Original Article

Effect of Body Mass Index on the Efficacy of Paracervical Block for Ultrasound-Guided Transvaginal Oocyte Retrieval as assessed by Requirement of Rescue Propofol

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Abstract

Background and Aims: Oocyte retrieval is the only vital aspect of *in vitro* fertilization requiring anesthesia. Previous studies have shown the inconclusive role of paracervical block (PCB) in transvaginal oocyte retrieval (TVOR) under ultrasound guidance. This study was planned to observe the role and efficacy of PCB as measured by the amount of propofol used as rescue in patients undergoing TVOR and grading it on the basis of body mass index (BMI). **Methods:** This prospective, comparative study, conducted over 1 year, recruited 140 American Society of Anesthesiologists I and II patients and divided into two groups as follows: Group A received PCB with 20 ml of 1% lignocaine and Group B received no PCB. Total propofol consumed, BMI, time taken, oocytes retrieved, postprocedure visual analog scale score, and complications were noted. In both the groups, patients were then divided into underweight, normal, overweight, and obese according to BMI. Statistical analysis was done using Statistical Package Mini Tab Version 17.0. The primary objective was to study the efficacy of PCB as estimated by amount of propofol required during the procedure. The secondary aim was to assess the effect of BMI on the efficacy of PCB. **Results:** Propofol requirement was found to be significantly more ($P < 0.05$) in Group B patients (172.14 ± 64.15) in comparison to Group A (132.14 ± 66.11). Amount of propofol required in normal BMI and overweight patients was significantly higher in Group B. No significant difference was observed in underweight, and obese patients in both the groups. **Conclusion:** PCB reduces the consumption of propofol in normal BMI patients. Underweight and obese population do not benefit from PCB.

Keywords: *Body mass index, in vitro fertilization, paracervical block, propofol, transvaginal oocyte retrieval*

Introduction

Ultrasound-guided transvaginal oocyte retrieval (TVOR) has become the standard technique for oocyte aspiration. It is one of the most vital and only aspects of *in vitro* fertilization (IVF) which requires anesthesia. None of the studies done till date has established the supremacy of one particular method or technique over another in providing effective conscious sedation and analgesia for pain relief during and after oocyte recovery.[1,2] Paracervical block (PCB) along with sedation is usually the preferred method of anesthesia in our setup. Some previous studies have shown the inconclusive role of PCB in TVOR.[3,4]

With obesity increasing to pandemic proportions, number of obese females presenting for IVF has risen.[5-8] Impact of obesity is more felt in the Asia

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Pacific region as is evident from revised WHO cutoff points of obesity for this region.[9] Very few studies have been done in the Asian population, especially Indian, regarding the optimum choice of anesthesia technique in TVOR patients.

Tontisirin *et al*., in their study, have found that propofol is efficacious for oocyte retrieval with a rapid induction and recovery and minimal side effects.[10] We had observed in our institute that obese patients require more propofol despite administering PCB. This study was planned to observe the efficacy of PCB in patients undergoing TVOR by determining the amount of rescue propofol required for successful completion without pain perception. The effect of body mass index (BMI) on the efficacy of PCB was also studied.

Methods

This prospective study was conducted in the Department of Reproductive Medicine for the duration of 1 year (January 2015–January 2016). During this period, a total of 236 patients underwent TVOR. A total of 50 patients did not fulfill inclusion criteria and were excluded from the study. In 46 patients, the data were rejected as the procedure was conducted by different anesthesiologist or gynecologist. Thus, a total of 140 patients were recruited for the study after obtaining informed consent from the patients and approval from the Ethics Committee [Table 1]. A sample size of 128 patients was found to be adequate for 90% confidence interval. In the first patient, the chit system was used for group allocation. After that, alternate group allocation was done. Thus, 70 patients were allocated in each group.

Indian women of age between 22 and 40 years, the American Society of Anesthesiologists (ASA) physical status classification Grades I and II, planned for TVOR with the presence of follicles in both the ovaries were included in the study. Exclusion Criterion were age >40 years, lack of consent, transabdominal approach for retrieval, women with more than two previous attempts, and allergy to medications used in the present study. All the possible complications, such as pain, bleeding, apnea, and excessive somnolence, were explained to the patient.

The primary aim of this study was to observe the efficacy of PCB for pain relief during TVOR as shown by the requirement of additional propofol. The secondary aim of this study was to study the effect of BMI on the efficacy of PCB.

Ovarian stimulation was done using gonadotropin-releasing hormone antagonist protocol which was usually started on day 6 of menstrual cycle. About 5000–10,000 unit of human chorionic gonadotropin was administered 34–36 h before oocyte retrieval.

