Comparison of the effects of dexmedetomidine and remifentanil in sedation, analgesia, and vital signs in patients undergoing stereotactic brain biopsy: a single-blind control trial

Faranak Behnaz  
Associate Professor, Anesthesiology Department, Shohadae Tajrish hospital, Shahid Beheshti University of Medical Sciences,

Sogol Asgari  
Assistant Professor, Anesthesiology Department, Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences

Narges Bazgir  
Hearing Disorders Research Center, Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences

Mohammadsmail Kordjazi  
Hearing Disorders Research Center, Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences

Parisa Sezari  
Assistant Professor, Anesthesiology Research Center, Shahid Beheshti University of Medical Sciences

Research Article

Keywords: stereotactic frame-based brain biopsy, remifentanil, dexmedetomidine, sedation, vital signs, analgesics

Posted Date: May 12th, 2023

DOI: https://doi.org/10.21203/rs.3.rs-2745586/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License
Abstract

**Background**: stereotactic frame-based brain biopsy is a minimally invasive neurosurgical procedure. Dexmedetomidine, an alpha-2 adrenergic agonist decreases heart rate, blood pressure, and stress response. Remifentanil is a short-acting opioid receptor agonist. In this study, we aim to compare the effects of dexmedetomidine and remifentanil on sedation, hemodynamic alterations, analgesia, and recovery profile of patients who underwent stereotactic brain biopsy.

**Method**: a single-blind clinical trial was conducted. Forty patients with American society of anesthesiology(ASA) class II were included. Initially, local anesthesia was administered and stereotactic frames were installed, then patients were transferred for magnetic resonance imaging (MRI) evaluations. Afterward, patients were randomly divided into two groups: The R group which received remifentanil, and the D group which received dexmedetomidine. Blood pressure, oxygen saturation, heart rate, and Ramsay sedation scale (RSS) of all included cases were recorded throughout the operation. After transferring to the post-anesthesia care unit (PACU), the visual analog score (VAS) and the amount of consumed morphine by each patient were measured.

The statistical analysis was conducted using SPSS version 22. Descriptive analysis, analysis of variance (ANOVA), and independent t-test were performed. A P-value less than 0.05 was considered to be statistically significant.

**Results**: forty consecutive patients consisting of 22 males and 18 females were included. Patients were randomly divided into two equal groups. After conducting statistical analysis, it was revealed that RSS was higher in the R group. Indicating a higher level of sedation. Heart rate, systolic blood pressure, and diastolic blood pressure were all higher in the D group. Furthermore, the VAS and consumed morphine were lower in the D group.

**Conclusion**: The RSS was higher in the R group, indicating a higher level of sedation in patients who received remifentanil. All recorded vital signs were higher in the D group. implicating that the vital signs were more stable during the operation in patients who received dexmedetomidine.

In addition, the VAS and dose of consumed morphine in PACU were lower in the D group.

**Trial registration**: the current study was registered in The Iranian registry clinical trial (code =IRCT20210415050983N2).

**Background**

The biopsy approach is a way to remove the brain lesions when open resection is not possible or there is a lack of imaging data for diagnosis. The biopsy also helps to establish the proper diagnosis(1, 2). By obtaining a small amount of the lesion and sending fit or pathological analysis, the biopsy aid to establish the precise diagnosis.
The brain biopsy technique has evolved dramatically from invasive free-hand craniotomy to stereotactic technique.

The imaging studies have helped to obtain the samples safer and more accurately (3, 4).

The image-based stereotactic frame-based brain biopsy is one of the frequent biopsy techniques used in neurosurgery. It is a minimally invasive and quick procedure(5, 6). By using imaging studies associated with fixed sets or radiopaque sets, the stereotactic approach helps to obtain a three-dimensional image of the brain(7).

There are few but serious complications related to frame-based stereotactic techniques such as neurological impairments, seizures, unconsciousness, and symptomatic and asymptomatic hemorrhage(8).

