

Pudendal Nerve Entrapment

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Anatomic bases of medical, radiological and surgical techniques.

Anatomic basis of chronic perineal pain: role of the pudendal nerve

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Abstract

Our anatomic findings have led us to define conflictual relations that may be encountered in their course by the pudendal n. and its branches. Starting from the clinical study of a group of patients suffering from chronic perineal pain in the seated position, we have defined, beginning with the cadaver, three possible conflictual settings: in the constriction between the sacrotuberal and sacrospinal ligaments; in the pudendal canal of Alcock; and during the straddling of the falciform process of the sacrotuberal ligament by the pudendal n. and its branches. Consequently, considering so-called idiopathic perineal pain as an entrapment syndrome, the clinical and neurophysiologic arguments and infiltration tests have led us to define a surgical strategy which has currently given 70% of good results in 170 operated patients. Earlier diagnosis should improve on this.

Allocated to different specialists, patients suffering from chronic perineal pain represent a dispersed group and undergo the failure of different local treatments: proctologic, urologic or gynecologic. However, their history is quite uniform: they have uni- or bilateral pain in the territory of the pudendal n. and this pain is exacerbated, if not entirely provoked, by the seated position. This postural nature of this pain in a particular territory led us to seek a compression syndrome of the nerve trunk. Thus, based on the convergent clinical features of a truncal pathology, we decided over 10 years ago to study the course of the pudendal n. and to deduce a physiopathologic explanation for certain pains which are often wrongly labeled as psychogenic.

Material and methods [9]

Anatomic study

Twelve subjects were dissected on both sides: 6 men and 6 women. This dissection was made on fresh cadavers and on formalised specimens. Initially, sagittal sections of the pelvis were made so that the n. could be followed throughout its course and the distribution of its collateral and terminal branches studied. Then, dissections by a transgluteal approach were carried out.

Results

The pudendal n. is usually given off by the third sacral root and may gain contributions from the adjacent roots of S2 and S4.

Description of the trunk and its branches (Fig. 1).

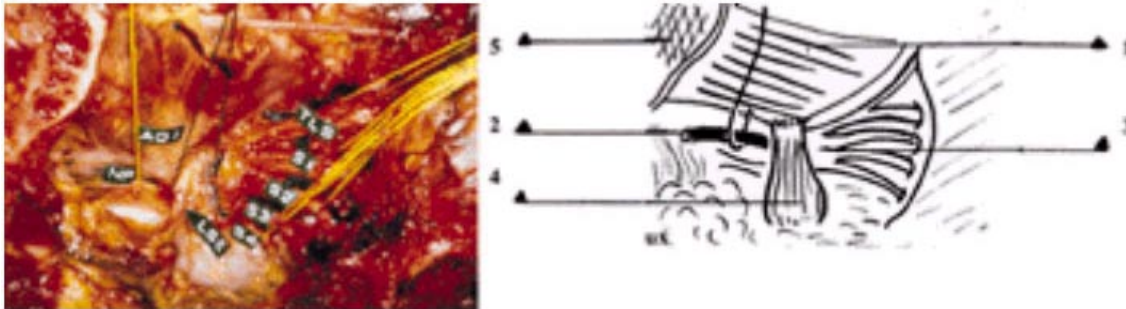


Fig. 1 - Diagram: 1 AOI Fascia of obturator internus m.; 2 NP: pudendal n.; 3 TLS lumbo-sacral trunk (S1, S2, S3, S4, ventral branches of sacral nn.); 4 LESSacrospinal ligament; 5: pubic symphysis. Photograph: Medial view of right hemipelvis. The initial portion of the pudendal n. and its gluteal course are concealed by the sacrospinal ligament (SSL). The levator ani m. has been detached to follow the nerve in its perineal course

Arising in the ventral sacral region, it then comes to lie medially and caudally in relation to the trunk of the sciatic n. Passing laterally, it soon enters the gluteal region in the infra-piriform canal and then traverses the greater sciatic foramen (Fig. 2).