The patients were blinded to the study. No concealment of allocation was done in the study. All the procedures done were performed by same anesthesiologist and gynecologist. The study protocol was similar to that used in our previous study.[11] Females were shifted to the operation theater unpremedicated, and all mandatory monitors were attached such as pulse oximeter, blood pressure cuff, and an intravenous (IV) line were secured. All patients were given IV injection glycopyrrolate 0.2 mg, injection midazolam 1 mg, and injection fentanyl 1.5 μg/kg. After proper positioning, painting, and draping, Group A patients were administered PCB at the 4 and 9 o'clock positions, in a concentration of 20 ml of 1% lignocaine 10 ml on each side through a 18G needle into vaginal vault 2.5 cm beneath the mucosa.[12] The block was given by the gynecologist alone under ultrasound guidance. At the time of administration of the block 20–30 mg of bolus dose of propofol was given. The waiting period was limited to that time which is required for the gynecologist to get ready for needle insertion for follicle aspiration after PCB. For standardization purposes, it was kept at 2 min. Thus, the retrieval was performed 2 min later using 18G single-channel needle under ultrasound guidance with a 7 MHz vaginal probe. Meanwhile, propofol was given in titrated doses till the patient stopped verbal communication. Maintenance of sedation was done using intermittent bolus doses of propofol (20–30 mg) whenever patient discomfort (facial grimacing, verbal communication of pain, or movement) was noted. Oxygen was maintained through mask at the flow of 4 L/min. Monitoring of blood pressure, electrocardiography, pulse, heart rate, and respiration was done during the procedure. The occurrence of any intraoperative and postoperative untoward events, including hemodynamic instability, apnea, nausea, vomiting, drowsiness, and dizziness, was managed and recorded. Group B patients did not receive PCB, and the rest of the procedure was the same as described above. In both the groups, the patients were divided into four subgroups as underweight (<18.5 kg/m^2), normal weight (18.5–22.99 kg/m^2), overweight (23–24.99 kg/m^2), and obese (≥25 kg/m^2) according to cutoff points proposed by the WHO for Asian population.

Parameters recorded were the amount of propofol required (in mg), number of oocytes retrieved**,** and total time taken for the procedure (in min). Time taken was from the insertion of needle for aspiration of first till the last oocyte**.** Postprocedure discomfort was assessed once the patient was awake, by visual analog scale (VAS) for

pain. After the procedure, the patient was shifted and placed in prop up position in the recovery room. Oxygen through face mask was administered for half an hour.

In the present study, the data were collected and entered into the excel sheet. Statistical analysis was done using statistical package Minitab version 17. Mean comparison between the groups was done using Student's unpaired *t*-test. $P < 0.05$ was considered as statistically significant. The final data were represented in the form of tables.

Results

A total of 140 patients, 70 patients in Group A (with PCB) and Group B (without PCB) were recruited in the study. There was no difference regarding age, BMI, ASA class, number of oocytes retrieved, and time taken between the two groups [Table 2]. However, propofol requirement was significantly higher in patients not receiving PCB. There was no difference in the VAS score of both the groups indicating that PCB does not improve postoperative analgesia. Both the groups were then divided into four subgroups based on BMI according to the WHO cutoff points recommended for Asia-Pacific region.

In underweight patients (BMI <18.5 kg/m^2), Group A had six patients while Group B had seven patients. All the parameters including propofol requirement were found to be comparable in both the groups with no statistically significant difference [Table 3]. Thus, PCB did not provide any significant difference in underweight category. In normal weight females (BMI 18.5–22.9 kg/m^2), the requirement of propofol significantly decreased in Group A (mean 119.74 mg) against Group B (mean 177.5 mg). VAS was also significantly lower in Group A while all other parameters were comparable in both the groups [Table 4].

In overweight females, the requirement of propofol was significantly less in Group A (127 mg) as compared to 216 mg in Group B. However, there was no difference in VAS scores [Table 5]. No difference in requirement of propofol was observed between the two groups in obese patients [Table 6]. VAS was similar in both the groups indicating the failure of PCB. One normal weight, four overweight, and one obese female not receiving PCB had VAS ≥4 requiring rescue analgesia.

