

# Comparative Evaluation of Segmental Spinal Anesthesia with Conventional Approaches for IVF Procedures

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## ABSTRACT

**Background:** With increase in need of IVF procedures, there has been ongoing discussions regarding the best suited anesthesia technique for same. The aim of this study was to compare different general anesthesia and regional anesthesia approaches with focus on intra operative hemodynamic stability, recovery duration and early mobilization, as required for a Day Care surgery.

**Methods:** This study was conducted over two-year period at a registered IVF center. Based on inclusion criteria, a total of 90 patients posted for IVF procedures were enrolled and divided in three random groups. The first group received TIVA, second group was given conventional Lumbar spinal anesthesia with hyperbaric Bupivacaine, and third group was given SAB with 3 ml of 0.15% hypobaric Bupivacaine with head down table tilt.

**Results:** All the patients tolerated surgery well, except four cases needed assisted ventilation in TIVA group. All the patients in regional anesthesia group were conscious and hemodynamically stable intraoperatively, with added advantage of preserved limb movements and early mobilization in the hypobaric drug receiving group. The surgeon's satisfaction score was also higher in the segmental spinal anesthesia group.

**Conclusion:** This study concluded that segmental spinal anesthesia can be used as a safe and feasible anesthesia approach for IVF procedures. The spectrum of hemodynamic stability, preserved limb movements, early mobilization and discharge makes it a promising technique.

**Key-words:** *In vitro* fertilization (IVF), Hypobaric spinal anesthesia, Oocyte retrieval, Rapid recovery and Hemodynamic stability

## INTRODUCTION

In the modern era of the increasing need for IVF techniques for pregnancy, there have been many studies to establish the best-suited technique of anaesthesia for these procedures<sup>[1]</sup>.

In the process of *in vitro* Fertilization technique, oocytes are stimulated in females by the administration of

hormones in a periodic manner, and later on retrieved under ultrasonographic guidance transvaginally<sup>[2]</sup>. Sperms from males are also retrieved and later fertilized *in vitro*. After embryo formation, it is transferred back into the females for the continuation of pregnancy<sup>[3]</sup>. The anaesthetists come into play during the process of oocyte retrieval and embryo transfer. Until now the preferred mode of anesthesia is General anesthesia with or without endotracheal intubation, conventional spinal anesthesia is also practised as per surgeon's preference in some centers. The procedures are usually performed as daycare surgery<sup>[4]</sup>.

During the process patient mostly experiences pain and discomfort while putting probe and needle transvaginally. These patients are emotionally more

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fragile than the normal population, because of facing a long period of infertility and undergoing many diagnostic tests and procedures [5]. Anxiety about difficult conception makes them psychologically labile. The requirement of IVF specialists is a pain-free and relaxed surgical field, but for a very short duration so the choice of anaesthesia should meet the above requirement along with rapid recovery [6,7].

## MATERIALS AND METHODS

**Research Design-** This study was done in a registered center of an IVF specialist for two years duration. The patients enrolled in the study were self-donors in the 18-45 years of age group. Patients with chronic pelvic inflammatory diseases or the presence of any acute illnesses during the IVF period, history of any drug allergy, existing coagulopathy, or infection at the block site were excluded from the study.

All patients in the study group were kept fasting for 6 hours before surgery. Trigger injections were given according to E2 levels at per surgeon's discretion. The patients were randomly categorized into 3 groups consisting of 30 each (Group A: TIVA group, Group B: Conventional lumbar spinal anaesthesia, and Group C: Segmental spinal anaesthesia) by computer-generated random numbers and were revealed at the time of induction of anaesthesia. In the operation theatre pulse rate, Oxygen saturation, Non-Invasive Blood Pressure & ECG were recorded. All patients were pre-medicated with an injection of Ondansetron 4 mg intravenously half an hour before surgery.

**Group 1 (TIVA)-** All patients received Inj Glycopyrrolate 0.2 mg, Inj Midazolam 1 mg, Inj Fentanyl 1.5 mcg/kg followed by Propofol 1-2 mg/kg. Depth of anaesthesia was maintained with intermittent Propofol boluses 10-15mg IV. All the patients received oxygen support via face masks. In case of desaturation/ hypoxia, assisted ventilation via bag and mask ventilation was provided.