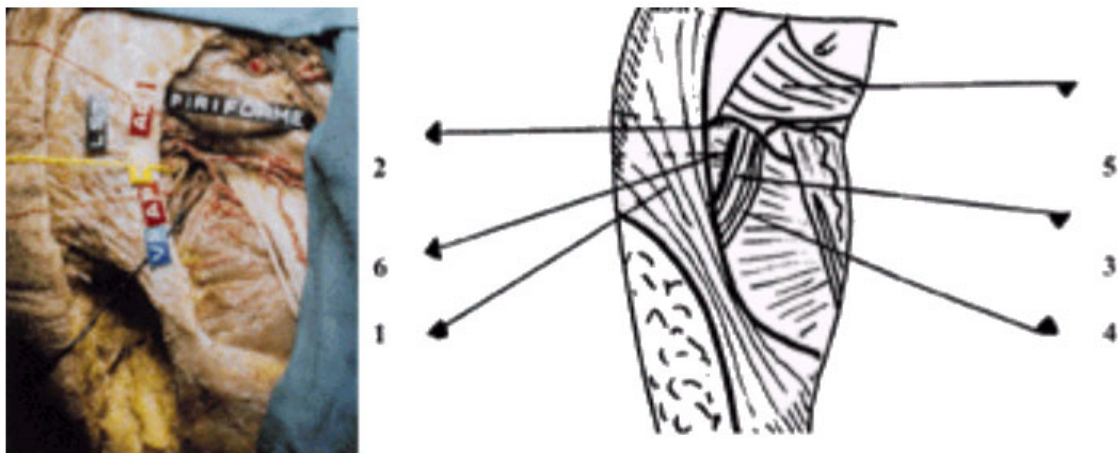


Fig. 2 - Diagram: 1 LST: Sacrotuberal ligament; 2 AG caudal gluteal a.; 3 AP: pudendal a.; 4 VP: pudendal v.; 5: piriformis m.; 6 NP pudendal n. Photograph: Dissection of right gluteal region. After detachment of fibers of gluteus maximus m. the following can be seen: the sacrotuberal ligament (STL), piriformis m., trunk of sciatic n. The pudendal n. is partly concealed by the sacrotuberal ligament

Accompanied by its artery, usually situated cranial to it, it is also surrounded by veins which readily assume a plexiform appearance. the pudendal bundle skirts round the termination of the sacrospinal ligament just before the latter's attachment to the ischial spine. If this is long and pointed, it may turn around the spine itself. At this level the pudendal n. is situated between the sacrospinal ligament ventrally and the sacrotuberal ligament dorsally (Fig. 3).

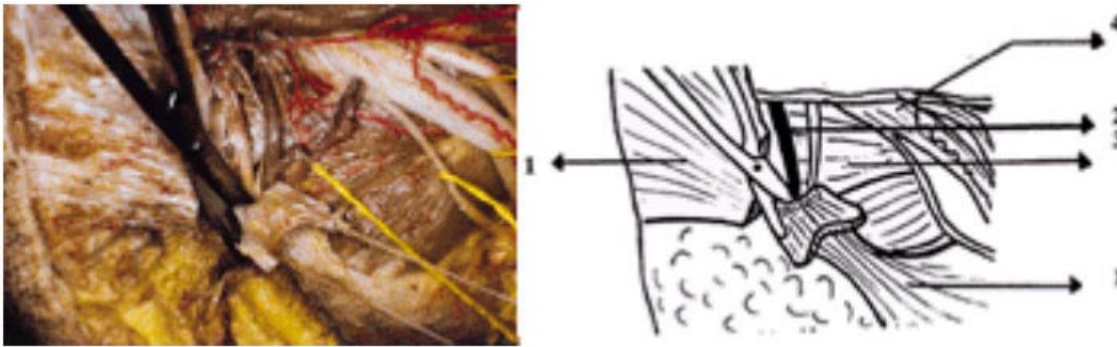


Fig. 3 - Diagram: 1 LST: Sacrotuberous ligament; 2 NP: pudendal n.; 3 LES: sacro-spinal ligament; 4: sciatic n. Photograph: Dissection of right gluteal region. To uncover the gluteal course of the pudendal n. partial resection of the sacrotuberous ligament is necessary. The nerve and its vascular partners cross behind the lateral attachment of the sacrospinal ligament to the ischial spine

