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Sedative methods used during extraction of wisdom teeth in patients with a high level of dental anxiety

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Introduction: Intravenous sedation is performed to ensure smooth and safe surgery. Dental anxiety is a reaction to an unknown danger. The Spielberger's state-trait anxiety inventory (STAI) can be used to simultaneously evaluate the levels of state and trait anxiety. State anxiety is defined as subjective feelings of nervousness. This study assessed the presurgical anxiety using STAI and performed intravenous sedation for patients whose level of state anxiety was > stage IV. Based on our clinical experience, it is believed that higher doses of sedatives are needed to induce the desired levels of sedation in patients with a high level of state anxiety.

Objectives: This study examined whether the sedative consumption of the patient with a high anxiety level increased.

Patients and Methods: Patients with state anxiety scores of ≥51 were included in Group V, and those with state anxiety scores ranging from 42 to 50 were placed in Group IV. To induce sedation, intravenous access was established, and a bolus dose of 3.0 mg midazolam was administered intravenously. Sedation was maintained by administering a continuous infusion of propofol, which was aimed at achieving an Observer's Assessment of Alertness/Sedation scale of 10-12/20. In this study, midazolam was initially administered when the body movements appeared to occur or the blood pressure increased. This was followed by the administration of higher doses of propofol if low sedation was observed.

Results: There were no significant differences in the patient demographics, duration of sedation, and doses of local anaesthetic agents between Groups IV and V. The midazolam dose and mean propofol dose needed to maintain comparable levels of sedation were significantly higher in Group V than in Group IV.

Conclusion: In female patients, whose level of preoperative state anxiety is more than Stage V of STAI, a large quantity of sedatives is needed for intravenous sedation.

Key words: Intravenous sedation, Spielberger's state-trait anxiety inventory, Preoperative anxiety

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Ⅰ. Introduction

Good physician-patient rapport and an anxiolytic and sedative treatment are necessary for comfortable and stress-free surgery under local anaesthesia.

Intravenous sedation has been successfully performed to ensure smooth and safe surgery.

Anxiety is an extremely common state, and most people experience some degree of dental anxiety, especially if they are about to undergo a procedure that they have never experienced before. Dental anxiety is a reaction to an unknown danger. It is predicted that patients experience a high degree of anxiety before extraction of wisdom teeth.

The Spielberger's state-trait anxiety inventory (STAI)[1] can be used to simultaneously evaluate the levels of state and trait anxiety. State anxiety is defined as subjective feelings of nervousness. Trait anxiety is an individual's underlying tendency to perceive a situation.

We assessed presurgical anxiety by using STAI and performed intravenous sedation for patients whose level of state anxiety was more than stage IV. Propofol and midazolam are commonly used as intravenous sedatives because of their easy adaptability and early recovery time.

On the basis of our clinical experience, we believe that higher doses of sedatives are often required to induce the desired levels of sedation in patients with a high level of state anxiety. In this study, we examined this hypothesis.

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Ⅱ. Materials and Methods

We compared the amounts of sedatives used in 20 female patients who were divided into 2 groups on the basis of STAI scores. Patients with state anxiety scores of ≥51 were included in Group V; those with state anxiety scores from 42 to 50, Group IV.(Fig. 1)

In the case of outpatients undergoing extraction of a wisdom tooth under local anaesthesia, presurgical assessment of anxiety was performed using the STAI by their attending dentist. The anaesthesiologist was not informed the detailed evaluation of STAI. Written informed consent was obtained from all patients after providing a thorough explanation of the treatment and management plan, according to approved instructions.

Standard intraoperative monitoring involved electrocardiography (ECG), non-invasive blood pressure monitoring, and measurements of the heart rate and oxygen saturation. Supplemental oxygen was administered to all patients. For induction of sedation, intravenous access was established, and a bolus dose of 3.0 mg midazolam was administered intravenously. Sedation was maintained by administering a continuous infusion of 2 mg · kg^{-1} · h^{-1} propofol, which was aimed at achieving a the Observer's Assessment of Alertness/Sedation scale (OAA/S) of 10-12/20. In this study, we initially administered 1-2 mg midazolam when body movements seemed to occur or the blood pressure increased; this was followed by administration of higher doses of propofol if low sedation was observed. The total amount of medications administered and the time were recorded. The depth of sedation was regulated by only 1 anaesthesiologist who had 15 years of experience. In addition, tooth extraction was performed by only 1 specialist in oral surgery, who had 30 years of experience.

Statistical analysis was performed using analysis of variance. (ANOVA) Significance was established at $P<0.05$.

