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Laparoscopic presacral neurolysis for endometriosis-related pelvic pain

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BACKGROUND: Some patients with endometriosis are candidates for sympathectomy of the superior hypogastric plexus. The objective of this paper is to describe our technique of laparoscopic presacral neurolysis for sympathectomy and to report 1 year results of the first 15 cases. METHODS: To achieve this objective in a prospective observational study of 1 year follow-up; we performed laparoscopic presacral chemical neurolysis with phenol in 15 patients with pelvic pain and minimal–moderate endometriosis. The main outcome measures were: the impact of treatment on pelvic symptom resolution, non-opioid analgesic consumption during menses, sexual performance and observed complications and side effects during 1 year follow-up. RESULTS: We noted a significant reduction in total pelvic symptom score as compared with baseline mean (SD) of 9.04 (1.2). The mean difference [95% confidence interval (CI)] of reduction was 5.7 (4.9–6.5), 5.8 (5.0–6.6) and 5.8 (4.9–6.6) from the baseline at the 3rd, 6th and 12th postoperative month ($P < 0.001$). We observed a significant improvement in Sabbatberg Sexual Rating Scale as compared with baseline mean (SD) of 30.9 (4.3). The mean difference (95% CI) of increase was 33.4 (30.3–36.4), 33.2 (30.1–36.2) and 33.2 (30.1–36.3) from the baseline at the 3rd, 6th and 12th postoperative month. We observed a significant reduction in analgesic consumption during menses in terms of total naproxen sodium tablets as compared with baseline mean (SD) of 8.9 (1.1). The mean difference (95% CI) of reduction in the total number of naproxen sodium 250 mg tablets was 6.5 (5.5–7.5), 6.7 (5.7–7.7) and 6.6 (5.6–7.6) from the baseline at the 3rd, 6th and 12th postoperative month. The most common side effect was constipation. CONCLUSION: Laparoscopic presacral neurolysis is feasible and simple. More data is needed to support its efficacy and safety.

Key words: endometriosis/neurolysis/pelvic pain/presacral neurectomy

Introduction

Hypogastric plexus is of surgical importance in gynaecology to relieve chronic pelvic pain. In 1990 Perez has shown that presacral neurectomy is feasible by laparoscopy (Perez, 1990). Since then, laparoscopic presacral neurectomy has been extensively studied and considered as an effective technique for the treatment of chronic pelvic pain and dysmenorrhea in selected cases (Kwok *et al*., 2001). The current trend is to recommend laparoscopic presacral neurectomy in patients suffering from midline pain. However laparoscopic presacral neurectomy is an eclectic operation, it demands very significant surgical skills and expertise from the surgeon. Even in the hands of experienced surgeons it is open to vascular and lymphatic complications because of the vicinity of great vessels and lymphatic channels (Chen and Soong, 1997; Chen *et al*., 1998; Kwok *et al*., 2001).

In 1990 it was shown by anaesthesiologists that transcutaneous neurolysis of the superior hypogastric plexus is effective and safe in relieving pelvic cancer pain (Plancarte *et al*., 1990). In the following years the indications expanded and included benign pathologies (de Leon-Casasola, 2000).

Pain syndromes are caused by activation of nociceptors and transmission of signals in pain pathways. Thus they are expected to respond to interruption or modulation of that transmission at any level above the site of activation. Chemical neurolysis destructs the microscopic neural architecture, and therefore interrupts the transmission function of the nerves. Neurectomy is the surgical procedure that cuts and removes the nerve fibres to interrupt transmission. The superior hypogastric plexus is the main pathway of neural transmission from the pelvis. While in neurectomy the plexus is exposed and the nerves are either cut or excised to interrupt the neural input, in neurolysis their microscopic neural architecture is chemically destroyed to interrupt the neural input.

In 1999 we decided to use chemical neurolysis via laparoscopy in order to treat recurrent and unbearable pelvic pain of minimal and mild endometriosis. It seemed very attractive to us because of the potential simplicity and effectiveness of the procedure.

The aim of this paper is to describe our technique of laparoscopic presacral neurolysis and to report 1-year results of the first 15 prospectively followed cases on symptom

resolution, non-opioid analgesic consumption during menses, sexual performance and its side effects.

