

## Effects of presacral neurectomy on pelvic pain in women with and without endometriosis

## Efektywność leczenia zespołu bólowego miednicy mniejszej metodą neurektomii przedkrzyżowej u pacjentek z i bez endometriozy

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## Abstract

**Objective:** Presacral neurectomy (PSN) is used in treatment of central chronic pelvic pain (CPP); however, the confounding effect of concomitant resection of endometriosis remains uncertain. This study was undertaken to evaluate and compare the effectiveness of presacral neurectomy (PSN) in the presence and absence of endometriosis.**Material and Methods:** Twenty-three women with midline CPP (age 30.3±7.9, range 21-46) unresponsive to medical therapy were recruited to the study. Endometriosis was absent in seven and present in sixteen subjects. Laparoscopic PSN using a harmonic scalpel was performed in all subjects; simultaneous excision of endometriotic lesions was also carried out in subjects with endometriosis. Intensity of dysmenorrhoea and pelvic pain was measured by visual analogue pain scale (VAPS) at 3 and 12 months postoperatively.**Results:** Dysmenorrhoea decreased at 3 months by 75% ( $P=0.018$ ) in those without endometriosis and by 78% ( $P=0.001$ ) in those with endometriosis. At 12-months, dysmenorrhea increased in women with endometriosis ( $P=0.008$ ), but not in those without endometriosis. Pelvic pain not related to menses decreased by 67% ( $P=0.0007$ ) and by 87% ( $P=0.028$ ), respectively, in women with and without endometriosis. Dyspareunia, declined dramatically at 3 and 12 months to a median score of 0 (the majority of subjects had no discomfort;  $P<0.001$ ); the change in dyspareunia between 3 and 12 months was in favour of patients without endometriosis ( $P=0.02$ )**Conclusions:** PSN using a harmonic scalpel results in long-term pain relief, especially in patients without endometriosis.Key words: **pelvic pain / endometriosis / laparoscopic presacral neurectomy / harmonic scalpel /**

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## Streszczenie

**Cel pracy:** Neurektomia przedkrzyżowa jest stosowana w leczeniu zespołu bólowego miednicy mniejszej, jakkolwiek sumaryczny efekt jednocześnie przeprowadzonej resekcji ognisk endometriozy pozostaje niejasny. Prezentowana praca ma na celu porównanie skuteczności laparoskopowej neurektomii przedkrzyżowej w przypadku obecności endometriozy, oraz u chorych, u których ta choroba nie występuje.

**Materiał i metody:** Badaniem objęto dwadzieścia trzy kobiety z centralnie zlokalizowanym przewlekłym bólem miednicy mniejszej (wiek  $30,3 \pm 7,9$ ; 21-46 lat), nieodpowiadającym na leczenie farmakologiczne.

Endometriozę stwierdzono u 16 pacjentek. W badanej grupie wykonano laparoskopową neurektomię przedkrzyżową z zastosowaniem skalpela harmonicznego, uzupełnioną o wycięcie ognisk endometriozy w 16 w/w przypadkach. Nasilenie bólu towarzyszącego krwawieniu miesięczkowemu oraz bólu niezwiązanego z krwawieniem oceniano na podstawie wzrokowej skali bólu (VAPS) przed zabiegiem oraz po 3 i 12 miesiącach po operacji. Bolesność stosunków płciowych oceniono z zastosowaniem czterostopniowej skali.

**Wyniki:** Po 3 miesiącach od operacji intensywność bólu związanego z krwawieniem miesięczkowym zmniejszyła się znacząco w obu grupach pacjentek (u chorych bez endometriozy o 75% ( $P=0,018$ ), a w grupie z endometriozą o 78% ( $P=0,001$ ). Po 12 miesiącach zaobserwowano wzrost intensywności odczuwanego bólu u kobiet z endometriozą ( $P=0,008$ ), natomiast u pacjentek bez endometriozy poprawa była na niezmiennym poziomie.