The latter, often in several layers, contains venous networks in its substance. In rare cases the nerve may travel between split layers of this ligament. The nerve trunk then passes ventrally, medially and caudally and enters the perineal region via the lesser sciatic foramen. It lies under the plane of the levator ani m. and enters within a duplication of the fascia of the obturator internus m., which forms the pudendal canal described by Alcock (Fig. 4) [4, 5, 6].

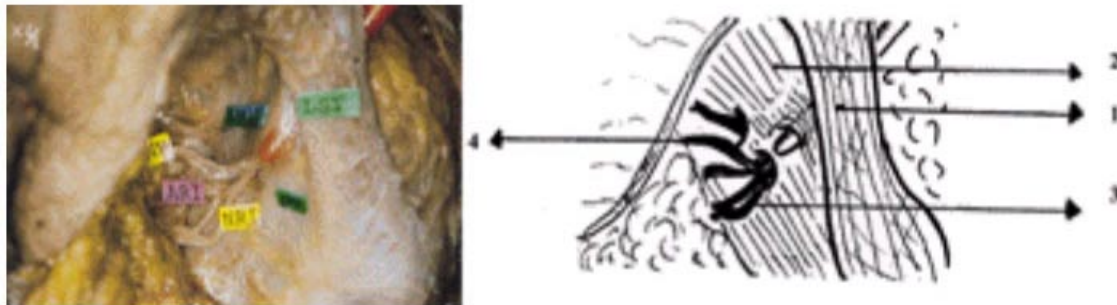


Fig. 4 - Diagram: 1 LST: Sacrotuberous ligament; 2 AMOI fascia of obturator internus m.; 3 NRI inferior rectal n.; 4 NP pudendal n. Photograph: Medial view of right gluteal region. The probe passes ventral to the sacrotuberous ligament and enters the splitting of the fascia of the obturator internus m. which forms Alcock's canal, in which travel the trunk and branches of the pudendal n and the inferior rectal n.

The collateral branches of the nerve are variably distributed. The inferior rectal n. to the anus may have a course parallel to the pudendal trunk and arise directly from the pudendal plexus. It then accompanies the nerve laterally and has a course modeled on that of the latter. It may also arise from the pudendal trunk before its entry into the pudendal canal.

The perineal branch is more ventral. It emerges at the posterior part of the pudendal canal and gives off sensory branches to the perineum (superficial perineal n.) and motor branches (deep perineal n.) to the perineal mm. and the external sphincter of the anus. Prolonging the trunk of the nerve, the dorsal sensory branch of the penis or clitoris appears as a true terminal branch.

Emerging from the dorsal aspect of the erectile organs, it travels in the infrapubic region and enters the pudendal canal where it joins the nerve trunk (Fig. 5).