Materials and methods

Among patients who had previous diagnosis and treatment of mild and minimal endometriosis according to the revised American Fertility Society (rAFS) classification (The American Fertility Society, 1985), those with symptoms due to 'probable' recurrent endometriosis, without interest in future child bearing, were considered to be eligible for the study. After thorough discussion of presacral neurectomy, percutaneous neurolytic techniques and the laparoscopic neurolytic technique we were planning to perform with the patients, we did the first laparoscopic presacral neurolysis among those who volunteered in August 1999.

A total of 15 patients were treated between August, 1999 and June, 2001. All patients were followed for at least 1 year.

At baseline all patients were screened for depressive and anxiety states by the Hospital Anxiety and Depression Scale (HADS), which is a self assessment mood scale specifically designed for the use of non-psychiatric hospital outpatients to determine the states of anxiety and depression (Zigmond and Snaith, 1983). It has been shown to be a reliable instrument for screening and a valid measure of severity of these mood disorders in patients under investigation of non-psychiatric departments. It consists of 14 items, seven for the anxiety and seven for the depression subscales. Five mutually exclusive answers are provided for each of the questions; they are rated from 0 to 4 according to increasing psychiatric severity. The points are then summed to give anxiety and depression subtotals and a total score. In terms of subscales a score of <7 indicates non psychiatric cases and >11 indicates psychiatric cases, whereas those in between are regarded as doubtful. For the validity and reliability of HADS in our population, the cut of point was found to be 10 and 7 for anxiety and depression subscales respectively. In this trial only non-psychiatric cases were considered to be eligible.

In all non-psychiatric cases, diagnostic laparoscopy and potential presacral neurolysis in patients with rAFS scores <16, were planned in the first postmenstrual week.

Our aim was to assess the effectiveness of laparoscopic presacral neurolysis on symptom resolution, on the need of non-opioid analgesic consumption during menses and on sexual performance. Furthermore the intraoperative and postoperative complications of presacral neurolysis were recorded.

To assess the impact of laparoscopic presacral neurolysis on symptoms, grading of symptoms and physical findings before and after treatment were done on a previously developed and commonly used scale (Biberoglu and Behrman, 1981). We have modified the original scale by excluding the induration. In this modified scale symptoms of dysmenorrhea, dyspareunia, pelvic pain, and the physical finding pelvic tenderness were each scored by the patient as: none (0 points), minimal (1), moderate (2) and severe (3). The sum of these variables comprised the Total Pelvic Symptom Score (TPSS) in this study.

To assess the impact of laparoscopic presacral neurolysis on the consumption of non-opioid analgesic use during menses to cope with dysmenorrhea, all patients were asked to use naproxen sodium 250 mg tablets twice daily whenever necessary throughout menses. They were asked to record the number of tablets during the whole period in the preoperative menstrual period and postoperative menses for 1 year.

Preoperatively all patients completed the questionnaire of the revised Sabbatsberg Sexual Rating Scale (SSRS) to define the impact of treatment on sexual functioning. The revised SSRS is a 12 item questionnaire for the assessment of sexual functioning (Garrat *et al*., 1995). For each item, there are five possible answers, scored from 0 to 4 points (from the lowest to the highest sexual satisfaction). The scores of 12 items are then summed and transformed to a scale of 0 to 100. This scale is reliable and valid in our patient population and widely used in clinical trials to assess the impact of interventions on sexual functioning. This scale is a general measure of sexual functioning for women and covers both the quantity and quality of sexual experience whilst being relatively brief and not intrusive. It raises simple questions regarding interest, sexual activity, sexual pleasure, orgasmic capacity and importance of sex at present and in the past. Women experiencing pain with sex have significantly lower sexual rating scores (Garrat *et al*., 1995). Our rational was to investigate the impact of this surgery in increasing sexual performance via decreasing pain.

Keeping the reported complications of presacral neuorectomy in mind, patients were specifically questioned regarding bowel habits and urinary symptoms (constipation, diarrhoea, stress incontinence, urge incontinence and voiding difficulty).

