

## Effect Of Virtual Reality Distraction On Anxiety During Various Surgery Under Spinal Anaesthesia

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**Abstract:** Background: Regional anaesthesia avoids general anaesthesia risks but can cause anxiety. Sedatives like midazolam help but have side effects. Virtual Reality (VR) distraction might reduce anxiety without these risks. Objective: Evaluate VR distraction versus midazolam sedation on patient satisfaction and anxiety during spinal anaesthesia. Case Presentation: In this study, 60 patients were divided into VR (n=30) and sedation (n=30) groups. Baseline demographics, intraoperative vital parameters, and postoperative satisfaction were recorded. Primary outcomes were patient satisfaction on a 5-point Likert scale. Secondary outcomes included satisfaction of surgeons and anaesthesiologists, and incidence of involuntary movements, desaturation, apnea, and hemodynamic changes. Results: The VR group reported higher patient satisfaction (mean score 4.73 vs. 4.4, p=0.1) and anesthesiologist satisfaction (mean score 4.47 vs. 3.73, p=0.007). Apnea (3.33% vs. 20%, p=0.02) and desaturation (3.33% vs. 13.33%, p=0.04) were lower in the VR group, which also had fewer intraoperative movements and less tachycardia. Conclusion: VR distraction during spinal anaesthesia improves patient and anesthesiologist satisfaction, reduces perioperative anxiety, and lessens hemodynamic instability, offering a safe and effective non-pharmacological alternative for anxiety management in surgical settings. [Patel V Natl J Integr Res Med, 2026; 17(1): 1-9, Published on Dated: 07/07/2026]

**Keywords:** Virtual Reality Distraction, Spinal Anaesthesia, Patient Satisfaction, Sedation

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**Introduction:** Regional anaesthesia allows surgery without impacting the patient's level of consciousness. This avoids potential risks and disadvantages related to general anaesthesia, especially regarding control of upper airways.

However, the prospect of "hearing and seeing everything" in the operating room can still be a source of great anxiety and discomfort for the patients, thus modulating pain perception, leading to dissatisfaction and possibly failure of the regional anaesthesia technique<sup>1</sup>.

However, sedative drugs may cause complications, such as respiratory depression or hemodynamic instability. Distraction by VR program that includes visual and audio suggestions for relaxation may achieve the intended goals of pharmacological sedation without drug-related side effects<sup>2</sup>.

Several distraction tools are useful in reducing anxiety and improving patient satisfaction outside

the operating room. VR appears to be one of these effective diversion methods, having proven its benefits, especially in the care of burned patients, patients with breast cancer, and paediatric patients. VR may distract patients from noisy, scary, and uncomfortable environments during surgery under spinal anaesthesia. VR stimulates the physical presence of the user in an artificially generated environment, VR can modulate the activation of several brain areas, especially the anterior cingulate cortex, insula, and tonsil, which are involved in attention and emotional pain pathways<sup>1,3,4</sup>.

Therefore, we hypothesized that VR distraction might achieve greater patient satisfaction without the side effects of drug sedation during various surgeries under spinal anaesthesia<sup>2</sup>. So, we conducted a prospective observational study comparing patients' satisfaction between VR distraction and midazolam-based sedation in patients undergoing various surgeries under spinal anaesthesia.

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**Material & Methods:** Study Design: Prospective Observational Study: Since July 2023 intraoperative VR distraction has been offered to patients operated in the Surgical Unit of our institution as a new standard care protocol.

Patients were randomly allocated to 2 groups: Group 1 with the VR headset, Group 2 without the headset and sedation group.

Inclusion Criteria: All patients who agreed to participate. Patients who were 18 years and older. Patients of both sexes, patients with ASA GRADE I AND II. Patients who could understand Oral and Written instructions (language English, Hindi, Gujarati).

Exclusion Criteria: Patients who could not give consent. Patients with any visual or auditory deficit. Patients with any kind of skin infection of the head and neck. Patients with head wounds or bandages that may interfere with the VR headset.

