NATIONAL INSTITUTE FOR HEALTH AND CLINICAL EXCELLENCE

INTERVENTIONAL PROCEDURES PROGRAMME

Interventional procedure overview of laparoscopic uterine nerve ablation (LUNA) for chronic pelvic pain

Pelvic pain in women can have a number of causes, including endometriosis (a condition in which tissue that is normally found lining the inside of the womb also occurs outside the womb, usually in the pelvic cavity). In many cases of pelvic pain, the cause is unknown. Laparoscopic uterine nerve ablation (LUNA) involves the destruction of a small segment of ligament that carries nerve fibres within the pelvis.

Introduction

This overview has been prepared to assist members of the Interventional Procedures Advisory Committee (IPAC) in making recommendations about the safety and efficacy of an interventional procedure. It is based on a rapid review of the medical literature and specialist opinion. It should not be regarded as a definitive assessment of the procedure.

Date prepared

This overview was prepared in February 2007.

Procedure name

- Laparoscopic uterine nerve ablation (LUNA)
- Laparoscopic uterosacral nerve transection
- Laparoscopic uterosacral ligament resection

Specialty societies

- British Society for Gynaecological Endoscopy
- Royal College of Obstetricians and Gynaecologists
- The Pain Society

Description

Indications

Chronic pelvic pain, including dysmenorrhoea and dyspareunia

Chronic pelvic pain is pain that occurs below the umbilicus that lasts for at least 6 months. It may or may not be associated with menstruation. Painful menstruation is known as dysmenorrhoea and is classified as primary or secondary. Primary dysmenorrhoea commonly affects teenagers and young women and does not have an underlying cause. Secondary dysmenorrhoea is used to describe period pain that is caused by an underlying problem. It is less common than primary dysmenorrhoea and tends to affect women later in their reproductive lives.

One of the most common causes of chronic pelvic pain, dysmenorrhoea and dyspareunia is endometriosis. In this condition tissue that is normally found lining the inside of the uterus also occurs outside the uterus, usually in the pelvic cavity. This tissue behaves in the same way as endometrial tissue during the menstrual cycle as a result of normal hormonal control, building up and then breaking down with bleeding. This leads to inflammation, pain and the formation of scar tissue. The cause of endometriosis is unknown, and definitive diagnosis is usually by laparoscopy or laparotomy. The severity of endometriosis is described using the American Fertility Society (AFS) stages I (minimal) to IV (severe) on the basis of the location and depth of endometrial deposits and the extent to which scar tissue has formed around them. The stage does not necessarily correlate with the frequency and severity of pain symptoms.

Other causes of chronic pelvic pain include pelvic inflammatory disease (usually caused by infection), pelvic congestion syndrome, nerve entrapment, neuropathic and post-surgical pain. In some cases of chronic pelvic pain, the cause cannot be identified.

Current treatment and alternatives

Treatment for chronic pelvic pain, dysmenorrhoea and dyspareunia depends on the underlying cause.

Treatment for endometriosis depends on several factors, including severity of symptoms and disease and the desire to have children. Hormonal treatments include testosterone derivatives, progestogens and gonadotropin releasing hormone (GnRH) analogues; the aim of these is to stop ovulation and allow the endometrial deposits to regress. Conservative surgery aims to remove the endometrial deposits, usually by laser or electrocautery, and is done via laparoscopy or laparotomy. Hysterectomy, with or without removal of the ovaries, may be considered for severe symptoms that do not respond to conservative treatment.

When the cause of the pelvic pain cannot be identified, conservative treatment includes non-steroidal anti-inflammatory drugs and trial of the contraceptive pill. If other treatments fail, options for surgical treatment include vaginal uterosacral ligament resection, uterine nerve ablation (UNA) and presacral neurectomy (PSN). UNA involves the transection of the uterosacral ligaments at their insertion into the cervix; PSN involves total removal of the presacral nerves. These procedures are conventionally performed by laparotomy. They are also used to treat pain associated with endometriosis.

What the procedure involves

Laparoscopic uterine nerve ablation (LUNA) is usually carried out under general anaesthesia. The peritoneal cavity is insufflated with carbon dioxide gas and several small incisions are made in the abdomen to provide access for the laparoscope and surgical instruments. After the course of the ureters has been delineated, the uterus is anteverted with a uterine manipulator and the uterosacral ligaments are identified and transected close to their attachment to the cervix. One or both of the ligaments may be transected. A small portion of ligament is sometimes resected and examined histologically to confirm the presence of nerve fibres. LUNA is often carried out during the course of other surgical treatment for endometriosis.

Efficacy

The Specialist Advisers listed key efficacy outcomes as pain relief and improvement in quality of life.

Pain relief
A systematic review of nine randomised controlled trials (RCTs) reported that there were no significant differences overall in pain relief between women treated with LUNA and controls (women treated with diagnostic laparoscopy or conservative surgery alone) at 6 months (odds ratio [OR] 1.15, 95% confidence intervals [CI] 0.66 to 1.99), 12 months (OR 1.20, 95% CI 0.72 to 1.99) or 36 months (OR 0.84, 95% CI = 0.39 to 1.80). For women with primary dysmenorrhoea, the OR for pain relief at 6 and 12 months was 1.43 (95% CI 0.56 to 3.69) and 6.12 (95% CI 1.78 to 21.03), respectively, in favour of LUNA. For women with secondary dysmenorrhoea, the OR for pain relief at 6 and 12 months was 1.03 (95% CI 0.52 to 2.02) and 0.77 (95% CI 0.43 to 1.39), respectively.

One RCT included in the systematic review compared laparoscopic PSN (LPSN) with LUNA; it reported that women treated with LPSN had significantly less pain at 12 months than women treated with LUNA (OR = 0.10, 95% CI 0.03 to 0.32). A non-randomised comparative study reported that 76% (25/33) of women treated with LUNA had relief of dysmenorrhoea at 6 months, compared with 91% (21/23) of women treated with LPSN (p value not stated). One RCT comparing LUNA with vaginal uterosacral ligament resection reported similar proportions of women with no chronic pelvic pain, or pain not requiring treatment at 12 months (75% [27/36] and 74% [28/38] respectively, p = 0.90).