In volunteers, diagnostic laparoscopy was performed in the first postmenstrual week for rAFS scoring. We performed laparoscopic presacral neurolysis only in cases with rAFS scores <16 to treat symptoms. We did not perform any fulguration, excision of endometriotic foci other than a biopsy for histological confirmation. The patients were discharged the day after the procedure and had an early postoperative visit at the 5th postoperative day.

The technique of laparoscopic presacral neurolysis is a simple one. A 10 mm umbilical port is used for the standard insufflation and video endoscopy. Two additional 5 mm subumbilical standard ports are created for diagnostic and therapeutic purposes. After the diagnostic laparoscopy for rAFS scoring the promontorium is identified. The peritoneum overlying the promontorium is grasped and elevated by a commercially available endoscopic grasper and from the other port, 5 ml of saline was injected retroperitoneally by a commercially available laparoscopic needle used for ovarian cyst puncture. This elevates the peritoneum and endopelvic fascia from the promontorium. Furthermore this space avoids inadvertent injection of phenol to vessels and backflow of phenol to the peritoneal space. Then 10 ml phenol (10% in Urografin, radiographic contrast medium; Shering AG, Germany) is injected slowly to the deeper part of the artificially created retroperitoneal space from another point of entry. Before withdrawing the needle an additional 2 ml of saline was given to avoid i.p. spillage of phenol during the withdrawal of the needle. Afterwards a thorough pelvic lavage was done. The presacral neurolysis itself is a 2 min operation not including the laparoscopic set-up, diagnostic laparoscopy and drug preparation. For demonstration purposes fluoroscopic controls can be used (Figures 1 and 2).

We have used phenol 10% in Urografin to achieve neurolysis. Phenol(carbolic acid) is a neurolytic agent. The solution was prepared in the operating theatre just before the injection (Raj, 1992). In order to prepare this solution the following steps were followed: 10 ml of ethanol 95%, was drawn into a 15 cc disposable plastic syringe, the needle was removed and a 0.2-μm acid stable filter was attached to the syringe and ethanol was pushed through the syringe on to a 4 × 4 inch sterile dry gauze pad. Then 5 ml of phenol 89% was drawn into another sterile glass syringe. The 0.2-μm acid stable filter, previously prepared by ethanol, was attached to this syringe and 0.9 ml of phenol was slowly pushed into a glass container in order to eliminate the ethanol residue in the filter. Urografin came in 30 ml ampoules; 26.7 ml Urografin was transferred into a sterile 30 ml vial and 3.3 ml of 89% phenol was added to this vial through the 0.2 μm acid stable filter. The final concentration of phenol was ~10% in this ready-to-use solution; 10 ml of this solution was used for laparoscopic presacral neurolysis.

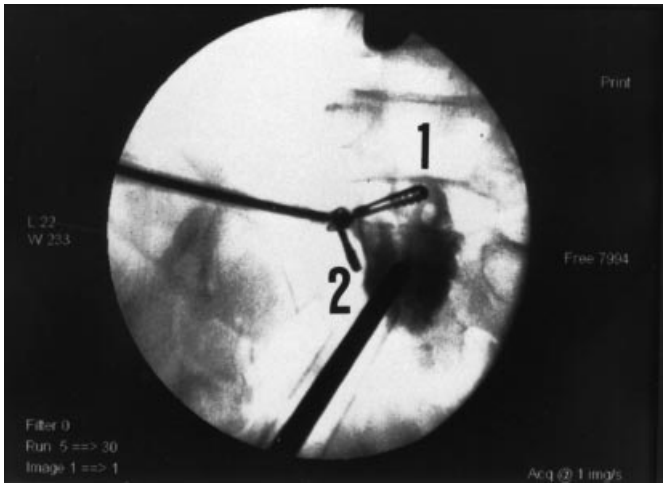

Figure 1. 10% 10 ml of phenol in Urografin in presacral retroperitoneal space. Antero-posterior fluoroscopic view that shows the dissemination of the neurolytic in to the desired anatomical site.1 = L5 vertebra; 2 = dissemination of phenol in Urografin.

