ORIGINAL ARTICLE

The Impact of General Anesthetic Technique Over Subarachnoid Block in Oocyte Retraction on the Outcome of In Vitro Fertilization

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Abstract:

Background: The management of discomfort and anxiety during oocyte retrieval makes anesthesia a crucial component of in vitro fertilization (IVF) treatments. Numerous research studies have looked at the impact of anesthetics on IVF's effectiveness. Objective: To evaluate the effect of anesthetic technique in oocyte pickup on the outcome of in vitro fertilization. Materials and method: This study is based on retrospective data gathered over 1 year and 6 months, from June 2022 to January 2024—patients' records from hospitals where OPU was performed under general anesthesia and SAB were analyzed. The research was conducted at the IVF Unit of the Anam IVF Fertility Centre, Bangladesh. A total of 206 patients were included in this study as a sample size. Every participant had been unable to conceive for at least a year. Every patient's file underwent an analysis done in retrospect.

The human chorionic gonadotropin (hCG) type (recombinant or urine) and the occurrence of ovarian hyperstimulation syndrome (OHSS) were all documented. The gonadotropin type was recombinant follicle-stimulating hormone [r-FSH] and/or urinary FSH [u-FSH]. Results: The mean ages for SAB and GA were 31.94± 5.91 and 31.73 ±4.81, respectively. Age, BMI, infertility duration, previous IVF cycle (if utilized), and baseline hormone levels were distributed equally across the groups. The duration of anesthesia was 24.16 ±8.49 minutes for the GA group and 27.28 ±12.15 minutes for the SAB group. Conclusion: According to some studies, acupuncture may help increase IVF success. However, other studies did not see similar results. Further research should be done because there are still questions regarding the ideal application window and the underlying mechanism of action.

Key words: IVF outcome, Anesthesia, Fertilization, Reproductive techniques, GA, SAB

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Introduction:

The term "assisted reproductive techniques" (ART) refers to procedures that employ artificial or partially artificial ways to bring about pregnancy. The majority of ART therapies in recent decades have been for infertility issues[1]. The most common kind of ART is in vitro fertilization (IVF), which allows the fertilization of male and female gametes (sperm and eggs) to take place outside of the female body. The five stages listed below are part of it[2]. Ovarian stimulation: To increase egg production, women are given medications (fertility drugs) that cause their ovaries to release more eggs than usual. Follicular aspiration and egg collecting: Using a USG-guided scan, this minor procedure is intended to extract the

woman's eggs from her body (transvaginal oocyte retrieval)[3]. The practitioner inserts a tiny needle into the ovary and egg-carrying sacs (follicles) through the vagina. The apparatus that suctions the eggs out of each follicle one at a time is attached to the needle[4].

The highest quality sperm and eggs are kept in a chamber with regulated environmental conditions. Fertilization is the process of a sperm entering an egg[5]. If there is a low likelihood of fertilization, the sperm may be injected straight into the egg. Intracytoplasmic sperm injection (ICSI) is what this is known as. Embryo culture: The divided fertilized egg develops into an embryo. Transferring the embryo back into the female's uterus is step five, such as 3-5 days after follicular aspiration; while the lady is still conscious, embryos are implanted into her womb[6].

The physician inserts a tube holding the embryos up into the woman's womb through her vagina. Pregnancy ensues when an embryo implants and matures within the womb's lining.

For IVF to be successful, a variety of IVF phases, including controlled ovarian stimulation (COS), oocyte pick-up (OPU), fertilization, embryo transfer, and implantation, must go well. Oocyte quality affects fertilization, embryo quality, and implantation, so the OPU procedure is crucial. Follicles carrying cumulus-oocyte complexes and follicular fluid are aspirated during the procedure[7]. The OPU technique is uncomfortable even though it is minimally invasive. As a result, it is frequently carried out under anesthesia[8].

