163-169, 2006.

** Hammer, N, Steinke, H, Slowik, V, Josten, C, Stadler, J, Bohme, J, Spaniel-Borowski, K, The sacrotuberous and the sacrospinous ligament: A virtual reconstruction, *Annals of Anatomy*, 191:417-425, 2009.

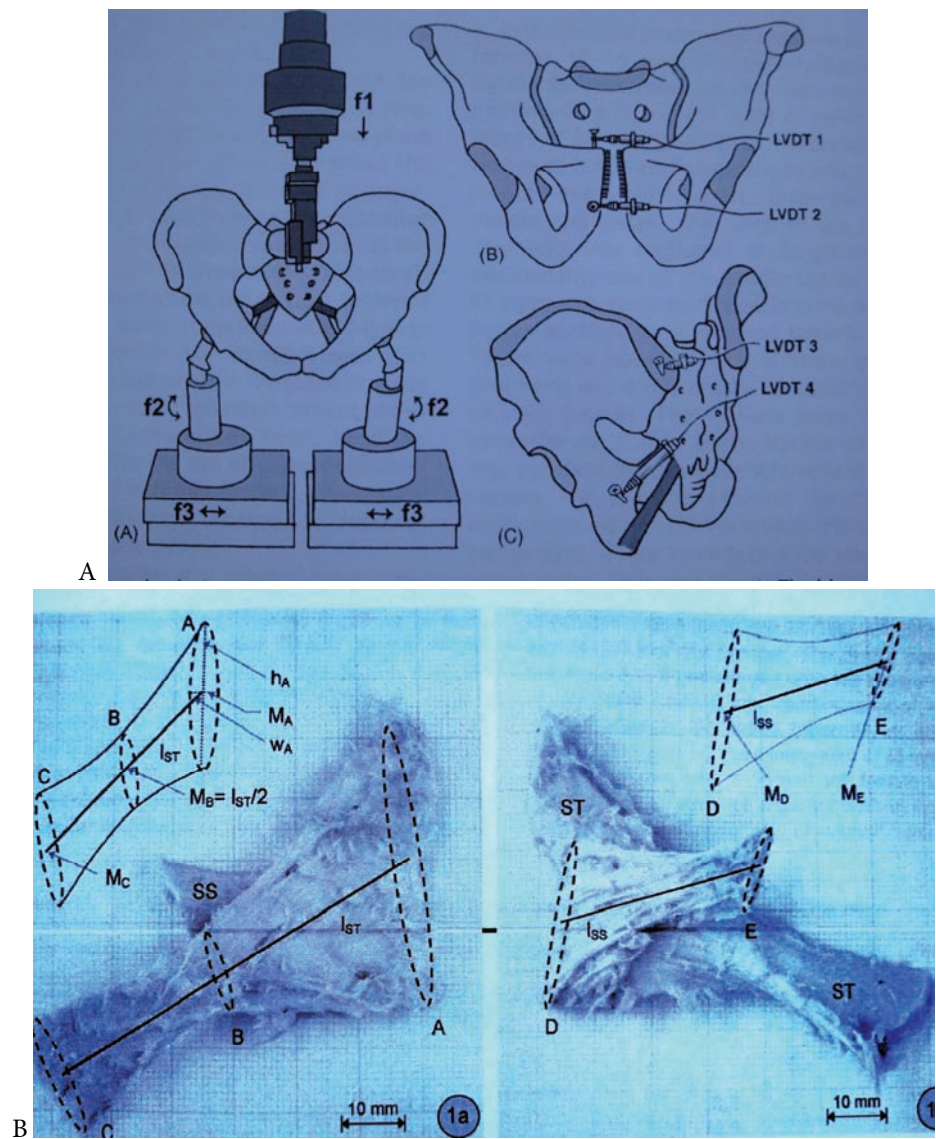


Figure 12-31. Biomechanical concepts of the sacrotuberous (ST) and sacrospinous (SS) ligaments. A) Example of biomechanical testing device used to evaluate strength of pelvic structures reviewed in Table 12-2. (Varga, E, Dudas, B, Tile, M, Putative proprioceptive function of the pelvic ligaments; biomechanical and histologic studies, *Injury*, 39:858-864, 2008.) B) The three dimensional appearance of the ST, left, and SS, right, ligaments demonstrating truncated interconnected cones. (Hammer, N, et al, The sacrotuberous and sacrospinous ligament: a virtual reconstruction, *Annals of Anatomy*, 191:417-425, 2009)

“Dr Dellon, I feel as if there is a cord or cable pulling me apart. It goes from my tailbone down to the inside of my thigh. It is an unbearable pain,” said Harry, a 30 year old man who had a history of pain with sitting, but no rectal pain. He had played soccer when younger, and may have had some stretching injuries during those years, but no one single injury stood out in his mind. He had ten years of pain, was unable to work, and had taken therapy for many months. Previous division of his pyrimiformis muscle, by another surgeon, did not give him any relief. His physical examination demonstrated tenderness over the pudendal nerve beneath the sacrotuberous ligament, which was located anatomically exactly where he described and drew the “cables” that were the source of his pain. At surgery, done through my preferred vertical posterior incision, he was found to have a wide and thick sacrotuberous ligament, no falciform ligament, and his rectal nerve to be already a separate nerve beneath the sacrotuberous ligament. Once divided, the sacrotuberous ligament spread apart 12 mm (usually it only spreads about 4 to 6 mm), and the pudendal nerve popped into view. This explained his absence of rectal symptoms, and his relief after surgery. See Figure 12-32 for the landmarks for the surgery, and Figure 12-33 for the appearance of the divided sacrotuberous ligament. It is likely that the sensory nerves that have been demonstrated to be within this ligament were under such tension, his mind perceived the pain to be coming directly from these tense ligaments rather than from other branches of the pudendal nerve. ***He HAD NO POST-OPERATIVE SYMPTOMS OF PELVIC INSTABILITY.***

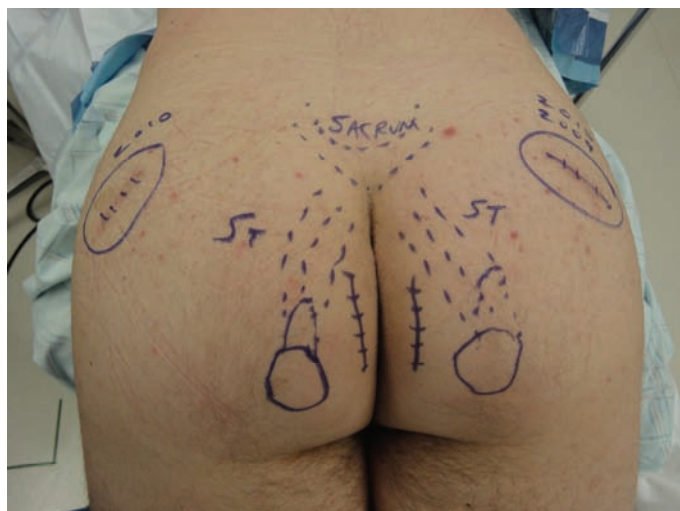


Figure 12-32. Surgical incision planning. The circled healed incisions at the outer, upper, lateral regions of the buttocks do NOT permit access to the region of the sacrotuberous ligament and Alcock's canal. In this patient, they were used to divide the piriformis muscle, decompressing the pudendal nerve at the greater sciatic notch, but this did not help the patient's symptoms. The sacrotuberous ligament (ST) location can be estimated by drawing lines from the ischial tuberosity (circle with projection towards the sacrum) and the sacrum. The vertical hatched lines are the proposed incisions for my preferred posterior surgical approach, which enters the ischiorectal fossa, identifies the rectal nerve, and then proceeds to the sacrotuberous ligament. There is a great deal of anatomic variation.

