



## **GEP's abstracts about the pudendal nerve for the meeting**

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## 1. Pudendal nerve anatomy : facts and controversies.

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According to the literature and our dissections the anatomy of the pudendal nerve could be described as follow. The pudendal nerve is a mixed nerve carrying motor and sensory fibers. Its fibers are derived from the sacral roots S2, S3 and S4 (1,2). Once the roots traverse the sacral foramen, they divide into autonomic branches forming the pelvic plexus (parasympathetic supply of the pelvic organs) and somatic branches merging to form the pudendal nerve travelling under the piriformis muscle. Near its formation point it gives a levator branch running on the inner (upper) surface of the levator plate and providing the innervation of this muscle (1). For Barber et al (3), this levator nerve originated directly from the S3, S4 or S5 roots. Some somatic fibers coming from S2 and S3 run close to the pelvic plexus to innervate the levator ani and the urethral sphincter (1). Caudally, the pudendal nerve enters a small space ("clamp") between the sacro-spinal and sacro-tuberous ligaments very near the ischial spine. Before the entrance in the clamp, we found in our last dissection a branch of the nerve which runs parallel to the great sciatic nerve in the posterolateral aspect of the thigh. Just below the ischial spine, the nerve gives a terminal branch, the dorsal nerve of the penis (1) or the clitoridal nerve (7). These nerves are separated from the main trunk by the pudendal vein and artery. Then it enters the Alcock's canal formed by a division of the obturator muscle aponeurosis. In the canal the nerve cross the sharp edge of the sacro-tuberous ligament (falciform process) (4,5). Caudally, at the level of the anus, the nerve gives medially the inferior rectal nerves (usually two branches) which innervate the anal sphincter (and probably the pubo-rectalis) and the skin of the posterior perineum and anterolaterally the transversus perinei branch (for this muscle and for the ischiocavernosus muscle) (1, 7). The remaining part of the nerve is usually called the perineal nerve. This nerve gives a bulbocavernosus branch and finally divides into a sphincteric branch (innervation of the urethra) and a branch which innervate the skin of the anterior perineum (6). Some aspects of this anatomy are still controversial and will be discussed during the lecture.

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## **2. Pudendal Neuralgia: Nerve Compression or Radiculopathy ?**

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Pudendal neuralgia is a frequent but often ignored pathology. From an organic point of view it is in general due to a compression of the pudendal nerve, either on the level of the muscle piriformis, or on the level of the inter-sacro-spino-tuberal ligaments, or into the fascias of the muscle obturatorius internus which constitutes the canal pudendal or Alcock tunnel.

Moreover, it is important to know a relatively frequent organic aspect of the pudendal neuralgia, namely an intraspinal radicular lesion of the nerve fibers (irritation, inflammation, mechanical dysfunctions ...). The most frequent causal agent is a disco- or vertébro-radicular conflict in L4-L5 and/or L5-S1. More, it is necessary to consider that nerve fibers previously damaged by a radicular lesion result in an oversensibility to the effects of a compression on its way.

Electrophysiological investigation we are using is based on needle EMG exploration of the muscles supplied by the pudendal nerve, the terminal conduction time evaluated by endo-cavitary stimulation (latency prolongation is not specific of a compression, but indicates only myelinic abnormalities, without specifying the aetiology), the sacral reflex, and on the [spinal] and cortical somesthetic evoked potentials. The investigation is supplemented by a puncture of the piriformis muscle and a radicular EMG of the lower limbs.

Considering needle EMG distinctive signs have to be pointed:out: abnormal spontaneous activity, increased percentage of polyphasic potentials with spike potentials of short duration (incomplete synchronisation within the distal innervation due to a neuritic processus), grouped polyphasic potentials (non-synchronisation of the potentials of different adjacent motor units – nerve compression or stretching, demyelination, neuritis), high voltage potentials from collateral readoption or sprouting (spondylo-radicular), or synchronisation (proximal and cord lesions), pseudomyotonic discharges (spondylo-radicular irritation), bursts of benign fasciculations (radiculopathy), myogenic potentials, nascent motor units (reinnervation).

This battery of explorations helps us to detect the pathological process, to specify the type (motor, sensory), to dissociate the various localizations and to know the degree and type of

the nerve lesion (myelinic, axonal). In fact, the clinical signs evoke the pudendal neuralgia, electrology makes the diagnosis.

It is necessary to take in account other possible sources of pain: the existence of myofascial pain, a post-op state of pain memory, the possibility of sine materia pain (hypochondria, conversion), referred pain from visceral dysfunction.

A total of 406 patients were examined for pelvi-perineal pain. Clinical investigation and electrophysiological tests were applied. Ninety one percent (370) had clinical and electrical signs of pudendal nerve compression. Forty six percent (171) of them had a surgical indication and were operated. Of the 171 patients, eight percent (14) had associated signs, clinical and/or electrological, of spondylo-radiculopathy. The remainders were treated with medical methods or were in stand-by. Of the 406 patients, six percent (23) had only a vertebro-radicular pathology, without a pudendal lesion.

