Pre-ovarian block versus paracervical block for oocyte retrieval

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BACKGROUND: A pre-ovarian block (POB) technique can be used for pain relief during oocyte retrieval in IVF. The local anaesthetic is deposited in the vaginal wall and between the vaginal wall and the peritoneal surface near the ovary using ultrasound guidance. The aim of this study was to test whether analgesia with POB resulted in improved pain relief compared to paracervical block (PCB).

METHODS: A prospective, randomized, multicentre study of POB versus PCB (10 ml of 1% lidocaine each) with 183 patients randomized to POB (n = 96) or PCB (n = 87) was performed. Randomization (via a computer-generated list) was balanced for age, previously completed IVF cycles, degree of anxiety, estimated number of follicles, BMI, premedication and centre. Pain was measured using a visual analogue scale (VAS, 0–100 mm) and given as median values. The primary end-point of this study was overall VAS pain score for both sides during the oocyte retrieval procedure.

RESULTS: Overall pain during the entire oocyte retrieval was 22 (POB) and 16 (PCB) (P = 0.42). No differences were found in degree of anxiety, premedication, dose of alfentanil, fertilization rate, number of good-quality embryos or clinical pregnancy rate. CONCLUSIONS: No differences were found in overall pain experienced during the entire oocyte retrieval procedure with POB compared to PCB.

Key words: oocyte retrieval/pain relief/paracervical block/pre-ovarian block

Introduction

Oocyte retrieval is reported to be the most painful physical part of the IVF procedure, and various methods of analgesia are in use. A good analgesic method for oocyte retrieval has to give satisfactory pain relief with rapid onset, rapid recovery and ease of administration and monitoring. It is also important that it is safe and has no toxic effects on the oocytes.

Conscious sedation appears to be the most commonly used method for pain relief for oocyte retrieval both in Europe and in the USA (Ditkoff et al., 1997; Bokhari and Pollard, 1999).

Randomized, controlled trials suggest that pain relief is superior when a paracervical block (PCB) is used in addition to sedation, as compared with sedation alone (Corson et al., 1994; Ng et al., 1999). It has also been shown that patients who received only PCB during oocyte collection experienced 2.5 times higher levels of vaginal and abdominal pain than those who received both PCB and conscious sedation (Ng et al., 2001). With the PCB, the local anaesthetic is usually deposited in four locations around the cervix in the vaginal mucosa.

A new technique, pre-ovarian block (POB), has been introduced by one of the authors of this study (I.Ek). The local anaesthetic is infiltrated under ultrasound guidance in the vaginal wall and between the vaginal wall and the peritoneal surface near the ovary. The follicle aspiration needle is then inserted in exactly the same location as the deposited lidocaine. The POB technique has been practised in several Swedish IVF clinics and has been found to be easy to perform and to induce subjectively good analgesia. In patients with high BMI, the clinical impression is that it is technically easier to perform a POB than a PCB. To our knowledge, no randomized trial of the POB versus PCB has previously been published.

The aim of this study was to test whether analgesia with POB resulted in better pain relief than PCB (with alfentanil i.v. for both groups) during oocyte retrieval.
Patients and methods

 Patients

This prospective, randomized, comparative, multicentre study was performed at the Centre of Reproductive Medicine, Sahlgrenska University Hospital, Goteborg, the Fertility Centre, Carlanderska Hospital, Goteborg, and Department of Obstetrics and Gynaecology, Karolinska University Hospital, Stockholm, Sweden, between October 2004 and January 2005.

The study protocol was approved by the ethics committees of Goteborg and Stockholm Universities, and all patients gave their written informed consent.

Patients were eligible for randomization if they fulfilled the following inclusion criteria: (i) signed the written consent, (ii) willing to participate and (iii) Swedish speaking. The exclusion criteria were as follows: (i) participated previously in this study, (ii) lidocaine allergy, (iii) only one ovary or abnormal position of ovaries (i.e. reachable only when passing the aspiration needle through uterus) and (iv) coating more than 1 day because of high risk of ovarian hyperstimulation syndrome.

Visual analogue scale (VAS) for measurement of pain intensity with a range from 0 to 100 mm was chosen for the trial. The McGill Pain Questionnaire was used to measure subjective pain experience and pain characteristics.