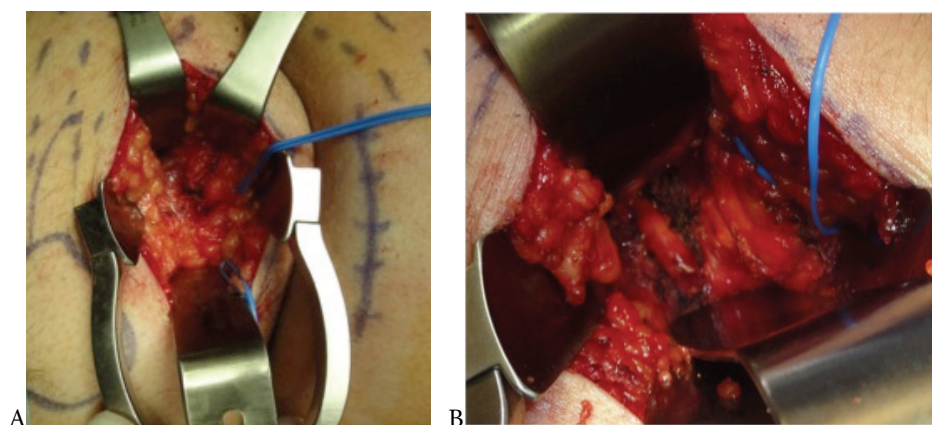


Figure 12-33. Intra-operative views of sacrotuberous ligament division and the pudendal nerve decompression. Correlate the skin markings of these photographs with those of Figure 12-32. A) The left ischiorectal fossa is entered and two branches of the rectal nerve are identified in the fat, encircled with blue "vessel loops". There is no falciform process of the sacrotuberous ligament covering them. The gluteus muscle, deeper red, is beneath the top retractor. B) The blackened edges of the divided sacrotuberous ligament are on both sides of the released, protruding pudendal nerve. The bipolar coagulator is used first to prevent bleeding prior to dividing the ligament, and protect the nerve from injury, giving the black color to the ligament. A purplish inflamed area of the pudendal nerve is present just as it passed the ligament. Alcock's canal is still further down to the lower left, and is not shown in this photo.

HIP JOINT AS A SOURCE OF PELVIC PAIN

Recently Deborah Coady, MD, a Gynecologist on the faculty at New York University -Langone Medical Center has been relating some causes of chronic pelvic pain with intrinsic problem in the hip joint. Her work was presented to the American College of Gynecology in 2011. Her patients all had pain in the clitoris, or vulva, or perineum and had complaints in their hip. An MRI of the hip demonstrated a true structural problem, usually a tear in the “labrum” associated with “impingement ” (an abnormal collision of bony structures within the hip joint). In 24 patients out of 100 who failed to improve with physical therapy and hip injections, an Orthopedic endoscopic hip procedure was done. At a minimum of 9 months after the hip surgery, 96% had improvement in hip symptoms, 71% had improvement in both hip and pelvic pain, 25% had improvement in hip but only some improvement in pelvic pain, and 4% had no benefit in either hip or pelvic pain. Younger women with a shorter duration of pain had the best outcomes.* The critical concept here is that if someone with pelvic pain also has hip complaints or a history of hip injury, it is essential to obtain a workup of the hip, including an MRI and an Orthopedic consultation. Since two-thirds of women in this report by Coady and co-workers showed improvement by addressing hip problems, it must be concluded that hip problems should be treated before surgery on the pudendal nerve or cluneal nerves.

PAIN WITH SITTING

“I CANNOT SIT WITHOUT PAIN”, said Grace. “It has been five years since I fell from a horse and landed on my ‘butt’. Ever since then I have both rectal pain and pain with sitting. I can put my finger on the side of the ‘sitz bone’, and it hurts when I press in there,” she continued. “I spend my day lying on my side on the couch, or standing. I cannot ride my horses anymore. I am on lots of medications, and my quality of life is horrible.”

* The Relationship Between Hip Disorders and Chronic Pelvic Pain, Deborah J. Coady, M.D. New York University- Langone Medical Center, New York, NY; Stacey J. Futterman, M.P.T., Beyond Basics Physical Therapy, New York, NY; Meeta Shah, M.D., Struan Coleman, M.D.Ph.D, Hospital for Special Surgery, New York, presented to the American College of Gynecology, 2011.

Grace had been evaluated by many doctors and in fact her X-ray of her pelvis showed a small, healed fracture at the medial posterior border of the ischial tuberosity. She had responded with relief of her rectal pain by a pudendal nerve block, and on physical examination was tender over the pudendal nerve at the sacrotuberous ligament and also near the medial border of the ischial tuberosity, the entrance of the pudendal nerve into Alcock's canal. It was certainly possible that sitting on this bone worsened her pudendal nerve entrapment. She was told that she might need two operations, one for the pudendal nerve for the rectal pain, and one through a different incision, for her pain with sitting if the posterior femoral cutaneous nerve branches were involved in the injury. *At her first surgery, the rectal branch of the pudendal nerve was released, and the sacrotuberous ligament was divided. This resulted in relief of her rectal pain within the first 6 weeks.*

By three months after surgery, while her rectal pain remained gone, she still had trouble sitting, and a second operation was planned (see Figure 12-34). *At her second surgery, the damaged branches of the posterior femoral cutaneous nerve were found to be adherent and stuck in scar at the site of her injury to the ischial tuberosity. These nerve branches were removed, relieving pain in this location. She now can sit as long as she wishes without pain. Another patient with this is seen in Figure 12-37.*

THIS HIGHLIGHTS THAT OFTEN PUDENDAL NERVE AND OTHER PROBLEMS OVERLAP, AND MAY REQUIRE MORE THAN ONE SURGERY TO RESOLVE THE COMPLEX PROBLEM. WHILE IT IS CRITICAL TO CORRECT PROBLEMS WITH THE PUDENDAL NERVE ITSELF, IT MUST BE REMEMBERED THAT OTHER NERVES CAN TRANSMIT THE PAIN MESSAGE THAT "SITTING HURTS", AND IT MAY BE NECESSARY TO TREAT THESE OTHERS NERVES EITHER INSTEAD OF THE PUDENDAL NERVE OR IN ADDITION TO THE TREATMENT OF THE PUDENDAL NERVE.

THE PUDENDAL NERVE DOES NOT GO TO THE BUTTOCK OR THE ISCHIAL TUBEROSITY, AND SO PUDENDAL NERVE PROBLEMS CANNOT CAUSE PAIN IN THOSE AREAS.

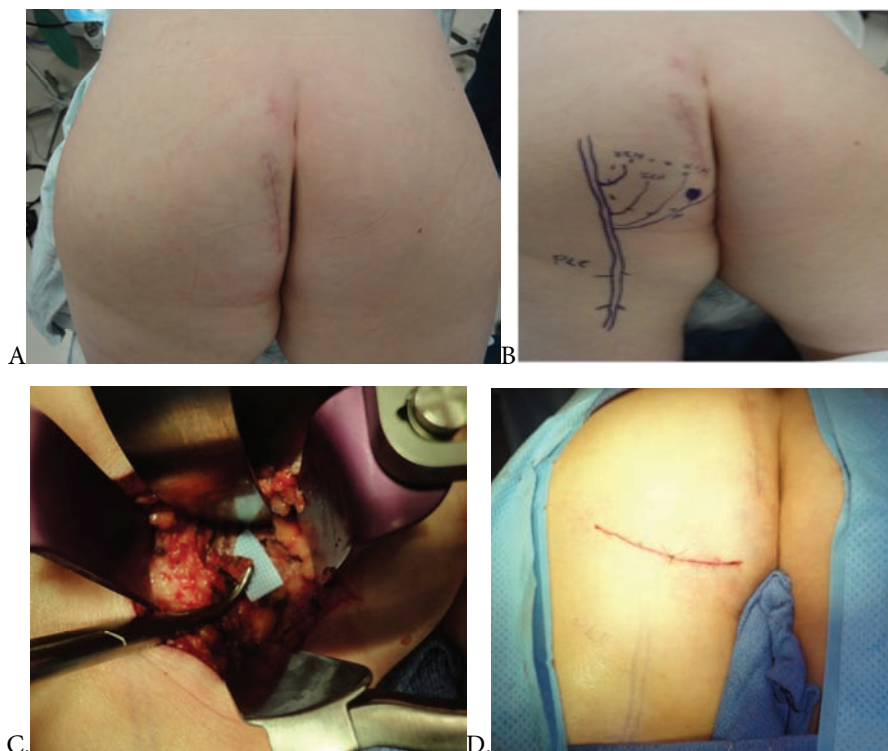


Figure 12-34. Woman who fell from a horse, landing upon her “butt”, causing both pudendal nerve (rectal) pain and pain with sitting. She had both a pudendal nerve entrapment, which was released in her first operation, relieving her rectal pain (note scar in A), and then required a second operation three months later to resect the inferior cluneal branches of the posterior femoral cutaneous nerve (note branches drawn in B with dark spot being her site of pain. Compare this drawing with the anatomy illustration in Figure 12-12. C. Intra-operative view of the damaged inferior cluneal nerve (held in clamp). This nerve was adherent to the ischial tuberosity at the site of her injury. Since this created a painful neuroma, this nerve was removed, implanting the proximal (live) end of the nerve into the gluteus maximus muscle. D. The gluteal crease incision used to approach the posterior femoral cutaneous nerve, shown immediately at the end of the operative procedure, with patient still in the prone position.(also see Figure 12-37)