In one case series of 85 women, excellent or satisfactory improvement (not further defined) was reported by 76% (38/50) of women with dysmenorrhoea and 80% (41/51) of women with deep dyspareunia after a mean follow-up of 19 months.

One case series of 52 women reported an overall success rate (defined as a response of pain relief of 8 or higher on a scale of 0–10, no need for oral

analgesics and the absence of pelvic pathology on pelvic examination) of 72% at 1 year, 58% at 2 years, 51% at 3 years and 40% at 4 years.

Safety

The Specialist Advisers stated that potential adverse events include vascular, bowel or ureter injury, bleeding, the need for conversion to open surgery, and prolapse.

Few complications were reported. In one non-randomised comparative study and one RCT, more complications were reported for LPSN than for LUNA. Constipation was reported in 0% (0/35) and 12% (4/34) of women treated with LUNA compared with 94% (31/33) and 21% (5/24) of women treated with LPSN. Urinary urgency, postoperative bleeding and painless labour were also reported in the LPSN groups but not the LUNA groups.

Two case reports described a total of five woman with uterine prolapse after having LUNA; three women were young nulliparous soldiers undergoing airborne training and the other two women had a history of vaginal childbirth.[8,9]

Literature review

Rapid review of literature

The medical literature was searched to identify studies and reviews relevant to LUNA. Searches were conducted via the following databases, covering the period from their commencement to 19 January 2007: Medline, PreMedline, EMBASE, Cochrane Library and other databases. Trial registries and the Internet were also searched. No language restriction was applied to the searches. (See appendix C for details of search strategy.)

The following selection criteria (table 1) were applied to the abstracts identified by the literature search. Where these criteria could not be determined from the abstracts the full paper was retrieved.

Table 1 Inclusion criteria for identification of relevant studies

Characteristic	Criteria
Publication type	Clinical studies were included. Emphasis was placed on identifying good quality studies. Abstracts were excluded where no clinical outcomes were reported, or where the paper was a review, editorial, or laboratory or animal study. Conference abstracts were also excluded because of the difficulty of appraising methodology.
Patient	Patients with chronic pelvic pain, dysmenorrhoea or dyspareunia
Intervention/test	Laparoscopic uterine nerve ablation (LUNA)
Outcome	Articles were retrieved if the abstract contained information relevant to the safety and/or efficacy.
Language	Non-English-language articles were excluded unless they were thought to add substantively to the English-language evidence base.

List of studies included in the overview

This overview is based on one Cochrane systematic review and meta-analysis, one additional RCT, one non-randomised comparative study, four case series and two case reports.[1–9]

Other studies that were considered to be relevant to the procedure but were not included in the main extraction table (table 2) are listed in appendix A.

Existing reviews on this procedure

A Cochrane review – Surgical interruption of pelvic nerve pathways for primary and secondary dysmenorrhoea – was published in 2005.[1] The review identified nine RCTs that met the criteria for inclusion, six of which included LUNA.[10–15] There was some evidence for the effectiveness of LUNA when compared with controls or no treatment in women with primary dysmenorrhoea, and there were no significant differences in short-term pain relief between LUNA and LPSN. However, in the long term LPSN was significantly more effective than LUNA. The authors concluded that there was insufficient evidence to recommend the use of nerve interruption in the management of dysmenorrhoea, regardless of cause, and that further RCTs should be undertaken. This review is summarised in table 2.

The European Society for Human Reproduction and Embryology (ESHRE) published a guideline for the diagnosis and treatment of endometriosis in 2005.[16] The guideline states that ‘ablation of endometriotic lesions reduces endometriosis-associated pain and the smallest effect is seen in patients with minimal disease; there is no evidence that also performing LUNA is necessary’.

Related NICE guidance

Below is a list of NICE guidance related to this procedure. Appendix B details the recommendations made in each piece of guidance listed below.

Interventional procedures

- Laparoscopic helium plasma coagulation for the treatment of endometriosis. *NICE Interventional Procedure Guidance* 171 (May 2006). See http://guidance.nice.org.uk/IPG171 for further information.

Technology appraisals

None.

Clinical guidelines

None.

Public health

None.

Table 2 Summary of key efficacy and safety findings on laparoscopic uterine nerve ablation (LUNA)

Abbreviations used: CI, confidence interval; LBCUV, laparoscopic bipolar coagulation of uterine vessels; LPSN, laparoscopic presacral neurectomy; OR, odds ratio; VUSR, vaginal uterosacral ligament resection