The point highlighted by this study is the importance of the electrophysiological technics for the surgical indication of pudendal nerve decompression, particularly the needle EMG, the sacral reflex and the somesthetic evoked potentials. Even if the percentage of pure radiculopathies is low, these findings suggest that a possible pudendal pain can be in relationship with a lumbo-sacro-radicular dysfunction which induces a false diagnosis of a pudendal syndrome. This fact has to be taken in consideration.

### **3. Pudendal Nerve Surgery. Intraoperative Electrophysiological Exploration**

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Generally speaking, clinical and electrophysiological investigations can establish a pudendal nerve lesion, but cannot with exactitude specify the seat of it. Even a prolongation of the terminal time of conduction, evaluated with the endo-recto-vaginal technique, cannot affirm a real localization in the pudendal tunnel. However, the battery of tests we are using (needle EMG, sacral reflexes, spinal and cerebral SEP) enables us to orientate the probable diagnosis towards an interligamental grip or a pudendal tunnel entrapment.

In fact we must consider that an intraoperative electrological exploration is more informative and allows us to localize with accuracy the seat of entrapment (interligamental grip, processus falciformis, pudendal tunnel). Our procedure consists in directly stimulating the nerve with 0,2 ms rectangular pulse and recording the stimulated potential in the anal sphincter. The surface stimulating electrode consists of two circular electrodes (5 mm) separated by a distance of 1 cm (Digistim Sugar®) fixed to the tip of a finger-stall. We directly stimulate the nerve on two levels, on both sides of the sacro-spino-tubéral ligament (cranial and caudal). The recording electrode is a concentric needle electrode inserted in the ventral half of the anal sphincter. Equipment is a standard electromyography system (synergy Oxford Medelec). The conduction time analysis makes it possible to dissociate a compression on the interligamental grip level of one of the pudendal tunnel.

With our actual experience, we can say that intraoperative electrophysiological exploration of the pudendal nerve: –

- ✍ Improves the surgical procedures.
- ✍ Informs the surgeon in the successful of the decompression or in the necessity of completing it (end or not of the operation).
- ✍ Differentiates a pudendal tunnel compression from an entrapment at the caudal part of the interligamental grip (Before the operating decision this topographical differentiation is not possible with the endocavitary terminal latency measurement test).

Here and now we think that intraoperative electrophysiological exploration of the pudendal nerve appears to be an important and valuable method for the success of surgical procedures.

#### **4. New approach for treatment of pudendal nerve entrapment : 406 cases and 171 decompressions**

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Since October 1998, pudendal neuralgia is pointed out by using a diagnosis score. Clinical diagnosis was confirmed by the electrophysiological tests in 406 cases. The study of a total of 362 canal syndromes showed prevalent injury at the sacro-spino-tuberal-ligamental grip which observe in 70% of the cases, compared to the Alcock canal which was present in only 20% of the cases. 171 of these patients underwent surgical decompression via a trans-ischio-rectal approach after negative results of the infiltration therapy. We report here the surgical methodology based on the geometry of the pudendal neuro-ligament conflict, the post-op follow-up and the results, which appear quite successful : after one year 84 % of the subjects are symptom-free or with a significant reduction of the pain.

#### **5. Surgical treatment of pudendal neuralgias**

**R Robert, JJ Labat, M Bensignor, T Riant, O Hamel, S Raoul**

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The investigation of patients suffering from perineal pain when sitting led the authors to consider that a tunnel syndrome due to ligamentous entrapment of the nerve does exist. An anatomical work was done among 50 cadavers and showed that the nerve trunk could be entrapped at the level of the claw between the sacro-tuberal and the sacro-spinal ligaments and/or in the Alcock's ( pudendal ) canal. In this area, both the fascia of the internal obturator muscle and/or the falciform process of the sacro-tuberal ligament may disturb the course of the nerve.

According to clinical and neurophysiological data, they described the technique of blocks at the two levels and obtained about 65% of good results in this way.

For people who keep on suffering, they defined a surgical technique by a single posterior (transgluteal) approach which offers the possibility of a complete decompression of the nerve all along its course.

The surgery is made under general anaesthesia, the patient being in a prone position. A bilateral approach can be done in the same time when required. Through the fibers of the gluteus maximus muscle, the sacro-tuberal ligament is reached and resected in its narrowed area. Then the pudendal nerve and vessels are discovered, crossing back the posterior wall of the sacro-spinal ligament. The nerve is dissected and easily followed in the Alcock's tunnel by retracting the fat tissue of the ischio-rectal fossa. Then a dissection is done in the tunnel after the opening of the internal obturator fascia and the eventual resection of the falciform process when it is found. At last, the section of the sacro-spinal ligament allows the transposition of the nerve ventrally to the ischiatic spine.

We have operated more than 700 patients since 1987. Our results are as follows:

44% of excellent results

20% improved

1% increased

35% unchanged

It must be determined whether we can increase the success rate by improving the choice of surgical candidates. The best thing for the future being an earlier diagnosis, which could decrease the destruction of the nerve fibers and avoid a chronic painful state.