Dexmedetomidine is an alpha2-androgenic agonist that impacts the locus Caeruleus area of the brain. The Caeruleus area regulates respiration and sleep. Decreasing the heart rate, blood pressure, and biological stress response are among the dexmedetomidine effects(9, 10). This drug minimally disturbs respiratory rate and tidal volume(11). Prolonged recovery is the main downside of this drug(12, 13).

Remifentanil is an opioid receptor agonist. Despite the other opioids, it is quickly hydrolase by both plasma and tissue esterase. Remifentanil action time is brief which ensures the quick resolution of adverse effects, and neutralization of analgesic effects(14).

In this study, we aim to conduct a parallel single-blind clinical trial to compare the effects of dexmedetomidine and remifentanil on sedation, hemodynamic alterations, analgesia, and recovery profile of patients who underwent stereotactic brain biopsy in Loghman Hakim hospital.

**Methods**

A single-blinded clinical trial was conducted in Loghman Hakim hospital from June to September 2022. We included forty patients with American society of anesthesiology (ASA) physical status class II who were aged 18 to 50 and were candidates for stereotactic brain biopsy.

The ethics committee of Shahid Beheshti University of Medical Sciences approved this survey (IR.SBMU.RETECH.REC.1400.657, date of registration: 09/01/2022, The Iranian registry clinical trial code = IRCT20210415050983N2). The study protocol was following the Declaration of Helsinki. All the included patients were informed about the purpose of the study, and written consent was obtained.

Inclusion criteria are composed of:

1. supratentorial lesions with or without hydrocephalus.
2. Mean procedure time length of one to two hours.
3. Patients with secondary lesions also were included.
4. Patients who were admitted and available for further follow-ups.

Patients who had body mass index (BMI) more than 35 or less than 16, alcohol or any other drug abuse, consumption of beta-blockers, heart rate less than 50, uncontrolled seizures, any liver or kidney dysfunction, mental disorders, hard intubations, severe neurological defects, any other uncontrolled background diseases, history of chronic pain, and brainstem lesions were excluded.

We also excluded cases with prior craniotomy, brain ventricles drainage, and patients who did not committed.

Through history, physical examination, neurological evaluations, laboratory investigations including hemoglobin, liver, and renal function tests, and electrocardiography were obtained.

Initially, scalps were locally anesthetized by administrating 20 milliliters of lidocaine 1.5% and 50 micrograms of fentanyl. Then the stereotactic frames were installed in the sitting position and patients were sent to the radiology ward for magnetic resonance imaging (MRI). Then 2 liters of oxygen per minute with a mask, 5 cc of normal saline per hour and 0.003 mg per kg of intravenous midazolam are given.

After an hour patients returned to the operating room, and two liters per minute of oxygen via mask was administered. An eighteen-gauge intravenous cannula was inserted for each case. Intraoperative monitoring consisting of end-tidal carbon dioxide (Etco2), electrocardiography, oxygen saturation, and non-invasive blood pressure was applied. The systolic blood pressure and diastolic blood pressure were recorded every five minutes until 25 minutes after the operation. We also recorded the heart rate of all cases in ten and twenty minutes for further evaluation.

All the airway equipment such as nasal or oral airways, endotracheal tube, laryngeal mask, and laryngoscope were provided before any sedation. Moreover, since the stereotactic frame has no mobile face component the screwdrivers are kept accessible.

Throughout the procedures, normal saline infusion at the rate of 5 ml/kg/hour and 0.003mg/kg IV midazolam were administered for all cases.

Afterwards, we randomly divided patients into two equal groups. This randomization was performed using a computer. Initially, ten random blocks are generated by computer. Each block includes five people in the intervention group and five people in the control group. The order of these people is randomly arranged by computer and people are assigned to groups in the same way. At the end of each block, a new block of ten is produced and this process will continue until the final sample volume is reached. Forms with number 1 and 2 are used in packaged envelopes to patients’ groups. These envelopes are given to patients randomly. Patients are no aware of the envelope. After entering to the operating room, the in-charge anesthesiology opens the envelope. Based on the number, the drug is administered. The drugs were administered by identical black non-transparent syringes. The clinical care giver is also blind to the grouping. The evaluator and recorder of the results and the person who analyzed the data all were
unaware of grouping. Thus, all patients and personnel were masked to allocation. The treatments were administered in single-blinded design.