Odczuwalność bólu w miednicy mniejszej niezwiązanego z krwawieniem miesięczkowym zmniejszyła się na skutek operacji o 67% ( $P=0,0007$ ) i o 87% ( $P=0,028$ ) odpowiednio w grupie z endometriozą i bez endometriozy. Bolesność stosunków płciowych zmniejszyła się istotnie 3 miesiące po operacji i efekt utrzymywał się nadal po 12 miesiącach (większość pacjentek nie podawała żadnego dyskomfortu,  $P<0,001$ ), jednak trwalszy efekt zaobserwowany został w grupie pacjentek bez endometriozy ( $P=0,02$ ).

**Wnioski:** Długoterminowa skuteczność laparoskopowej neurektomii przedkrzyżowej z zastosowaniem noża harmonicznego w leczeniu zespołu bólowego miednicy mniejszej jest obserwowana szczególnie u kobiet bez współistniejącej endometriozy.

Słowa kluczowe: **endometrioza / laparoskopowa neurektomia przedkrzyżowa /  
/ nóż harmoniczny / zespół bólowy miednicy mniejszej /**

## Introduction

Midline chronic pelvic pain is one of the most common medical problems among women referred to gynecologists. More than 10% of gynecologic consultations in the United States concern chronic pelvic pain (CPP). CPP may consist of dysmenorrhea, dyspareunia and/or chronic, low abdominal pain not related to menses. CPP is most commonly accompanied by endometriosis and almost 70% of women affected by endometriosis have CPP. Another common cause of CPP is the presence of adhesions, usually a consequence of chronic and recurrent pelvic inflammatory disease. It has also been noted that up to 40% of women with CPP may have no obvious underlying anatomic cause, indicating a possible role of psychological factors [1, 2].

A broad range of treatments for CPP reflects the complex and still poorly understood pathogenesis of this condition. One of the potential surgical modalities of CPP treatment is excision of nerve bundles in the superior hypogastric plexus – presacral neurectomy (PSN). The effectiveness of PSN was evaluated in several studies [3-5] suggesting some relief of midline abdominal pain. Recent large randomized double-blind controlled trial confirmed that PSN is effective for the treatment of severe dysmenorrhoea caused by endometriosis [6]. This study was designed to determine whether the presence of endometriosis impacts effectiveness of PSN on central pelvic pain.

Previous reports evaluated effects of PSN performed using various instruments including scissors, bipolar cautery, Argon Beam Coagulator and Nd:Yag laser [7-9]. Recently, the harmonic scalpel, which uses ultrasonic energy of a high frequency vibrating blade, has been introduced to operative laparoscopy. This allows for rapid, safe and nearly bloodless resection of tissues [10].

## Aim of the Study

The aim of this study was to evaluate prospectively the effectiveness and complications of laparoscopic presacral neurectomy performed using the harmonic scalpel in women with midline chronic pelvic pain, irrespective of its pathogenesis. To our knowledge this is the first report comparing prospectively effectiveness of PSN in the presence and absence of endometriosis.

## Material and Methods

Twenty-three women ( $30.3 \pm 7.9$  years old; range 21-46) admitted to the Division of Infertility and Reproductive Endocrinology at Poznan University of Medical Sciences in the years 2004-2006, with midline chronic pelvic pain lasting for at least 6 months and unresponsive to medical therapy were recruited to the study. Patients with lateral chronic pelvic pain or with a history of previous surgical treatment were excluded. The study was approved by the local ethics committee and written informed consent was obtained from all patients.