Patients were randomized on the day of oocyte retrieval with an Internet-based central randomization programme to either the POB or the PCB group. Randomization ratio was 1:1. Optimal allocation was applied according to Pocock’s minimization technique for sequential randomization (Pocock, 1983), with consideration given to the woman’s age, the number of previously completed IVF cycles, the degree of anxiety, estimated number of follicles, BMI, premedication and centre. In some cases, when the website was down, envelopes were used. Enrolment and obtaining written consent from participants were performed by the physician performing the last ultrasound examination, 2–5 days before oocyte retrieval.

The patient was blind to which method was used as was the midwife performing the measurements of VAS.

Before oocyte retrieval, participants completed ratings indicating current anxiety on a VAS that ranged from 0 to 100 mm. For anxiety, scale end-points ranged from 0 ‘not at all worried’ to 100 ‘extremely worried’. Patients were defined as not anxious at VAS levels of ≤22 mm or anxious at VAS levels of ≥22 mm before oocyte aspiration (Stener-Victorin et al., 2003; Gejervall et al., 2005).

Ratings of pain during and after oocyte retrieval

During oocyte retrieval, patients rated pain during administration of lidocaine, during needle puncture of the vaginal wall, during oocyte aspiration and post-operatively. The patients were asked to rate the following: ‘current pain’, ‘overall pain’ and ‘maximal pain’. For the VAS pain ratings, end-points ranged from 0 ‘no pain’ to 100 ‘unbearable pain’. VAS rated over 30 was assumed to be clinically relevant pain (Rawal and Berggren, 1994). Patients were also asked to characterize the entire experience of oocyte retrieval by completing the Short-Form McGill Pain Questionnaire, a standardized self-reported measure of subjective pain experiences and characteristics (Melzack, 1975; Burckhardt and Bjelle, 1994), after the follicle aspiration was completed. The questionnaire measures different aspects of the pain experience. The patients chose 15 words, 11 of which describe sensory and four affective qualities of pain. For each word, the intensity of the pain was assigned (0, none; 1, mild; 2, moderate and 3, severe). The total number of words can thus range from 0 to 15, and total pain intensity can range from 0 to 45. The sensory pain intensity ranged from 0 to 33 and the affective pain intensity 0 to 12. The patients reported present pain intensity by filling in a VAS (0–100) and a descriptive present pain intensity (experience, 0–5, Table III).

Ovarian stimulation

Down-regulation was obtained, using a long luteal protocol, with buserelin (Suprecur™, Hoechst, Frankfurt, Germany) nasal spray 1.2 mg/day. Gonadotrophin (Gonal-FTM, Serono, Geneva, Switzerland; Puregon™, Organon, Oss, the Netherlands; or Menopur™, Ferring, Copenhagen, Denmark) dosage was chosen individually, taking into account age, number of antral follicles and previous response. Ovarian response was monitored with serum oestradiol and transvaginal ultrasound. Ovulation was triggered using 10 000 IU of HCG (Pregnyl, Organon) or 250 µg recHCG (Ovitrelle, Serono). Transvaginal oocyte retrieval was performed with ultrasound guidance with a single lumen aspiration needle of 1.4 × 1.0 × 350 mm (Swemed Lab Intl. AB, Billdal, Sweden).

From a random sample from one centre, follicular fluid from the first and the last follicles on the first side was collected and analysed for lidocaine concentration. A sample of blood/serum was collected from the patient’s venous catheterer at the same time as the first and the last follicles were punctured. The serum was analysed for lidocaine concentration. The method used for lidocaine concentration analysis was alkaline extraction to organic solvent and re-extraction to an acid water base, which then was injected into a reverse phase HPLC system with ultraviolet detection. Detection limit was 0.02 µmol/l (0.0000046 µg/ml).

Pre-ovarian block

For participants randomized to POB, 5 ml (50 mg) of 1% lidocaine was used in each side, thus a total of 100 mg (10 ml of 1% lidocaine, Xylocain™ 10 mg/ml, AstraZeneca Sverige AB, Södertälje, Sweden), and injected under ultrasound guidance in the vaginal wall and between the vaginal wall and the peritoneal surface near the ovary, where the follicle aspiration needle was going to be inserted (Figure 1a,b). A POB™ needle 1.2 mm diameter and 260 mm length (Swemed Lab Intl. AB) was used.

