

The neuropelveology: a new specialty in medicine?

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INTRODUCTION

The pelvis contains not only different organs such as the bladder, rectum or genital organs, but also pelvic nerves. After the central nervous system and spinal cord, no other part of the body contains so many and such important nerves: pelvic nerves are not only involved in sexuality, voiding and storage pelvic organs and locomotion but also in the transport of all sensitive information's generated in the lower limbs and pelvis to the central nervous system. Pelvic nerves damages lead therefore to pelvic visceral dysfunctions, problems with locomotion and different kinds of pain. Unfortunately no specialty deals electively with the pathologies of the pelvic nerves and plexuses!

PELVIC NERVES ARE OMITTED IN MEDICINE

Reports about pelvic nerves damages secondary to surgical and obstetrical procedures are rare in literature. This is surprising if one considers how many invasive procedures in proximity to the pelvic nerves are performed every day over the world and how many pelvic pathologies do exist which could potentially induce a compression, entrapment or invasion of the pelvic nerves. Incidences of pelvic nerves pathologies are widely underestimated obviously because of lack of awareness that such lesions may exist, lack of diagnosis and acceptance, declaration and report of such lesions. The same phenomenon of "incidence underestimation" is observed with all neurogenic and non-neurogenic pelvic nerves and plexuses pathologies.

The most probable reasons for omission of the pelvic nerves in medicine are the complexity of the pelvic nerve system, the difficulties of etiologic diagnosis and - probably the main reason - the limitations of access to the pelvic nerves for neurophysiologic explorations and neurosurgical treatments. Neurosurgical procedures techniques are well established in nerve lesions of the upper limb but pelvic retroperitoneal areas and surgeries to the pelvic nerves are still unusual for neurosurgeons. Few open-surgical approaches to the sacral plexus have been described by neurosurgeons for treatment for traumatic pelvic plexopathies, but these approaches are laborious and invasive, offer only limited access to the different pelvic areas and expose patients to risk of severe vascular complications. Techniques of nerves neuromodulation to control pelvic pain syndromes and dysfunctions are for the same reasons, limited to spinal cord and sacral nerves roots stimulation that restrict considerably their indications and effectiveness.

LAPAROSCOPY ENABLES PELVIC NEURO-FUNCTIONAL SURGERY...

All these limitations of access to the pelvic nerves and plexuses can now be overcome with the laparoscopy: development of video endoscopy and microsurgical instruments enables good access to all areas in the retroperitoneal pelvic space, providing the necessary visibility with magnification of the structures and possibility to work with appropriate instruments (figure 1).¹ Using laparoscopic exposure and sparing of the motor autonomic nerves of the pelvic organs, postoperative functional morbidities can be avoided successfully in radical pelvic surgery.² Therefore iatrogenic dysfunctions such as bladder retention, chronic

constipation, urinary and faecal incontinence or sexual dysfunctions cannot longer been accepted as a fatality that patients must accept as the "price for a optimal procedure", but must be considered complications that can be avoided by using selective nerve sparing techniques, without compromising the radicality of the procedure. In pelvic pain and/or dysfunctions due to pelvic nerves damages secondary to pelvic surgeries or pelvic pathologies, laparoscopy allows for an exact morphologic, etiologic and functional exploration of the pelvic nerves that can results in an effective treatment. Classical neurosurgical procedures such as nerve decompression and reconstruction are feasible in optimal surgical conditions through this way. Moreover, laparoscopic surgery is the gold standard for treatment of etiologies such as nerve endometriosis or vascular/fibrotic tissue/surgical material nerve entrapment.³ The laparoscopy is therefore the essential and logical step in the management of pelvic nerve pathologies that must be indicated as soon as possible, before the nerve damage becomes irreversible and before the process of "pain chronification" starts.

... THAT OPENS A NEW THERAPEUTIC WAY FOR A LARGE NUMBER OF PATIENTS ...