Study details	Key efficacy findings	Key safety findings	Comments
Proctor ML (2005)[1] **Systematic review (Cochrane) and meta-analysis** Search period: June 2004 Population: women with primary or secondary dysmenorrhoea Indications: inclusion criteria listed as women of reproductive years, women with primary dysmenorrhoea (no identifiable organic pathology), women with secondary dysmenorrhoea (identifiable specific pathology). Exclusion criteria: women with secondary dysmenorrhoea associated with the use of intrauterine contraceptive devices 6 RCTs including LUNA were identified: 1. Chen (1996),[10] n = 68, LUNA versus LPSN 2. Johnson (2004),[11] n = 123, LUNA and conservative surgery for endometriosis versus conservative surgery or LUNA at laparoscopy versus laparoscopy alone, 12 month follow-up 3. Lichten (1987),[12] n = 21, LUNA versus diagnostic laparoscopy alone, 12 month follow-up 4. Sutton (2001),[13] n = 51, LUNA with laparoscopic treatment of all visible endometriosis versus laparoscopic treatment of all visible endometriosis, 6 month follow-up 5. Vercellini (2003),[14] n = 180, conservative laparoscopic surgery with LUNA versus conservative laparoscopic surgery, 12 month follow-up 6. Yen (2001),[15] n = 85, LUNA with LBCUV versus LBCUV, 6 month follow-up	**LUNA (+/- control) versus control (control was diagnostic laparoscopy alone, conservative surgical treatment of endometriotic lesions, LPSN or LBCUV)** Pain relief up to 6 months (5 studies, N = 258): OR 1.15, 95% CI 0.66 to 1.99 Pain relief up to 12 months (4 studies, N = 285): OR 1.20, 95% CI 0.72 to 1.99 Pain relief up to 36 months (1 study, N = 116): OR 0.84, 95% CI 0.39 to 1.80) *Primary dysmenorrhoea* (2 RCTs, N = 68) Pain relief up to 6 months, OR 1.43, 95% CI 0.56 to 3.69, and at 12 months, OR 6.12, 95% CI 1.78 to 21.03 (in favour of LUNA) Patient satisfaction rates (1 RCT) • LUNA = 83% (15/18) • Control = 69% (22/32), p > 0.05 There was no significant difference in the need for additional treatment between the groups. *Secondary dysmenorrhoea* Pain relief Follow up ≤ 6 months (3 RCTs, N = 190): OR 1.03, 95% CI 0.52 to 2.02 At 12 months (2 RCTs, N = 217), OR 0.77, 95% CI 0.43 to 1.39 Up to 36 months after treatment (1 RCT, N = 116) OR 0.84, 95% CI = 0.39 to 1.80 Patient satisfaction rates (1 RCT, N = 180), based on intent-to-treat analysis: • LUNA = 68% • Control = 73% At 12 months' follow-up, there were no significant differences between groups for quality-of-life data.	Constipation (1 RCT, n = 68): • LUNA = 0% (0/35) • LPSN = 94% (31/33) OR 0.02, 95% CI 0.01 to 0.06 Urinary urgency and painless labour were also reported in the LPSN group (numbers not stated).	The review states that the effect of treatment may overlap with the placebo effect of laparoscopy, reducing differences in short-term efficacy between groups. The review states that lack of power to detect a clinically important difference was an issue of concern in the trials with null results. The Lichten trial,[12] which reported significant differences in pain relief at both short- and long-term follow-up, used sequential allocation; concealment was described as inadequate. The Johnson trial[10] was considered by the Cochrane review authors to have adequate allocation concealment and randomisation. Five of the six RCTs used double blinding. Two trials included an intent-to-treat analysis.

Abbreviations used: CI, confidence interval; LBCUV, laparoscopic bipolar coagulation of uterine vessels; LPSN, laparoscopic presacral neurectomy; OR, odds ratio; VUSR, vaginal uterosacral ligament resection

Study details	Key efficacy findings	Key safety findings	Comments
Proctor ML (2005) continued. Potential conflict of interest: two authors are investigators in a randomised controlled trial of LUNA, funded by a grant from the Princess of Wales Memorial Trust and administered by the Mercia Barnes Fund of the Royal Australian and New Zealand College of Obstetrics and Gynaecology (RANZCOG). Two authors are involved in a LUNA trial funded by Wellbeing, Royal College of Obstetrics and Gynaecology (RCOG), UK.	**LUNA versus LPSN** *Primary dysmenorrhoea* (1 RCT, N = 68) Pain relief Follow up ≤ 6 months, OR 0.67, 95% CI 0.17 to 2.61 Up to 12 months, OR 0.10, 95% CI 0.03 to 0.32 (in favour of LPSN)		In one trial only 64% of participants (116/180) were analysed.[13] In another, 46% (18/39) of women were excluded from analysis due to pathology at follow up.[11] One trial reported no withdrawals or losses to follow up and three trials reported less than 15% of randomised participants withdrew or were lost to follow up. The review states that lack of sustained long-term benefit could be due to regrowth of nerves or pain signals being transferred via alternative routes.

Abbreviations used: CI, confidence interval; LBCUV, laparoscopic bipolar coagulation of uterine vessels; LPSN, laparoscopic presacral neurectomy; OR, odds ratio; VUSR, vaginal uterosacral ligament resection

<table>
<tr><th>Study details</th><th>Key efficacy findings</th><th>Key safety findings</th><th>Comments</th></tr>
<tr>
<td>Palomba S (2006)[2]

Randomised controlled trial

Italy

Study period: 2001–2003

n = 80

Population: postmenopausal women with intractable and severe midline chronic pelvic pain
• LUNA = 50% (40/80), mean age = 55 years, median parity = 2 (range 0–4)
• VUSR = 50% (40/80), mean age = 54 years, median parity = 2 (range 0–5)

Indications: The postmenopausal state was confirmed by an assay of follicle stimulating hormone and oestradiol levels, the severity of pelvic pain was considered severe if the score on a 100 mm visual analogue scale was at least 80 mm. Exclusion criteria were: major medical disease, psychological/psychiatric disorders, neurological alterations of lumbar–sacral tract, previous pelvic surgery, history of severe abdominal or pelvic infections, history of infertility, presence of other gynaecological pathologies, previous or current use of hormone replacement therapy. Women who were unable to complete the daily diary or who had a history of alcohol abuse or other drugs were also excluded.

Technique: VUSR involved transection of the uterosacral ligaments via a transverse posterior colpotomy of about 6 cm. The ends of the remaining uterosacral ligament were tied with reabsorbable sutures.

Follow-up: 12 months</td>
<td>‘Cure’ was defined as no chronic pelvic pain, or chronic pelvic pain not requiring medical treatment.

Peritoneal adhesions were observed in 3 women and vascular adhesions in 1 woman. In all other women, organic pelvic pathologies were excluded by laparoscopy.

In all cases, histological examination confirmed the presence of nerve fibres in the uterosacral ligament removed.