**Group 2 (lumbar spinal anaesthesia)-** All patients in this group were given SAB in a sitting position with 2 ml of 0.5% hyperbaric Bupivacaine in L3-L4 space under all aseptic precautions.

**Group 3 (Segmental spinal anaesthesia)-** Under all aseptic precautions, patients were given SAB with 3 ml of 0.15% hypobaric bupivacaine at L3-L4 intervertebral space. The head end of the OT table was kept 10-20 degrees low in all patients. After 5 minutes of injection lithotomy position was established.

## Inclusion and Exclusion Criteria

### Inclusion Criteria

- All the patients in the 18-45 years age group posted for IVF procedures

### Exclusion Criteria

- This study excluded those patients with chronic pelvic inflammatory disease or any acute illness during IVF period
- Patients with history of drug allergy, coagulopathy and infection at the block site were also excluded

**Statistical Analysis-** In our study, a total of 30 patients were enrolled in each study group, which was statistically determined using the software power and Sample-Size program Alpha-0.05, Power-0.7, Delta-2.5, Sigma-4.2. Data was computed on Microsoft Excel software and statistical analysis was done using a licensed version of SPSS 23.0. Descriptive analysis was done by calculating proportions, means, and standard deviation. Appropriate statistical tests were applied depending on the distribution and type of data ( $p < 0.05$ ) were considered significant).

**Ethical Approval-** The study method has been approved by the Ethical Committee of the hospital.

## RESULTS

Our study enrolled 30 patients in each of the three study groups. All the patients were comparable on baseline demographic characteristics.

All the patients were monitored for fluctuations in oxygen saturation, heart rate, and blood pressure during procedures. Table 2 depicts the hemodynamic parameters in mean $\pm$ S.D. and also includes any episodes of hypotension or bradycardia observed among all the groups.

**Table 1:** Demographic characteristics of study subjects

Characteristics	Group I (TIVA)	Group II (Conventional SA)	Group III (Hypobaric SA)
Age	33.45±4.98	34.81±5.39	31.94±5.91
BMI	24.9±4.70	25.11±4.76	25.68±4.5

**Table 2:** Intra-op hemodynamic adverse events

Parameter	Group I (TIVA)	Group II (Conventional SA)	Group III (Hypobaric SA)
Hypotension (%)	8/30	14/30	2/30
Bradycardia (%)	0/30	2/30	0/30

Our main aim of the study was to observe which group has the fastest recovery time, minimal side effects and ease of procedure from surgeon's perspective. Table 3

depicts the recovery profile and surgeon satisfaction score in different groups.

**Table 3:** Recovery profile and surgeon satisfaction score.

Observation	Group I	Group II	Group III
Ability to shift from OT table	0	0	30
Time from end of procedure to lower limb movement (min)	25-70	135-160	present
Surgeons' satisfaction score	average	Average	Very satisfied

All the patients were observed in intra-op and post-operative periods for any adverse event like a need for

assisted ventilation, nausea, vomiting, or urinary retention (Table 4).

**Table 4:** Adverse events

Adverse event	Group I	Group II	Group III
Need for assisted ventilation	4/30	0/30	0/30
Nausea/vomiting	1/30	0	0
Urinary retention	0	2/30	0/30

## DISCUSSION

Ovum pickup is a challenging procedure for the anaesthetists skill set, as it needs relaxed and pain-free patients for a short period, and requires rapid recovery. Another concern in the above set of patients is disturbed hormonal levels, obesity, and anxiety which are key factors that need to be dealt with. The drawback during the conduction of cases under MAC/TIVA in obese patients is the need for assisted ventilation, which often raises the need for airway manipulation, thus leading to prolonged recovery time [8]. In our study four patients needed assisted ventilation in TIVA group, airway manipulation was not a concern in Regional anesthesia group. It was seen during previous studies that Propofol was used to accumulate inside the oocyte although no proven adverse effect on pregnancy outcome [9].

Conduction of cases under regional anesthesia ensures better intra and postoperative pain and muscle relaxation, although late mobilization/ prolonged motor blockade in cases where the hyperbaric drug was used. However, it is proved by many that it has raised the fertility rate of patients having general anesthesia. Azmude *et al.* conducted a study in 200 patients over 2 years. They performed spinal anesthesia using 2% Lignocaine 75 mg in group 1 and general anesthesia with intubation using Propofol, and Atracurium in group 2. They found a significantly better pregnancy rate in spinal anesthesia group patients [10].