In most IVF centers, general anesthesia and SAB are utilized for OPU[9]. However, among clinicians performing OPU, there is no agreement on the kind of anesthetic agent to be used. The most popular anesthetic during OPU is intravenous propofol in GA, which is premedicated with either midazolam or fentanyl, which are anxiolytics and analgesics, respectively[10]. Short-acting anesthetics like propofol during GA have quick induction and recovery periods[11], good alertness, and less postoperative nausea[12]. However, propofol has been linked to decreased fertilization rates (FR) in murine studies[14] and has been shown to prevent blastocyst development in one-cell embryos[15]. During OPU, SAB is frequently used to induce anesthesia[16]. All anesthetic agents are not suitable for ovum pick-up. What type of anesthetic agents are used should be considered. Drugs like gaseous agents (N2O) are harmful to ovum maturity. Halothane/isoflurane should be kept in mind because it negatively influences ovum development. The benefits of SAB include a low risk of heart instability, less respiratory depression, and practical analgesic qualities[17]. Frequent nausea, vomiting, psychomimetic symptoms, tachycardia, and a protracted recovery period are drawbacks[11]. This study aimed to evaluate the impact of general anesthetic technique over SAB in oocyte pickup on the outcome of in vitro fertilization. Objective oif the study was to evaluate the impact of general anesthetic technique over SAB in oocyte pickup on the outcome of in vitro fertilization.

Materials and method:

Study period: June 2022 to January 2024

Study Place: Anam Fertility Entre, Bangladesh.

Study Population: 206 primary infertile women receiving IVF under general anesthesia & SAB made up the participants. All participants had experienced infertility for at least a year.

Variables: Patient files were consulted for demographic information, including age and body mass index (BMI) (kg/ m2), smoking, alcohol usage, and baseline hormone levels, as well as details on the cause and length of infertility.

Inclusion criteria: Availability of anesthesia data was the priority of inclusion criteria.

Exclusion criteria: The exclusion criteria included the use of cocaine, opiates, or glucocorticoids, as well as chronic diseases, bronchoconstrictive diseases, endocrinopathies, cancer, infectious diseases, and autoimmune diseases.

Data Collection: Every patient's file was retrospectively analyzed. The gonadotropin type

(recombinant follicle stimulating hormone [r-FSH] and/or urinary FSH [uFSH]), the starting dose of gonadotrophin used for COS, the type of human chorionic gonadotropin (hCG) (recombinant or urinary), and the presence of ovarian hyperstimulation syndrome (OHSS) were all noted.

Data Analysis: Statistical Package for Social Sciences for Windows (SPSS 20) was used. A 'p' value of less than <0.05 was statistically significant.

Results:

The SAB and GA mean ages were 31.94 ± 5.91 and 31.73 ± 4.81, respectively. Age, BMI, the length of infertility, the prior IVF cycle (if used), and baseline hormone levels were evenly distributed among the groups.

Table 1: Baseline demographic features of the group

	SAB group	GA group	P value
Age	31.94 ± 5.91	31.73 ±4.81	0.2
BMI	34.96 ± 6.1	34.51 ± 5.41	0.1
Duration of Infertility	25.8 ± 4.79	25.12 ± 4.5	0.6
Previous IVF cycle	6.46 ± 4.58	7.13 ± 3.65	0.3
Sperm Parameters	60.52 ± 60.81	65.87 ± 88.23	0.1
Smoking use	16/217 (7.4%)	5/60 (8.3%)	0.2
Alcohol habits	1/217 (0.5%)	0/60 (0%	0.1

All women received recombinant HCG and underwent the gonadotropin-releasing hormone antagonist procedure for pituitary gland down-regulation. Both r-FSH and u-FSH were used to stimulate most women (71.8%). The kind of gonadotropins, the first dosage of r-FSH, and the initial dose of u-FSH did not substantially differ across the groups regarding the stimulation parameters. The two groups shared a comparable level of OHSS and poor ovarian response. Anesthesia lasted for 27.28 ±12.15 minutes in the SAB group and 24.16 ± 8.49 minutes in the GA group.

Table 2: Ovarian stimulation characteristics and anesthesia-related parameters

	SAB group	GA group	P value
Type of gonadotrophins			
r-FSH (%)	29.5%	25%	0.7
u-FSH + þ r-FSH	70.5%	75%	0.1
Starting dose of r-FSH	249.02 ± 62.40	232.91 ± 64.35	0.1
Starting dose of u-FSH	132.18 ± 42.46	140.55 ± 39.27	0.1
Poor ovarian response (n%)	33.3%	30.5%	0.7
Presence of OHSS (n%)	4.1%	3.3%	0.6
Duration of anesthesia (min)	27.28 ± 12.15	24.16 ± 8.49	0.1
Median dose of anesthetic drugs (mg)	156.08 ± 47.37	88.03 ± 28.34	0.1

Testicular sperm extraction failed in 7 patients; after OPU, no oocytes were obtained in 24, and only immature oocytes were collected in 9 individuals. Compared to the SAB group, the FR in the GA group was significantly lower (40.49 32.89%) (p 14 0.013). Clinical pregnancy (17.1% of the SAB group, 10% of the GA group, and take-home baby rates (15.8% in the SAB group, 7.5% in the GA group.)

