Laparoscopic therapy of endometriosis and vascular entrapment of sacral plexus

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Introduction
Deeply infiltrating endometriosis (DIE) is usually associated with a multitude of symptoms and constitutes a complex treatment challenge. While ureteral and intestinal involvements are well-known clinical forms of DIE, sacral plexus endometriosis is largely unknown and still considered as rare in gynecology (1). Same low incidences are reported in literature with all further etiologies for pelvic nerves pathologies (2). The aim of this study is to report about our experience with pelvic pathologies of the sacral plexus and sciatic nerve to draw gynecologists’, neurologists’ and neurosurgeons’ attention to such pathologies.

Materials and Methods
All consecutive patients send us between November 2004 and February 2010 for treatment for unilateral sciatica (L5,S1-2) and/or pudendal/gluteal pain (S2-4) of unknown genesis after exclusion of any spinal cord etiology - were included prospectively in this study. Patients with laparoscopically confirmed surgical (3) or traumatic damages to the sacral plexus were excluded from this study. All data was collected at time of surgery on a standardized form used in the clinical care of all our patients.

Preoperative assessment not only focused on gynecological aspects, but also included neurologic symptoms for sacral radiculopathies. Careful anamnese was performed with detailed informations of pain involving the buttock, the pudendal area and the lower extremities. Informations were obtained on possible motoric deficits of hip adduction (L3/Obturator Nerve), knee extensors (L1-L4/Femoral Nerve), ankle dorsiflexion (foot drop – L5) and ankle plantar flexion (S1). Sphincters dysfunctions, motor/sensitive urinary urgency or voiding difficulties were explored by urodynamic testing. Clinical examination included vaginal palpation (eventually anesthetic infiltrations) of pudendal nerves and the lower sacral nerve s roots (S3, S4) and research for any hypo/a/hyperesthesia at the lumbo-sacral dermatomes and peripheral nerves.

The same evaluation was performed for post-operative follow-up.
Our surgical principle is based on the full exposure of the nerves clinically suspected of being involved by transperitoneal approach. Exposure of the sacral nerves roots below the cardinal ligament – “infra-cardinal level” of the sacral plexus - has been reported elsewhere (4). Exposure of the distal portion of the sacral plexus and of the sciatic nerve - “supra-cardinal level” – can be obtained by starting dissection at the level of the lumbo-sacral fossa passing laterally to the external iliac vessels or by starting dissection at the level of the internal iliac artery. Full exposure of the sciatic nerve, of the gluteal nerves and of the pudendal nerve before its leaves the pelvis is obtained by detaching inter-iliac lymph-fat-tissue from the pelvic sidewall and following the dorsal border of the obturator internus muscle in direction the sciatic spine.

Visual Analog Scale (VAS) score was obtained pre- and postoperatively. Paired t-test was used to compare pre and post-operative VAS scores.

Results

Two hundred thirteen consecutive patients were included in this study. Mean age of patients was 28 years (17-79) by a mean BMI of 29.2 (25-32). All procedures were performed by laparoscopy without any need of conversion to laparotomy. Table 1 shows associated surgical procedures. No intra-operative complication occurred. One patient developed during the first postoperative night an intimae dissection of the right internal iliac artery that required an inguinal ilio-femoral bypass. No further postoperative complications occurred.

Twenty-seven patients presented an isolated endometrial cyst of the sciatic nerve (ISE – isolated sciatic endometriosis without identification of any further manifestation of endometriosis), twenty four patients on the left side and three on the right (5). The lesions, with diameters varying from millimeters to centimeters, had built a true hole inside the nerve at suprapyriform level that contains the L5, S1 and ±S2 nerve fibers. The treatment consisted in a intrafascicular neurolysis with excision of endometriotic tissue and superficial coagulation of the entire sciatic hole. Eleven required a further dissection of the nerve through the greater sciatic foramen downwards to the gluteal region. These patients presented preoperatively L5, S1 and S2 sciatica with in thirteen of them a sacral dermatome hypoesthesia and four a partial foot drop. None of them presented with bladder dysfunctions, hyperactivity or hypersensitivity. One hundred-forty-eight further patients presented a parametric DIE with infiltration per continuum of the sacral plexus. Because of close anatomical relationship, of the sacral uterine ligaments and/or the recto-vaginal was correlated with involvements of he sacral nerves roots S2, S3 and S4 while DIE starting higher from the ovarian fossa or directly from cardinal ligaments (ureteral endometriosis!) involved preferentially the sacral nerves roots S1, S2 and S3, never L5 (table 2). Patients had presented S1-S4 sciatica, gluteal (buttock) and pudendal
pain with troubles of urinary system: urodynamic testing showed sensory urinary urgency in 49 patients, motor bladder hyperactivity in 38 patients and a detrusor hypotension in 37 patients.

In thirty-seven further patients, laparoscopic exploration showed an isolated sacral plexus vascular entrapment. Most frequent entrapped nerves were S1, S2 and the sciatic nerve by atypical sacral and inferior gluteal veins (figure 1). Treatment consisted in the exposure of the nerves with resections of these vessels using bipolar coagulation.

One patient presented a compression of S2 right by a hypertrophic pyriformis muscle (pyriformis syndrome). Partial muscle resection with decompression of S2 was performed. VAS pain scores at six-month follow-up are show in table 3 mean follow-up 21 months, 7-76 months). Postoperative evolutions of pain are show in figure 2. In patients suffering from a foot drop by a massive ISE, surgical treatment did not results in recovery of foot flexion but surgery did not deteriorate the functional disorders.

