

# Injury to the perineal branch of the pudendal nerve in men: Outcomes from surgical resection of the perineal branches

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**Objective:** The objective is to report the outcome of an anterior surgical approach to treat neuroma of the perineal branch of the pudendal nerve (PBPB).

**Patients and methods:** An IRB-approved prospective study enrolled 14 consecutive male patients from 2011 through 2015 who had symptoms of perineal/scrotal pain. Each patient had a successful, diagnostic, pudendal nerve block. The surgical procedure was resection of the PBPB and implantation of the nerve into the obturator internus muscle. Mean age at surgery was  $50 \pm 15$  years. Median duration of pain symptoms was 5.5 years (range 1.2–42.9 years). Mechanisms of injury was exercise (6/14), prostatectomy (4/14), and falls (4/14). Outcomes were the Male Pudendal Pain Functional Questionnaire (MQ), and the Numeric Pain Rating Scale (NPRS).

**Results:** The mean postoperative follow-up was  $26 \pm 14$  months. The MQ demonstrated that after surgery, patients overall had significantly less disability due to pudendal pain ( $P < .03$ ). The NPRS revealed that pain significantly improved ( $P < .004$ ).

**Conclusions:** Resection of the PBPB and implantation of this nerve into the obturator internus muscle significantly relieved men's pelvic pain disability.

## 1 | INTRODUCTION

Urologists operate at the base of the penis, the scrotum, and the perineum, anatomic regions innervated in part by the perineal branches of the pudendal nerve (PBPB). It is remarkable, therefore, that injury to this nerve has been reported just twice in the Urology literature (Dellon, Wright, & Manson, 2014; Gillitzer et al., 2006). One man had the entire pudendal nerve injured by a retractor during a radical retroperitoneal prostatectomy (Gillitzer et al., 2006), and the second man was injured during a HoLEP procedure (Holmium Laser Enucleation of the Prostate) for benign prostatic hypertrophy (Dellon et al., 2014). More recently, a cohort of seven men, who had resection of the PBPB, were included among a cohort of 20 men and 35 women having pudendal nerve surgery (Dellon, Coady, & Harris, 2015). That study, included patients having either an anterior approach to the perineal and dorsal branches of the pudendal nerve, or the more traditional transgluteal approach to the entire pudendal nerve. That study, utilized a nerve resection to treat a neuroma and a neurolysis to treat compression of the pudendal nerve or its branches (Dellon et al., 2015). In that study, seven men had an injury to the PBPB, and these seven men were treated surgically with a resection of the PBPB, with the proximal end of the PBPB implanted into the obturator internus muscle. Five of the

seven men had an excellent outcome and the remaining two had a good outcome. It is the objective of the present study, based upon the observations from this earlier, retrospective study (Dellon et al., 2015), to evaluate prospectively the outcomes of the surgical treatment of injury to the PBPB in men.

## 2 | MATERIALS AND METHODS

This study received IRB approval from the Johns Hopkins Medical Institutes, Baltimore, Maryland, USA. The IRB number is 00084209.

Fourteen sequential male patients from 2011 to 2015 were identified from the private practice of the senior author (ALD). Inclusion criteria were (1) that these patients had pain in the distribution of the pudendal nerve distal to the takeoff of the rectal sensory branches, but without involvement of the penis, i.e., they had complaints of perineal and scrotal (not testicular) pain, (2) a normal 3-T MRI of the pelvis that evaluated the pudendal nerve at the sacrotuberous ligament, and (3) a diagnostic pudendal nerve block, done by an Interventional Radiologist, with numbness occurring in the distribution of the pudendal nerve and with temporary relief of their pain, as judged by the Interventional Radiologist, (4) none of these patients had previously been operated on by A. Lee Dellon, and finally that (5) each patient had completed

nonsurgical management which included neuropathic pain medication, nerve block of pudendal nerve, and pelvic pain therapy to include at least 6 months of "conservative therapy". Exclusion criteria were (1) presence of rectal symptoms, as this symptom suggests that the pudendal nerve site of compression or injury is at sacrotuberous ligament and not anteriorly and (2) symptoms of numbness or pain in the penis, as these relate to the dorsal branch of the pudendal, which is a branch discrete from the PBPB.