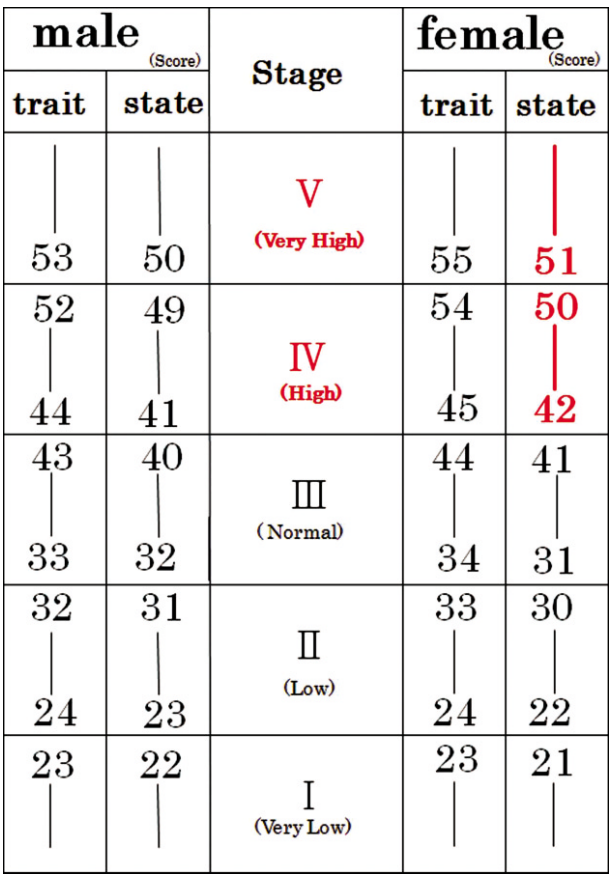

Fig. 1. Decision criteria of the Spielberger's state-trait anxiety inventory.

Ⅲ. Results

The subjects were divided into Group IV (n=9) and Group V (n=11).(Table 1) The subjects did not have contributory medical or psychological history except dental anxiety. There were no significant differences in the patient demographics, durations of sedation, and dosages of local anaesthetic agents between subjects belonging to Groups IV and V.(Table 1)

In both groups, patients were able to leave the recovery room within 15 minutes after the end of the operation. There were no cases wherein the operation was terminated because of sedation complications. In all cases, the patient was sedated in the absence of severe hemodynamic instability. The midazolam dosages in Groups IV and V were 4.6±0.9 mg and 8.3±2.1 mg, respectively. The average propofol dose was 3.0±0.4 mg · kg^{-1} · h^{-1} for Group V and 2.1±0.3 mg · kg^{-1} · h^{-1} for Group IV. The midazolam dose and the average propofol dose required to maintain comparable levels of sedation were significantly greater in Group V than in Group IV.(Fig. 2)

Table 1. Patient background

	Group IV (n=9) [SD]	Group V (n=11) [SD]
Age (old)	29.3 [10.2]	31.1 [9.2]
Height (cm)	159.1 [1.5]	156.0 [5.7]
Weight (Kg)	50.2 [5.7]	54.4 [11.1]
Operation time (min)	42.8 [23.6]	55.4 [20.0]
Sedation time (min)	69.0 [25.0]	72.3 [18.2]

SD, Standard Deviation

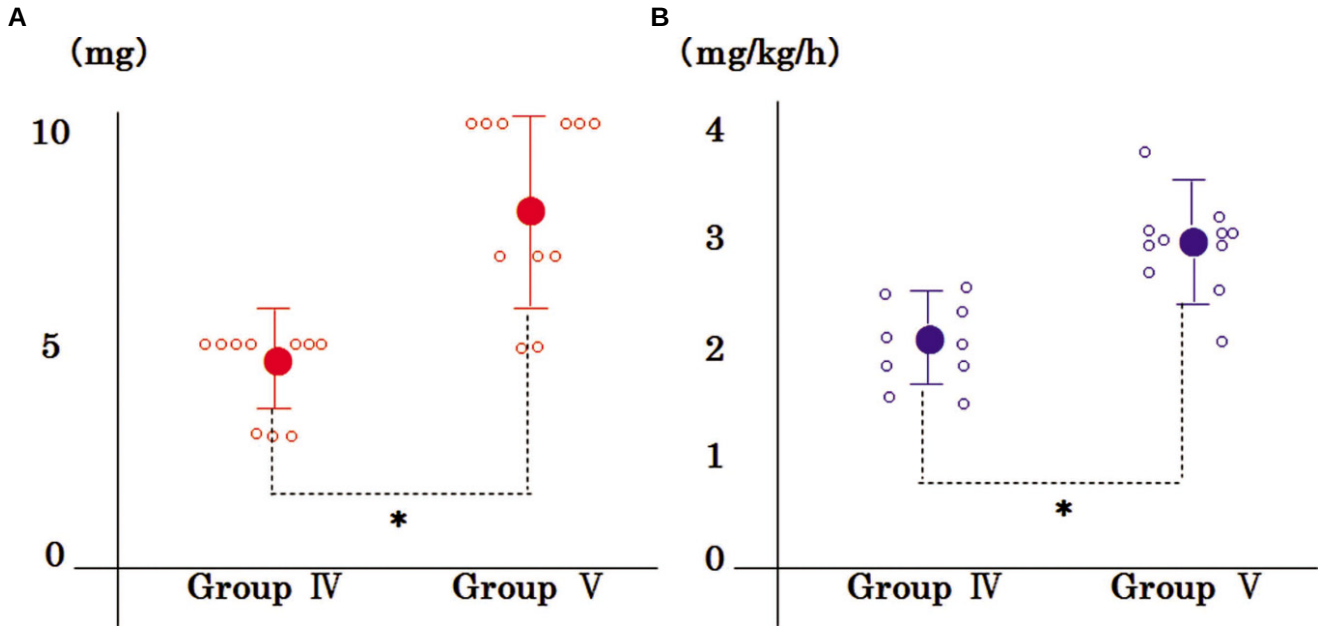

Fig. 2. Dose of sedatives administration.
A: midazolam dosages, B: propofol dosages. *P < 0.05