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All laparoscopic surgeries were performed under general endotracheal anesthesia and following bowel preparation. Laparoscopes, trocars, secondary instruments, and the light source were provided by Aesculap - Chifa, Poland. All procedures were performed by the first and/or the last author (P.J. and L.P.). Standard technique using three 5mm ports placed suprapubically was used. An operative laparoscope was inserted through a 10mm incision at the umbilicus. Steep Trendelenburg positioning with some tilting of the operating table to the left side was used to displace the sigmoid colon to the left. The retroperitoneal space was entered by horizontal incision of the peritoneum overlaying the sacral promontory using microscissors; the incision was extended laterally towards the ureter on the right and towards the inferior mesenteric artery and the sigmoid colon on the left. The incision was also extended cephalad towards the bifurcation of the aorta and caudally. Identification of the nerve bundles of the superior hypogastric plexus was performed bluntly using micrograspers. Nerves of the presacral plexus were interrupted by ultrasonically activated scalpel - harmonic scalpel (Ethicon, Johnson & Johnson, USA) using a 5mm hook-blade spatula. Nerve fibres were excised to the level of S2, and the material obtained was sent for histopathological confirmation of nerves resection. Bleeding vessels were coagulated using bipolar electrocautery. After meticulous irrigation of the operating field and control of the bleeding, edges of the incised peritoneum were not sutured. When endometriosis was encountered, excision or desiccation of endometriotic lesions was carried out. Postoperative management was as in other routine operative laparoscopies. Intra- and postoperative complications were recorded.

All subjects underwent baseline evaluation including physical examination and ultrasound scan. Detailed history regarding earlier medical therapy and concomitant medications was collected. Pain intensity of dysmenorrhoea and pelvic pain not related to menses was assessed with visual analogue pain scale (VAPS) at the baseline office visit and subsequently at 3 and 12 months postoperatively. VAPS has been described in detail previously [11]. Briefly, VAPS is a 100 mm scale with two poles depicted as: no pain and worst pain imaginable. Patients assessed pain intensity (dysmenorrhoea and pelvic pain not related to menses) using VAPS.

To assess dyspareunia at baseline and 3 and 12 months postoperatively, an a 4-grade verbal scale was used:

- 0 – no discomfort;
- 1 – minor, acceptable discomfort;
- 2 – pain and discomfort, causing cessation of intercourse;
- 3 – avoidance of intercourse due to severe, unbearable pain.

Patient satisfaction with overall pain relief after the surgical treatment was assessed at the final visit at 12 months postoperatively, using a modified satisfaction scale (0% - no pain relief and 100% - complete pain relief).

Results in figures are presented as median and interquartile ranges. Statistical analysis was performed using Analysis of Variance, Wilcoxon Signed Rank Test and chi-square test, as required. Results are presented in the form of box plots. Differences at  $P < 0.05$  were considered statistically significant.

## Results

All subjects recruited underwent PSN, confirmed by histopathological examination and completed a 12-month follow-up. Endometriosis (stage II-IV) was diagnosed in 16 patients (69.6%); resection of the endometriosis was performed during the same surgery as PSN. No major intra- and postoperative complications, including severe bleeding and trauma to pelvic organs, were observed. Short-term constipation was reported by 6 women (26%); it invariably resolved within several days following the procedure. Opioids were not used for post-operative pain relief.

The median score of dysmenorrhoea decreased by 76% at 3 months ( $P < 0.0001$ ); this improvement remained significant at the end of 12-months (decrease vs. baseline by 65%;  $P = 0.0004$ ) in the analysis of all study patients ( $N = 23$ ). (Figure 1a).

A comparable decline of dysmenorrhoea at 3 months was observed in the subgroup without endometriosis (decline by 75%;  $N = 7$ ;  $P = 0.018$ ) and in the subgroup with endometriosis (decline by 78%;  $N = 16$ ;  $P = 0.001$ ). (Figure 1b and 1c).

Notably, between 3 and 12 months after PSN, there was a modest but significant ( $P = 0.008$ ) increase of dysmenorrhoea among women with endometriosis; no significant change of dysmenorrhoea was seen in patients without endometriosis ( $P = 0.42$ ).