These two groups consisted of equal 20 patients, one called the D group that received dexmedetomidine, and the R group that received remifentanil.

D group initially received a loading dose of 0.5 microgram/kg in ten minutes, and then 0.5 microgram/kg/hour intravenous infusion by a pomp infusion throughout the surgery.

For the R group a loading dose of 1 microgram/kg IV boluses of remifentanil, followed by 0.05 to 0.2 microgram/kg/min IV infusion using a pomp infusion was administered.

Our aim included the hemodynamic alterations, analgesia, sedation, and recovery profile of patients.

The sedation of the patients was measured by the Ramsay sedation scale (RSS). The RSS was measured every three to five minutes all over the operation length. We aimed to achieve the RSS of two to four.

Ramsay sedation score(15)

1. The patient is anxious and agitated or restless, or both.
2. The patient is cooperative, oriented, and tranquil.
3. The patient responds to commands only.
4. The patient exhibits a brisk response to a light glabellar tap or loud auditory stimulus.
5. The patient exhibits a sluggish response to a light glabellar tap or loud auditory stimulus.
6. The patient exhibits no response.

Parameters such as blood pressure, heart rate, noninvasive blood pressure, and oxygen saturation were measured every five minutes all over the surgery, during the painful procedures, and during the cessation of drug infusion at the end of the surgery.

Our primary outcome composed of vital sign stability, saturation, analgesia, recovery and sedation.

If any adverse reactions like bradypnea (respiratory rate less than eight), apnea of more than 15 seconds, and oxygen saturation of less than 94% were observed, the infusion of the drugs was held and the respiration of patients was aided.

At the end of the operation, drug infusions were discontinued and patients were transferred to the post-anesthesia care unit (PACU).

In PACU we evaluated the pain of patients via visual analog score (VAS). The amount of morphine used for each included patient was also recorded.

After monitoring all the cases, patients who achieved a modified Aldrete score of more or equal to nine were transferred to the neurosurgery ward.
Modified Aldrete score (16):

Activity
- 2 = Moves all extremities voluntarily or on command
- 1 = Moves two extremities voluntarily or on command
- 0 = Unable to move extremities

Respiration
- 2 = Breaths deeply and coughs freely
- 1 = Dyspneic, shallow or limited breathing
- 0 = Apneic

Circulation
- 2 = BP ± 20 mmHg of pre-anesthetic level
- 1 = BP ± 20–50 mm of pre-anesthetic level
- 0 = BP ± 50 mm of pre-anesthetic level

Consciousness
- 2 = Fully awake
- 1 = Arousable on calling
- 0 = Not responding

Oxygen saturation
- 2 = SpO2 > 92% on room air
- 1 = Supplemental O2 required to maintain SpO2 > 90%
- 0 = SpO2 < 90% with O2 supplementation

The planned number of participants were 40. The following formula was used to determine the sample size.

\[
N = 2 \times \left( \frac{z_{1-\alpha} + z_{1-\beta}}{\delta_0} \right)^2 \times s^2
\]

The statistical analysis was conducted using SPSS version 22. Descriptive analysis, analysis of variance (ANOVA), and independent t-test were performed. A P-value less than 0.05 was considered to be
Results

We conducted a single-blind control trial in Loghman Hakim hospital from June to September 2022. Forty consecutive patients were included in this study. Twenty-two males (55%) and 18 females (45%) were evaluated. The mean weight of the cases was 66.7 ± 10.7 (ranging from 37 to 84). The mean of systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), and oxygen saturation (SPO2) were 113.6 ± 9.5, 67.7 ± 12.8, 86.1 ± 13.3, and 96.4 ± 1.5 respectively.

Patients were equally randomized into two groups each containing 20 participants. Further during the survey, no individual was excluded. Thus, all primary and secondary outcomes were calculated for 20 participants in each group.