Mean patient age at surgery was 50 years  $\pm$  15 years. Mean duration of pain symptoms was 5.5 years (range 1.2–42.9 years). Mechanism of injury was exercise in 44% (6/14), prostatectomy in 28% (4/14), and falls in 28% (4/14). Of the 14 patients, four men had urethral symptoms, and two had pain with ejaculation. The exercise injury was related to doing "squats" with heavy weight on the shoulders and doing "lunges" while carrying "kettle balls". All patients were taking a neuropathic pain medication like Gabapentin, and 8 of the 14 patients were taking opiates.

### 3 | SURGICAL TECHNIQUE

The patient is placed under general anesthesia, and then placed into lithotomy position. After clipping the perineal hairs, a betadine scrub is done, and the appropriate draping placed. Surgical loupe magnification (3.5 $\times$ ) is used. The ischial tuberosity and inferior pubic ramus are palpated. An incision approximately 4 cm long is made cephalad to the ischial tuberosity, just lateral to the scrotum. This site is infiltrated with 1% xylocaine with 1:100,000 epinephrine, and time allowed for the epinephrine to take effect. The ischiorectal fossa is entered through this incision. Hemostasis is obtained throughout with a bipolar coagulator set at the lowest energy level consistent with obtaining coagulation. A small Weitlander retractor is used to spread more deeply into the ischiorectal fossa looking for the perineal branches. These travel transversely to the incision. When the first branch is found, it is encircled with a vessel loop. There are often 2 or 3 branches, unless the perineal nerve divides quite distally, in which case the one branch will be much larger (Figures 1–3). Gentle traction on each branch will show movement in the skin territory it innervates. In just 10% of the patients will the dorsal nerve to the penis be with the perineal branches as they exit

the canal of Alcock (Furtmueller, McKenna, Ebmer, & Dellon, 2014). (Even when the dorsal branch does exit near the perineal branches, it travels adjacent to the inferior pubic ramus and does not transit towards the base of the penis until it exists from beneath the corpora cavernosa more anteriorly. In 90% of the patients, the dorsal branch will be in a separate tunnel, exiting more anteriorly (Furtmueller et al., 2014). There are no rectal branches from the pudendal nerve exiting anteriorly. None of these resected branches are motor branches.)

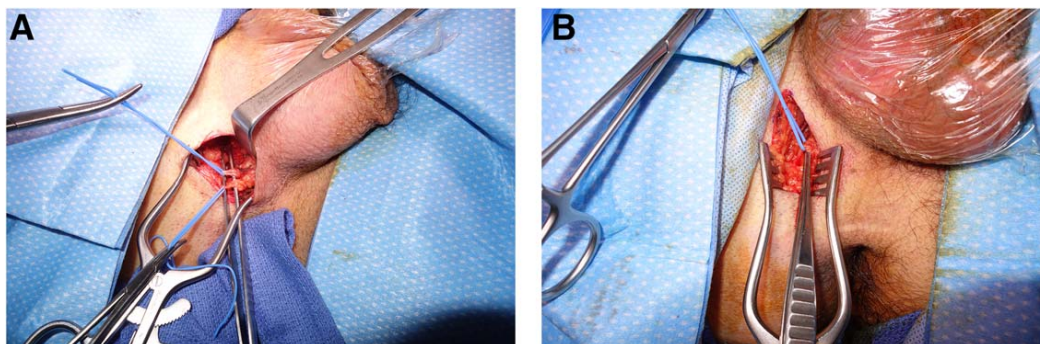
A nasal speculum facilitates the dissection. When the nerve is clearly identified, the local anesthetic is injected into the nerve to block the nerve prior to dividing it. A distal segment of the nerve is cauterized at either end of the segment and removed as a specimen for Pathology. Then the proximal end of the nerve (or of the branches) is (are) turned, being held in a tonsil clamp, is (are) placed into the Alcock canal, and finally implanted into the obturator internus muscle (Figure 4). (Note: this is done blindly as the muscle cannot be seen directly. Implanting the nerve into muscle prevents the proximal end from regenerating back into the perineum. After checking for hemostasis, the wound is closed with interrupted 4–0 Monocryl, intradermal sutures, and interrupted and continuous 5–0 nylon sutures to the skin. The dressing is Xeroform, a small, sterile gauze, and a small Tegaderm. The dressing is removed at 48 h, and the wound is cleaned with Beta-dine solution twice a day until sutures are removed on post-op day 12 to 14.