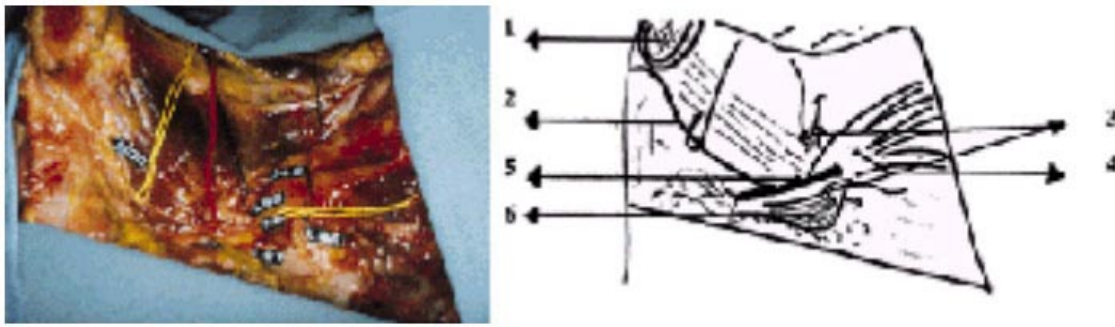


Fig. 5 - Diagram: 1: Pubic symphysis; 2: dorsal n. of clitoris; 3: sacrospinal ligament (sectioned); 4: lumbosacral plexus; 5: pudendal n.; 6: falciform process of sacrotuberal ligament. Photograph: Lateral endopelvic view of right hemipelvis. The dorsal n. of the clitoris (DNC) crosses below the pubic symphysis and joins the trunk of the pudendal n. in the pudendal canal

Relations

In the presacral region the nerve trunk is related to the dorsal pelvic organs in the retrorectal region. Its passage into the gluteal region occurs under the piriformis m. in a ligamentous pinch formed by the sacrotuberal and sacrospinal ligaments. In the perineal region the n. has mainly aponeurotic and muscular relations, where it is applied to the medial aspect of the obturator internus m. in Alcock's canal, formed by a duplication of the aponeurosis of this muscle. At the posterior wall of this canal it crosses over the falciform process of the sacro-tuberal ligament, a fibrous sheet with a sharp upper border, concave upwards, parallel to the medial aspect of the ischium.

Medially, there is the abundant fat of the ischio-rectal fossa, which occupies the entire posterior perineum.

Physiopathologic aspects [6, 7, 9]

Study of the course of the pudendal n., as we have just seen, stresses possible impingements:

- In the ligamentous pinch at the level of the ischial spine the nerve is fixed between the sacro-tuberal and sacrospinal ligaments, sometimes even ensheathed by ligamentous expansions which constitute a perineural compartment. Traveling in the midst of ligamentous layers, it then assumes a flattened appearance. We have even seen it traverse the sacrospinal ligament in its thickness or override a sharp sacrospinal ligament which may even be calcified. It is also at this level that the piriformis m., situated cranial to the nerve, may come into contact with it and sometimes possesses a fibrous sheet endangering the nerve trunk.

- The falciform process of the sacrotuberal ligament may arise high up and come into contact with the nerve, which literally straddles it (Fig. 6).

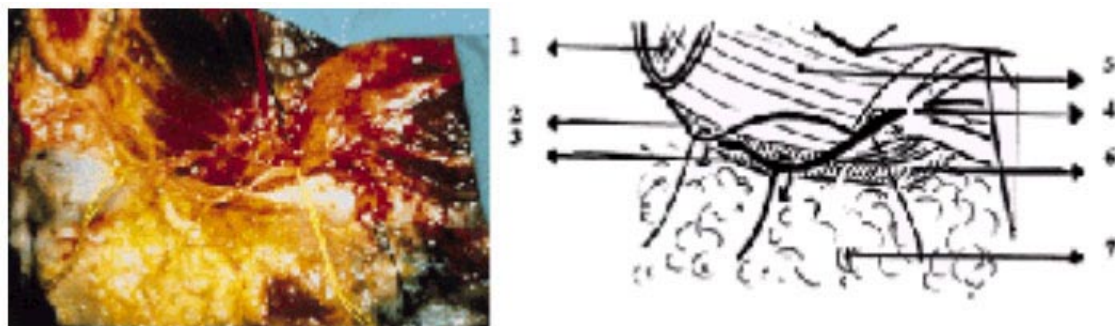


Fig. 6 - Diagram: 1: Pubic symphysis; 2: dorsal n. of penis; 3: perineal branch of pudendal n.; 4: lumbosacral plexus; 5: obturator internus m.; 6: falciform process of sacrotuberal ligament; 7: fat of ischio-anal space. Photograph: Superolateral endopelvic view of right hemipelvis. The trunk of the pudendal n. and its branches, freed by dissection of the obturator internus fascia, cross over the falciform process of the sacrotuberal ligament

Lastly, the fascia of the obturator internus m., when it is duplicated, may be thickened and thus become a possible entrapment site.