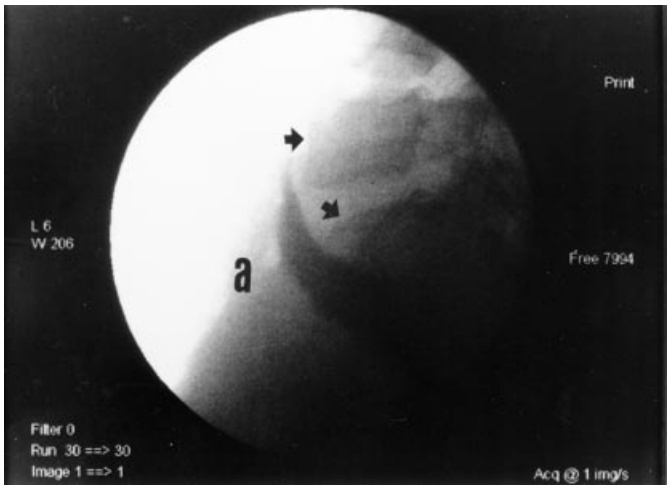

Figure 2. Lateral fluoroscopic view of the presacral retroperitoneal space that shows the dissemination of the neurolytic in the desired anatomical site. Arrows: L5 vertebra and promontorium; a = lateral view of phenol dissemination.

Patients were re-evaluated at the 3rd, 6th, and 12th month postoperatively. At each of these visits total pelvic symptom score, non-opioid analgesic consumption (as the total number of naproxen sodium 250mg tablets) and SSRS were re-evaluated and noted. Complications were searched and appropriately treated.

Statistical analysis of this trial was done by InStat software for Windows (Graph Pad Inc., USA). After performing the descriptive statistics for our patient population, we have performed repeated measures of Anova with Tukey as the post test if $P < 0.05$ to analyse the impact of intervention on TPSS, SSRS and non opioid analgesic consumption during the study period. All data passed the normality tests.

Results

The baseline descriptive statistics of our patient population is given in Table I. At baseline evaluation only two patients reported constipation whereas none reported diarrhoea, urinary incontinence or voiding difficulty.

Table I. Baseline clinical characteristics of study subjects

Baseline characteristics	Mean (SD)
Age	33.4 (1.9)
Gravida	2.3 (0.8)
rAFS score at laparoscopy	6.4 (2.06)
HADS score	
Anxiety	4.5 (1.1)
Depression	3.6 (0.8)
Total	8.2 (1.2)
TPSS	9.0 (1.2)
ACDM[a]	8.9 (1.1)
SSRS	30.9 (4.3)

[a]Total number of naproxen sodium 250mg tablets.
HADS = The Hospital Anxiety and Depression Scale; TPSS = Total Pelvic Symptom Score; ACDM = Analgesic consumption during menses; SSRS = The revised Sabbatsberg Sexual Rating Scale

Table II. The impact of presacral neurolysis

	Baseline Mean (SD)	3rd month Mean (SD)	6th month Mean (SD)	12th month Mean (SD)
TPSS	9.06 (1.2)	2.6 (0.9)	2.4 (1.1)	2.2 (0.8)
SSRS	30.9 (2.3)	64.3 (3.2)	64.1 (2.8)	64.2 (2.8)
ACDM[a]	8.9 (1.1)	2.4 (0.9)	2.2 (1.01)	2.6 (0.8)

[a]Total number of naproxen sodium 250 mg tablets during menses.
TPSS = Total Pelvic Symptom Score, SSRS = Sabbatsberg Sexual Rating Scale; ACDM = Analgesic Consumption During Menses.

The impact of laparoscopic presacral neurolysis on TPSS, SSRS and the non-opioid analgesic consumption during menses is given in Table II. Repeated measures of analysis of variance of main outcome measures during the study period is presented in Table III. It was evident that laparoscopic presacral neurolysis was effective in eliminating pelvic symptoms, restoring sexual performance and reducing analgesic need during menses. In each variable the impact of treatment was evident at the 3rd postoperative month and continued during the whole follow up period without any significant change.