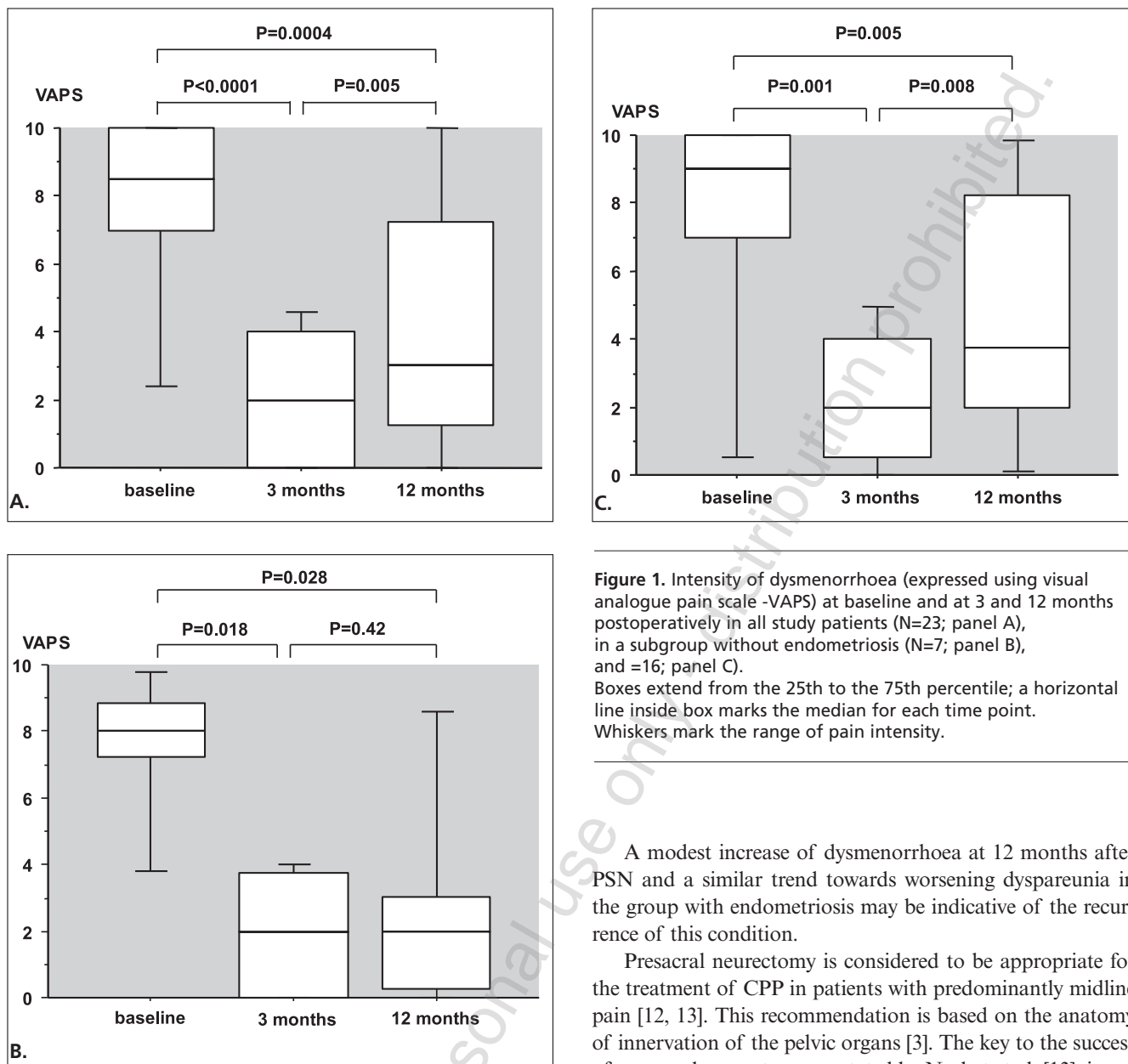
A significant decrease in the median intensity of pelvic pain not related to menses (Figure 2a) was observed postoperatively at 3 months in the analysis of all study patients (decline by 67%;  $P < 0.0001$ ), in the analysis of subjects without endometriosis (decline by 87%;  $P = 0.028$ ) (Figure 2b) and in those with endometriosis (decline by 67%;  $P = 0.0007$ ) (Figure 2c).