HAMSTRING PULL AND PAIN WITH SITTING

The hamstrings are the muscles that originate (begin) on the ischial tuberosity (the “sitz bone”) and connect to leg in such a position that they flex the knee (see Figure 12-12, and 12-35). These muscles can be torn or sprained, or actually torn loose from the bone giving problems not only with muscle function, but also, as it relates to chronic pelvic pain, can give pain with sitting. Sitting on the pudendal nerve worsens symptoms of pudendal nerve compression: worsening of pain in the rectum, perineum, vulva, scrotum, vagina, penis/clitoris.

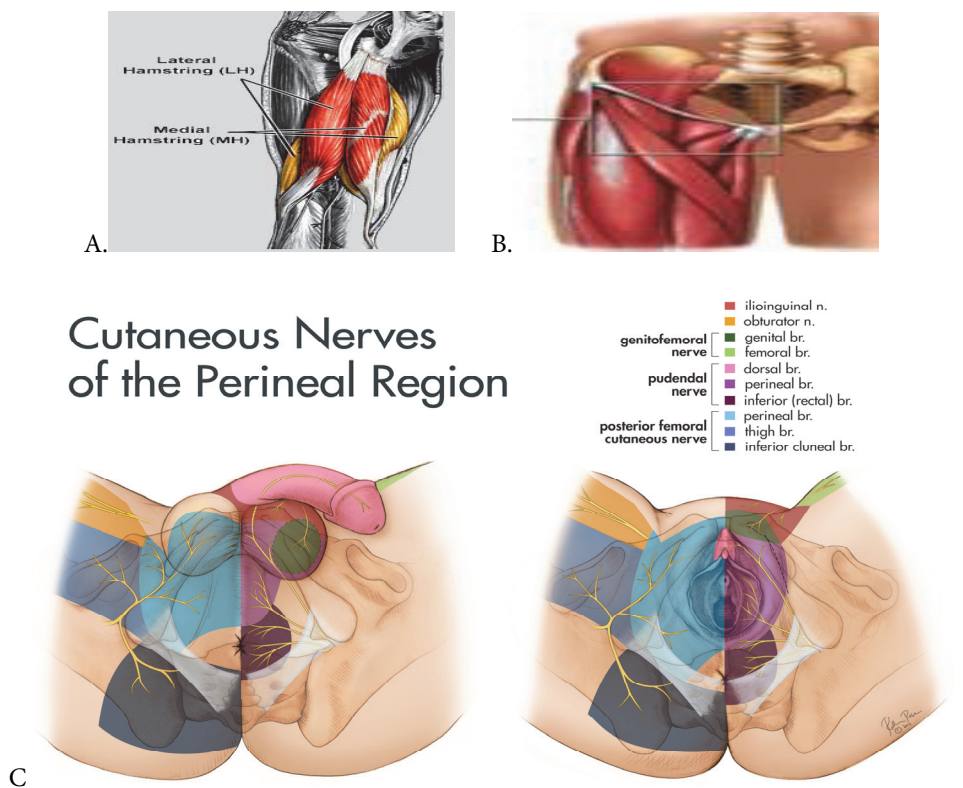


Figure 12-35. Muscles that originate from the ischial tuberosity can cause pelvic pain. A) The hamstrings are posterior, and injury can give pain related to sitting. B) The adductor group, which pull the knees towards each other, and are accessory movers of the hip, primarily cause groin pain near the front of the pubic bone, rather than giving pain with sitting. The physical examination is important for differentiating their involvement in pelvic pain. C) Illustration of the skin territories of the perineum. For both the male and female illustration, the person's right side, the left side as you view the drawing, shows the posterior femoral cutaneous nerve. For both the male and female illustration, the person's left side, the right side as you view the drawing, shows the pudendal nerve. Note how the perineal branch of the posterior femoral cutaneous nerve overlaps the perineal branch of the pudendal nerve. Other nerves that innervate the groin region are also illustrated according to the legend.

The pudendal nerve enters Alcock's canal at the medial (inner) side of the ischial tuberosity. This is a location not far from the site where the hamstring muscles (the biceps, and the semimembranosus and semitendinosus muscles) start out. If the forceful muscle pull injures either the little nerve branches that go to the periosteum (the white connective tissue covering of the bone) from which the muscles arise, or the force of the injury or its inflammation involve the branches that cross these muscles (the inferior cluneal or perineal branches) of the posterior femoral cutaneous nerve, then the brain will receive pain messages with sitting. The patient will usually be noted to either stand while awaiting you in the examining room, or be seated on some sort of improvised pillow (Figure 12-35).

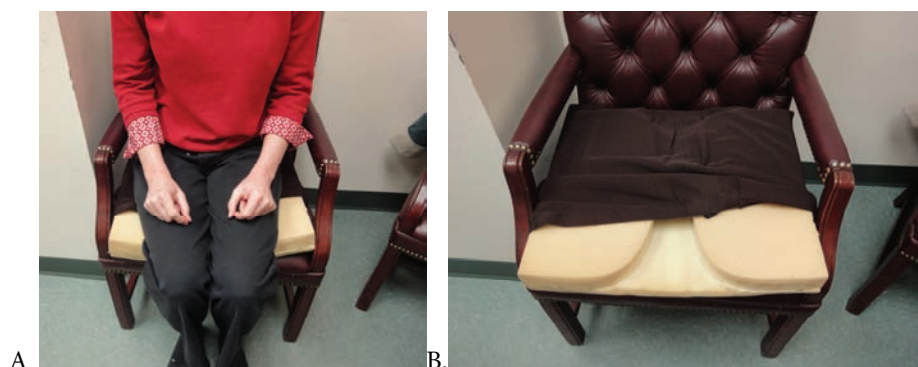


Figure 12-36. Woman in waiting room, who is sitting (A) but does so only with an adaptive, custom created foam pillow (B). The history and physical examination are critical in making the differential diagnosis of pain related to the pudendal nerve and/or the branches of the posterior femoral cutaneous nerve.

In this situation, while a pudendal nerve block may relieve the rectal pain, it will not relieve the pain with sitting. When this occurs, it is important for the doctor to point out to the patient that decompression of the pudendal nerve may relieve the rectal pain, but it will not relieve the pain with sitting. It is therefore critical that the doctor caring for pudendal nerve problems in the patient who experiences pain with sitting carry out a physical examination designed to see if there is pain with resisted leg (knee) flexion, which causes the hamstring muscles to pull against the ischial tuberosity, and if there is pain at the inferior and medial aspect of the ischial tuberosity. This type of pain is illustrated by the following case history.