Laparoscopy is also the only technique that enables selective placements of electrodes to all pelvic nerves and plexus. This technique of **L**aparoscopic **I**mplantation **O**f **N**europrothesis also called "LION procedure", enable both, a morphologic and functional exploration of the nerves before the decision of implantation, and a selective placement under optimal vision of electrodes in direct contact to the nerves.⁴ The use of multiple channel electrodes enables stimulation of different pelvic nerves and plexuses at the same time and with a broad variation and combination of electrical currents. So the sacral plexus LION procedure permits to control most of pain syndromes and dysfunctions of pelvic organs (chronic pelvic pain, sacral radiculopathies, pudendal/gluteal/genital pain, urgency syndrome, bladder hyperactivity and/or retention, urinary and faecal incontinence...) and of the lower limbs (phantom and residual post-amputation pain, spasticity and spasms, muscle atrophy...). This evolution also presents new therapeutic options in the management of patients suffering from neurogenic pathologies of the peripheral (multiple sclerosis, polyneuropathies, neuromas...) and of the central nervous system (multiple sclerosis, Parkinson syndromes, stroke...).

...AND A REVOLUTION FOR SPINAL CORD INJURED PEOPLES

For spinal cord injured people, since a complete biological cure is unlikely to be developed in the near future, electrical devices are still required to restore functions. The LION procedure enables implantation of electrodes to the different pelvic nerves involved in pelvic functions and locomotion. In this way, pudendal neuromodulation enables relaxation of the bladder during filling phase and micturition when desired, letting patients free from catheterization. The sciatic neuromodulation allows for control of spasticity of the lower extremities by muscle training that constitute in combination with the electrical induced skin blood flow

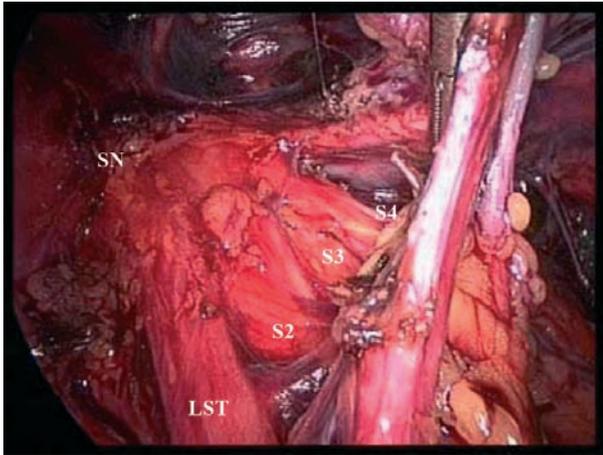


Fig. 1 – Laparoscopic exposure of the left sacral plexus SN: sciatic nerve – LST: lumbosacral trunk – S: sacral nerve root.

improvement, an optimal prophylaxis against decubitus lesions.⁵ Blockade of the knees in extension by femoral stimulation with stabilization of the pelvis by concomitant sciatic stimulation enable lower paraplegics (Th7-Th12) to recover an autonomic alternative locomotion. In spina bifida children's, the LION procedure offers a unique method for controlling pelvic floor dysfunction using selective pelvic nerve stimulation and bypassing the points of anatomic abnormalities and scar tissue due to previous dorsal surgeries. Laparoscopic Neuro-Navigation is an essential Technique in this pathology since it grants an exact functional exploration and cartography of the pelvic nerves allowing for a more selective stimulation adapted to specific nerve damages. All these new aspects are the results of pioneering work which has been resumed under the term "neuropeleology". This new specialty in medicine focuses on the prevention, diagnosis and treatments of pathologies of the pelvic nerves and plexuses. The dilemma is that all knowledge required for this approach is dispersed into completely different speciality

areas, which usually have nothing in common: knowledge in neurology, pelvic neuro-anatomy, pathologies of the pelvic organs and training in laparoscopic (neuro-)surgery are mandatory. Nonetheless, because of the huge number of patients who may profit from these new developments, omission of the pelvic nerves in medicine is not any longer acceptable. This evolution will require more exchange of ideas between clinical physicians and basic researchers and should encourage young physicians to involve energy and work in fields of clinical and experimental surgery.

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