Cure rate at 6 months:
• LUNA = 82.5% (33/40)
• VUSR = 87.5% (35/40), p = 0.53
Cure rate at 12 months:
• LUNA = 75.0% (27/36)
• VUSR = 73.7% (28/38), p = 0.90

Severity of chronic pelvic pain (100 mm visual analogue score ranging from ‘least possible pain’ to ‘worst possible pain’). Data expressed as mean ± standard deviation.
<table>
<tr><th>Time of evaluation</th><th>LUNA</th><th>VUSR</th><th>p value</th></tr>
<tr><td>Baseline</td><td>86.1 ± 4.4</td><td>84.5 ± 3.1</td><td>0.06</td></tr>
<tr><td>6 months</td><td>38.5 ± 5.2</td><td>40.6 ± 4.8</td><td>0.07</td></tr>
<tr><td>12 months</td><td>50.5 ± 3.5</td><td>48.5 ± 3.2</td><td>0.06</td></tr>
<tr><td>p value (baseline versus 6 months)</td><td>< 0.001</td><td>< 0.001</td><td></td></tr>
<tr><td>p value (baseline versus 12 months)</td><td>< 0.001</td><td>< 0.001</td><td></td></tr>
</table>
</td>
<td>The report states that no intra-operative or long-term complications occurred in either group. Specifically, there were no cases of uterine prolapse or bladder dysfunction.</td>
<td>An additional 28 women were eligible for entry into the study but 10 refused to give informed consent and 18 refused randomisation.

7.5% (6/80) women were lost to follow-up at 12 months (4 in the LUNA group and 2 in the VUSR group).

There were no significant differences between the two study groups with regard to age, parity, body mass index or duration of pelvic pain.</td>
</tr>
</table>

Abbreviations used: CI, confidence interval; LBCUV, laparoscopic bipolar coagulation of uterine vessels; LPSN, laparoscopic presacral neurectomy; OR, odds ratio; VUSR, vaginal uterosacral ligament resection

<table>
<tr><th>Study details</th><th>Key efficacy findings</th><th>Key safety findings</th><th>Comments</th></tr>
<tr>
<td>Palomba S (2006) continued

Conflict of interest: none stated</td>
<td>Severity of deep dyspareunia (100 mm visual analogue score ranging from ‘least possible pain’ to ‘worst possible pain’). Data expressed as mean ± standard deviation.
<table>
<tr><th>Time of evaluation</th><th>LUNA</th><th>VUSR</th><th>p value</th></tr>
<tr><td>Baseline</td><td>67.3 ± 5.8</td><td>69.6 ± 6.5</td><td>0.09</td></tr>
<tr><td>6 months</td><td>28.4 ± 6.1</td><td>29.9 ± 5.4</td><td>0.25</td></tr>
<tr><td>12 months</td><td>37.0 ± 5.5</td><td>36.9 ± 6.0</td><td>0.99</td></tr>
<tr><td>p value (baseline versus 6 months)</td><td>< 0.001</td><td>< 0.001</td><td></td></tr>
<tr><td>p value (baseline versus 12 months)</td><td>< 0.001</td><td>< 0.001</td><td></td></tr>
</table>
Median postoperative hospital stay:
• LUNA = 1.1 days (range 0.5–2.5)
• VUSR = 1.5 days (range 0.5–2.6), p = 0.49
Median number of pain relief drug vials:
• LUNA = 7 (range 5–9)
• VUSR = 4 (range 2–5), p < 0.001
Median time to return to full activity and/or work:
• LUNA = 7 days (range 2–16)
• VUSR = 8.5 (range 2–13), p = 0.72</td>
<td></td>
<td></td>
</tr>
</table>

Abbreviations used: CI, confidence interval; LBCUV, laparoscopic bipolar coagulation of uterine vessels; LPSN, laparoscopic presacral neurectomy; OR, odds ratio; VUSR, vaginal uterosacral ligament resection

<table>
<tr><th>Study details</th><th>Key efficacy findings</th><th>Key safety findings</th><th>Comments</th></tr>
<tr>
<td>Zullo F (1996)[3]

Non-randomised comparative study

Italy (multicentre)

Study period: not stated

n = 58

Population: women with predominant midline pelvic pain, cyclic or acyclic, persisting for more than 6 months
• LUNA = 59% (34/58), mean age = 31.2 years
• LPSN = 41% (24/58), mean age = 29.3 years

Indications: inclusion criteria were predominant midline pelvic pain, cyclic or acyclic, persisting for more than 6 months and unresponsive (or only temporarily responsive) to medical treatment, laparoscopically assessed endometriosis or no visible pathology at laparoscopy.

Technique: additional conservative treatment of endometriosis included adhesiolysis, endometriomectomy, and ablation of all endometriotic lesions.

Follow-up: 6 months

Conflict of interest: none stated</td>
<td>Successful relief of dysmenorrhoea
• LUNA = 75.8% (25/33)
• LPSN = 91.3% (21/23)

Successful relief of deep dyspareunia
• LUNA = 78.6% (11/14)
• LPSN = not reported

Successful relief of pelvic pain unrelated to menses or coitus
• LUNA = 85.0% (17/20)
• LPSN = 87.5% (14/16)
•

Pain intensity (1–10 linear numeric scale). Data expressed as mean ± standard deviation.
<table>
<tr><th></th><th>Preoperative</th><th>6 month follow-up</th></tr>
<tr><td>LUNA</td><td></td><td></td></tr>
<tr><td>Dysmenorrhoea</td><td>5.82 ± 1.56</td><td>3.02 ± 1.78*</td></tr>
<tr><td>Deep dyspareunia</td><td>6.38 ± 1.53</td><td>1.11 ± 2.21*</td></tr>
<tr><td>Pelvic pain</td><td>6.73 ± 0.70</td><td>1.86 ± 1.64*</td></tr>
<tr><td>LPSN</td><td></td><td></td></tr>
<tr><td>Dysmenorrhoea</td><td>7.29 ± 1.23</td><td>2.87 ± 1.75*</td></tr>
<tr><td>Deep dyspareunia</td><td>5.87 ± 1.12</td><td>1.12 ± 0.99*</td></tr>
<tr><td>Pelvic pain</td><td>8.0 ± 0.85</td><td>2.58 ± 1.08*</td></tr>
</table>
* $p < 0.001$

LPSN had significantly higher efficacy than LUNA in the relief of dysmenorrhoea, but the results were comparable for deep dyspareunia and pelvic pain.