At 12 months, the improvement of pelvic pain not related to menses remained significant in the analysis of all study patients ( $P = 0.0004$ ), as well as in the analysis of both the subgroup without endometriosis ( $P = 0.043$ ) and the subgroup with endometriosis ( $P = 0.003$ ).

Analysis of the 4-grade verbal scale describing dyspareunia, revealed a significant reduction in the number of patients with pain grade 3 (pain leading to avoidance of intercourse) at 3 months and 12 months (by 80%;  $P < 0.01$ ). Dyspareunia (Figure 3a), when analyzed in all subjects, declined at 3 and 12 months postoperatively to a median score of 0 (i.e. no dyspareunia in the majority of subjects;  $P = 0.001$ ). While, overall, similar effects were observed in subjects without (Figure 3b) and with (Figure 3c) endometriosis; the change in dyspareunia scores between 3 and 12 months was in favor of patients without endometriosis ( $P = 0.02$ ).

At the final visit 12 months postoperatively, 79% of patients described overall satisfaction with respect to pain relief.

One subject, aged 43, had no pain relief in any of the parameters evaluated at 3 and 12 month postoperatively and underwent a total abdominal hysterectomy with bilateral salpingoophorectomy performed after the completion of the follow-up period. Major improvement of pelvic pain was reported subsequently by this patient.



**Figure 1.** Intensity of dysmenorrhoea (expressed using visual analogue pain scale -VAPS) at baseline and at 3 and 12 months postoperatively in all study patients (N=23; panel A), in a subgroup without endometriosis (N=7; panel B), and =16; panel C). Boxes extend from the 25th to the 75th percentile; a horizontal line inside box marks the median for each time point. Whiskers mark the range of pain intensity.