**Discussion**

Even if numerous etiologies have been reported in the literature, the incidence of sacral radiculopathies and other pelvic neuropathies is still underestimated in the literature. Endometriosis, one of the most prevalent gynecological disorders affecting millions of women around the world, has only been reported two times as a possible etiology for sacral radiculopathy in the literature. (1,11,12) Only few case reports are available on acute pelvic nerve damage secondary to pelvic surgeries (3,13). This is in absolute contradiction to the reality if one considers that neurogenic dysfunctions of the lower urinary/intestinal tract (14,15) and chronic neural pelvic pain (3, 16,17) secondary to pelvic surgery are common complaints in many medical offices. Main probable reasons for omission pelvic nerves pathologies are the difficulty of diagnosis and treatment of such lesions, but also lack of awareness that such lesions may exist (2). In our series, the finding that most patients had undergone several laparoscopies previously (four in average) before suspicion of sacral plexus pathology has been once evocated corroborates this hypothesis. A further dilemma for patients affected by pelvic nerves pathologies is that etiologies, diagnosis and treatments are dispersed into completely different specialties, which usually have nothing in common.

In the present manuscript, we report our experience with sacral plexus endometriosis. Isolated sciatic endometriosis (ISE) and sacral nerves roots endometriosis (SNRE) are apparently two different entities, with distinguishable clinical and surgical findings. SNRE is systematically a part of a parametric DIE: because of close anatomical relationships, sacro-uterine ligament and rectovaginal DIE are risky situations for S3 and S4 involvement, whereas infiltrations of cardinal ligaments and ovarian fossa correlate with S2 and S3 involvements. Typical neurologic symptoms are then pudendal and gluteal pains (S3, S4), S2 sciatica, and troubles of sensibility and functions of
pelvic organs (bladder hyperactivity/sensitivity, troubles of continence, detrusor hypo-contractility...), but never problems with locomotion.

In contrast, ISE is always located at the supra-piriform portion of the sciatic nerve (L5, S1, ±S2) and never part of a parametric DIE. Symptoms are L5 and S1 sciatica, gluteal pain and sometimes, troubles of locomotion (foot drop), but never bladder dysfunctions; pudendal pain is also absent. ISE seems to develop and grow inside the sciatic nerve itself and to expand caudally through the greater sciatic foramen. Therefore, trans-gluteal approach for sciatic nerve decompression exposes the patients to the risk of incomplete surgery by missing the endopelvic part – the main part – of the lesion. ISE requires intra-fascicular neurolysis of the sciatic nerve with resection of destroyed/involved parts of the nerve, whereas in SNRE exposure/decompression of the sacral nerve roots is usually sufficient.

This study is the first report about the vascular entrapment as a potential etiology for pelvic nerves pain, an absolutely unknown pathology in gynecology. This pathology is in contrary well-known by neurosurgeons as a frequent etiology for facial neuralgia. The vascular entrapment of the pelvic nerves seems to be a special clinical form of a pelvic congestion syndrome that emphasizes the necessity of a neurologic examination and anamnesis in patients with chronic pelvic pain.

This study emphasizes the anatomical advantage of laparoscopy with the possibility of exposing by this way all somatic pelvic nerves. Development of video endoscopy and instruments enable good access to all areas in the pelvis, providing the necessary visibility of the nerves and the technical feasibility for neurosurgical procedures (18,19). However preoperative assessment is the most important part of management because it not only justified indication for surgery but also orient the dissection to expose only the damages nerves avoiding unnecessary dissection.

References
Ureterolysis / Ureteral resection  n= 98
Rectum resection (discoid/segmental)  n= 69
Hysterectomy  n= 3
Adnexectomy  n= 2

**Table 1:** Associated surgical procedures

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<tr>
<th>Procedure</th>
<th>LST</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4/5</th>
<th>ON</th>
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<tr>
<td>DIE septum rectovaginal (n=78)</td>
<td>0</td>
<td>13</td>
<td>49</td>
<td>78</td>
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<td>7</td>
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<td>11</td>
<td>11</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Obturatoric fosse (n=12)</td>
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<td>4</td>
<td>12</td>
<td>5</td>
<td>2</td>
<td>11</td>
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</table>

**Table 2:** Correlation between localization of DIE and involvement of the sacral plexus and of the sciatic nerve


<table>
<thead>
<tr>
<th>Procedure</th>
<th>LST</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4/5</th>
<th>ON</th>
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<td>Endometriosis</td>
<td>7,7 (±1,16; 6-10)</td>
<td>6,6 (±1,43; 5-9)</td>
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<td>Vascular entrapment</td>
<td>2,6 (±1,77; 0-6)</td>
<td>1,5 (±1,27; 0-4)</td>
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<td>Pyriformis muscle syndrome</td>
<td>p&lt; 0,001</td>
<td>p&lt; 0,001</td>
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**Table 3:** Comparison in VAS-score pre- and postoperative at 6-months follow-up according with the etiologies
Figure 1: Vascular entrapment covering the entire distal sacral plexus and the sciatic nerve (right side)  
*Left: before decompression – Right: after decompression and full exposure of the sciatic nerve*

VAS-score

![Graph showing VAS-score over time with data points for Pre-operative, one-week, one-month, six-month, and one-year periods. The graph illustrates the minimum/maximum VAS score and mean VAS score over time.]

Figure 2: Evolution of postoperative VAS-score over the time.  
*After a period of few days of completely loss of pain, 91% of the patients developed pain again because of surgical irritation of the nerves that disappear first few months after the procedure.*