The techniques were comparable in the relief of pain symptoms in women with endometriosis and in those with no visible pathology.</td>
<td>Acute complications

Major bleeding from midsacral vessels
• LUNA = 0%
• LPSN = 4.2% (1/24) (resolved laparoscopically; required blood transfusion)

‘Late’ complications

Constipation
• LUNA = 11.8% (4/34)
• LPSN = 20.8% (5/24)

Urinary urgency
• LUNA = 0% (0/34)
• LPSN = 8.3% (2/24)</td>
<td>Retrospective analysis

This study was excluded from the Cochrane review described previously because women were not randomised to treatment.

There were no significant differences between the groups with regard to age, weight, pain intensity and incidence of infertility.

Laparoscopic diagnosis was endometriosis stage I-II in 16 women, endometriosis stage III–IV in 24 women and no visible pathology in 18 women.</td>
</tr>
</table>

Abbreviations used: CI, confidence interval; LBCUV, laparoscopic bipolar coagulation of uterine vessels; LPSN, laparoscopic presacral neurectomy; OR, odds ratio; VUSR, vaginal uterosacral ligament resection

<table>
<tr><th>Study details</th><th>Key efficacy findings</th><th>Key safety findings</th><th>Comments</th></tr>
<tr>
<td>Chapron C (1998)[4]

Case series

France

Study period: 1992–1996

n = 85

Population: women with chronic pelvic pain suggestive of retroperitoneal endometriosis infiltrating the uterosacral ligaments

Mean age = 30.8 years (range 18–52)

Indications: inclusion criteria not stated. Women with suspected endometriotic invasion of the rectovaginal septum and those for whom there was doubt concerning involvement of the bowel were excluded from the series.

Technique: all endometriotic lesions infiltrating the uterosacral ligament were excised. Other endometriotic lesions, such as adhesions, ovarian cysts and superficial peritoneal implants, were also treated during the same laparoscopy. All women were treated with LUNA but it was an isolated procedure in only 10.6% (9/85) women.

Resection of the uterosacral ligament:
Bilateral = 14.1% (12/85)
Left ligament = 56.5% (48/85)
Right ligament = 29.4% (25/85)

Mean follow-up (for 69 women with minimum follow-up of 3 months) = 19 months (range 4–41)

Conflict of interest: none stated</td>
<td>Improvement in dysmenorrhoea, according to patient (n = 50)
• Excellent = 48.0% (24/50)
• Satisfactory = 28.0% (14/50)
• Slight = 16.0% (8/50)
• No improvement = 8.0% (4/50)

Improvement in deep dyspareunia, according to patient (n = 51)
• Excellent = 56.9% (29/51)
• Satisfactory = 23.5% (12/51)
• Slight = 11.8% (6/51)
• No improvement = 7.8% (4/51)

Efficacy according to stage of endometriosis (revised American Fertility Society classification)
<table>
<tr><td></td><td colspan="2">Stage of endometriosis</td><td>p value</td></tr>
<tr><td></td><td>I and II</td><td>III and IV</td><td></td></tr>
<tr><td colspan="4">Dysmenorrhoea (n = 50)</td></tr>
<tr><td>Excellent or satisfactory improvement</td><td>64.5%</td><td>94.7%</td><td>0.01</td></tr>
<tr><td>Slight or no improvement</td><td>35.5%</td><td>5.3%</td><td></td></tr>
<tr><td colspan="4">Deep dyspareunia (n = 51)</td></tr>
<tr><td>Excellent or satisfactory improvement</td><td>76.5%</td><td>88.2%</td><td>ns</td></tr>
<tr><td>Slight or no improvement</td><td>23.5%</td><td>11.8%</td><td></td></tr>
</table>
</td>
<td>Complications
• Conversion to laparotomy = 0% (0/85)
• Vascular injury = 0% (0/85)
• Transfusion = 0% (0/85)
• Postoperative urinary retention (requiring self-catheterisation) = 1.2% (1/85)
• Nerve injury = 1.2% (1/85)
• Rectovaginal fistula = 1.2% (1/85)
• Vaginal cuff wound perforation during surgery = 2.4% (2/85)
• Postoperative vaginal cuff wound separation = 2.4% (2/85)
• Postoperative pelvic pain (requiring re-admission) = 1.2% (1/85)</td>
<td>Retrospective analysis

81% (69/85) women had a minimum follow-up of 3 months and were included in the efficacy analysis.</td>
</tr>
</table>

Abbreviations used: CI, confidence interval; LBCUV, laparoscopic bipolar coagulation of uterine vessels; LPSN, laparoscopic presacral neurectomy; OR, odds ratio; VUSR, vaginal uterosacral ligament resection

Study details	Key efficacy findings	Key safety findings	Comments
Papasakelariou C (1996)[5] **Case series** USA Study period: 1984–1986 **n = 52** Population: women with central type, progressive and incapacitating dysmenorrhoea not responding to medical therapy Indications: inclusion criteria included incapacitating and progressive central type dysmenorrhoea not responding to a minimum of 6 months' medical therapy (non-steroidal anti-inflammatory agents and an oral contraceptive containing < 50 µg oestrogen taken concurrently). No patient had undergone a previous pain-relieving operation such as LUNA or presacral neurectomy, and none of the women had a history of previous laparoscopic evaluation. Technique: Any pelvic pathology that was found was also treated during the same procedure (pelvic pathologv was found in 91% [39/43] of women: 34 cases of endometriosis, 3 of peritoneal defects and 2 of pelvic adhesions). **Follow-up: All women were followed up for a minimum of 4 years.** Conflict of interest: none stated	Success was defined as a response of pain relief of 8 and higher (on a scale of 0 indicating no relief of pain to 10 indicating complete relief of pain), no need for oral analgesics and the absence of pelvic pathology on pelvic examination. Overall success rate by year of follow-up: • 1 year = 72.0% • 2 years = 58.1% • 3 years = 51.2% • 4 years = 39.5% Success according to surgical findings *Endometriosis stages I–II* • 1 year = 85.7% • 2 years = 71.4% • 3 years = 64.3% • 4 years = 53.6% *Endometriosis stages III– IV ('moderate to severe')* • 1 year = 33.3% • 2 years = 16.6% • 3 years = 0% (all 6 women required a second procedure and 2 underwent hysterectomy and salpingo–oophorectomy) *Pelvic adhesions* • 1 year = 50.0% • 2 years = 50.0% • 3 years = 50.0% *Peritoneal defects* • 1 year = 0% *Normal findings* • 1 year = 100.0% • 2 years = 75.0% • 3 years = 75.0% • 4 years = 50.0%	The report states that 'none of the subjects experienced any complications and no side-effects were reported'.	Consecutive women 17% (9/52) women were lost to follow-up, leaving a study sample of 43.