#### 3.1 | Outcome measurements

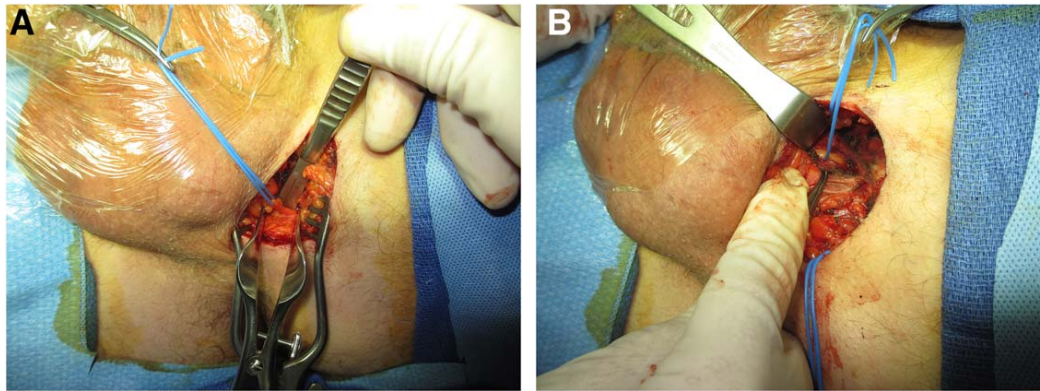
Outcome measures were the Male Pudendal Pain Functional Questionnaire (MQ) (Dellon et al., 2015) and the Numeric Pain Rating Scale (NPRS). Patients were asked to complete these questionnaires pre and postoperatively. The postoperative questionnaire was done at a minimum of 12 months after surgery.

#### 3.2 | Statistical analysis

Preoperative and postoperative scores from the VQ, and the NPRS were analyzed using Prism 5 (GraphPad Software) and paired one-tailed t tests.



**FIGURE 1** Intraoperative views, right side, 4 cm incision alongside the scrotum, just anterior to the palpable ischial tuberosity. Blue vessel loops noted on perineal branches of the pudendal nerve. A, Three branches are noted. B, A different patient with one large perineal branch is noted



**FIGURE 2** Intraoperative views, left side. A, Blue vessel loop around a large perineal branch of the pudendal nerve, with the Weitlander retractor pulling inferiorly, and a nasal speculum used for deeper visualization. B, Note the Weitlander retractor pulling superiorly, with the perineal branch observed in A in the posterior aspect of the incision. A second blue loop is on the dorsal branch of the pudendal nerve, further anteriorly, in a separate site of compression

#### 4 | RESULTS

The mean postoperative follow-up was 26 months  $\pm$  14 months.

The MQ demonstrated that after surgery, patients had significantly less disability due to resolved pain from the perineal branch of the pudendal nerve, and the NPRS also revealed that pain significantly improved (see Table 1).

Thirteen of the 14 men in the study had excellent relief of their symptoms, meaning they were able to stop pain medication and resume normal activities of daily living. One had a good relief, still having some pain with sitting.