Ⅳ. Discussion

The prevalence of fear and anxiety toward dentistry has been internationally documented in numerous studies[2]. Boker *et al*.[3] reported that 60% of patients who present for elective surgery experience anxiety. A study conducted in Japan found that 21% of subjects were very afraid or terrified to visit the dentist[4].

The Spielberger's STAI is the gold standard for measuring preoperative anxiety[5,6]. STAI scores usually range from 20 to 80.

In Japanese women, the state anxiety is considered high when the STAI score is above 42, and the trait anxiety is considered high when this score is above 45. We instruct all patients who require minor surgery to answer STAI for evaluating their anxiety level. Subsequently, during minor oral surgery, we administer intravenous sedatives to patients with a high level of state anxiety.

Propofol is commonly used as an intravenous sedative because of its easy adaptability and early recovery time. Because propofol does not show analgesic action, body movements may often occur. In addition, it is reported that patients with a high level of preoperative anxiety show greater intraoperative body movements. Osborn and Sandler[7] reported that in female patients who underwent wisdom teeth extraction, the propofol dosage required for intravenous sedation increased according to the level of preoperative anxiety. In their study, a single operator was not used, and midazolam and narcotic drugs were used in addition to propofol. We think that the use of narcotic drugs should be avoided in patients who undergo day surgery because of the side effect of respiratory depression. Therefore, we used propofol and midazolam as intravenous sedatives. Our experiences indicate that in most cases, body movements can be controlled using a suitable combination of propofol and midazolam. In the sedation procedure used in the current study, propofol and midazolam were used without narcotic drugs; the benefit of this procedure is that if oversedation occurs, the optimal level of sedation can be quickly restored by decreasing the dosage.

There is bispectral index (BIS) value as objective evaluation for sedative depth. This device is highly complex and difficult to interpret. The current methods used to measure the level of patient sedation are often based on the subjective observation of the anaesthetist, and clinical scoring methods are commonly used (e.g., OAA/S). OAA/S evaluates for 4 items ("responsiveness to given name", "speech", "facial expression", and "eyes") with 5 points as full points for each item and 20 points at the time of full arousal. Liu *et al*.[8,9] demonstrated that the BIS value correlates with the depth of both midazolam and propofol-induced sedation as validated by use of the OAA/S rating scale. The depth of sedation was adjusted in accordance with OAA/S that become 10-12/20 by an identical anaesthetist. It can be considered that the dose of sedatives that needed to maintain sedative depth would be correlated to BIS value. We

did not inform the detailed evaluation of STAI to the anaesthetist. We perform a sedation method even for case that can be anticipated for high surgical invasion. It cannot be denied for a possibility that the anaesthetist could analogize a high anxiety level of patient. However, since target cases for this study are retrospectively selected with the condition of identical surgeon, identical anaesthetist, and females with Ⅳ or higher for state anxiety level by STAI, it is considered there is less bias by anaesthetist.

Some studies have reported that gender and age are closely correlated with preoperative anxiety[10,11]. Many studies have shown that women have a higher level of preoperative anxiety. To minimize variation in the present study, only female patients were included, 1 anaesthesiologist controlled the anaesthetic depth, and 1 operator performed all procedures.

In addition, we only included subjects whose anxiety level was high.

One of the limitations of the present study is that we did not consider the patients' age. According to Kim *et al*.[6], the state anxiety of patients aged ≥45 years is strongly associated with the hemodynamic changes that occur during anaesthetic induction and is a predictor of these changes. Sun *et al*.[11] reported that the prevalence of anxiety is higher among young patients than among other patients. The results of the present study may have been different if senior patients had been studied. Further research is required to clarify this issue.

In the present study, we found that stage V of state anxiety served as a predictor of increased intraoperative anaesthetic requirements.

We suggest that patients with stage V of preoperative state anxiety require an increased amount of sedative medication to induce and maintain a clinically acceptable level of sedation.

It is possible to develop anaesthetic techniques that allow deeper sedation, ensure patient comfort, and prevent potentially harmful intraoperative movements by knowing that patients with a high anxiety level require more medication for sedation.

Ⅴ. Conclusion

In female patients whose level of preoperative state anxiety is more than Stage V of STAI, a large quantity of sedatives is required for intravenous sedation. Preoperative anxiety stage V of STAI can be used as a predictor of anaesthetic requirements to avoid complications and enable administration of a sufficient dose of sedatives to achieve whole-body control.

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