Table 3: The effects of anesthetic drugs on the success of IVF.

	SAB group	GA group	P value
FR (%)	54.65 ± 32.73	40.49 ± 32.89	0.005
Implantation (n%)	22.8%	10%	0,1
Clinical pregnancy (n%)	17.1%	10%	0.3
Take home baby (n%)	15.8%	7.5%	0.4

GA administration had a harmful predictive effect on normal FRs when age, BMI, the cause of infertility, the percentage of sperm motility, fast progressive sperm motility (grade A percentage), and the length of anesthesia were taken into account (p = 0.01, β = -1.08, OR [95% CI] = 0.33 [0.14e0.77]). Endometriosis was another factor that negatively predicted FRs (p = 0.028). The predictive effects of the anesthetic drugs on FRs are displayed in Table 4.

Table 4: Predictive effect of anesthetic agents on fertilization rate

	β	p value	OR
Endometriosis	Not applicable	0.28	Not applicable
PCOS	0.11	0.11	1.12
Unexplain	0.19	0.59	1.21
DOR	0.67	0.58	1.96
Tubul	0.67	0.52	1.962
Propofol	-0.35	0.28	0.7
Ketamine	-1.08	0.01	0.33

Discussion:

Contradictory findings were reported in earlier investigations of SAB's impact on FRs[8,12]. The current investigation's results, which align with those of a study by Alsalili et al.18, did not show a relationship between SAB and low FRs. In contrast to the current work, propofol has been shown to have deleterious effects on FRs that are dose- and time-dependent in mice [7,8]. Ben-Shlomo *et al*.[19] found that SABdid does not negatively impact human fertility or embryo quality. When compared to FRs recorded using lidocaine and prilocaine, the use of GA appeared to be associated with lower FRs in another study[20]. Equivalent IVF results after SAB, no anesthetic regimens were administered[21], and equivalent FRs in the SAB groups were found[1,22]. Contradictory findings were reported in earlier investigations of SAB's impact on FRs[8,18]. The current investigation's results, which align with those of a study by Alsalili *et al*. [18], did not show a relationship between SAB and low FRs.

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The length of sedation and the details of oocyte retrieval were not associated with FRs in the current investigation. Additionally, we found no correlation between more extended periods of anesthesia (>30 min) and take-home baby rates, embryo quality, normal FR, or oocyte retrieval parameters. The rates of clinical and implantation pregnancy after prolonged anesthesia, however, were lower than those after shorter periods. The length of sedation and the total amount of drug given in SAB were unrelated to human ovulation and embryo quality, which is consistent with our findings[19].

According to Janssenswillen *et al*.[3], SAB was detrimental to subsequent embryo cleavage and development up to the blastocyst state in mice. In our investigation, none of the patient groups had anesthesia for more than 30 minutes on average. The latter might explain why FRs were not related to anesthetic duration. The increased local anesthetic drug in SAB levels in human follicular fluid was shown to be closely associated with the total dosage of the drug delivered in earlier research[3,24,25]. The buildup of anesthetic drugs in follicular fluid and their potential effects on the quality and fertility of oocytes have led some to recommend that the OPU procedure be maintained as brief as feasible[24]. According to prior research[8], the detrimental effects of dose- and time-dependent anesthetic drugs may be the cause of the unfavorable effects of prolonged anesthesia duration on implantation and clinical pregnancy rates.

Conclusion:

In conclusion, FRs may be impacted by the anesthetic drug in GA used during OPU. Two different anesthetic regimens, however, don't seem to be connected to variations in implantation, clinical pregnancy, and take-home baby rates. Anesthesia should not last more than 30 minutes since a more extended period of anesthesia is linked to reduced chances of clinical pregnancy and implantation. It is essential to conduct a larger sample size and prospective randomized controlled studies to assess how anesthetic medications affect the success of IVF.

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