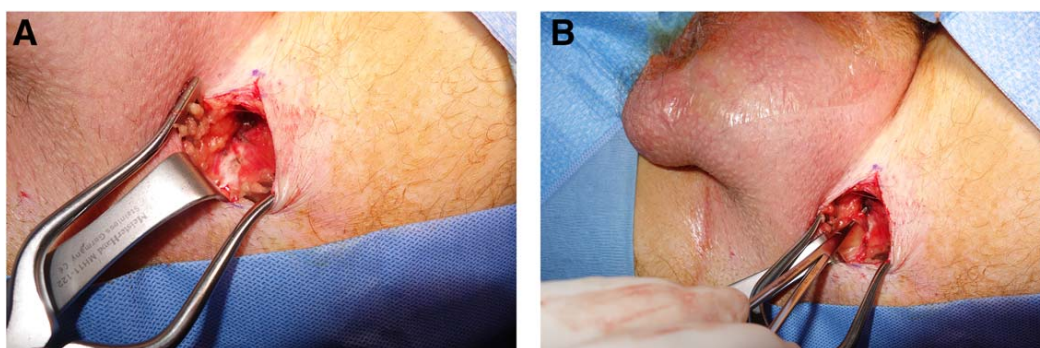
There were no complications in any of these patients. In particular there was no loss of erection or ejaculation, no loss of urinary or bowel continence. Furthermore, there were no complications related to wound healing, infection, or “anesthesia dolorosa”.

#### 5 | DISCUSSION

This is the first, male-only cohort study consisting of men with painful neuroma of the PBPB treated by nerve resection and implantation of the nerve proximally into the obturator internus muscle using the

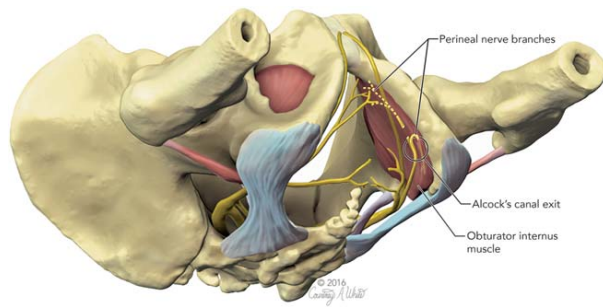
anterior approach. The anatomic site for compression of the dorsal branch of the pudendal nerve to the penis was first described in 2005 (Hruby, Dellon, Ebmer, Holtl, & Aszmann, 2009). This anterior approach was first used surgically in 2009 for a neurolysis of the pudendal nerve at this anterior site of compression, the inferior pubic ramus canal (Hruby, Ebmer, Dellon, & Aszmann, 2005). The first report of using this anterior approach to resect the perineal branches of an injured pudendal nerve was reported in 2015 (Dellon et al., 2015), and contained 23 patients (7 men and 16 women). A learning curve was associated with that surgery, such that while there were no excellent results the first year of the study (0 of 7 patients), there were 70% excellent results the second year (7 of 10) patients, and 72% excellent results the third year of the study (5 of 7 patients). The critical observations made in the early phase of that study that led to improvements in the subsequent years of the study was that there are often three separate branches of the perineal “branch” of the pudendal nerve. The surgeon must look for these. This knowledge and experience have led to the observed excellent results in the present study.

The implanted perineal branches of the pudendal nerve are secure from being dislodged by normal movements due to the anatomy. The obturator internus muscle is within the pelvis, while the ischiorectal



**FIGURE 3** Intraoperative views of ischiorectal fossa, left side. A, In comparison to the yellow fat noted in the ischiorectal fossa in Figures 1 and 2, a white fibrous region of scar noted in this view, consistent with the history of trauma. B, After removal of the scar in A, the perineal branch of the pudendal nerve noted within the blue vessel loop





**FIGURE 4** Illustration of location of the left obturator internus muscle, with the pudendal nerve crossing it to exit from the Alcock Canal anteriorly just anterior to the ischial tuberosity. Note: perineal branch divided and implanted into the obturator internus muscle

fossa where the surgery is done, is outside the pelvis. The pudendal nerve travels from posterior to anterior across the pelvis, and cannot be pulled “back” into the ischioanal fossa by normal movement.