“Dr Dellon, I fell at home getting out of my bathtub,” said Arlene,” and tore my left hamstring right from the bone. I had horrible pain right away, and could not walk. The Orthopedic Surgeon re-attached my muscle to the bone with three screws. That was 4 years ago. Well, I could walk after that but have been unable to sit for more than 5 or 10 minutes without severe pain next to that bone where the muscle was hooked back.” When I examined Arlene, she was tender directly at the site at which the muscles had been reattached to the ischial tuberosity. Furthermore, she had an area of decreased sensation in a line straight down from her buttock crease (gluteal fold) to the back of the knee (popliteal fossa). This skin is directly supplied by the posterior femoral cutaneous nerve (see the green zone behind the thigh in Figure 12-4). Arlene had no rectal complaints, so that in this situation her pain with sitting was clearly due just to the branches of the posterior femoral cutaneous nerve and that nerve itself. Since this represented a stretch/traction injury and neuroma, this nerve had to be removed. Figure 12-37

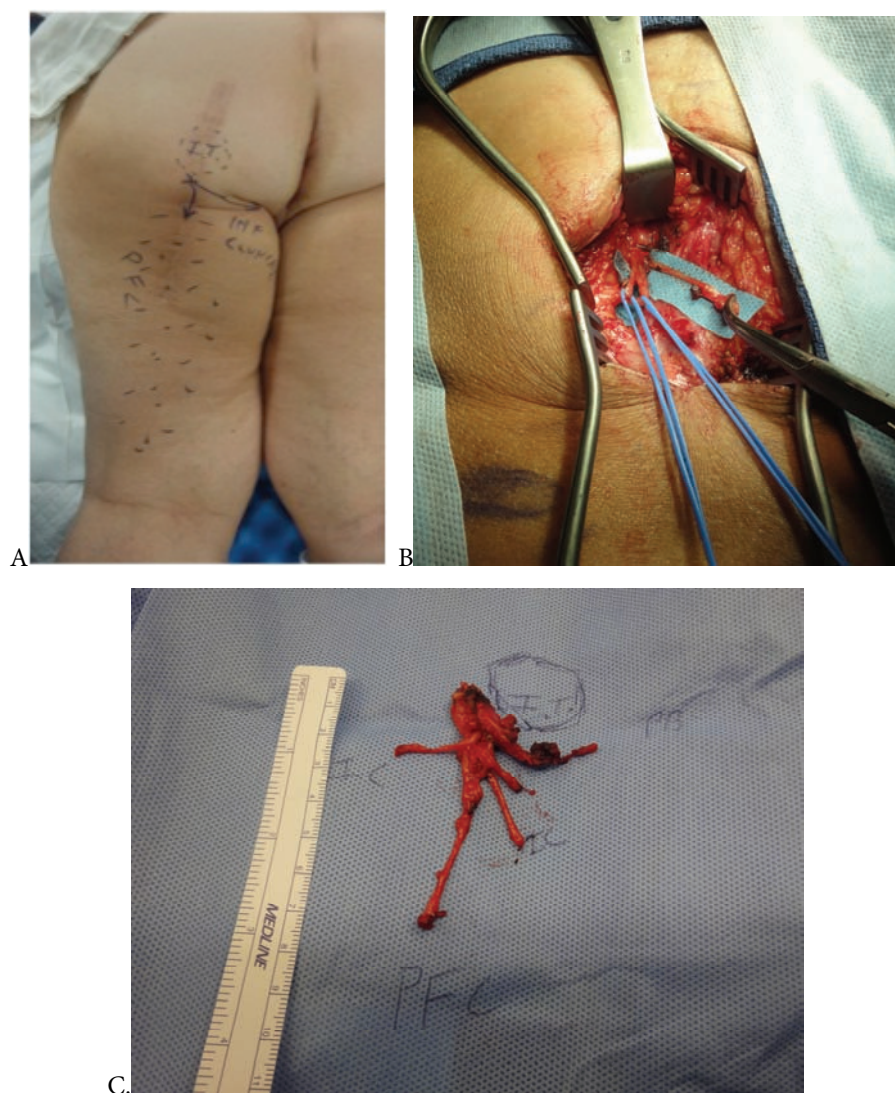


Figure 12-37. A woman who tore her left hamstring from the ischial tuberosity. The muscle was reattached by an Orthopedic Surgeon, using screws. While her muscle function returned, she had debilitating pain and could not sit due to a neuroma of the posterior femoral cutaneous nerve and its branches. A) the area of numbness from the sensory loss is shown in blue dots down the back of her thigh. The scar from the orthopedic surgery is seen across her buttock. The branches of the nerve are drawn in. B) the posterior femoral cutaneous nerve is held in the clamp, while other inferior cluneal branches are identified with blue rubber loops. C) Injured nerve and its branches are excised. The relationship of this nerve to the ischial tuberosity is noted by depicting the bone as a circle labeled "IT". PFC is the posterior femoral cutaneous. IFC are inferior cluneal nerve branches.

demonstrates this surgery. Following this surgery, Arlene began a program of water therapy, as discussed earlier in this chapter. She had no more pain with sitting. The numb area related to removing this nerve was almost not detectable 6 months later.

THE DOCTOR MUST DEMONSTRATE AND EXPLAIN TO THE PATIENT THAT PAIN WITH SITTING CAN BE DUE TO MORE CAUSES THAN JUST PUDENDAL NERVE ENTRAPMENT. THESE OTHER CAUSES MUST BE EVALUATED BEFORE PUDENDAL NERVE SURGERY IS DONE. PUDENDAL NERVE SURGERY ALONE MAY NOT BE SUFFICIENT TO RESTORE THE ABILITY TO SIT WITHOUT PAIN. WHILE SITTING PUTS PRESSURE ON THE PUDENDAL NERVE AND WORSENS PUDENDAL NERVE SYMPTOMS, THE PUDENDAL NERVE ITSELF DOES NOT CAUSE PAIN IN THE BUTTOCKS OR AT THE ISCHIAL TUBEROSITY.

GROIN PULL AND CHRONIC PELVIC PAIN

Chronic pelvic pain may be related to tearing the origin of the adductor muscles. For women, this can happen during childbirth, or it may be a consequence of stretching of the muscles while in the lithotomy position for an internal pelvic exam or during vaginal surgery. For women the adductor muscle pull may be the result of sports such as soccer, pilates stretching, gymnastics, etc. The pain is at the origin of the muscle from the front of the pubic bone primarily, but some of the adductor muscles do arise more posteriorly with origin towards the ischial tuberosity. It is usually the adductor longus, right at the area just below the vulva, where the tear occurs, and hence the confusion of this pain with anterior vaginal pain, vulvodynia, or even clitoral pain. In men, the muscle is most often torn during soccer or rugby, American Football or sliding during baseball, but a simple slip with a leg becoming outstretched can do it.

In contrast to the patient who has pain with sitting, and who is seen either standing in the exam/waiting room, or lying on the exam table, the patient with a groin pull will be seen sitting in a chair with the leg extended slightly at the hip (see Figure 12-38). The most accurate way to make this diagnosis is to have the patient lie flat on their back and try to let the flexed leg rotate externally. This will cause pain referred to the anterior pelvic ring, and a thickened fascia at the site of the tear can be palpated with the limited external rotation clearly evident (see Figure 12-38).

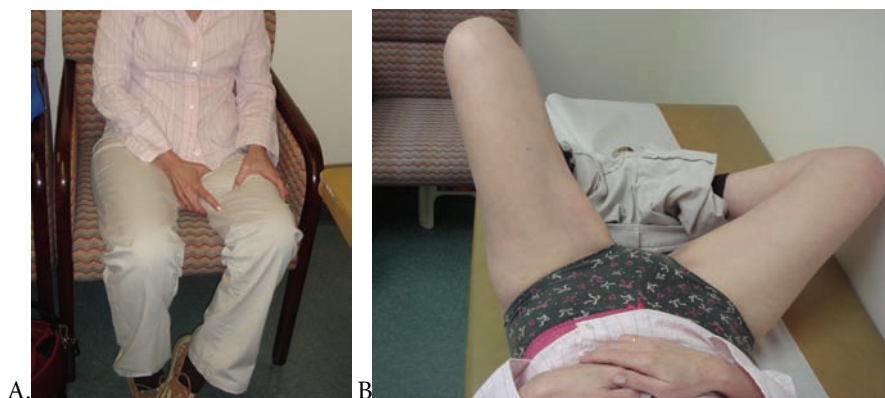


Figure 12-38. Groin Pull, an injury to the leg (thigh) adductor muscles, causes pain referred to the front of the pubic area. Sitting itself does not hurt usually but the pain itself can cause an abnormal sitting posture (A). The best physical examination test is to have the patient lie on their back (B) and with the non-painful side rotated externally, as in the right side shown here, try to externally rotate the painful side. If there has been a tear in the adductor muscle, the leg will not rotate as far outwards, and the muscle will have a thickened hard area protrude with pain where it connects to the pubis.