Viscomi *et al.* concluded in their study that the spinal group n=51 had lesser postoperative stay because of less incidence of PONV than the MAC group n=44, although no difference in reproductive rates [11].

Manica *et al.* compared 1.5% and 5% hyperbaric lidocaine (7.5% dextrose) as spinal anaesthesia drugs for oocyte retrieval. A total of 56 patients were taken in a randomized manner to receive 60 mg of hyperbaric solutions of either 1.5% or 5% lignocaine with 10mcg intrathecal fentanyl. The group receiving 1.5% lidocaine had significantly shorter times to ambulation (141±21 min vs 162± 29 min; p<0.05), voiding (147±21 min vs 174±28 min; p<0.05), full motor recovery (86±21 min vs 111±22 min; p<0.0001), and discharge (170±38 min vs 201±41 min; p<0.05). The use of 1.5% hyperbaric lidocaine for transvaginal oocyte retrieval provides a significantly shorter recovery time when compared to 5% hyperbaric lidocaine and is a good choice for spinal anaesthesia for ovum pickup [12].

Although they received Lignocaine a short-acting intrathecal drug, but use of hypobaric drugs in our technique made patients ambulate early [12]. Aghamoo *et al.* found a rise in the chemical pregnancy rate if spinal anaesthesia was used instead of general anaesthesia for oocyte retrieval [13].

The use of hypobaric drugs for spinal anaesthesia is now gaining popularity with new research. As the hypobaric drug is not available commercially, we prepared it with the help of sterile Distilled water into the isobaric Bupivacaine, 1.5 ml Isobaric Bupivacaine was taken and made to 5 ml, its concentration is now 0.15%. This mixture contains 1.5 mg of Bupivacaine in each ml of drug, thus the total drug used for block was 3ml i.e. 4.5 mg. The hypobaric drug is whose density is lower than three standard deviations below the mean density of cerebrospinal fluid. The baricity of the drug decides the distribution of local anesthetic solution into the CSF, thus the hypobaric drug ascends against gravity [14].

In our study, we tilted the table to make hypobaric drug ascend towards the pelvis i.e. the desired operating field. The concentration of the drug used was very low, leading to only sensory effects. This made patients shift from the OT table to a stretcher on their own. All patients were able to sit within one hour and were able to go to the toilet within 90 minutes. A unilateral spinal block was observed by Kaya *et al.* [15] in the lateral position, it gave rapid motor and sensory recovery. Mohamed Said Nakhil used hypobaric 5mg and 7.5 mg for hip fractures and found both effective.

Imbelloni *et al.* compared isobaric, and hyperbaric with hypobaric drugs, and concluded that both hypobaric and

hyperbaric drugs are effective for unilateral block. Imbelloni *et al.* conducted orthopedic surgeries with 0.15% 3 ml hypobaric Bupivacaine i.e. a total of 5 mg drug. It was injected @ of 1ml/15 seconds. In his study, 75% of patients got the unilateral block and all patients remained hemodynamically stable [16]. Imbelloni *et al.* used hypobaric Lidocaine in jackknife position for anorectal surgeries and were found to provide appropriate sensory anesthesia for the surgeries [16].

Paliwal *et al.* described the usefulness of hypobaric drugs in terms of the required drugs at the target without any hemodynamic fluctuations [17]. In our study, patients having hypobaric drugs had no hemodynamic changes, early recovery, fewer side effects, and better surgeon, satisfaction. Although the size of the study group is small, we need more patient data to establish hypobaric drugs as a preferred technique for ovum retrieval [18].

## CONCLUSIONS

This study concluded that regional anesthesia techniques are better choice for IVF procedures due to avoidance of airway manipulation and prolonged recovery from sedation. Segmental anesthesia ensures added advantage of preserved lower limb functions, quick recovery and early mobilization when compared to conventional Lumbar spinal anaesthesia. Regional anaesthesia promises relaxed surgical field, but better surgeon's satisfaction score in segmental anaesthesia group. In addition, fertility rates continued to be similar across all groups, thus making segmental anaesthesia preferred choice for above mentioned procedures.

## CONTRIBUTION OF AUTHORS

**Research concept-** Richa Chandra, Naresh Paliwal

**Research design-** Richa Chandra, Gaurav Misra

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**Article editing-** Gaurav Misra, Nivedita Yadav

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