Patients with nausea, vomiting, and motion sickness. Patients with claustrophobia. Patients who were reported with a history of using anxiety medication. Psychotropic drugs or having a history of seizures or convulsive disorders, vertigo, or equilibrium.

Study Protocol: To assess the implementation of intraoperative VR, a satisfaction survey was conducted with 60 similar postoperative questionnaires issued. Thirty patients who did not have access to VR were included in (the sedation group) and Thirty patients who benefited from VR distraction during surgery included in (the VR group)

Anaesthesia Protocol: All patients would undergo routine monitoring, including electro cardiography, non-invasive arterial pressure monitoring, and pulse oximetry. Mean arterial pressure, respiratory rate, and heart rate had been measured every 5 min and oxygen saturation (SpO<sub>2</sub>) had been monitored continuously.

No premedication had been administered. Spinal anaesthesia had been induced by intrathecal injection of hyperbaric 0.5%, 3-3.5 ml at the L4–L5 or L5–S1 spinal level to achieve an adequate spinal sensory block. After induction of spinal anaesthesia, all patients would receive their

allocated study intervention. All patients had been observed postoperatively in the recovery room for at least 30 min.

VR Group: The patients assigned to the VR group were subjected to a VR program According to the duration of surgery. This program was designed for relaxation and distraction from anxiety in patients. The patients would watch a VR while listening to narratives designed to induce relaxation and meditation. If the surgery is not completed within 60 min, the patient will watch the VR program again.

Sedation Group: The sedation group would undergo pharmacological sedation with midazolam used at an initial bolus dose of 0.02 mg/kg. Oxygen had been supplied at 4 L/min via a facemask in the sedation group but not in the VR group. If a patient who was assigned to the VR group wanted to stop watching the VR program, the VR program was removed, Initial bolus dose of midazolam was given.

Study Outcomes: Preoperative records of baseline demographic information had been made, including sex, age, and body mass index.

Additionally, the kind of surgery and the overall duration of the procedure would be noted. The patient's reported satisfaction score, as determined by a 5-point verbal rating scale akin to a Likert scale and based on a predetermined score-defining table (1, Not at all satisfied; 2, slightly satisfied; 3, neutral; 4, very satisfied; 5, extremely satisfied), had been the main outcome variable. When the patient awakens in the recovery room, the patient's satisfaction score is calculated.

As secondary outcomes, the satisfaction levels of the anaesthesiologist and surgeon would also be assessed after the procedure using the same predetermined scoring table (Table 1). The criteria for reporting the satisfaction score had been explained to the patients, surgeons, and anaesthesiologists before the induction of anaesthesia.

During their stay in the recovery room, the patients were presented with a score table again and were asked to rate their satisfaction when they became completely alert. If the patient was found confused by the residual effect of

midazolam, the scoring of satisfaction had been performed after transfer to the general ward. The patients would also be asked about their memory of the surgical procedure or procedural pain they experienced during surgery (measured on a 0–10

numeric rating scale where 0 was no pain and 10 was the worst pain imaginable). Length of stay in the recovery room had been recorded. The criteria for discharge to the recovery room in our hospital was a modified Aldrete score  $\geq 9$ .