The treatment for a groin pull is primarily non-surgical, but by the time someone gets to see me, they have had physical therapy, cortisone injections, anti-inflammatory treatments, which are all the same approaches used for treating hamstring injuries. Most often, the diagnosis is completely missed and the patient just has the diagnosis of **chronic pelvic pain**. By this time in this chapter you have come to realize that **CHRONIC PELVIC PAIN IS NOT A DIAGNOSIS BUT A SYMPTOM** and it is critical to make the correct diagnosis to give the best treatment.

With a groin pull, there can be a secondary compression of the saphenous branch of the femoral nerve, because the adductor muscle group participates in the formation of the ADDUCTOR CANAL in which the saphenous nerve can become entrapped. If this is present, the patient may also complain of knee pain, such as the following.”

“Dr Dellon I was referred to you for knee pain. I am a soccer player at the University, and have sprained my knee many times. The Orthopedic Surgeon says my MRI of my knee ligaments is perfect, and they cannot find anything wrong with my knee, and will not do a knee arthroscopy.” “Susan,” I said, “Did you have a groin pull?” “Yes, Dr Dellon, I did. In high school, about 6 years ago. It never really got better but I have learned to play soccer with that pain.” When I examined Susan, she had pain at the junction of the adductor tendons from the pubic bone, with pain, but she also had a tender spot when I tapped on the known site of compression of the saphenous nerve in the tunnel in the

lower thigh, above the knee, where this nerve can be compressed by a tunnel formed by the adductors and the quadriceps muscle. Furthermore, she had abnormal touch sensation along the branches of the saphenous nerve (see Figure 12-39). After release of the adductor contracture and neurolysis of the saphenous nerve, she was free of knee pain and back playing soccer.



Figure 12-39. A) Groin pull in the right side, which after many years of contracture of the adductor muscles, in this college soccer player, caused secondary compression of the saphenous nerve in the adductor canal. Note the blue asterisk at the right pubic bone, origin of the adductor muscle. Note the inability of the right thigh to completely externally rotate, even, as is shown here, under general anesthesia, demonstrating the tight adductor muscle. Note the blue asterisk and arrow in the thigh at the side of the saphenous nerve entrapment, and the dotted blue region with abnormal sensibility due to entrapment of the saphenous nerve. Treatment consisted of release of the adductor contracture, denervation of the damaged obturator nerve branch to the periosteum of the pubic bone origin of the adductor muscle (similar to removing the branches of the posterior femoral cutaneous nerve at the ischial tuberosity after a hamstring injury), and doing a neurolysis of the saphenous nerve in the adductor canal. B) At 6 months, post-operative appearance of the groin and thigh scars, and demonstration of complete external rotation of the thigh after the adductor release. C) Here she is doing a "lunge" demonstrating no further knee or groin (chronic pelvic) pain.

The specific surgery to release the adductor muscle contracture is demonstrated in Figure 12-40. The patient walks immediately after surgery. Once the sutures come out on day 12, water walking begins.*

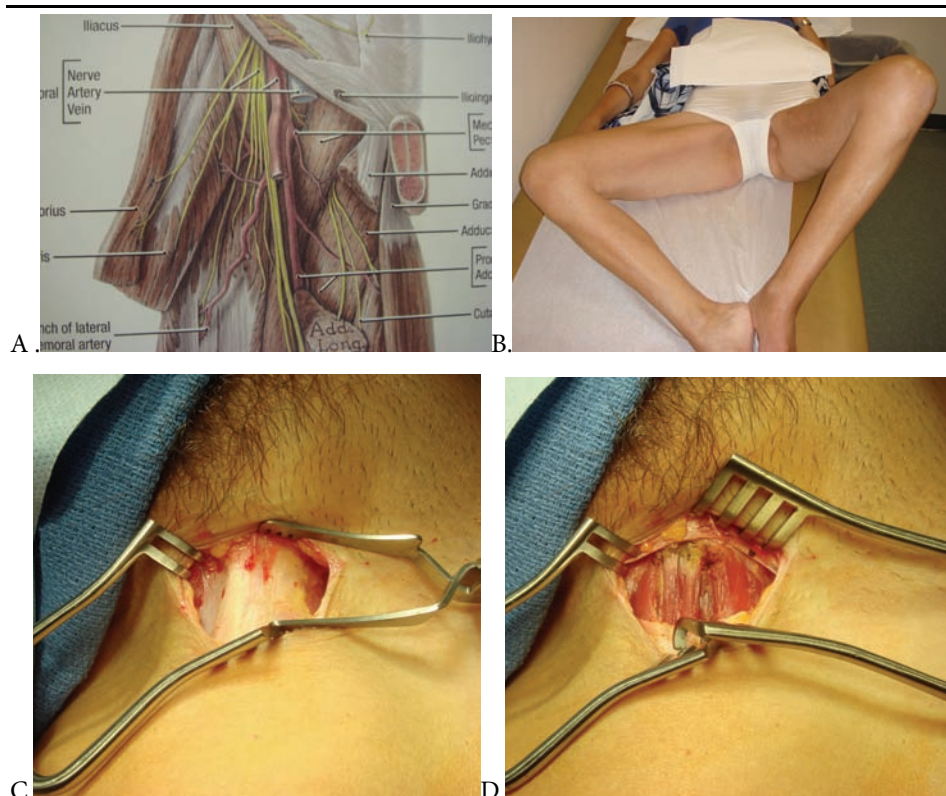


Figure 12-40. Surgery for groin pull. A) Anatomy in a man shows the normal white fascia of the adductor and saphenous branches of the femoral nerve that can cause referred pain to the knee. B) Note the left leg does not rotate externally at the hip. C) The left thickened white fascia where the adductor muscle stretched and tore. D) That white fascia has been divided, allowing the muscle to stretch out. Note the red muscle which is normal beneath the white, now released, fascia. The muscle is not cut.* The patient walks immediately after the surgery. The scar lies beneath the underwear.

* Dellon, AL, et al, Denervation of the periosteal origin of the adductor muscles in conjunction with adductor fasciotomy in the surgical treatment of refractory groin pull, Plastic and Reconstructive Surgery, in print 2011.

BETTER CLASSIFICATION:

BETTER TREATMENT

The better we can understand a problem, the better we will be at fixing that problem. **CHRONIC PELVIC PAIN** is a perfect example of what appears to be a clinical problem, but upon examination is actually a whole host of problems, many of which remain to be defined individually. The definition of chronic pelvic pain, given in the first page of this chapter, as pain from the umbilicus to the mid-thigh is more of a geographic definition than a medical definition. It is like saying the problem is related to “the house”. In this chapter, I have tried to separate “the house” into its components, its foundation, its walls, its plumbing, and its electrical wiring, and given some of these the medical names that are in common use in the doctor’s office. Instead of saying “my house is having a problem, please fix it,” we want to say, “there is a problem with the electrical wiring to the upstairs bedroom, please fix it”. To better get help from the correct home repair person, we want to figure out the exact problem and the best way to fix it. For example, if the house is locked, and you have lost the key, you can get into the house through the front or the back door to the house, or maybe through the cellar window. First you must define the problem, and then figure out how to approach the problem, and which way into the house will disrupt the house the least; break a window, hire a locksmith, break down the door, find the hidden key beneath the door mat.

My goal, at the **DELLON INSTITUTE FOR PERIPHERAL NERVE SURGERY®** is to develop an approach to making the correct diagnosis of the source of the pain, to develop a safe and reproducible surgical approach to relieving the pain problem once non-surgical treatments have failed to relieve the pain, and then to follow the patients to be sure they obtain the relief that they desire. This chapter is about my approach to the **CHRONIC PELVIC PAIN** problems that have a neurological basis. As discussed, those problems related to the ilioinguinal, iliohypogastric, genitofemoral and lateral femoral cutaneous nerves, nerves that go from the mid-thigh to the umbilicus, have been described in Chapter 4 on **GROIN PAIN**. To approach the treatment of the pudendal nerve, it is critical to base the surgical plan on where along the pathway of this nerve the compression or injury has occurred and plan a surgical approach based upon that location. Furthermore, it is critical to understand when symptoms that seem as if they are related to the pudendal nerve may be related to injury or compression of structures that are intimately related to that pathway, such as Groin Pull, Hamstring Pull, and the cluneal

nerves. In the sections to follow, I will present my own classification of the pudendal nerve anatomic pathway related to known anatomic sites for compression and locations for injury, with clarification of the confounding problems that must be evaluated and treated if they are present.