## Discussion

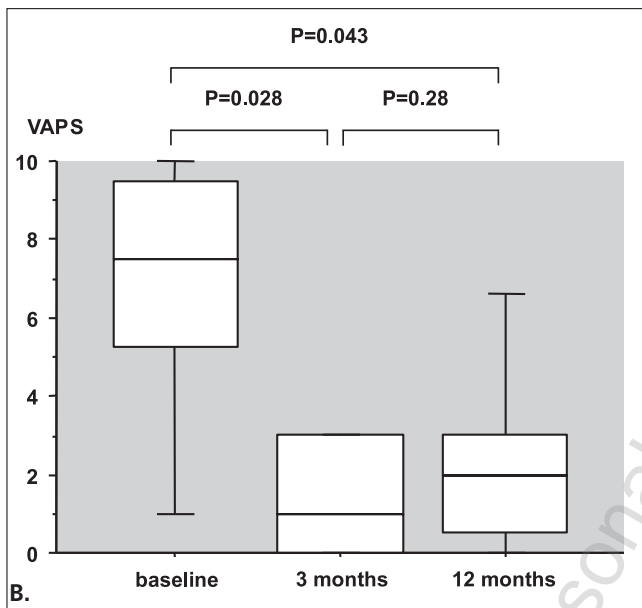
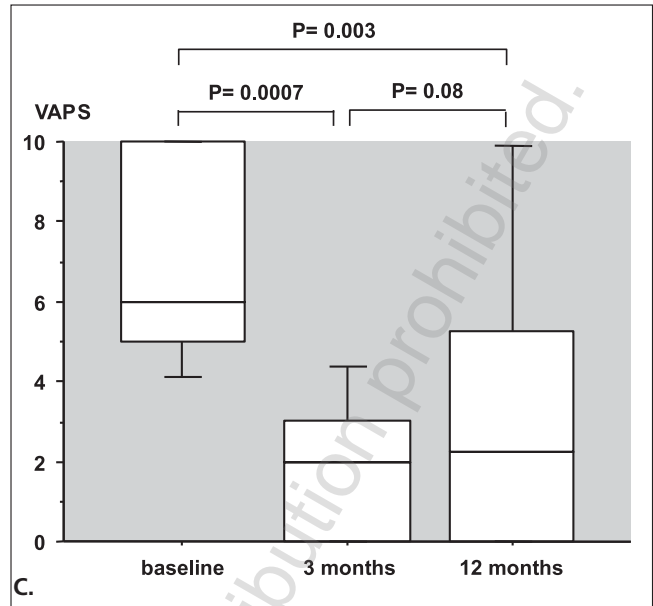
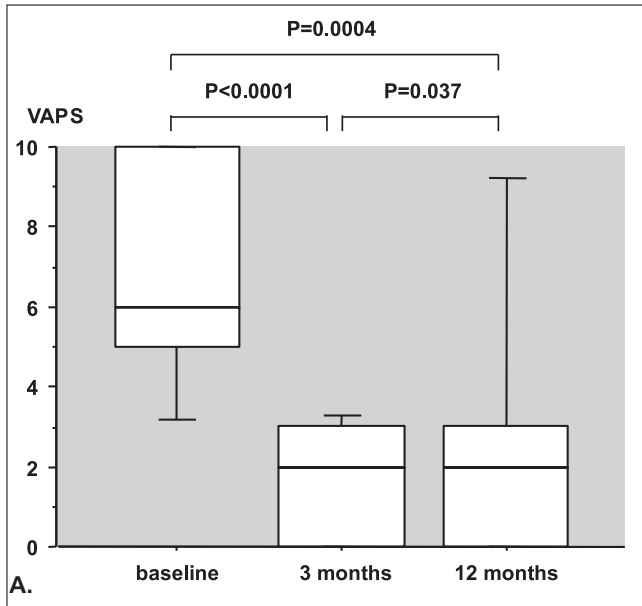
The present study demonstrates that laparoscopic presacral neurectomy performed using a harmonic scalpel is an effective surgical treatment of women with midline chronic pelvic pain both in the presence and in the absence of endometriosis. Significant improvement in dysmenorrhoea, dyspareunia and chronic pelvic pain was noticeable at 3 months and remained significant at 12 months postoperatively. This may indicate long term effectiveness of this therapy. Endometriosis was detected in almost 70% (n=16) of patients and probably plays a major role in the development of CPP. Notably, different patterns of long-term effects on dysmenorrhoea were observed in the subgroups with and without endometriosis.

A modest increase of dysmenorrhoea at 12 months after PSN and a similar trend towards worsening dyspareunia in the group with endometriosis may be indicative of the recurrence of this condition.

Presacral neurectomy is considered to be appropriate for the treatment of CPP in patients with predominantly midline pain [12, 13]. This recommendation is based on the anatomy of innervation of the pelvic organs [3]. The key to the success of presacral neurectomy, as stated by Nezhat et al. [13], is not only the wide excision of nerve bundles in the plexus, but also the appropriate selection of subjects with midline pain [14]. In addition, some investigators reported the beneficial effects of PSN in the treatment of chronic pelvic inflammatory disease [12, 15]. There is ongoing controversy over routine performance of simultaneous PSN during resection of endometriosis [16-18]. Several studies show significant beneficial effects of PSN [3, 5, 9, 12, 19].

In a group of 176 subjects with a follow-up of 2 to 5 years, Nezhat et al. demonstrated that beneficial effect of PSN remained apparent over a longer period of time [5]. In a recent double-blind randomized controlled trial, the effectiveness of PSN in women with severe dysmenorrhoea caused by endometriosis was reconfirmed [6]. Performance of PSN in addition to conservative laparoscopic surgery for endometriosis resulted in greater improvement of signs and symptoms at follow up examinations at 6 and 12 months. Less convincing results were demonstrated when PSN was performed at laparotomy [20].