We observed no technical difficulty during the performance of the laparoscopic presacral neurolysis procedure, noted no intraoperative and only one early postoperative surgical complication. The only early postoperative complication was retention of the urine and it recovered by the 12th postoperative day without any medication other than clean intermittent self catheterization. At the 3rd postoperative month evaluation, 11 patients including the previous two complained of constipation. One patient with baseline constipation worsened. A high fibre diet with 3 l water plus one small coffee cup of olive oil at bed time proved to be effective in ten of the patients while the last patient improved by adding senna in the recommended dosage at the fourth postoperative month.

Discussion

In our opinion it is particularly necessary to discuss three important aspects of this study: (i) our rationale behind the laparoscopic presacral neurolysis; (ii) the technique and its

Table III. Repeated measures analysis of variance during the study period

	TPSS			SSRS			ACDM (Naproxen 250 mg tablets)		
	Mean difference	95% CI	*P*-value	Mean difference	95%CI	*P*-value	Mean difference	95% CI	*P*-value
Baseline versus 3rd month	5.733	4.9–6.5	< 0.001	–33.40	(–)36.4–(–)30.3	< 0.001	6.53	5.5–7.5	< 0.001
Baseline versus 6th month	5.867	5.0–6.6	< 0.001	–33.21	(–)36.2–(–)30.1	< 0.001	6.73	5.7–7.7	< 0.001
Baseline versus 12th month	5.800	4.9–6.6	< 0.001	–33.26	(–)36.3– (–)30.2	< 0.001	6.66	5.6–7.6	< 0.001
3rd versus 6th month	0.13	(–)0.6–0.9	ns	0.20	(–)2.8–3.2	ns	0.20	(–)0.8–1.2	ns
3rd versus 12th month	0.06	(–)0.7–0.8	ns	0.13	(–)2.9–3.1	ns	0.13	(–)0.8–1.1	ns
6th versus 12th month	–0.06	(–)0.8–0.7	ns	0.06	(–)3.1–2.9	ns	–0.06	(–)1.0–0.9	ns

TPSS = total pelvic symptom score; SSRS = Sabbatsberg sexual rating scale; ACDM = analgesic consumption during menses; CI = confidence interval; ns = not significant.

potential complications and (iii) our rationale for not treating the endometriosis itself and not using the laparoscopic presacral neurolysis as an adjunctive measure.

A significant proportion of patients with endometriosis are candidates for sympathectomy. Sympathectomy as presacral neurectomy is not a new idea and dates back to 1899 (Kwok *et al*., 2001). In 1990 it was shown that this can be done by laparoscopy (Perez, 1990). However this operation is an advanced endoscopic procedure and it carries major surgical risks even in the hands of experienced surgeons (Chen and Soong, 1997; Kwok *et al*., 2001). Neurolysis of superior hypogastric plexus dates back to 1990. Plancarte from Mexico city was the first pain specialist that performed posterior transcutaneous superior hypogastric plexus neurolysis (Plancarte *et al*., 1990). Their group of patients were those with pelvic malignancy at the beginning and it was later shown by them and others that superior hypogastric plexus neurolysis was effective in reducing pelvic pain and daily opioid use in both benign and malignant diseases (Waldman *et al*., 1991; de Leon-Casasola *et al*., 1993; Plancarte *et al*., 1997; Rosenberg *et al*., 1998; de Leon-Casasola, 2000). However their method was technically difficult, required bispatial fluoroscopy and there was an active search in pain literature to simplify the described technique by alternate ways of approach and advanced imaging techniques (Waldman *et al*., 1991; Cousins and Bridenbaugh, 1998; Stevens *et al*., 2000; Cariati *et al*., 2002). Transvascular approach has been reported (Cousins and Bridenbaugh, 1998). It was not possible for us to use the standard technique as gynaecologists. Superior hypogastric blocks which are technically the same are used in patients with endometriosis (Wechsler *et al*., 1995; Kanazi *et al*., 1999). One author used this block during laparoscopic pain mapping in order to select patients for presacral neurectomy (Steege, 1998). Based on the previous works of these distinguished authors we have realised that injection of neurolytic agent under direct vision via laparoscopy to the presacral retroperitoneal space can be a very simple and effective form of sympathectomy. During our study period the simplicity of the procedure for the average gynaecologist was clearly evident. We noted similar effectiveness as compared with the literature on neurolysis and neurectomy.