DELLON CLASSIFICATION OF
PUDENDAL NERVE INJURY ZONES

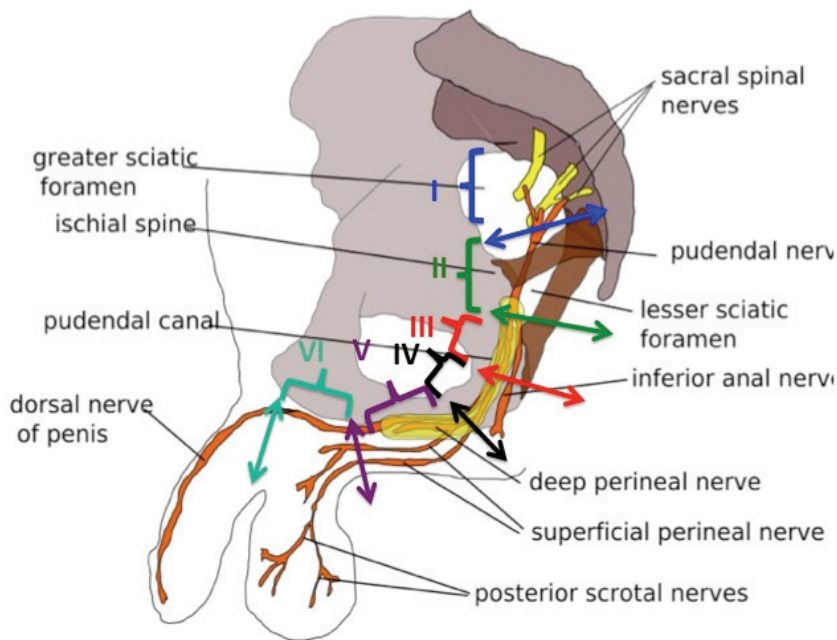


Figure 12-41. Anatomically determined zones in which the pudendal nerve can be injured. Each requires a different surgical approach to achieve the best results. See Table 12-4 for description of the zones. (Modification of drawing from Wikipedia, originally taken from Grant's Anatomy [http://en.wikipedia.org/wiki/File:Pudendal_nerve.svg])

Table 12-4
PUDENDAL NERVE ZONES OF ENTRAPMENT
(see Figure 12-41)

ZONE NAME	LOCATION OF ZONE	ETIOLOGY OF ENTRAPMENT	SURGICAL APPROACH
I	Within pelvis	Tumor	Intra-pelvic or high lateral transgluteal
II	Between the Sacrospinous & Sacrotuberous Ligaments	Trauma	Transgluteal or ischiorectal fossa
III	Entrance to Alcock's Canal	Trauma	Ischiorectal fossa, or transischial
IV	Within Alcock's Canal	pelvisFracture	Transischial, or ischiorectal fossa
V	Exit from Alcock's Canal	Trauma	Anterior, pubic ramus
VI	Pubic Ramus Canal	Trauma	Anterior, pubic ramus or supra (dorsal penile) - pubic

The main factor to consider in determining the approach to surgical decompression of the pudendal nerve is the symptom grouping of the patient. It must be remembered that while the pudendal nerve can be a single trunk comprising all three of its branches, rectal, perineal, and dorsal, there may be branching of the rectal component proximal to the sacrotuberous ligament. Compression of the pudendal nerve in Zone I or Zone II can therefore give symptoms that involve all three components of the pudendal nerve: rectum, perineum/vagina, vulva/scrotum, clitoris/penis , although one or more set of symptoms may predominate. Conversely, if the symptoms involve only the penis/clitoris, then the compression is not likely to be in Zone I or Zone II.

The second factor to consider in determining the approach to pudendal nerve decompression is the mechanism of injury. If the injury involves a fall on to the buttocks, the location of the entrapment is likely to be in Zone II or Zone III. If the injury involves a pelvic fracture along the course of Alcock's canal, the entrapment is likely to be in Zone IV. If the injury involves a pelvic fracture at the pubic symphysis, or a frontal blunt trauma, then the entrapment is likely to be in Zone V or VI. Previous surgery should be considered a form of trauma. Thus a transvaginal hysterectomy or urethral sling procedure can injure the pudendal nerve in Zone V.

The third factor to consider in determining the approach to pudendal nerve decompression is the physical examination. The site of nerve entrapment creates a tenderness of the nerve in that location. Therefore, if there is tenderness just at the sacrotuberous ligament or at the entrance to Alcock's canal, then the entrapment is likely to be at Zone II or III, respectively. If there is tenderness at the dorsum of the penis/clitoris at the transverse perineal ligament, or along the pubic ramus at the exit of Alcock's canal, then the entrapment is likely to be at Zone VI or V, respectively.

Finally, a fourth factor to consider in determining the approach to pudendal nerve decompression is the mechanism of injury.)

An inappropriate approach is noted in Figure 12-24A, where a high and lateral transgluteal incision, giving access to the pudendal nerve near the piriformis muscle, Zone II, is used to decompress the pudendal nerve in a man who only has symptoms of penile pain, Zone V-VI. Another example is given in Figure 12-42.

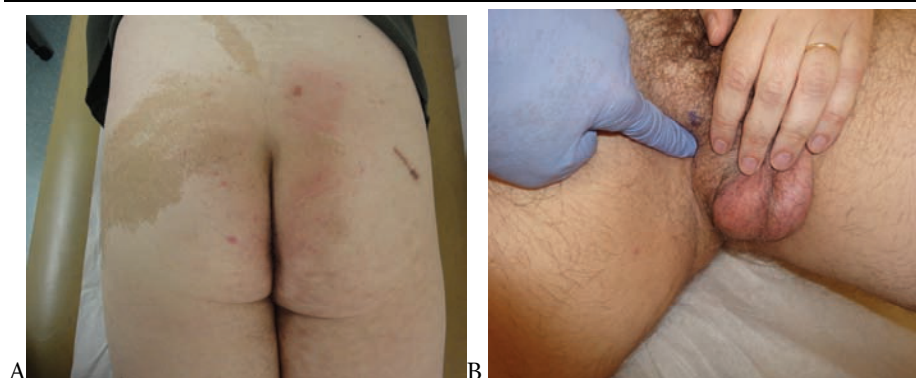


Figure 12-42. In a man with symptoms of right-sided penile pain, an inappropriate approach is the high transgluteal (A, right buttock). The physical examination showed tenderness over the right pubic ramus canal (B), which is the appropriate location to decompress the dorsal nerve to the penis, using an anterior approach as in Figure 12-26.

Other examples of inappropriate approaches to treat symptoms are given in Figures 12-43, in which a high lateral transgluteal approach was used to treat someone who just had rectal pain and physical findings in Zone III, and in Figure 12-44, in which a transischial approach was used to treat a painful penis when the physical findings demonstrated entrapment at Zone V and Zone VI.

The high lateral transgluteal incision is appropriate to treat the rare piriformis syndrome, which has sciatic, not pudendal, nerve symptoms, and gains access to Zone I - II. This approach can be used to approach very proximal pudendal nerve problems where, for example, a tumor requires an intrapelvic and extrapelvic approach.

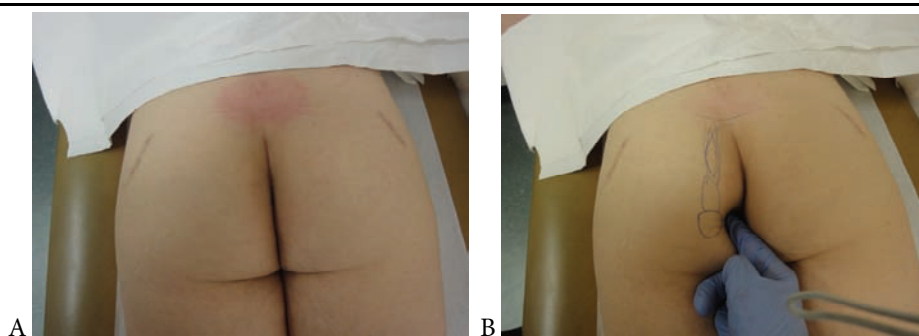


Figure 12-43. Patient with rectal pain symptoms whose surgical decompression failed through the high lateral transgluteal incision (A). Physical examination demonstrated nerve tenderness in Zone III, entrance to Alcock's canal, and the appropriate incision would be a low medial vertical incision in the ischioanal fossa, as in Figure 12-25.