**Table 1: Satisfaction Score<sup>2,5</sup>**

| Rater                    | Score                       | Description                                                                                                                                                                                                                                                                                                           |
|--------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Patient</b>           | 1<br>(Not At All Satisfied) | Any of the following:<br>1. Patients recalled all steps of surgical procedure.<br>2. Patients felt severe pain during surgery (NRS $\geq 7$ ).<br>3. Patients repeatedly moved due to discomfort.                                                                                                                     |
|                          | 2<br>(Slightly Satisfied)   | Any of the following :<br>1. Patients recalled about two-thirds of surgical procedure time.<br>2. Patients felt moderate pain (NRS of 4 to 6).<br>3. Patients moved several times due to discomfort.                                                                                                                  |
|                          | 3<br>(Neutral)              | Any of the following :<br>1. Patients recalled less than one-third of the surgical procedure time.<br>2. Patients felt mild pain (NRS of 2 to 3).                                                                                                                                                                     |
|                          | 4<br>(Very Satisfied )      | All of the following:<br>1. No patient's recall of surgery.<br>2. No pain at all.<br>3. Patients felt comfortable during surgery.                                                                                                                                                                                     |
|                          | 5<br>(Extremely Satisfied ) | All of the following :<br>1. No patient's recall of surgery.<br>2. No pain at all.<br>3. Patients felt extreme comfort and were not connected about position and surgery at all.                                                                                                                                      |
| <b>Anaesthesiologist</b> | 1<br>(Not At All Satisfied) | Any of the following:<br>1. Patients involuntarily moved 3 or more times and repeatedly spoke which interfered with the surgical procedure.<br>2. More than three events of apnea.<br>3. Desaturation (spo2 <90% more than 5s) more than twice.<br>4. Assisted ventilation is required due to desaturation and apnea. |
|                          | 2<br>(Slightly Satisfied)   | Any of the following:<br>1. Patients involuntarily moved or spoke 1 to 2 times, which interfered with the surgical procedure.<br>2. Apnea developed twice.<br>3. Desaturation (spo2<90% more than 5s) once.<br>4. Oral or nasal airway insertion due to desaturation and apnea.                                       |
|                          | 3<br>(Neutral)              | All of the following :<br>1. Patients involuntarily moved or spoke 1 to 2 times, but did not interfere with the surgery.<br>2. Apnea developed once but did not require oral or nasal airway insertion or assisted ventilation.                                                                                       |

|                |                                                  |                                                                                                                                                                                                                                                                                                                                                                           |
|----------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | <p><b>4</b><br/><b>(Very Satisfied )</b></p>     | <p>All of the following :</p> <ol style="list-style-type: none"> <li>1. No patient's voluntary movement or speaking.</li> <li>2. Apnea developed once but did not require oral or nasal airway insertion or assisted ventilation.</li> </ol>                                                                                                                              |
|                | <p><b>5</b><br/><b>(Extremely Satisfied)</b></p> | <p>All of the following :</p> <ol style="list-style-type: none"> <li>1. No patient's voluntary movement or speaking.</li> <li>2. No apnea.</li> </ol>                                                                                                                                                                                                                     |
| <b>Surgeon</b> | <p><b>1</b><br/><b>(Not All Satisfied)</b></p>   | <p>Any of the following :</p> <ol style="list-style-type: none"> <li>1. Patients involuntarily moved or repeatedly spoke, which made the surgical procedure stop more than twice.</li> <li>2. Persistent penile erection (30 or more episodes lasting &gt;10s) that significantly interfered with the surgical procedure and required phenylephrine injection.</li> </ol> |
|                | <p><b>2</b><br/><b>(Slightly Satisfied)</b></p>  | <p>Any of the following:</p> <ol style="list-style-type: none"> <li>1. Patients involuntarily moved or repeatedly spoke, which made the surgical procedure stop once.</li> <li>2. Persistent penile erection ( 2 or more episodes &gt;10s) that interfered with the surgical procedure, but not use phenylephrine.</li> </ol>                                             |
|                | <p><b>3</b><br/><b>(Neutral)</b></p>             | <p>Any of the following:</p> <ol style="list-style-type: none"> <li>1. Patients involuntarily moved or spoke a little, but no interference with the surgical procedure.</li> <li>2. Transient penile erection (&lt;10s) that did not interfere with the surgical procedure significantly.</li> </ol>                                                                      |
|                | <p><b>4</b><br/><b>(Very Satisfied)</b></p>      | <p>All of the following:</p> <ol style="list-style-type: none"> <li>1. No Patient's voluntary movement or speaking. No interference with the surgical procedure.</li> <li>2. Transient penile erection (&lt;10s) which did not interfere with the surgical procedure at all.</li> </ol>                                                                                   |
|                | <p><b>5</b><br/><b>(Extremely Satisfied)</b></p> | <p>All of the following:</p> <ol style="list-style-type: none"> <li>1. No patient's voluntary movement or speaking. No interference with the surgical procedure.</li> <li>2. No penile erection at all.</li> </ol>                                                                                                                                                        |

To meet our study outcomes, postoperative satisfaction questionnaires were consecutively distributed to eligible patients.