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**Figure 2.** Intensity of chronic pelvic pain (expressed with visual analogue pain scale – VAPS) at baseline and at 3 and 12 month postoperatively in all study patients (N=23; panel A), in a subgroup without endometriosis (N=7; panel B), and =16; panel C). Boxes extend from the 25th to the 75th percentile; a horizontal line inside box marks the median for each time point. Whiskers mark the range of pain intensity.

This may be due to the more extensive and more traumatic nature of the procedure and/or a greater risk of postoperative adhesion formation. However, it should be kept in mind that even more radical therapy such as total abdominal hysterectomy fails to provide improvement in about 20% of the patients operated upon [21]. As suggested by some researchers, this may be due to psychosomatic factors [21].

Precise assessment of the effectiveness of PSN is confounded by concomitant removal of endometriotic lesions at the same surgery, since improvement of pain may be largely related to treatment of endometriosis [22]. However, as demonstrated in this report, long-lasting and pronounced pain relief has been observed following PSN in the absence of endometriosis. To our knowledge this is the first report assessing separately effectiveness of PSN in the presence and absence of endometriosis. In our opinion careful selection of

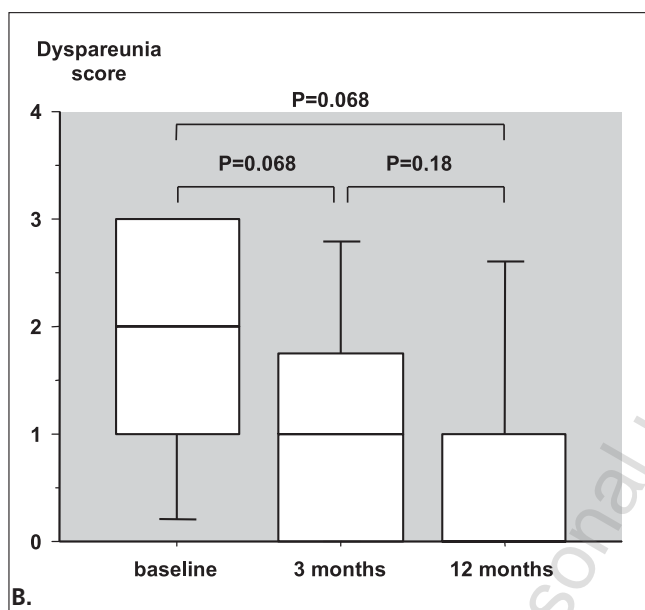
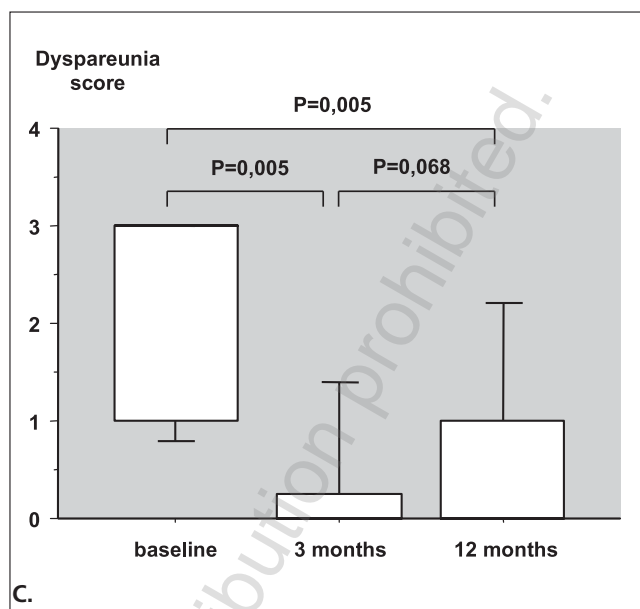
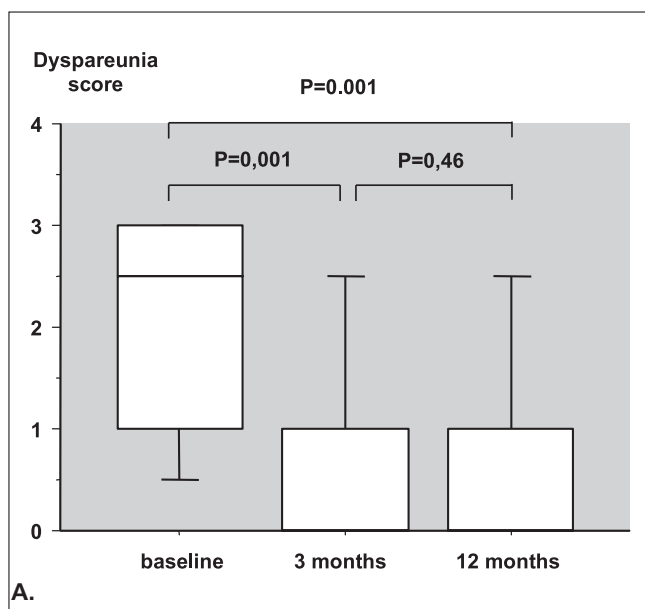
patients with severe midline dysmenorrhea, dyspareunia and central pelvic pain irrespective of pathogenesis, and proper surgical technique are crucial for the long lasting relief of these symptoms.