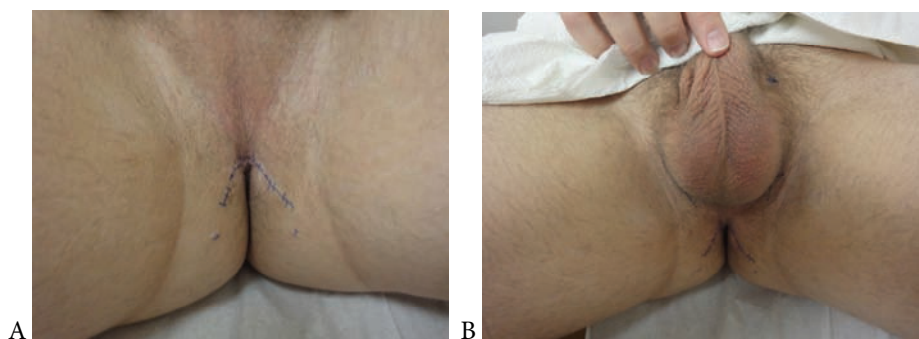


Figure 12-44. (A) Man with penile pain approached through a transverse ischioanal fossa approach that was not successful. (B) The two small blue dots are scars where drains were placed after surgery. In B, the left blue asterisk marks his tender region of the dorsal nerve to the penis, and the best approach is outlined in blue, along the inferior pubic ramus, to gain access to Zones VI and VI, as shown in Figure 12-26.

“My pain is in on the right side of my rectum, perineum and vagina. That is the side that I landed on twice. I fell backwards on an escalator and once I fell from a horse. Those falls were about 6 years ago. The pain has come on slowly, and now is with me all the time. I have pain with sitting. Medication no longer helps,” explained Marilu, a 45 year old mother of two. “Pudendal nerve blocks made my rectum and vagina partially numb and relieved my pain. Can you help me?” On physical examination, Marilu was tender at the juncture of the hamstrings with the ischial tuberosity (Zone III), but not beneath the sacrotuberous ligament, and so I said “Yes Marilu, I can help you.” The operative findings are in Figure 12-45. She made a wonderful recovery with relief of pain and being able to sit again. I did not divide her sacrotuberous ligament.

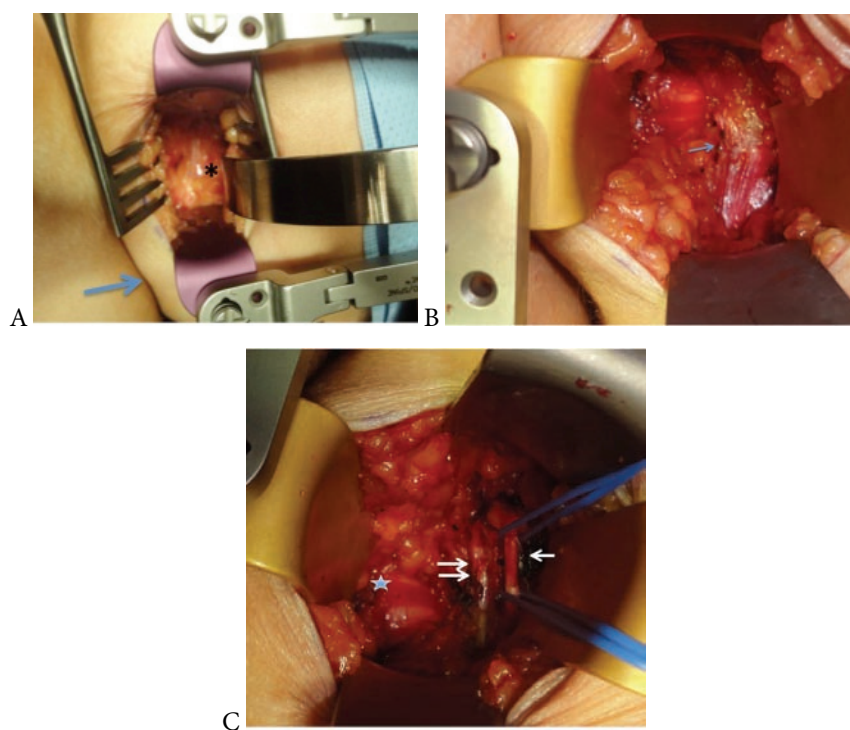


Figure 12-45. Woman with right rectal, perineal and vaginal pain. A) The gluteal crease is seen (arrow). The gluteus maximus is retracted by the upper retractor on the right buttock. Through this medial vertical ischioanal approach, the white shining rectal branches can be seen coming as a separate branch beneath the sacrotuberous ligament (star). B) At the entrance to Alcock's canal, white scar tissue is present between the hamstring muscle origin (arrow) and obturator fascia. C) The perineal and dorsal nerve to the clitoris are encircled with blue vessel loop after neurolysis (arrow), pudendal vessels have a double arrow. The rectal branches are seen to the left of the levator ani muscle (star). Since there was room to admit one finger beneath the sacrotuberous ligament, and the rectal branch did not come through the ligament, this ligament was not divided. This is a Zone II and Zone III approach.

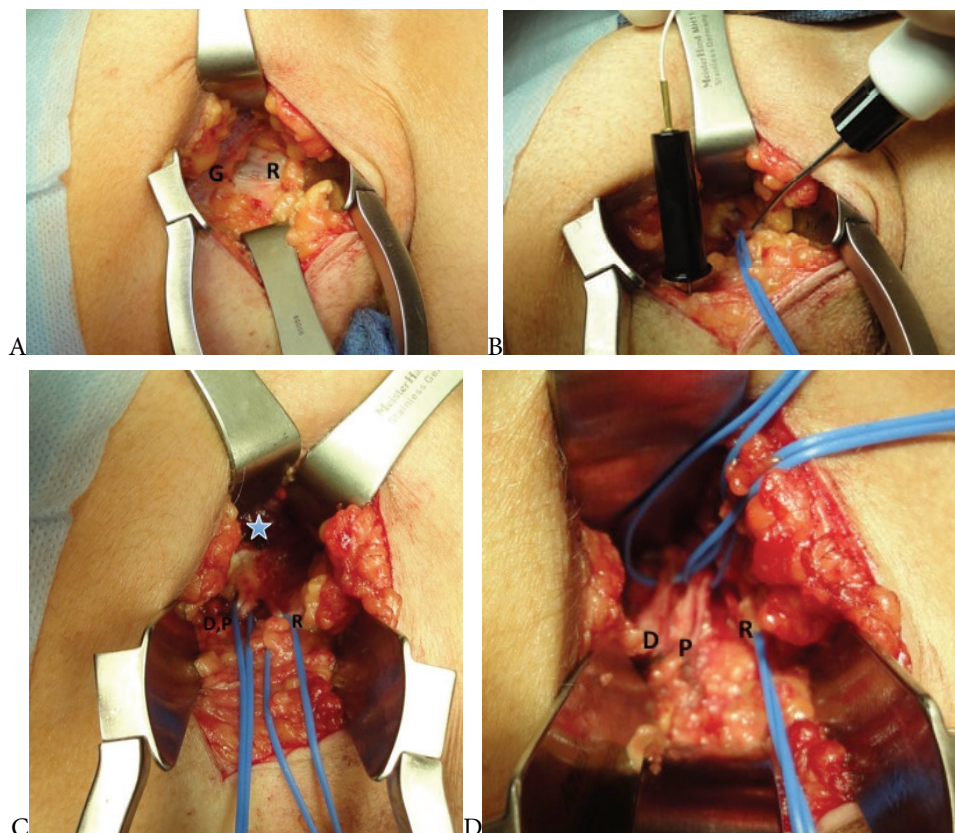


Figure 12-46. Woman with LEFT rectal and vaginal pain who was tender just beneath the distal side of the sacrotuberous ligament and at the entrance to Alcock's canal. Her surgical approach to Zone II and Zone III was through a medial vertical ischioirectal incision as seen in A), in which the gluteus muscle (G) is seen, and a rectal branch is noted (R). B) Intra-operative electrical stimulation of the rectal branch can be done to demonstrate the motor fibers. C) The sacrotuberous ligament is divided (star) and beneath is the severe scarring of the branches of the pudendal nerve (R, rectal; P, perineal; D, dorsal nerve to clitoris). In D), after neurolysis, each of the three branches is free, with the entrance to Alcock's canal having been open between the retractor and dorsal nerve.