- The vessels are often of considerable size. The pudendal a. may describe perineural curves or constrict the nerve trunk with its collateral branches. The vv. are often tortuous and dilated, leaving little room for the nerve component within the vascular sheath that is often encountered.

The course of the nerve is thus very special. It successively traverses three very different regions, describes a curve which drags it around the region of the ischial spine, which it straddles like a violin string on its bridge. The seated position was simulated in the cadaver. It is associated with an ascent of the ischio-anal fat, which becomes applied laterally to the falciform process of the sacrotuberous ligament, so that this is elevated and approximated to the nerve trunk. The latter, contained in the aponeurosis of the obturator internus m., has no means of escape, any more than it has in the gluteal region in the ligamentous grip described above, since the piriformis m. bars any possibility of upward escape.

There is an obvious parallel here with other peripheral nerve entrapments: the median n. in the carpal tunnel, the common peroneal n. over the head of the fibula, the ulnar n. at the elbow, to mention only the most well-known of the entrapment syndromes. These anatomic findings determine the diagnostic, clinical and neurophysiologic approaches and lead to decisions on treatment.

Clinical aspects

The site of the pain is in the perineum, and may be anterior (urogenital), posterior (anal) or mixed. Situated in the territory of the pudendal n., it is uni- or bilateral and to be distinguished from other regional pains with which it must not be confused (coccydynia, located more posteriorly, neuralgia of the ilioinguinal, iliohypogastric or genitofemoral nn.). In two-thirds of the cases women are affected. The character of the pain consists of sensations of burning, torsion or heaviness, and also of foreign bodies in the rectum or vagina. The pain is piercing and very comparable to acute toothache. The mode of onset is often gradual, but a fall is sometimes provocative; sometimes it is post-operative, especially after orthopedic procedures where a traction table has been used [3, 8]. Pain after repetitive energetic bicycling has led to the term "cyclist's syndrome" [1]. It may be much more indolent and develop gradually over time without a definite provoking factor. Lastly, it may be exacerbated by a regional surgical procedure: proctologic, urologic or gynecologic. The exacerbation of the pain is then only the patient's awareness of a therapeutic failure.

The positional nature of the pain is very suggestive. At a certain point in the case history the seated position provokes or exacerbates the pain. These patients have no pain at night and are comfortable when standing or lying on the non-painful side especially. It is an important point that they have no pain when on the lavatory seat, ie when the painful zone is relieved from pressure. The main daily activities requiring the seated position (work, meals, driving, theaters, etc) are no longer available to these patients, whose mental attitude is one of chronic pain sufferers so obsessed with their miserable state as to be rapidly regarded by their doctors as psychiatric cases.

Clinical findings are few [6, 7]. Perineal sensation is preserved for long, as is muscular trophicity. Urinary disturbances are usually absent, and sexual problems are related to loss of libido resulting from the pain. Rectal examination is painful opposite the ischial spine. Pressure at this level quite often elicits the same type of pain as that felt spontaneously. The striking subjective manifestations contrast with the sparse examination findings.

Supplementary radiologic examination certainly excludes any other pathology, especially tumoral [7]. Thus the neurophysiologist has to attempt to derive organic conclusions from an essentially subjective pathology.

Neurophysiologic aspects

The anatomic study we performed led us to regard the distal motor latency of the pudendal n. as the examination of choice. In fact, electromyography of the ischiocavernosus or transverse perineal mm. is usually normal. Chronic perineal denervation must suggest a descending perineal syndrome, another aspect of pelvi-perineal pathology, especially in women. Study of the latency of the bulbocavernosus reflex involves the afferent and efferent path-ways and the medullary centers. It is therefore nonspecific. This also applies to evoked somesthetic potentials. The distal sensory latency obtained in antidromic fashion is also helpful. The distal motor latency of the pudendal n. is studied by means of a digital stimulation electrode inserted in the rectum (Fig. 7).