Paracervical block

For participants randomized to PCB, 2.5 ml (25 mg) of 1% lidocaine was used in each of the four positions, thus a total of 100 mg (10 ml of 1% lidocaine, Xylocain™ 10 mg/ml, AstraZeneca Sverige AB), and injected at the 2, 4, 8 and 10 o’clock positions using a needle of 0.9 mm diameter and 120 mm length (Mediplast AB, Malmö, Sweden).

All participants in both groups received alfentanil 0.25–0.5 mg i.v. (Rapifen™ 0.5 mg/ml; Janssen-Cilag AB, Sollentuna, Sweden). If needed, a supplementary dose of 0.25 mg of alfentanil was given once, twice or three times, and the total dose was recorded. All patients received rectal paracetamol 1 g (Panodil® 1 g; GlaxoSmithKline, Täby, Sweden) preoperatively. If the patient expressed anxiety preoperatively, she received oral flunitrazepam (FluscandTM 0.5 mg; Pharmacchemie BV, Haarlem, the Netherlands) or 2.5 mg of midazolam i.v. (DormicumTM, Roche, Basel, Switzerland).

Surgery time was measured from initiation of the local anaesthesia until the end of oocyte retrieval. Post-operative care time was measured from the end of oocyte retrieval until the time the patient left the hospital/centre.

The number of oocytes collected, the number of oocytes fertilized, the number of ‘good quality embryos’, the number of embryos for embryo transfer and the number of embryos frozen were registered at embryo transfer. The same embryo scoring system was used in the three centres. Definition of a good quality embryo was <20% fragmentation (grade 1 or 2) and 4–6 cells on day 2 or 6–8 cells on day 3.
or blastocysts grade A or B on days 5–6. Embryo transfer could be performed on day 2, day 3 or blastocyst days 5–6. Luteal support, with micronized progesterone intravaginal ly, was given according to the routines of each centre.

Pregnancy rate was defined as urinary HCG test 14 days after embryo transfer. Clinical pregnancy rate was calculated from ultrasound verification of foetal heartbeat at least 5 weeks after embryo transfer.

Statistical analysis
The primary outcome was vaginal and abdominal pain during the entire oocyte collection measured with VAS directly after the oocyte retrieval. Assuming both sides overall pain in the PCB group to be 30 mm on VAS, with a standard deviation (SD) of 20 mm, 90 patients in each group would be needed to demonstrate a decrease in both sides overall pain of 9 mm (30%) with 80% power and a significance level of 0.05, (two-tailed tests). SPSS version 12.0 and SAS 8.0 were used.

The statistical analysis was made primarily according to intention to treat, i.e. strict analysis according to randomization group regardless of subsequent protocol violation. For descriptive statistics, mean, SD, median and range were used. Statistical tests were carried out using Fisher exact test for dichotomous variables and Mann–Whitney U-test for continuous variables.

The secondary outcomes were pain rating during application of lidocaine and post-operative pain, McGill pain score, lidocaine concentrations in follicular fluid, number of oocytes, number of good quality embryos and pregnancy rate.

Multiple, stepwise linear forward regression was used to examine whether the independent variables age, BMI, number of completed cycles, number of estimated follicles, degree of anxiety, treatment group and premedication were related to both sides overall pain. Because both sides overall pain was not quite normally distributed, the square root of both sides overall pain was used for the regression analysis.

Results
A total of 183 patients were randomized. Ninety-six patients were allocated to POB and 87 were allocated to PCB. All the patients received the interventions as allocated. One patient from the POB group had intolerable pain and received extra lidocaine infiltration and did not fill in the VAS assessment but was included in the intention to treat group where possible. No other subject withdrew from care or was lost to follow-up. All 182 participants completed the trial (Figure 2).

There were no differences in patient characteristics between the two groups (Table I).

Pain ratings during the procedures
No difference between POB and PCB was found in ‘both sides overall pain’, 22 (0–75) versus 16 (0–98) \((P = 0.42)\) during the oocyte retrieval, the primary end-point of this study (Table II).

Figure 1. (a) Before infiltration. The arrow indicates the site of the infiltration of local anaesthetics. (b) After infiltration. The peritoneum is lifted up because of the infiltrated lidocaine at the site of infiltration.