In this study, we observed no major complications and only minor gastrointestinal symptoms (transient constipation) in 26% of subjects. Similar observations were reported in other studies; hence constipation may be viewed as a frequent but not significant postoperative complication [12, 13, 20]. Disruption of bowel function may be related to the participation of both the sacral and lumbar spine in the regulation of function of the sigmoid colon and bladder [23]. Animal studies have revealed that destruction of lumbar bundles/nerves with preservation of sacral bundles results in dysfunction of the sigmoid colon and the bladder, but does not cause loss of motor function during defecation and urination. Precise identification of the nerve fibres innervating individual organs is impossible and hence avoidance of short-term bladder and intestine dysfunction may not be possible [13]. On the other hand, temporary impairment of function of these organs indirectly confirms appropriate nerve resection. Additionally, the application of the harmonic scalpel during laparoscopy proved to be a safe and effective method for nerve interruption.

Our findings confirm that laparoscopic PSN is an effective, minimally invasive therapeutic option for centrally located chronic pelvic pain, especially in young women. The laparoscopic approach provides excellent visualization of the operative field, low risk of complications, and rapid recovery.

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**Figure 3.** Intensity of dyspareunia (relative score) at baseline and at 3 and 12 month postoperatively in all study patients (N=23; panel A), in a subgroup without endometriosis (N=7; panel B), and =16; panel C).

Boxes extend from the 25th to the 75th percentile; a horizontal line inside box marks the median for each time point. Whiskers mark the range of pain intensity.

## Conclusions

In appropriately selected patients, endoscopic presacral neurectomy may result in long-term relief of pelvic pain, dysmenorrhoea and dyspareunia. The beneficial effects of PSN were noted irrespective of the concomitant presence and treatment of endometriosis.

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Application of the harmonic scalpel enables resection of the nerve bundles in a safe and precise fashion, minimizing tissue destruction and thermal injury. In contrast to monopolar electrosurgery, the use of the harmonic scalpel is not associated with risks of stray electrical charges or capacitive coupling. The risk of damage to the adjacent structures is minimal since cutting and coagulation take place in close proximity to the harmonic scalpel blade [24]. This causes less tissue necrosis and thus may minimize scarring. Several studies in animal models demonstrated reduced adhesion formation and less tissue damage when compared to electrocauterization [25]. Notably, however, harmonic scalpel may be less effective than bipolar electrocautery in its ability to coagulate larger vessels [24].

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