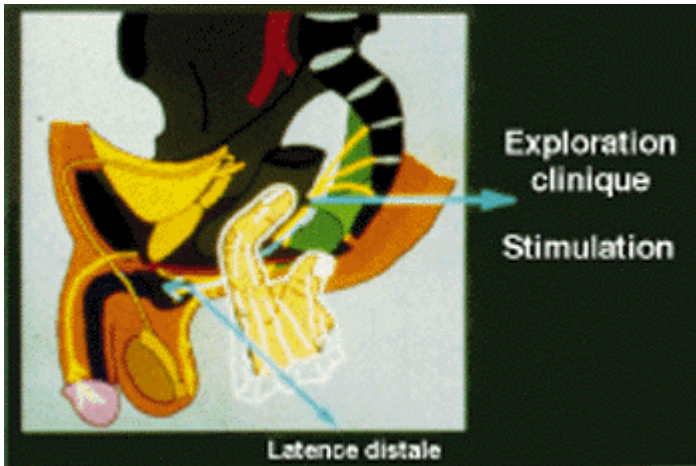


Fig. 7 - Diagram of sagittal section of pelvis. A finger carrying a digital electrode is inserted in the rectum; stimulation of the nerve trunk is made at the level of the ischial spine and the potentials are collected by a needle in the perineal mm. This yields the distal motor latency

This stimulation is made opposite the ischial spine and the results collected by a detection electrode placed in the mm. of the perineal floor. For comparative study with the normal side, we estimate that a distal latency recorded in the ischiocavernosus mm. is pathologic when it exceeds 5 ms. Recording at the level of the anal sphincter yields pathologic figures when in excess of 2.5 ms.

Therapeutic implications

Infiltrations. Peri-truncal anesthetic blocks, possibly preceded by caudal or transsacral blocks, constitute a diagnostic and therapeutic test of the greatest importance. By analogy with other entrapment syndromes, especially in the carpal tunnel, we believe that infiltration should be made at the sites of potential impingement [2]: at the level of the ischial spine under the image intensifier (Fig. 8),

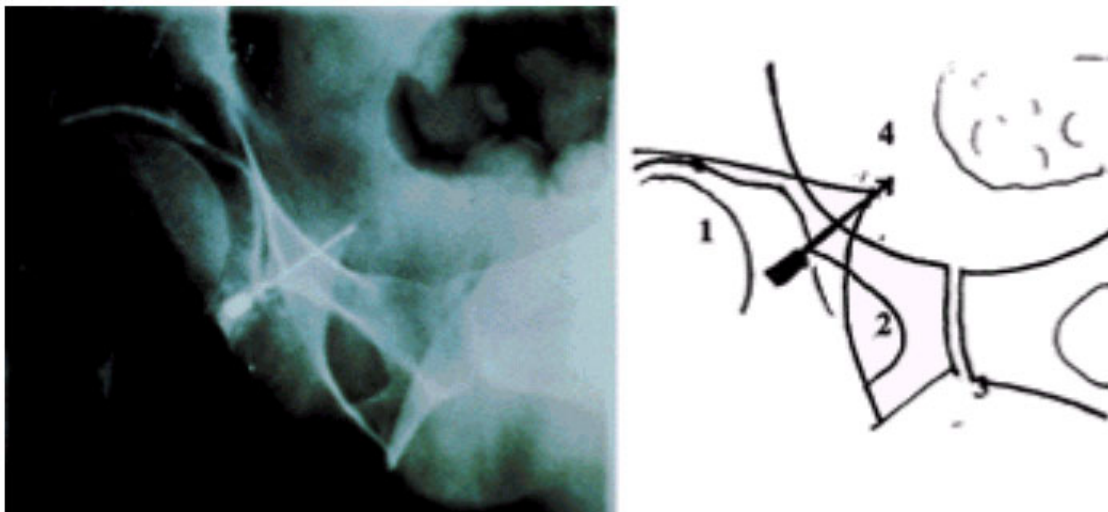


Fig. 8 - Diagram: 1: Femoral head; 2: obturator foramen; 3: pubic symphysis; 4: ischial spine. Photograph: Radiograph of right hemipelvis. Performance of needle infiltration of pudendal n. at level of lateral attachment of sacrospinal ligament to ischial spine

and at the pudendal canal under the scanner (Fig. 9).