NO NERVE WRAPPING IS NEEDED.

NO SACROTUBEROUS LIGAMENT RECONSTRUCTION IS NEEDED.

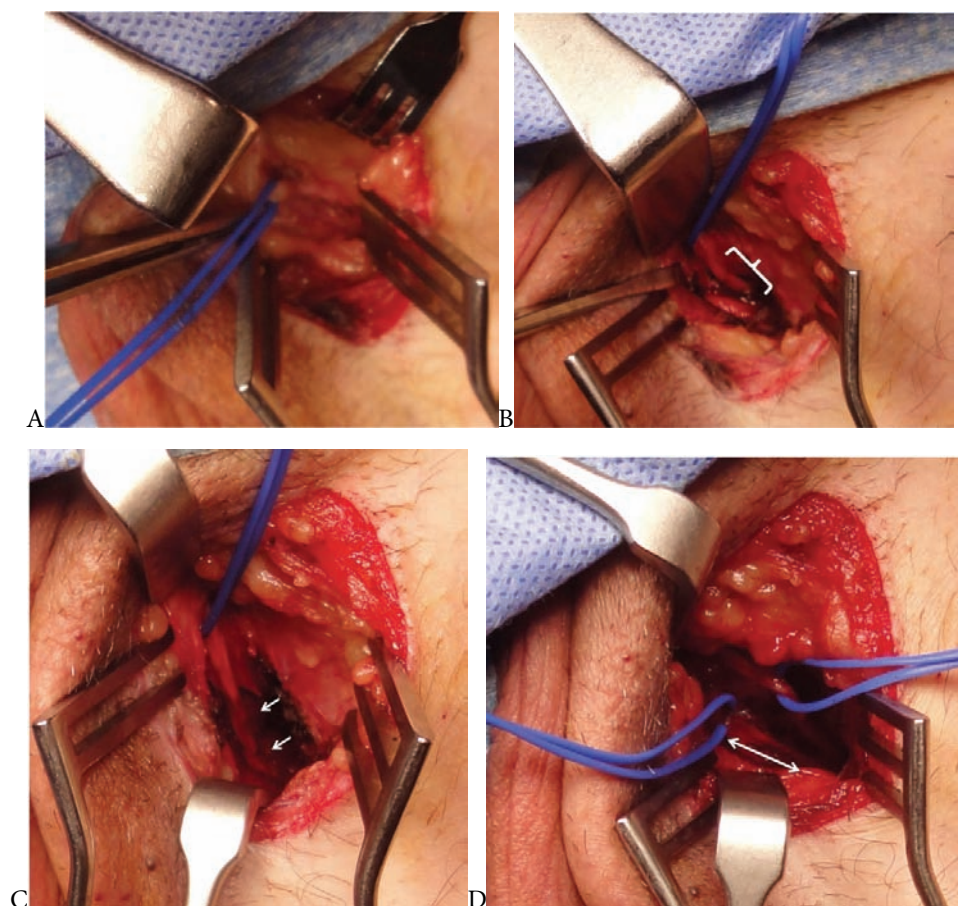


Figure 12-47. Woman with pain in her RIGHT clitoris, labia and vagina. She actually felt as if someone had an ice pick in the entrance to the left vagina. The surgical approach to her Zone V and Zone VI entrapment of the dorsal nerve to the clitoris is shown in A). Left para-labial incision demonstrates the terminal branch of the nerve to the clitoris, encircled with the blue loop as it exits the pubic ramus canal. B) The pubic ramus canal is opened, region of the white marker. C) After neurolysis of this nerve in the exit of Alcock's canal, multiple indentations of the pudendal nerve are noted at white arrows. D) Perineal branch of the pudendal nerve is encircled by the second blue loop as it enters the "ice pick" pain part of the labia. This branch was resected and the proximal end implanted into the obturator internus muscle.

With a fracture of the pubic symphysis, or an injury to the region of the penis/clitoris, the dorsal branch of the pudendal nerve may be injured directly as it crosses from the pubic ramus canal, over the transverse perineal ligament to enter the penis/clitoris. An example of a neurolysis in this region, and the exposure is given in Figure 12-48.

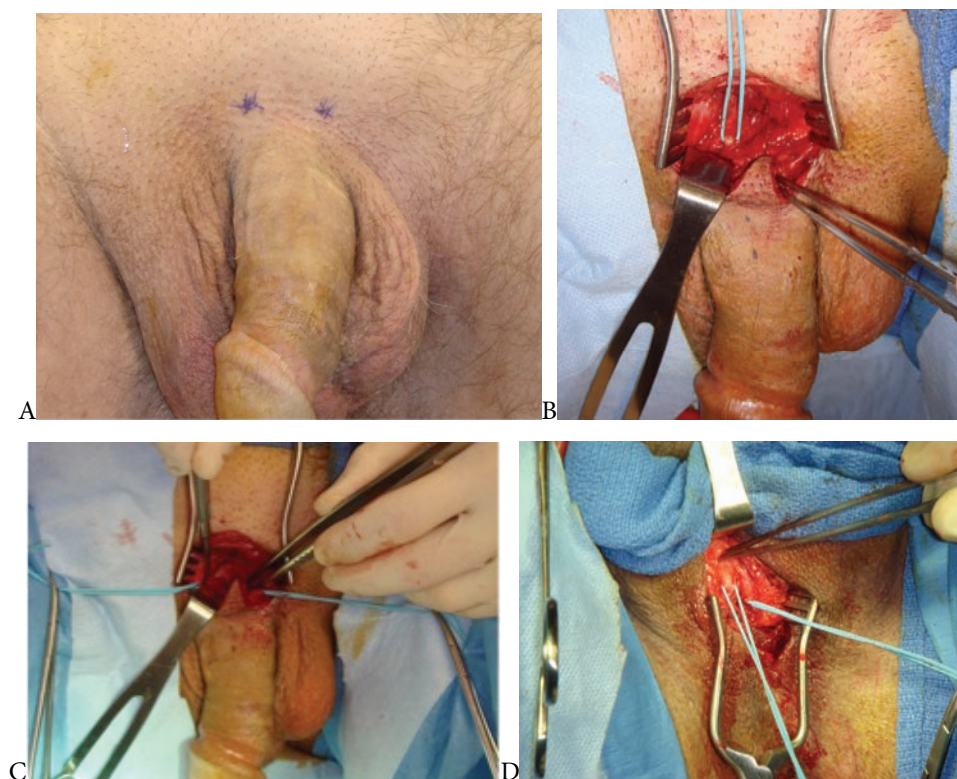


Figure 12-48. A) Physical exam demonstrates pain over the dorsal nerve to the left and right side of the penis as it exits beneath a previous symphysis pubis fracture to enter the penis (ink stars), which is Zone VI. B) Through a "V" shaped incision, the dorsal nerve to the penis is approached (right) and then C) left, and a neurolysis carried out. A blue vessel loop encircles each dorsal nerve. Through a separate parascrotal incision (D), here on the right side, a neurolysis of the dorsal nerve in Zone V can also be done.

SUMMARY

Chronic pelvic pain can be treated non-operatively, successfully in most patients with pelvic floor physiotherapy, medication, and treatment of associated problems, such as interstitial cystitis, endometriosis, bowel problems and depression. When these approaches fail, and especially with a history of trauma, the symptoms may be related to entrapment of the pudendal nerve somewhere along its winding, and variable anatomic passage from within the pelvis, near the sacrum, to the ischiorectal fossa, to the pubic ramus, and finally to the penis/clitoris. To determine the location of the entrapment, the history of the trauma/symptoms, physical findings, and the results of nerve blocks are critical. Based upon these determinations, a decision can be made as to the optimum surgical approach for a neurolysis of the pudendal nerve. In some people, more than one surgical approach may be necessary, one from the front, at the pubic ramus, and one from the back, transgluteal (ischiorectal), requiring two different surgeries. There should be hope for relief in 80% of people.