Figure 2. Flow chart of patients randomized for the study.
There was no difference in pain during application of lidocaine. By contrast, the pain was significantly higher in the POB group when the aspiration needle was inserted through the vaginal wall, 15 (0–61) versus 8 (0–97) (<i>P</i> = 0.028), in the first side but no difference in pain score in the second side. With the exception of 20 min post-operative overall pain [See Table II, <i>P</i> = 0.12 (N/S)], post-operative overall pain and the maximal pain was significantly higher in the POB group 20, 40 and 60 min post-operatively, whereas the current pain at 20, 40 and 60 min post-operatively did not differ between the groups. When the frequency of patients with clinically relevant pain (both sides overall pain), VAS > 30 (Rawal and Berggren, 1994), was analysed, the two groups did not differ significantly 28 (PCB) versus 39% (POB), <i>P</i> = 0.16.

The Short-Form McGill Pain Questionnaire showed total pain intensity, total number of words chosen, present pain intensity (descriptive and VAS measurement), sensory and affective pain intensity according to Table III. No differences between the groups were found.

There were no differences in fertilization rate, number of good quality embryos, clinical pregnancy rate, doses of alfentanil, surgery time or care time between the two groups as presented in Table IV.

Table II. Measurements of visual analogue scale (VAS), mm; median (range)

<table>
<thead>
<tr>
<th>Occasions of VAS rating</th>
<th>POB (n = 95)</th>
<th>PCB (n = 87)</th>
<th>&lt;i&gt;P&lt;/i&gt;-value&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local infiltration</td>
<td>9 (0–80)</td>
<td>8 (0–78)</td>
<td>0.95</td>
</tr>
<tr>
<td>Side one, first puncture</td>
<td>15 (0–61)</td>
<td>8 (0–97)</td>
<td>0.028</td>
</tr>
<tr>
<td>First side overall pain</td>
<td>16 (0–80)</td>
<td>12 (0–87)</td>
<td>0.11</td>
</tr>
<tr>
<td>First side max pain</td>
<td>27 (8–83)</td>
<td>18 (0–97)</td>
<td>0.067</td>
</tr>
<tr>
<td>First side current pain</td>
<td>15 (0–70)</td>
<td>7 (0–95)</td>
<td>0.098</td>
</tr>
<tr>
<td>Side two, first puncture</td>
<td>15 (0–87)</td>
<td>11.5 (0–99)</td>
<td>0.95</td>
</tr>
<tr>
<td>Second side overall pain</td>
<td>22 (0–75)</td>
<td>16.5 (0–98)</td>
<td>0.59</td>
</tr>
<tr>
<td>Second side max pain</td>
<td>33 (0–88)</td>
<td>25.5 (0–98)</td>
<td>0.60</td>
</tr>
<tr>
<td>Second side current pain</td>
<td>15 (0–81)</td>
<td>15.5 (0–97)</td>
<td>0.71</td>
</tr>
<tr>
<td>Both sides overall pain</td>
<td>22 (0–75)</td>
<td>16 (0–98)</td>
<td>0.42</td>
</tr>
<tr>
<td>Both sides max pain</td>
<td>35 (0–96)</td>
<td>29 (0–98)</td>
<td>0.48</td>
</tr>
<tr>
<td>Both sides current pain</td>
<td>15 (0–82)</td>
<td>6 (0–88)</td>
<td>0.066</td>
</tr>
<tr>
<td>20 min post-operative overall pain</td>
<td>20 (0–80)</td>
<td>15 (0–85)</td>
<td>0.12</td>
</tr>
<tr>
<td>20 min post-operative max pain</td>
<td>28 (0–95)</td>
<td>20 (0–98)</td>
<td>0.028</td>
</tr>
<tr>
<td>20 min post-operative current pain</td>
<td>18 (0–83)</td>
<td>11 (0–82)</td>
<td>0.079</td>
</tr>
<tr>
<td>40 min post-operative overall pain</td>
<td>18 (0–80)</td>
<td>11 (0–92)</td>
<td>0.027</td>
</tr>
<tr>
<td>40 min post-operative max pain</td>
<td>26 (0–90)</td>
<td>16 (0–91)</td>
<td>0.012</td>
</tr>
<tr>
<td>40 min post-operative current pain</td>
<td>13 (0–71)</td>
<td>8 (0–94)</td>
<td>0.057</td>
</tr>
<tr>
<td>60 min post-operative overall pain</td>
<td>15 (0–83)</td>
<td>9 (0–89)</td>
<td>0.039</td>
</tr>
<tr>
<td>60 min post-operative max pain</td>
<td>23 (0–90)</td>
<td>13 (0–99)</td>
<td>0.016</td>
</tr>
<tr>
<td>60 min post-operative current pain</td>
<td>7 (0–68)</td>
<td>4 (0–65)</td>
<td>0.051</td>
</tr>
</tbody>
</table>

<sup>a</sup>Mann–Whitney <i>U</i>-test.