Discussion

The aim of this study was to assess the usefulness of PCB in providing analgesia during TVOR. We found that PCB was effective in patients having normal BMI and overweight patients, thereby reducing the requirement of propofol [Table 2]. However, in underweight and obese patients, it had no advantage as it did not reduce the requirement of propofol during TVOR. PCB did not alleviate immediate postprocedure pain as assessed by VAS. Significant difference was found only in VAS score of normal weight patients with better pain relief with PCB. However, the requirement of propofol as well as VAS did not decrease significantly in obese patients receiving PCB [Table 4]. This demonstrates the noneffectiveness of PCB in patients with high BMI. Thus, our study proves that anesthesia techniques should be modified in obese as well as underweight patients.

With malnutrition showing an increasing trend in our society, incidence of underweight and obese individuals has also increased. The effects of obesity are significantly more in Asian Population.[9] PCB works in normal BMI patients. In underweight patients and obese patients, PCB can be avoided. In underweight females failure of PCB is difficult to explain. No studies could be found to corroborate our finding. Probably there is increased ovarian mobility due

Table 1: Flowchart showing the selection of patients

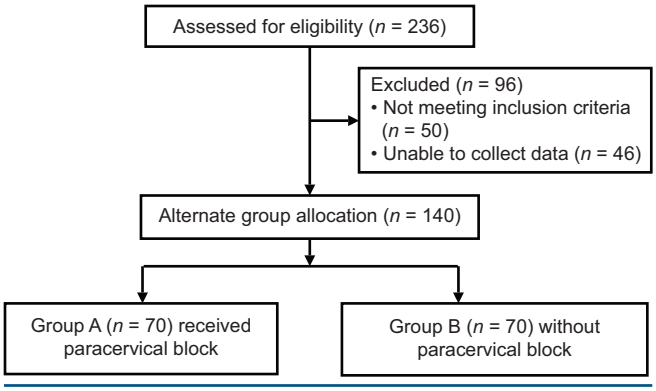

Table 2: Comparison of various parameters between the two groups

Parameters	Group A	Group B	*P*
Age (years)	28.83±2.81	28.33±4.02	
BMI (kg/m^2)	24.24±5.09	24.21±4.56	
ASA Class (I/II)	48/22	48/22	
Number of oocytes retrieved	15.89±8.26	14.94±6.44	0.452
Propofol requirement (mg)	132.14±66.11	172.14±64.15	<0.001*
Time taken (min)	17.29±7.73	16.41±8.57	0.529
VAS score	0	1	0.092
Complications (%)	5.71	8.57	0.459

Comparison of various parameters between the Group A (receiving PCB), *n*=70 and Group B (not receiving PCB), *n*=70. VAS score has been mentioned as median while other parameters are represented as mean±SD. *P*<0.05 is considered as statistically significant. The two groups are comparable in terms of age, BMI, ASA class, oocytes retrieved, and time taken for the procedure. **P*<0.05, statistically significant. BMI=Body mass index, ASA=American Society of Anesthesiologists, VAS=Visual analog scale, SD=Standard deviation, PCB=Paracervical block

Table 3: Comparison of various parameters in underweight females (body mass index <18.5 kg/m²)

Parameter	PCB	Without PCB	*P*
Age (years)	28.83±2.14	27.57±4.28	0.509
BMI (kg/m²)	17±1.4	17.7±0.81	0.31
Number of oocytes	15.33±12.11	11.86±5.37	0.537
Amount of propofol required (mg)	138.33±49.56	160.00±56.08	0.475
Time taken (min)	17±6.77	15.00±8.45	0.654
VAS	1	0	0.282

VAS score has been mentioned as median while other parameters are represented as mean±SD. Group A (*n*=6) and Group B (*n*=7) are comparable in terms of age, BMI, number of oocytes retrieved and time taken for the procedure. Amount of rescue propofol (mg) required is also statistically insignificant in both the groups. *P*<0.05, statistically significant. BMI=Body mass index, VAS=Visual analog scale, PCB=Paracervical block, SD=Standard deviation

Table 4: Comparison of various parameters in normal weight females (body mass index ≥18.5-22.99 kg/m²)

Parameter	PCB	Without PCB	*P*
Age (years)	28.07±2.59	27.7±3.39	0.648
BMI (kg/m²)	20.72±1.31	20.86±1.02	0.666
Number of oocytes	15.33±6.73	17.42±6.56	0.258
Amount of propofol required (mg)	114.82±51.47	168.46±61.88	0.001*
Time taken (min)	14.52±5.24	16.71±6.56	0.222
VAS	0	0.5	0.012*