Patients were followed up until they achieved a modified Aldrete score of more or equal to nine and were transferred to neurosurgery ward.

The means of each group’s weight, age, systolic blood pressure, diastolic blood pressure, heart rate, and oxygen saturation are listed in Table 1.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Age</th>
<th>Weight</th>
<th>Systolic blood pressure</th>
<th>Diastolic blood pressure</th>
<th>Heart rate</th>
<th>Oxygen saturation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>26.1 ± 7.7</td>
<td>65.3 ± 11.5</td>
<td>113.3 ± 9.7</td>
<td>69.7 ± 13.5</td>
<td>88.2 ± 13.6</td>
<td>96.3 ± 1.35</td>
</tr>
<tr>
<td>R</td>
<td>24.7 ± 6.2</td>
<td>68.1 ± 10.1</td>
<td>114.1 ± 9.4</td>
<td>65.7 ± 11.9</td>
<td>84.1 ± 12.9</td>
<td>96.5 ± 1.6</td>
</tr>
</tbody>
</table>

There was no significant difference in the age and weight of the two groups. in addition, the SBP, DBP, HR, and SPO2 of the two groups had no significant variance.

After conducting t independent test, it was revealed that the means of the two groups differed significantly in RSS in all recorded minutes. The RSS mean and standard deviation of each group and the resultant P-value are demonstrated in Table 2.
Table 2 illustrates the RSS mean and standard deviation of each group and the resultant P-value.

<table>
<thead>
<tr>
<th>Rass sedation scale</th>
<th>Group</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minute 6</td>
<td>D</td>
<td>2.5</td>
<td>0.94</td>
<td>0.046</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>1.85</td>
<td>1.03</td>
<td></td>
</tr>
<tr>
<td>Minute 9</td>
<td>D</td>
<td>3.15</td>
<td>0.81</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>4.55</td>
<td>0.99</td>
<td></td>
</tr>
<tr>
<td>Minute 14</td>
<td>D</td>
<td>4</td>
<td>0.32</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>4.95</td>
<td>0.22</td>
<td></td>
</tr>
<tr>
<td>Minute 20</td>
<td>D</td>
<td>3.5</td>
<td>0.51</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>4.75</td>
<td>0.44</td>
<td></td>
</tr>
<tr>
<td>Minute 25</td>
<td>D</td>
<td>3.25</td>
<td>0.55</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>4.8</td>
<td>0.36</td>
<td></td>
</tr>
</tbody>
</table>

As it was illustrated in Table 2 except for RSS in minute 6, the mean of RSS was higher in the R group, implicating that the sedation was higher in the R group.

The mean of recorded vital signs such as SBP, DBP, HR, and SPO2 also varied significantly.

The mean and standard deviation of recorded SBP and resultant P-value are listed in Table 3.

Table 3 summarizes the SBP values in minutes 10, 15, 20, and 25.

<table>
<thead>
<tr>
<th>Systolic blood pressure</th>
<th>Group</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minute 10</td>
<td>D</td>
<td>105.7</td>
<td>15.2</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>91.4</td>
<td>10.25</td>
<td></td>
</tr>
<tr>
<td>Minute 15</td>
<td>D</td>
<td>101.75</td>
<td>14.8</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>87.15</td>
<td>7.8</td>
<td></td>
</tr>
<tr>
<td>Minute 20</td>
<td>D</td>
<td>97.7</td>
<td>14.45</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>87.15</td>
<td>7.8</td>
<td></td>
</tr>
<tr>
<td>Minute 25</td>
<td>D</td>
<td>98.5</td>
<td>85.7</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>11.4</td>
<td>7.3</td>
<td></td>
</tr>
</tbody>
</table>
As it was shown in Table 3, the SBP mean was significantly higher in all recorded periods in D groups. the results of DBP and HR were following SBP. The details of DBP and HR values are shown in Tables 4 and 5 respectively.