**Image 1: Patients Satisfaction Questionnaire<sup>1</sup>**

| <b>PATIENT'S Satisfaction Questionnaire</b>                                                                                                                                                                           | <b>PATIENT LABEL</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <p align="center"><i>You just underwent surgery under peripheral regional anesthesia.<br/>In order to improve quality of care, please take a moment to share your impressions with us !<br/>Thanks you.</i></p> <hr/> |                      |
| <p><b>1. How would you evaluate the overall satisfaction with your regional anesthesia?</b></p>                                                                                                                       |                      |
| <p><b>2. How would you evaluate your anxiety before the surgery?</b></p>                                                                                                                                              |                      |
| <p><b>3. How would you evaluate your anxiety during the surgery?</b></p>                                                                                                                                              |                      |
| <p><b>4. Do you have any comments on this experience?</b></p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>                                                                                                     |                      |

**Results:** 60 patients of ASA grade I & II were assessed for eligibility to be included in this study after informed consent, 30 patients were included in the VR group, and the remaining 30 patients were included in the sedation group. All 60 patients finished the study protocol and were included in the analysis. No patient in the VR group asked to stop watching the VR program and no rescue medication was administered in either study group. There was no missing data for any of

our study variables. All patients were able to report their satisfaction scores in the recovery room. The patients characteristics at baseline are shown in Table 2 Patients were comparable in terms of demographics, ASA scores, types and durations of surgeries, and modalities (type and dose) for spinal anaesthesia. The patient demographics and comorbidity were comparable. The duration of surgery was not different between the groups.

**Table 2: Demographics Variables**

| Case number               | 30               | 30                 |
|---------------------------|------------------|--------------------|
| Age (years)               | 42.7(23-69)      | 43.2(23-69)        |
| Weight (kg)               | 70.6(46-94)      | 65.5(48-85)        |
| Height (cm)               | 1.64(1.5-1.78)   | 1.66(1.5-1.79)     |
| BMI (kg/m <sup>2</sup> )  | 26.2(19.4-34.95) | 23.67(17.18-30.44) |
| ASA 1/2                   | 15/15            | 17/13              |
| <b>Underlying Disease</b> |                  |                    |
| Hypertension              | 4                | 4                  |
| Diabetes                  | 4                | 2                  |
| COPD                      | 2                | 3                  |
| Thyroid                   | 5                | 4                  |
| Duration of Surgery       | 64(30-140)       | 61.8(30-130)       |

**Table 3: Surgeries**

| Variables                | VR Group | Sedation Group |
|--------------------------|----------|----------------|
| Orthopedic               | 16       | 13             |
| Tibia Nailing            | 3        | 4              |
| Calcaneum K-Wire         | 2        | 2              |
| Metatarsal K-Wire        | 2        | 1              |
| Proximal Femoral Nailing | 1        | 1              |
| TKR                      | 6        | 3              |
| ACL Repair               | 2        | 2              |
| Surgery                  | 8        | 10             |
| Appendicectomy           | 3        | 2              |
| Fistulectomy             | 2        | 3              |
| Inguinal Hernioplasty    | 1        | 3              |
| RFA                      | 6        | 7              |
| <b>Gynec</b>             |          |                |
| D And C                  | 2        | 2              |