Abbreviations used: CI, confidence interval; LBCUV, laparoscopic bipolar coagulation of uterine vessels; LPSN, laparoscopic presacral neurectomy; OR, odds ratio; VUSR, vaginal uterosacral ligament resection

Study details	Key efficacy findings	Key safety findings	Comments
Nascu PC (2006)[6] **Case series** Canada Study period: 1998–2003 **n = 27** Population: premenopausal women with chronic pelvic pain and no macroscopic disease identified at laparoscopy Median age = 24 years (range 17–35) 17 women (63%) were nulliparous Indications: inclusion criteria were chronic pelvic pain of at least 6 months duration, no or minimal relief with hormonal therapy and non-steroidal anti-inflammatory drugs, no other medical condition that could account for the pain, and visually normal pelvis at laparoscopy. Exclusion criteria included macroscopic disease in pelvis. Technique: Diagnostic laparoscopy and LUNA, uterosacral ligaments were divided with a laser; the portion removed was sent for histopathological examination. **Follow-up: 12 months** Conflict of interest: none stated	Bilateral uterosacral ligament resection was performed in all but one patient, in whom only the left uterosacral ligament could be safely resected because of the proximity of the ureter to the ligament. Histopathological examination revealed nerve tissue in all specimens. Microscopic endometriosis was identified in 2 women, endosalpingiosis in 2 women, and chronic inflammation (characterised by lymphocytic infiltrate) in 14 women. Of the 21 women who required preoperative pain medication, 8 (38%) no longer needed it after the procedure ($p \leq 0.005$). Days lost from work because of pain: • Before surgery = 52% (12/23) • At 1 year follow-up = 9% (2/23) *Dysmenorrhoea* Postoperative symptom resolution or improvement = 52.2% (raw data not reported) Mean reduction in 10-point numerical pain score = 2.4 ($p \leq 0.001$) At 1 year, 43.5% (10/23) women reported no change compared with preoperative period; 1 woman (4.3%) had worsening symptoms. *Non-cyclical pain* Postoperatively, non-cyclical pain was less severe in 13/21 women (62%). Mean score reduction = 2.9 ($p \leq 0.002$). *Dyspareunia* Postoperatively, severity of dyspareunia was lower in 6/15 women (40%), with a mean score reduction of 2.5.	Paper did not mention any complications.	A total of 108 women with chronic pelvic pain were evaluated and underwent laparoscopy during the study period; 81 were excluded because of the presence of macroscopic disease. 4/27 women (14.8%) were lost to follow-up.

Abbreviations used: CI, confidence interval; LBCUV, laparoscopic bipolar coagulation of uterine vessels; LPSN, laparoscopic presacral neurectomy; OR, odds ratio; VUSR, vaginal uterosacral ligament resection

Study details	Key efficacy findings	Key safety findings	Comments
Guyer C (2000)[7] **Case series** UK Study period: not stated **n = 30** Population: women having LUNA procedure within previous 3 years (symptoms included dysmenorrhoea, dyspareunia and 'other' unspecified) Mean age = 30.6 years (range 22–43) primiparae = 15/30 (50%) multiparae = 15/30 (50%) 73% (22/30) women had endometriosis Indications: inclusion and exclusion criteria not stated. Technique: endometriotic deposits were ablated or excised along with LUNA. **Median follow-up: 26 months (range 4–37)** Conflict of interest: none stated	64% (16/25) women reported improvement in quality of life. *Improvement in quality of life by symptom complex* • Dysmenorrhoea: 1 out of 2 cases improved. • Dyspareunia: 1 out of 1 case improved. • Dysmenorrhoea and dyspareunia: 3 out of 5 cases improved. • Dysmenorrhoea and other: 2 out of 3 cases improved. • Dyspareunia and other: 1 out of 2 cases improved. • Dysmenorrhoea, dyspareunia and other: 8/13 cases (61.5%) improved. 63.2% of women (12/19) with endometriosis felt that surgery had made an overall improvement to their quality of life. 57.1% of women (4/7) without endometriosis felt that surgery had made an overall improvement to their quality of life. 42.1% of women (8/19) with endometriosis reported some recurrence of symptoms. For women treated without LUNA, symptoms improved in 80% (65/81); 57% of women (37/65) had some symptom recurrence; 25 required some form of repeat treatment.	Paper did not mention complications.	Women who had undergone surgery in the previous 3 years were sent a postal questionnaire. In addition to the 30 women having LUNA, 67 women had other laparoscopic treatment for endometriosis and were also included in this study. Response rate = 87% (26/30) The paper states that 'the majority of women had endometriosis so it is difficult to attribute their response to the LUNA alone'. The authors state that they no longer perform LUNA in women with endometriosis unless the disease affects the uterosacral ligaments. They will continue to offer LUNA to women with dysmenorrhoea and dyspareunia without endometriosis.