Laparoscopic presacral neurolysis is a very simple operation for the average gynaecologist. It is merely injecting 10 ml of neurolytic solution in the retroperitoneal space over the promontorium. Phenol and alcohol are the principle agents used for sympathetic neurolysis. Phenol (carbolic acid) is used extensively in neurolysis, it causes a nonspecific destruction on neural architecture. To date no complications regarding the superior hypogastric plexus neurolysis with phenol is reported in more than 200 transdermally performed cases (Cousins and Bridenbaugh, 1998; de Leon-Casasola, 2000). However potential theoretical complications that have to be taken into account in transdermal approach are intramuscular (psoas muscle), intravascular, subarachnoid, epidural, intraperitoneal, intravisceral (bowel, ureter) injections. Neurolytic damage of somatic nerves can occur with direct needle trauma or with spillage of neurolytic solutions. Vascular puncture can cause retroperitoneal haematoma formation. None of these theoretically possible complications is reported; however, there are some universal cautions to exercise (Cousins and Bridenbaugh, 1998). The first is proper needle placement which is checked by the fluoroscopy or advanced imaging in the transdermal approach. Aspiration for blood is important. Intravascular injection of phenol may cause tinnitus, flushing, tremors and convulsions. The recovery is rapid and complete. Unexpected spread to nearby somatic nerves may cause permanent neural deficits. Thus the least possible volume should be chosen. In the first 15 cases we have treated, we used direct laparoscopic approach to the presacral space and achieved the exact anatomic orientation. In other words laparoscopy was the advanced and ultimate imaging technique of proper place selection. We were aware of the retroperitoneal location of major vessels and by raising the peritoneum with retroperitoneally injected saline we stayed away from the middle sacral vein and artery. We were aware of the fact that there was no somatic nerve in this anatomical location. As we injected the least possible volume recorded in the literature for this particular procedure and did not create any weakness of endopelvic fascia structure, we avoided spillage of the solution. Furthermore by injection of the solution from another point of entry, and an additional 2 ml of saline before removal and through pelvic lavage we avoided i.p. spillage of the agent. We

observed no intraoperative or postoperative complications related to the procedure itself. However as the neurolysis was effective, one patient developed transient urinary retention and a significant proportion developed constipation as side effects. These are the recorded side effects of neurolysis and presacral neurectomy (Chen and Soong, 1997; Nezhat *et al*., 1998; Perry, 1999).

In the literature it is very difficult to know how much credit to assign to the presacral neurectomy in the relief of endometriosis symptomatology as the procedure is often performed in conjunction, as an adjunctive measure, with other procedures such as fulguration, excision of endometriotic foci (Kwok *et al*., 2001). We consider these procedures, as well as the laparoscopic presacral neurolysis-neurectomy, as a symptomatic not a causal form of treatment in patients with endometriosis. Literature also supports the view that endometriosis is a dynamic disease that can be progressive, static or resolving in any given patient (Sutton *et al*., 1997). Since currently we are unable to identify those progressive cases in any given time, we have chosen to treat the symptoms by neurolysis in minor degrees of endometriosis. This design was particularly useful to prove the potential impact of laparoscopic presacral neurolysis on symptom relief attributed to endometriosis.

In the study period we noticed how easy it could be to perform a laparoscopic presacral neurolysis. In our opinion surgery should be simple but the surgeon should have expertise and be cautious. Furthermore our results indicated an effective technique that achieved symptom relief. Most probably due to its effectiveness on the control of visceral pain, this technique also decreased analgesic consumption, and improved sexual performance.

In conclusion, laparoscopic presacral neurolysis is feasible and easy to perform. Our data indicates that this novel technique can be considered in the treatment of painful benign pelvic conditions as the only form of symptomatic treatment or as an adjunctive procedure. However more data is needed to support its efficacy and safety. We must emphasize the preliminary nature of the study and we believe randomized controlled trials are necessary before the procedure becomes widely adopted.

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