### Table 4
summarizes the DBP values in minutes 10,15,20, and 25.

<table>
<thead>
<tr>
<th>Diastolic blood pressure</th>
<th>Group</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minute 10</td>
<td>D</td>
<td>67.1</td>
<td>15.01</td>
<td>0.103</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>57.3</td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td>Minute 15</td>
<td>D</td>
<td>64</td>
<td>14.8</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>51</td>
<td>7.7</td>
<td></td>
</tr>
<tr>
<td>Minute 20</td>
<td>D</td>
<td>61.7</td>
<td>13.1</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>47.5</td>
<td>8.1</td>
<td></td>
</tr>
<tr>
<td>Minute 5</td>
<td>D</td>
<td>62.1</td>
<td>12.7</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>48</td>
<td>10.2</td>
<td></td>
</tr>
</tbody>
</table>

### Table 5
summarizes the HR values in minutes 10 and 20.

<table>
<thead>
<tr>
<th>Heart rate</th>
<th>Group</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minute 10</td>
<td>D</td>
<td>76.0</td>
<td>7.5</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>68.4</td>
<td>8.5</td>
<td></td>
</tr>
<tr>
<td>Minute 20</td>
<td>D</td>
<td>66.5</td>
<td>6.07</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>62.0</td>
<td>6.25</td>
<td></td>
</tr>
</tbody>
</table>

Except for minute 10, compared to the R group, the D group had a higher DBP mean.

Likewise, the heart rate was higher in the D group.

The difference in VAS and amount of morphine used in the recovery room were significant (p-value of 0.001 and 0.003 respectively). The mean of VAS and dose of morphine was significantly lower in the D group.

The same results were repeated after conducting ANOVA. The result of conducted ANOVA is demonstrated in Table 6.
Table 6 demonstrates the result of conducted ANOVA.

<table>
<thead>
<tr>
<th>Variable</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSS9</td>
<td>0.045</td>
</tr>
<tr>
<td>RSS14</td>
<td>0.000</td>
</tr>
<tr>
<td>RSS20</td>
<td>0.000</td>
</tr>
<tr>
<td>RSS 25</td>
<td>0.000</td>
</tr>
<tr>
<td>SBP 10</td>
<td>0.000</td>
</tr>
<tr>
<td>SBP 15</td>
<td>0.000</td>
</tr>
<tr>
<td>SBP 20</td>
<td>0.000</td>
</tr>
<tr>
<td>DBP 10</td>
<td>0.101</td>
</tr>
<tr>
<td>DBP 15</td>
<td>0.000</td>
</tr>
<tr>
<td>DBP 20</td>
<td>0.001</td>
</tr>
<tr>
<td>HR 10</td>
<td>0.003</td>
</tr>
<tr>
<td>HR 20</td>
<td>0.002</td>
</tr>
<tr>
<td>VAS</td>
<td>0.001</td>
</tr>
<tr>
<td>Morphine dose</td>
<td>0.003</td>
</tr>
</tbody>
</table>

As it is illustrated in Table 6, except for DBP in the 10th minute, all other variables significantly differed between the two groups. RSS scores all were higher in the R group and monitored HR, SBP, and DBP were all less changed in the D group. The mean of VAS and morphine dose was significantly less in the D group.

**Discussion**

Stereotactic biopsy of the brain is the least invasive way to obtain an adequate sample from cerebral lesions(17, 18).

The frame-based stereotactic technique is an approach for three-dimensional point needle procedures such as biopsies, aspiration, and brachytherapy (19–23).

This minimally invasive approach must be conducted under analgesics to reduce the pain throughout the process. Besides, the arterial pressure of carbon dioxide and oxygen must be kept stable to avoid increasing intracranial pressure (ICP). Furthermore, cardiorespiratory depression must be avoided(24–26).
Dexmedetomidine is a highly selective α2-adrenoceptor agonist that causes a modest decrease in HR and blood pressure. It inhibits non-adrenergic neurons in locus coeruleus, while it has the least impact on respiratory derive(27–29). It is a unique sedative drug that induces arousable sedation like sleep(30, 31). The effects on the cardiovascular system consist of a minimal decrease in BP and heart rate. In contrast, administering higher doses of dexmedetomidine causes hypertension and bradycardia(29). Due to its many desirable effects on the nervous system, this drug has been used in many neurosurgical processes like deep brain stimulation, awake craniotomy, and awake fiber-optic intubation(32).