Table III. The Short-Form McGill subjective pain experience; median (range)

<table>
<thead>
<tr>
<th>Description</th>
<th>POB (n = 95)</th>
<th>PCB (n = 87)</th>
<th>&lt;i&gt;P&lt;/i&gt;-value&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of words chosen</td>
<td>4 (0–15)</td>
<td>3 (0–15)</td>
<td>0.60</td>
</tr>
<tr>
<td>Total pain intensity</td>
<td>5 (0–35)</td>
<td>4 (0–29)</td>
<td>0.41</td>
</tr>
<tr>
<td>Sensory pain intensity</td>
<td>5 (0–27)</td>
<td>4 (0–23)</td>
<td>0.31</td>
</tr>
<tr>
<td>Affective pain intensity</td>
<td>0 (0–10)</td>
<td>0 (0–7)</td>
<td>0.35</td>
</tr>
<tr>
<td>Descriptive present pain intensity</td>
<td>1 (0–4)</td>
<td>1 (0–4)</td>
<td>0.44</td>
</tr>
<tr>
<td>Present pain VAS (0–100)</td>
<td>15 (0–82)</td>
<td>6 (0–88)</td>
<td>0.066</td>
</tr>
</tbody>
</table>

<sup>a</sup>Mann–Whitney <i>U</i>-test.

PCB, paracervical block; POB, pre-ovarian block; VAS, visual analogue scale.

Lidocaine concentrations

Serum and follicular liquid lidocaine concentrations in a random sample of patients (<i>n</i> = 15) from one centre were analysed. The results showed great variations, both in serum and in follicular liquid in both groups. The median serum concentrations at the time of first follicular puncture were 0.23 μg/ml (0.17–0.68) in the POB and 0.87 μg/ml (0.18–1.56) in the PCB group. Corresponding follicular fluid concentrations from the first follicle were 2.29 μg/ml (0.42–23.4) and 0.54 μg/ml (0.04–23.4). These concentrations did not differ significantly, <i>P</i> = 0.059 and <i>P</i> = 0.068, respectively.

Other factors influencing pain

In a multiple linear regression analysis, the following variables were found to be independently associated with overall pain during oocyte retrieval: BMI (<i>P</i> = 0.002), number of follicles punctured (<i>P</i> = 0.012) and anxiety (<i>P</i> = 0.017). Adjusted <i>R</i><sup>2</sup> = 0.114. No other variables were found to be independently associated with overall pain.

Adverse events

No clinically important adverse events were observed in either intervention group.

Discussion

No difference was found in both sides overall pain, the primary end-point of this study, during oocyte retrieval with POB as compared to PCB. Significantly higher pain ratings were found in the POB group during needle puncture of the vaginal wall in
the first side and for overall pain and maximal pain post-operatively. The clinical significance of these differences, however, seems to be limited. Nineteen of 21 median values of VAS ratings were below 30, the limit usually used for the administration of analgesics (Rawal and Berggren, 1994). Because no differences in main outcome were found, it is possible that the other differences are random findings attributable to multiple comparisons.

Although other trials have employed physician assessment of pain, it was decided to confine the outcome of this study to self-assessment. Patients undergoing fertility treatment may be highly motivated and reluctant to show their emotions. In an observational study, mean pain scores were lower with a physician observer assessment than with self-assessment (Gohar et al., 1993). The physicians participating in this study had the clinical impression that the POB gave better pain relief than PCB.

A possible risk associated with PCB is the potential toxicity of absorbed lidocaine, which has been discussed in earlier studies (Wikland et al., 1990; Schnell et al., 1992). Follicular fluid lidocaine concentrations as low as 1.0 μg/ml were associated with toxic effects on fertilization and embryo development in a mouse model (Schnell et al., 1992). In human use, however, there is no evidence of adverse events associated with lidocaine PCB. Mean follicular fluid lidocaine concentration was 0.36 ± 1.1 μg/ml after PCB with 50 mg of lidocaine (Wikland et al., 1990). No adverse effects on fertilization, cleavage or pregnancy rates were shown using PCB (Wikland et al., 1990).