**Table 4: Sedation Variables**

| Variables                                  | VR Group  | Sedation Group | P Value |
|--------------------------------------------|-----------|----------------|---------|
| Involuntary movement during surgery        | 5(16.67%) | 10(33.33%)     | 0.023   |
| Patients who requested to stop watching VR | 0(0%)     | 0(0%)          |         |
| Administration of rescue sedative          | 4(13.33%) | 0(0%)          | 0.031   |
| Desaturation (o <sub>2</sub> required)     | 1(3.33%)  | 4(13.33%)      | 0.04    |
| Apnea                                      | 1(3.33%)  | 6(20%)         | 0.02    |

|                                                                     |           |           |       |
|---------------------------------------------------------------------|-----------|-----------|-------|
| Frequency in patients with apnea required assisted mask ventilation | 0(0%)     | 2(6.67%)  | 0.14  |
| Atropine administration incidence                                   | 2(6.67%)  | 4(13.34%) | 0.28  |
| Felt procedural pain during surgery                                 | 0(0%)     | 0(0%)     |       |
| Remember the operative procedure                                    | 2(6.67%)  | 5(16.67%) | 0.14  |
| Nausea, Vomiting                                                    | 3(10%)    | 5(16.67%) | 0.32  |
| Patient's satisfaction score                                        | 4.73(0-5) | 4.4(0-5)  | 0.1   |
| Surgeon satisfaction score                                          | 4.57(0-5) | 4.1(0-5)  | 0.06  |
| Anaesthesiologist satisfaction score                                | 4.47(0-5) | 3.73(0-5) | 0.007 |

**Table 5: Perioperative Hemodynamic Vital Parameters**

| Variables                   | .                      | VR Group         | Sedation Group   | P Value |
|-----------------------------|------------------------|------------------|------------------|---------|
| Systolic Blood Pressure     | SBP Baseline           | 133.5 (114-154)  | 131.8 (114-150)  | 0.5     |
|                             | SBP Intraoperative Max | 120.2 (106-154)  | 128.07 (108-154) | 0.013   |
|                             | SBP Intraoperative Min | 106.87 (100-120) | 113 (100-130)    | 0.019   |
| Heart Rate (bpm)            | HR Baseline            | 82.4 (64-96)     | 81.07 (62-98)    | 0.57    |
|                             | HR Intraoperative Max  | 71.13 (96-60)    | 78.33 (60-100)   | 0.008   |
|                             | HR Intraoperative Min  | 60.4 (50-70)     | 68.07 (48-90)    | 0.001   |
| Intraoperative Hypertension |                        | 6 (20%)          | 10 (33.3%)       | 0.12    |
| Intraoperative Hypotension  |                        | 0 (0%)           | 0 (0%)           |         |
| Intraoperative Tachycardia  |                        | 4 (13.33%)       | 9 (30.00%)       | 0.046   |
| Intraoperative Bradycardia  |                        | 1 (3.33)         | 4 (13.33%)       | 0.1     |

**Satisfaction Score:** The distribution of the satisfaction scores of the patients and anaesthesiologists was significantly different between the groups.

The incidence of extreme satisfaction (satisfaction score 5) for patients and anaesthesiologists was significantly higher in the VR group than in the sedation group.

Immediate postoperative satisfaction score was significantly higher in the VR group compared to the Standard Care group with a significant increase in the proportion of very satisfied patients.

**The Comparison Of Outcome Variables Between The Groups:** Most patients did not move inadvertently during surgery in the VR group.

There were significantly more patients who developed apnea in the sedation group than in the VR group. Two patients in the sedation group received assisted mask ventilation. The hemodynamic variables during surgery, including

the incidence of hypotension and bradycardia, were not different between the groups. The duration of stay in the recovery room was not different between the groups.

**Anxiety:** There was no difference in the pre-operative anxiety scores between the two groups.

On the other hand, the VR group experienced much less anxiety during the procedure than the Sedation group. The VR group's stated level of anxiety throughout the procedure significantly decreased.

**Hemodynamic Parameters:** The two groups did not vary in baseline vital indicators (SBP, DBP, and HR) assessed upon admission to the surgical department.

Intraoperative hemodynamic alterations were shown to be significantly less common when virtual reality was used.

Additionally, the VR group experienced tachycardia less frequently than the sedative

group (p=0.046). In neither group has there been an occurrence of hypotension.

**Discussion:** We have compared two groups of patients who underwent lower abdomen and lower limb surgeries under spinal anaesthesia before and after the implementation of an intraoperative virtual reality distraction protocol.