Remifentanil is an ultra-short-acting opioid. Thus, it shortens the recovery time. The adverse effect includes bradycardia, and post-operative hyperalgesia, which increases the need for opioid consumption (14).

In this study, we conducted a single-blinded clinical trial on the effect of remifentanil and dexmedetomidine on two groups of patients who underwent a stereotactic fame-based brain biopsy.

As was illustrated, SBP, DBP, and HR were all significantly higher in the D group. In contrast, the amount of morphine used and VAS post-operatively were less in the D group. Showing that the vital signs are more stable in patients who received dexmedetomidine. Furthermore, the postoperative pain control was better in D group.

In a meta-analysis comparing dexmedetomidine and remifentanil, it was revealed that dexmedetomidine had lower hypotension, nausea, vomiting, and immediate post-operative pain(34). Likewise, in our study patients who were sedated with dexmedetomidine had higher systolic and diastolic blood pressure throughout the procedure. Moreover, the number of opioids used post-operatively was less in the D group.

In a clinical trial conducted by Samir et al., they compared the effects of dexmedetomidine and propofol. They showed that HR, SBP, and DBP were all significantly less in the D group. Although dexmedetomidine decreased these hemodynamic variables, it did not cause bradycardia or any severe hypotension which leads to drug discontinuation(35). The reason for this hemodynamic stability in dexmedetomidine is the effect on post-synaptic smooth muscle effects that causes vasoconstriction(36).

To evaluate the effect of dexmedetomidine and remifentanil, a comparative study was performed on 42 patients who underwent video laparoscopic cholecystectomy. It was revealed that catecholamine release was less in the group that received dexmedetomidine during intubation and pneumoperitoneum. The SBP and DBP were higher in the D group. Despite the current study, they found no statistical difference in HR between D and R groups (37).

Ninety patients who underwent laparoscopic hysterectomy were randomly assigned to receive fentanyl, remifentanil, and dexmedetomidine. The VAS, bispectral index (BIS), and observer assessment of alteration/sedation (OAA/S) were measured. It was demonstrated that the OAA/S score was significantly lower in the D group. The VAS and BIS were almost the same in all three groups. The group that received dexmedetomidine had significantly lower BP and HR(38). The finding of the mentioned study was in
contrast to ours. We found that HR and BP were both higher, and VAS was significantly lower in the D group. This variation in results may be explained by the difference in the administered doses, as the dose of dexmedetomidine in the Choi et al study was higher than ours.

Forty patients were randomized into R and D groups. They showed that VAS was higher in the R group. This finding was consistent with our survey. They also revealed that patient-controlled analgesia and postoperative nausea and vomiting were lower in the D group. In accordance, we showed that post-operative opioid consumption is less in the D group(39).

Karabayirli et al. included 50 patients who were planning to undergo functional endoscopic sinus surgery (FESS). They divided them equally and randomly into D and R groups. They compared the amount of bleeding, VAS score, postoperative nausea and vomiting, shivering, and demand for additional analgesics in two groups. They found no statistical difference in mentioned variables between the two groups(40). Again, the probable explanation for this discrepancy could be the variation in administered doses and the type of patients included.

To compare the effect of dexmedetomidine and remifentanil, 44 patients who were planned to undergo selective cesarean section were divided into two equal groups. The BIS, hemodynamic variables, and the amount of post-operative propofol consumption were measured. It was illustrated that the mean arterial pressure (MAP) was increased in both, but more in the D group. In addition, BIS was lower in the D group(41).

In 2016 Rajan et al. conducted a randomized double-blind study on patients who underwent craniotomy. Sixty-eight patients received dexmedetomidine and 71 received remifentanil. They showed that post-operative MAP, VAS, and amount of opioid consumption were less in the D group(42). In accordance, we found the VAS was less in the D group.