PCB with different doses of lidocaine has been studied, and no differences were found in pain levels during oocyte retrieval when 50, 100 or 200 mg was used (Ng et al., 2000; Ng et al., 2003). Thus, the lowest dose has been recommended.

One randomized trial suggested a trend towards lower follicular fluid lidocaine concentrations with lidocaine vaginal gel than with PCB (Weeraklet et al., 1999). However, subjective measures of pain intensity and the total pain experience were greater with lidocaine vaginal gel than with lidocaine PCB during oocyte retrieval (Tummon et al., 2004). In our study, no significant difference between the groups in lidocaine concentrations in follicular fluid or in serum samples was found. However, large variation between patients was found in both serum and follicular fluid in both groups. Nine of the 15 patients analysed became pregnant, including the patient with the highest level of lidocaine in follicular fluid.

In a recent Cochrane review (Kwan et al., 2005), the efficacy of conscious sedation and analgesia versus alternative methods such as general anaesthesia, spinal epidural, PCB, electro-acupuncture, placebo and no treatment was assessed on pregnancy outcomes and pain relief in patients undergoing transvaginal oocyte retrieval. No significant differences were found in clinical pregnancy rates, pain relief and patient satisfaction between the methods compared. It was concluded that there is insufficient evidence to determine the best method of pain relief for oocyte retrieval (Kwan et al., 2005).

In another systematic review (Stener-Victorin, 2005), the objective was to analyse the pain-relieving effects of acupuncture and conscious sedation methods for oocyte retrieval. The conclusion was that no method could be regarded as superior to another. However, the author recommended low doses of lidocaine in PCB as well as electro-acupuncture without premedication. The clinical pregnancy rates were similar among the different methods of analgesia.

Internationally, conscious sedation appears to be the most commonly used method for pain relief during oocyte retrieval and as this method does not require specialized equipment or the involvement of an anaesthetist, it is financially preferable (Trout et al., 1998). Use of anxiolytic premedication reduced pre-operative anxiety levels, and pain levels during oocyte retrieval, but was associated with a higher percentage of moderate/severe drowsiness in the post-operative period (Ng et al., 2002). In our study, we found that pain was independently associated with anxiety.

Because pain experience varies from individual to individual, the optimal method of analgesia may also be individualized. Anxiolytic premedication may be added for anxious patients.

Although the three variables (BMI, number of follicles punctured and anxiety) were all independently associated with pain, the adjusted $r^2$ was low (0.114) and thus we have no explanation for the main variability in pain.

In conclusion, this prospective, controlled trial found no difference in both sides overall pain during oocyte retrieval between the POB and the PCB techniques. In both groups, per- and

<table>
<thead>
<tr>
<th>Table IV. Treatment and outcome variables, median (range) when applicable</th>
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<tbody>
<tr>
<td><strong>POB (n = 96)</strong></td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Number of oocytes collected</td>
</tr>
<tr>
<td>Fertilization rate (%)</td>
</tr>
<tr>
<td>Alfentanil (mg)</td>
</tr>
<tr>
<td>Number of good quality embryos</td>
</tr>
<tr>
<td>Pregnancy rate/embryo transfer (%)</td>
</tr>
<tr>
<td>Pregnancy rate/started cycle (%)</td>
</tr>
<tr>
<td>Clinical pregnancy rate/embryo transfer (%)</td>
</tr>
<tr>
<td>Clinical pregnancy rate/started cycle (%)</td>
</tr>
<tr>
<td>Surgery time (minutes)</td>
</tr>
<tr>
<td>Care time (minutes)</td>
</tr>
</tbody>
</table>

PCB, paracervical block; POB, pre-ovarian block.
*Mann–Whitney U-test.
†Fisher exact test.
post-operative VAS pain ratings were low and the pain relief was regarded as satisfactory.

Both POB and PCB in combination with alfentanil i.v. are considered safe methods with rapid onset, rapid recovery and ease of administration and monitoring. No detrimental effects were detected on fertilization and embryo development.

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