VAS score has been mentioned as median while other parameters are represented as mean±SD. Group A (*n*=27) and Group B (*n*=26) are comparable in terms of age, BMI, number of oocytes retrieved, and time taken for the procedure. Amount of rescue propofol (mg) required is significantly more in Group B. *P<0.05, statistically significant. BMI=Body mass index, VAS=Visual analog scale, PCB=Paracervical block, SD=Standard deviation

to lesser peritoneal fat. This leads to multiple punctures and might explain the failure of PCB in these patients. Interestingly, the requirement of propofol was almost similar in underweight and obese females indicating its dependence on lean body weight rather than total body weight as proposed by Chassard *et al*. in female patients.[13]

The time required for the TVOR procedure is definitely more in overweight and obese patients as has been shown in our previous study.[11] In the present study too, the time required was definitely more in overweight and obese patients. The access to the ovary is difficult in these patients, and multiple punctures are required.[14] This might explain the failure of PCB to provide adequate analgesia. Lignocaine gets concentrated in follicular fluid, especially in those that are aspirated later on.[15] Thus, the chances of lignocaine accumulation are more in obese patients. Although PCB has shown a significant beneficial effect in overweight patients, its reliability is limited due to very few patients in our study.

Table 5: Comparison of various parameters in overweight females (body mass index 23-24.99 kg/m²)

Parameter	PCB	Without PCB	*P*
Age (years)	29.78±1.86	29±4.43	0.643
BMI (kg/m²)	23.9±0.61	24±0.56	0.753
Number of oocytes	15.56±6.19	15.67±6.5	0.974
Amount of propofol required (mg)	127.78±38.33	216.67±82.62	0.014*
Time taken (min)	20±10.15	21.67±13.35	0.787
VAS	2	0.5	0.117

VAS score has been mentioned as median while other parameters are represented as mean±SD. Group A (*n*=9) and Group B (*n*=6) are comparable in terms of age, BMI, number of oocytes retrieved, and time taken for the procedure. Amount of rescue propofol (mg) required is significantly more in Group B. *P<0.05, statistically significant. BMI=Body mass index, VAS=Visual analog scale, PCB=Paracervical block, SD=Standard deviation

Table 6: Comparison of various parameters in obese females (body mass index ≥25 kg/m²)

Parameter	Mean±SD		*P*
	PCB (*n*=28)	Without PCB (*n*=31)	
Age (years)	29.25±3.28	28.9±4.44	0.737
BMI (kg/m²)	29.29±3.66	28.54±2.8	0.378
Number of oocytes	16.64±9.55	13.42±6.05	0.133
Amount of propofol required (mg)	148.93±84.39	169.36±63.87	0.303
Time taken (min)	19.54±8.51	16.13±7.83	0.162
VAS	1	1	0.071

VAS score has been mentioned as median while other parameters are represented as mean±SD. Group A (*n*=28) and Group B (*n*=31) are comparable regarding age, BMI, number of oocytes retrieved, and time taken for the procedure. Amount of rescue propofol (mg) required is also statistically insignificant in both the groups. *P*<0.05, statistically significant. BMI=Body mass index, VAS=Visual analog scale, SD=Standard deviation, PCB=Paracervical block

Modalities available for TVOR include monitored sedation, general anesthesia, and regional anesthesia. Studies in different anesthetic techniques and agents failed to give prominence to the ideal one. However, most of the centers prefer using monitored sedation for TVOR.[16] Gonen *et al*. had concluded in their study that the use of general anesthesia, especially nitrous oxide, for oocyte retrieval has an adverse effect on IVF outcome.[17] This deleterious effect manifests itself only after embryo transfer and leads to lower pregnancy and delivery rates. Recent trial has also concluded that the use of spinal anesthesia improves IVF outcome.[18] Neuraxial blockade might be an option in underweight patients, but in obese individuals, its administration is not easy.

PCB has remained a controversial option till date. PCB in conjunction with sedation has been found to be a better option.[19,20] Various techniques have been used for administering PCB, and the concentration of local

anesthetic drug administered also varies in different studies. In our institution, we prefer giving USG block as the depth and site of injection is confirmed. This ensures better success of the block. The technique used is that described by Renner *et al*.[12] The mechanism of action of PCB has been hypothesized partly to be due to tissue distension blocking the nerves. This may explain why a waiting period is not necessary and why a 20-ml block is superior to a 10-ml volume block.

Complication rates were insignificant in both the groups in our study. Two patients in Group A and four patients in Group B had apneic episode which was transient and easily managed by mask ventilation. BMI did not affect the complication rate. No other complications, such as nausea, vomiting, and bleeding, were noted.

This study concludes that PCB in conjunction with sedation is the safe technique available for normal and overweight females undergoing TVOR. In underweight and obese females, PCB can be avoided as it shows no benefit.

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Conflicts of interest

There are no conflicts of interest.

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