Polat et al. randomized 90 patients who underwent nasal surgery into three groups consisting: the control, D, and R groups. They measured the emergency agitation in all groups. They concluded that the R group had the lowest rate of emergency agitation. Besides, the administration of analgesics in PACU was higher in group R(33).

In conclusion, we conducted a double-blind randomized clinical trial on 40 patients. it was revealed that the vital values such as SBP, DBP, and HR were all higher in the D group. Moreover, the amount of morphine used in the recovery room and VAS was significantly lower in the D group. we also measured RSS in two groups. The RSS was significantly higher in the R group.

**Limitation**

This study was conducted as a single-center survey.

A multi-center study with more patients is required to have more precise results.
Abbreviations

ANOVA = analysis of variance
ASA = American society of anesthesiology
BIS = bispectral index
BMI = body mass index
DBP = diastolic blood pressure
ETCO2 = end-tidal carbon dioxide
FESS = functional endoscopic sinus surgery
HR = heart rate
MAP = mean arterial pressure
MRI = magnetic resonance imaging
PACU = post-anesthesia care unit
RSS = Ramsay sedation score
SBP = systolic blood pressure
SPO2 = oxygen saturation
VAS = visual analog score

Declarations

Conflict of interest: None

Ethics and consents to participate:

The study was in accordance to Declaration of Helsinki. This study was ethically approved by ethical committee of Shahid Beheshti University of Medical Sciences (IR.SBMU.RETECH.REC.1400.657). Written informed consents were obtained from all included patients. (The Iranian registry clinical trial code =IRCT20210415050983N2, date of registration: 09/01/2022)

Competing Interest: There are no conflicts of interest relevant to this work.
Consent for publication: Not applicable

Funding Sources: No specific funding was received for this work.

Author contribution: PS, NB and FB conceptualized the study, MK, SA acquisition of data, and drafting the manuscript, PS, SA, FB revising for critical intellectual concept and approved of the version to be submit.

Data availability: All analyzed data during this study are included in this article. Further enquiries can be directed to the corresponding author.

Acknowledgment: we wish to thank who contribute to this study.

References


27. Weerink MAS, Struys M, Hannivoort LN, Barends CRM, Absalom AR, Colin P. Clinical Pharmacokinetics and Pharmacodynamics of Dexmedetomidine. Clin Pharmacokinet. 2017 Aug;56(8):893-913. PubMed PMID: 28105598. Pubmed Central PMCID: PMC5511603 this review. CONFLICT OF INTEREST: Maud A. S. Weerink, Laura N. Hannivoort, Clemens R. M. Barends, and Pieter Colin have no conflicts of interest to declare. Michel M. R. F. Struys's research group/department received grants and funding from The Medicines Company (Parsippany, NJ, USA), Masimo (Irvine, CA, USA), Fresenius (Bad Homburg, Germany), Acacia Design (Maastricht, The Netherlands), and Medtronic (Dublin, Ireland); and he has received honoraria from The Medicines Company (Parsippany, NJ, USA), Masimo (Irvine, CA, USA), Fresenius (Bad Homburg, Germany), Baxter (Deerfield, IL, USA), Medtronic (Dublin, Ireland), and Demed Medical (Temse, Belgium). Anthony R. Absalom's research group/department received grants and funding from The Medicines Company (Parsippany, NJ, USA), Masimo (Irvine, CA, USA), Fresenius (Bad Homburg, Germany), Acacia Design (Maastricht, The Netherlands), and Medtronic (Dublin, Ireland); and he has received honoraria from The Medicines Company (Parsippany, NJ, USA) and Janssen Pharmaceutica NV (Beerse, Belgium). Epub 2017/01/21. eng.


33. Polat R, Peker K, Baran I, Bumin Aydin G, Topçu Gülöksüz Ç, Dönmez A. Comparison between dexmedetomidine and remifentanil infusion in emergence agitation during recovery after nasal...