Abbreviations used: CI, confidence interval; LBCUV, laparoscopic bipolar coagulation of uterine vessels; LPSN, laparoscopic presacral neurectomy; OR, odds ratio; VUSR, vaginal uterosacral ligament resection

Study details	Key efficacy findings	Key safety findings	Comments
Davis GD (1996)[8] **Case reports** USA Study period: not stated **n = 3** Population: female soldiers undergoing airborne training after previous LUNA procedures Ages: 26, 22 and 30 years. Conflict of interest: none stated	All three women reported experiencing relief of pain after the LUNA procedure.	All 3 women developed uterine prolapse during or after airborne training. One woman had LUNA three years earlier for severe dysmenorrhoea, one had LUNA 14 months earlier for severe dysmenorrhoea and the third had LUNA 18 months earlier for chronic pelvic pain and dysmenorrhoea. At the time of the report, two of the women had elected not to undergo reparative surgery and one was planning to have surgery in the near future.	The authors note that there is no way of knowing whether the same degree of uterine descensus would have occurred without the antecedent LUNA procedure. During airborne training, students are required to undergo daily physical training including parachute jumps and high-impact aerobics.

Abbreviations used: CI, confidence interval; LBCUV, laparoscopic bipolar coagulation of uterine vessels; LPSN, laparoscopic presacral neurectomy; OR, odds ratio; VUSR, vaginal uterosacral ligament resection

Study details	Key efficacy findings	Key safety findings	Comments
Good (1992)[9] **Case report** USA Study period: not stated **n = 2** Population: women with history of vaginal childbirth and subsequent development of secondary infertility and severe dysmenorrhoea. Ages: 34 and 36 years. Conflict of interest: none stated		Both women had severe uterine prolapse following LUNA. The first patient developed a prominent cystocele after vaginal childbirth, which was successfully repaired. Subsequently, the patient developed severe dysmenorrhoea and secondary infertility. Laser laparoscopy and LUNA were performed. Three months later, a severe uterine prolapse was diagnosed; the patient underwent a successful transvaginal hysterectomy, posterior repair and sacrospinous fixation. The second patient developed severe dysmenorrhoea and secondary infertility after her first pregnancy. Laser ablation of endometrial deposits, lysis of adhesions and LUNA were carried out. Three months later, the patient became pregnant and at ten weeks' gestation, experienced prolapse of the cervix through the introitus on standing. She delivered vaginally at term. After a third vaginal delivery, the patient is currently symptomatic and planning reparative surgery.	The authors note that although the temporal sequence is suggestive that the uterosacral ligaments function to support the uterus, there is no way of knowing whether the same degree of uterine descensus would have occurred without the antecedent LUNA procedure.

Validity and generalisability of the studies

- The main efficacy outcome for this procedure is pain relief, which can only be measured subjectively; there is likely to be a placebo effect associated with treatment.
- In 3 of the 6 RCTs included in the Cochrane review, LUNA was delivered concomitantly with other surgery. Pooling of the results with those of the other 3 RCTS where LUNA was the only treatment provided makes interpretation difficult.
- One RCT included only postmenopausal women with chronic pelvic pain and excluded women with other gynaecological pathologies. [2]
- One study included only women with a visually normal pelvis at laparoscopy. [6]
- Most of the studies that included women with endometriosis treated the endometriotic deposits at the same time as performing LUNA. It is therefore difficult to assess how much of any improvement can be attributed to the LUNA itself.
- Most studies did not report whether one or both ligaments were transected.
- It is impossible to know whether the prolapses reported in the two case reports were attributable to LUNA.[8,9]

Specialist Advisers' opinions

Specialist advice was sought from consultants who have been nominated or ratified by their Specialist Society or Royal College.

Dr B Collett, Mr A Cutner, Ms S Jones, Dr D Rajasingam, Dr W Stones, Mr J Wright

- Four Specialist Advisers described the procedure as established practice and no longer new.
- There is uncertainty about the efficacy of the procedure.
- Comparators for this procedure include presacral neurectomy and non-surgical management, such as non-steroidal anti-inflammatory drugs and the contraceptive pill. If endometriosis is present, an appropriate comparator would be laparoscopic ablation of endometriosis.
- Key efficacy outcomes include pain relief and quality of life.
- Potential adverse events include the need to convert to open surgery, vascular, bowel or ureter injury, bleeding, damage to ligaments, burns to nearby structures, and bladder dysfunction. Potential adverse outcomes that may occur after a longer term include adhesions and prolapse.

Issues for consideration by IPAC

- A multicentre prospective RCT of LUNA coordinated by the Birmingham Clinical Trials Unit finished recruitment in December 2005. A total of 487 women were recruited and initial results were expected to be submitted for

publication by mid-March 2007. A conference abstract submitted to the European Society of Gynaecological Endoscopy in October 2006 stated that no significant difference was observed between the LUNA and no-LUNA groups for any type of pain.

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Appendix A: Additional papers on laparoscopic uterine nerve ablation (LUNA) not included in summary table 2

The following table outlines the studies that are considered potentially relevant to the overview but were not included in the main data extraction table (table 2). It is by no means an exhaustive list of potentially relevant studies.