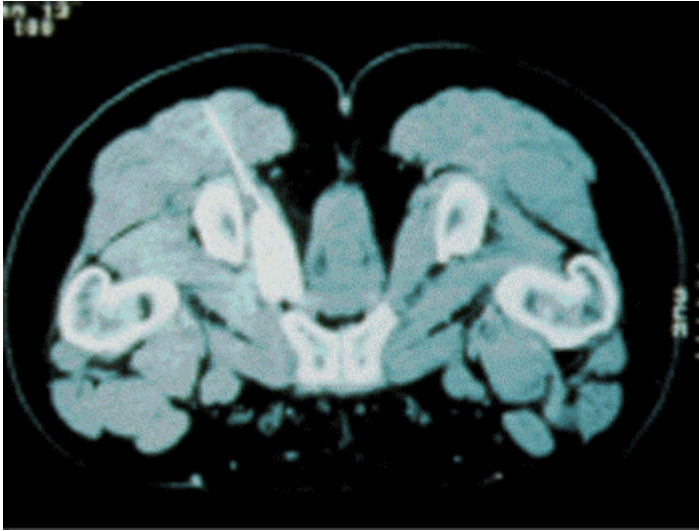


Fig. 9 - Scanner-guided infiltration of pudendal n. in Alcock's canal. Note the angulation of the needle, which must be parallel to the plane of the obturator internus m., into whose fascia the injection is made

It should be noted that, during the infiltration with local anesthetics, paresthesiae are evoked in the painful territory of the nerve, which represents a very valuable landmark. Corticoids are then injected at the same time and may produce lasting relief. Two or three infiltrations are performed; this number should not be exceeded for fear of deterioration in the nerve trunk.

Surgery of the pudendal n. [9]. Originally conducted by the perineal route, which causes difficulties due to position, the abundance of fatty tissue, the depth of the region and its many veins, we have done this during the last 10 years by a transgluteal route [10, 11]. The surgical principle is simple: the gluteal incision is made in the axis of the fibers of the gluteus maximus m. on either side, with a transverse limb passing over the coccyx and thus situated at the level of the ischial spine. The posterior aspect of the sacrotuberous ligament is stripped free of its muscular attachments, The sacrotuberous ligament is windowed over 2-3 cm (Fig. 10).

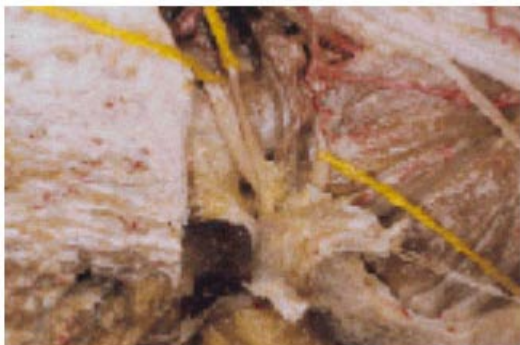


Fig. 10 - Diagram: 1: Sacrotuberous ligament (incised and reflected); 2: sacrospinal ligament; 3: pudendal n. (two bundles); 4: inferior rectal n.; 5: pudendal vascular bundle; 6: sciatic n.; 7: pelvitrochanteric mm. Photograph: Principles of surgery by right transgluteal approach. Partial resection of the sacrotuberous ligament allows visualisation and freeing of the pudendal n. in its gluteal course

The pudendal neurovascular bundle is then seen crossing behind the sacrospinal ligament. The latter is divided and the nerve can then be transposed in front of the spine, thus gaining precious centimetres thanks to this freeing (Fig. 11). The sacrifice of these two ligaments is not accompanied by any biomechanical disorder. Following the nerve into the pudendal canal is easy by this route. The fascia of the obturator internus m. is incised and the nerve trunk as well as its branches are freed over 3-4 cm (Fig. 12); a threatening falciform process is divided whenever necessary. Hence the entire nerve trunk is freed through a single approach.