VR distraction has been studied in regional anaesthesia to assess its sedative and analgesic-sparing effects. However, the studies included only a small number of patients as a pilot.

In this prospective observational study, we used a commercially available VR program specifically designed for perioperative settings to evaluate participants' satisfaction.

The satisfaction score of the anaesthesiologists was significantly higher in the VR group than in the sedation group.

The incidences of extreme satisfaction reported by the patients and anaesthesiologists were significantly higher in the VR group than those in the sedation group.

Our study results suggest that VR distraction may be preferable for both patients and anaesthesiologists during various surgeries under spinal anaesthesia.

Subjective intraoperative anxiety was significantly reduced when virtual reality was used, and the anxiolytic effects of the technique were suggested by a significant decrease in patient-reported anxiety scores during surgery compared to the preoperative period when accessing it.

Virtual reality was also associated with fewer intraoperative hemodynamic changes in blood pressure and heart rate with reduced occurrence of tachycardia episodes. No adverse event related to the device use was reported during this study.

Previous studies investigating virtual reality in the operating room have most often been carried out during lower-limb surgeries and compared VR to sedation protocols.

Few of them investigated VR for procedures performed under peripheral regional anaesthesia

alone, though these techniques are increasingly being recommended to limit the impaired area and promote functional recovery and rapid return of the patient at home<sup>6</sup>.

Our results suggest that distractive virtual reality could become a new standard practice and be widely applied to patients undergoing lower abdomen and lower limb surgery, as an add-on to spinal anaesthesia.

With benefits in terms of patient satisfaction and reduction in perioperative anxiety levels leading to greater hemodynamic stability during surgery, VR is a simple and affordable distraction technique that can be used by everyone and everywhere; its implementation can be readily effective in many surgery centers around the world.

The feasibility and the safety of VR are supported by the study of Chan et al., who demonstrated in 9 patients undergoing hip or knee replacement surgery under regional anaesthesia that it was possible to use a virtual reality helmet during the procedure<sup>7</sup>.

They have shown a non-significant sedation-sparing effect in the VR group but no benefit in terms of postoperative patient satisfaction.

However, in this small study, each of the two groups systematically received a sedation protocol, explaining the lack of difference observed.

A recent study by Jee Youn Moon et al. supports our data in terms of patient satisfaction; they showed a higher proportion of very satisfied patients when using a virtual reality helmet for urological surgical procedures performed under spinal anaesthesia, compared to a sedation protocol<sup>8</sup>.

We contrasted midazolam-induced drowsiness with VR distraction. Comparing this benzodiazepine to propofol or dexmedetomidine, it is not as popular as it formerly was due to its longer duration of action. The results of our investigation demonstrated a high rate of apnea under midazolam sedation.

For the procedure of sedation, other drugs often used include propofol and dexmedetomidine<sup>9,10,11</sup>.

Propofol is linked to a quick recovery, although it can also cause arterial hypotension when reflex tachycardia is suppressed. Compared to other sedatives like benzodiazepines and propofol, dexmedetomidine sedation improves analgesia and causes less respiratory depression<sup>12,13</sup>.

It is true that in our study before implementing VR satisfaction scores were very high. It was observed that benefiting from VR may be the consequence of more time spent with the patients when explaining the functioning and modalities of the device, more than the VR session.

Further, we used the VAS score for assessing patient satisfaction, which is a simple and rapid tool and widely used<sup>13,14</sup>, and not a more objective tool such as the "EVAN-ALAR" scale<sup>15</sup>.

**Conclusion:** Our study results suggest that VR distraction is preferable to pharmacologic sedation with midazolam in terms of patient and anaesthesiologist satisfaction and avoiding the respiratory side effects of midazolam during the lower abdomen and lower limb surgeries under spinal anaesthesia in patients with ASA grade I-II.

Implementation of a virtual reality distraction protocol in the operating room effectively improves patient satisfaction, with hemodynamic stabilization effects, and reduces perioperative anxiety, without any complication related to the device and with excellent acceptability from the medico surgical team.

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