Article title	Number of women/ follow-up	Direction of conclusions	Reasons for non-inclusion in table 2
Amin AF, Darwish AM, Makhlouf AM, et al (2000) Endoscopic management of chronic pelvic pain. *Middle East Fertility Society Journal* 5 (1): 57–61.	n = 28 Follow-up = 6 months	79% (22/28) pain-free, 21% (6/28) improved.	Small case series with short follow-up
Carter JE. (1995) Laparoscopic treatment of chronic pelvic pain in 100 adult women. *Journal of the American Association of Gynecologic Laparoscopists* 2 (3): 255–62.	n = 100 (56 with LUNA) Follow-up = 3 years	Average pain level reduced from 8.2 preoperatively to 2.2 at 3 years. Six women ultimately underwent hysterectomy.	Results for women treated with LUNA are not presented separately.
Davis GD (1996) Uterine prolapse after laparoscopic uterosacral transection in nulliparous airborne trainees. *The Journal of Reproductive Medicine* 41: 279–82.	n = 3	3 cases of severe uterine prolapse after previous LUNA procedure, in young nulliparous soldiers undergoing airborne training	Case report
Good MC, Copas PR, Doody MC (1992) Uterine prolapse after laparoscopic uterosacral transection. *The Journal of Reproductive Medicine* 37 (12): 995–6.	n = 2	2 cases of severe uterine prolapse following LUNA, in women with history of vaginal childbirth. It is not known whether the same degree of uterine descent would have occurred without the LUNA procedure.	Case report
Ewen SP, Sutton CJG. (1994) A combined approach for painful heavy periods: laparoscopic laser uterine nerve ablation and endometrial resection. *Gynaecological Endoscopy* 3 (3): 167–8.	n = 14 Follow-up = 6–18 months	93% (13/14) of women reported light or absent menses and improvement or absence of pain.	Small case series LUNA used in conjunction with transcervical resection of the endometrium.
Ewen S, Sutton CJG. (1995) Complications of laser laparoscopy: eleven years experience. *Minimally Invasive Therapy* 4: 27–9.	n = 2344 laser laparos-copies	65% included treatment for endometriosis and LUNA, 5% LUNA alone. 0.4% (9/2344) significant complications, including the need for 3 laparotomies (0.1%).	The results include all 2344 laser laparoscopies and do not discuss LUNA individually.

Article title	Number of women/ follow-up	Direction of conclusions	Reasons for non-inclusion in table 2
Gurgan T, Urman B, Aksu T, et al. (1992) Laparoscopic CO2 laser uterine nerve ablation for treatment of drug resistant primary dysmenorrhoea. *Fertility and Sterility* 58 (2): 422–4.	n = 20	Menstrual pain assessed by linear analogue pain score showed reduction of 33%. There were no major complications.	Small case series
Juang CM, Yen MS, Horng HC, et al. (2006) Treatment of primary deep dyspareunia with laparoscopic uterosacral nerve ablation procedure: a pilot study. *Journal of the Chinese Medical Association* 69 (3): 110–14.	n = 12 Follow-up = 12 months	67% (8/12) women were very satisfied or satisfied 3 months after surgery, and 50% (6/12) at 12 months.	Small case series
Sutton CJ, Ewen SP, Whitelaw N, et al (1994) Prospective, randomized, double-blind, controlled trial of laser laparoscopy in the treatment of pelvic pain associated with minimal, mild and moderate endometriosis. *Fertility and Sterility* 62 (4): 696–700.	n = 63 Follow-up = 6 months	62.5% of women in the laser laparoscopy group reported improvement or resolution of symptoms, compared with 22.6% in the expectant management group	Laser laparoscopy included laser ablation of endometriotic deposits as well as LUNA. Control group were treated with expectant management alone.

Appendix B: Related published NICE guidance for laparoscopic uterine nerve ablation (LUNA)

Guidance programme	Recommendation
Interventional procedures	**IPG171 Laparoscopic helium plasma coagulation for the treatment of endometriosis** 1.1 Current evidence suggests there are no major safety concerns associated with laparoscopic helium plasma coagulation for the treatment of endometriosis. However, evidence on efficacy does not appear adequate for this procedure to be used without special arrangements for consent and for audit or research. 1.2 Clinicians wishing to undertake laparoscopic helium plasma coagulation for the treatment of endometriosis should take the following actions. • Inform the clinical governance leads in their Trusts. • Ensure that women understand the uncertainty about the efficacy of the procedure and provide them with clear written information. In addition, use of the Institute's *Information for the public* is recommended (available from www.nice.org.uk/IPG171publicinfo). • Audit and review clinical outcomes of all women undergoing laparoscopic helium plasma coagulation for the treatment of endometriosis. 1.3 Clinicians undertaking this procedure should have adequate training before performing the technique. The British Society for Gynaecological Endoscopy has produced standards for training (www.bsge.net). 1.4 Publication of randomised controlled trials on the efficacy of this procedure will be useful. The Institute may review the procedure upon publication of further evidence.
Technology appraisals	None applicable
Clinical guidelines	None applicable
Public health	None applicable

Appendix C: Literature search for laparoscopic uterine nerve ablation (LUNA)

Database	Date searched	Version searched
Cochrane Library	18/01/2007	2006, Issue 4
CRD databases (DARE & HTA)	18/01/2007	2006, Issue 4
Embase	18/01/2007	1980 to 2007 Week 02
Medline	18/01/2007	1950 to January Week 1 2007
Premedline	18/01/2007	January 17, 2007
CINAHL	18/01/2007	1982 to December Week 2 2006
British Library Inside Conferences	18/01/2007	-
NRR	18/01/2007	2006, Issue 4
Controlled Trials Registry	18/01/2007	-

Search strategy used in Medline

The search strategy was adapted for use in the databases above

1 exp Laparoscopy/
2 exp Laparoscopes/
3 exp Surgical Procedures, Minimally Invasive/
4 laparoscop$.tw.
5 endoscop$.tw.
6 percutan$.tw.
7 or/1-6
8 uterin$ nerve ablat$.tw.
9 LUNA.tw.
10 uterosacr$.tw.
12 ((pelv$ or uterin$) adj3 nerv$).tw.
13 (nerv$ adj3 ablat$).tw.
14 or/8-12
15 exp Pelvic Pain/
16 (pelv$ adj3 pain$).tw.
17 exp Dysmenorrhea/
18 dysmenorrh$.tw.
19 exp Dyspareunia/
20 dyspareun$.tw.
21 exp Endometriosis/
22 Endometrios$.tw.
23 exp Vaginismus/
24 Vaginis$.tw.
25 (Pain$ adj3 (menstrual$ or period$)).tw.
26 exp Pelvic Inflammatory Disease/
27 (pelv$ adj3 (inflamm$ or diseas$)).tw.
28 PID.tw.
29 ((uterin$ or uter$ or womb$) adj3 fibroid$).tw.
30 or/14-29
31 7 and 14 and 30

32 Animals/
33 Humans/
34 32 not (32 and 33)
35 31 not 34
36 from 35 keep 1-199