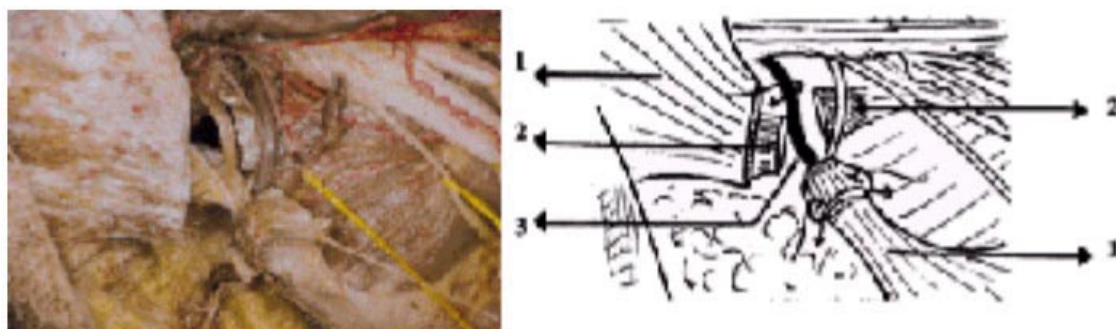


Fig. 11 - Diagram: 1: Sacrotuberous ligament (incised); 2: sacrospinous ligament (incised); 3: pudendal n., transposed in front of sacrospinous ligament. Photograph: same view as photograph in Fig. 10. Section of the sacrospinous ligament allows transposition of the freed pudendal n. in front of the ischial spine

Results

We have performed 150 freeings of the pudendal n., either uni- or bilaterally. The patients were predominantly female (two-thirds of the cases). Our follow-up exceeds 10 years. The results are promising since in a patient group considered as chronic and beyond all possible treatment, we recorded after the failure of repeated infiltrations 45% who considered them-selves cured, 22% improved, and 33% who derived no benefit from the surgery but who suffered no exacerbation.

Treatment by X-ray or scanner guided infiltrations cured 65-70% of the patients. Operation was reserved for those in whom repeated nerve blocks failed. We have to report only two complications, common to all surgery: a hematoma and an abscess, which both had to be surgically evacuated.

Conclusion

Anatomic study of the pudendal n. and its branches led us to a multidisciplinary description of the typical features of perineal pain previously regarded as idiopathic, to analyse it by a neurophysiologic method, and to treat it as a canalar syndrome favorably if transiently influenced by infiltrations.

The surgery of the pudendal n. is currently the subject of a randomised program comparing a series of operated patients with one of patients treated conservatively.

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Note – This article was modified on May 17, 2002 by Jack Harich starting with an English version in Word from the Pudendal Neuropathy website. The following changes were made:

1. All images were then at 125% of original image size. This made most of them too small to see crucial details. To correct this problem, all images except figures 7 and 9 were changed to be 200% of original size, then processed with Photoshop to create originals so that the PDF files would contain the 200% size, not the original 100%. Figures 7 and 9 were left unchanged since they were already large.
2. To make the article more readable the Normal style was changed from justified to flush left.
3. The phrase “at the pudendal canal under the scanner (Fig. 9).” was changed to “and at the pudendal canal under the scanner (Fig. 9).” This appeared to be a French to English translation error.
4. The title “Pudendal Nerve Entrapment” was added, since the article had no title.
5. Finally, since Word is platform specific, not all Windows users may have Word or a current enough version, and Word documents are virus prone, the article was converted to a PDF file using Acrobat 4.0. PDF is the defacto platform independent technical document internet publishing standard.