The MQ outcome instrument used in this study was developed for the 2015 study on the outcomes of pudendal nerve surgery specifically to evaluate male sexual function that may be diminished due to the presence of pudendal nerve compression or neuroma. Prior to that study, only the Vulvar Questionnaire (VQ), an outcome instrument, existed for the evaluation of vulvodynia or vaginal pain (Hummel-Berry, Wallace, & Herman, 2007). The Female Sexual Function Index clearly was not applicable to men (Rosen et al., 2000). The National Institutes of Health Chronic Prostatic Screening Index (Litwin et al., 1999), also was not applicable to men with injury to the perineal branch of the pudendal nerve except for the small group of men with an injury who that might have pain with urination, such as four of the men reported in the present study. In contrast to the MQ, the CPSI includes no questions about sexual function (Hummel-Berry et al., 2007; Litwin et al., 1999).

Pelvic pain related to prostatectomy has been reported in just two men, each in a case report (Dellon et al., 2014; Gillitzer et al., 2006). The present study reports an additional 4 men with pelvic pain following prostatectomy. An evaluation of the Urology literature in 2007 commented on the “disparity in the quality of surgical complication reporting” in a review of 146,961 patients (Donat, 2007). Another 2007 study reviewed 2,775 endoscopic urologic procedures, including

463 radical prostatectomies, and did not report a single injury to a nerve (Permpongkosol et al., 2007). A 2012 study reviewed 2,590, endoscopic urologic procedures, including 320 prostatectomies, and did not report a single injury to a nerve (Habuchi et al., 2012). The most recent evaluation of complications related to urologic procedures, from 2015 (Patel et al., 2015), reported on 39,700 procedures. Complication rates of 19% were reported in radical retroperitoneal prostatectomy, but nerve injuries were not mentioned specifically. The incidence and prevalence of pudendal nerve injury related to Urologic procedures remains unknown, but it is likely to be greater than the current literature suggests.

Urethral pain is included in the Nantes Criteria (Labat et al., 2008) for “pudendal neuralgia or pudendal nerve entrapment” as an “associated sign that does not exclude the diagnosis.” The present study suggests it is possible that perception of urethral pain is mediated by the perineal branches of the pudendal nerve. In the earlier work cited (Dellon et al., 2015), urethral symptoms were not discussed. In the present study, 4 of the 14 patients had dysuria, despite negative urine cultures and after at least 6 months of treatment for what had been presumed to be chronic prostatitis. Three of these four patients had complete relief of their dysuria after resection of the PBBN. This suggests that dysuria can be a symptom of injury to the PBBN in men. Of the two patients with painful ejaculation prior to the surgery reported here, one had relief after resecting the PBBN. This suggests that a painful injury to the PBBN can be a cause of erectile dysfunction. The relationship between urinary symptoms and injury to the PBBN remains a subject for further research.

While the present study is limited by its small size, this is, nevertheless the largest cohort of men with symptoms related to an injury to the PBBN. It is hoped that this report will create awareness of this clinical condition and the surgical approach that can be used to obtain relief of this form of pelvic pain.

## 6 | CONCLUSION

Resection of the perineal branches of the pudendal nerve, through an anterior surgical approach, significantly relieved men's disability due to injury to these nerves.

## CONFLICT OF INTEREST

None of the authors have a conflict of interest.

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**TABLE 1** Results related to questionnaires

Instrument	Mean ± SD	P value
MQ (n = 9)		
Pre-Op	16.67 ± 8.38	
Post-Op	11.22 ± 7.41	
Post-Op minus Pre-Op	−5.44 (95% CI: −11.51 to 0.62)	P = .03
NPRS (n = 10)		
Pre-Op	7.60 ± 2.27	
Post-Op	4.70 ± 2.58	
Post-Op minus Pre-Op	−2.90 (95% CI: −4.85 to −0.95)	P = .004

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