

A Sleep paralysis after total knee replacement and arthroplasty – a low dose midazolam recovered mental status: case report

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ABSTRACT

Postoperative cognitive dysfunction is common complication of elderly patient. However, postoperative sleep disorder is a very rare complication. Sleep paralysis is a frightening form of paralysis that occurs when a person is suddenly unable to move for a few minutes. A 76-year-old female was scheduled for total knee replacement and arthroplasty. After the operation under general anesthesia, she transferred to postanesthetic care unit (PACU). 10 minutes later, she was stuporous mental status and had irregular breathing pattern. However, patient's SpO₂ and the result of arterial blood gas analysis were within the normal ranges. Although we administered sugamadex and naloxone in turn, the patient's status did not improve. After administration of 1mg of midazolam, she recovered her mental status and breathing pattern. She was aware of the event. She felt no discomfort about breathing in PACU. We thought this case was more suitable for sleep paralysis than other psychologic problems.

Keywords: Sleep paralysis, Geriatric anesthesia, Postoperative cognitive dysfunction, Sleep disorder

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INTRODUCTION

The elderly population is growing rapidly, so there are more opportunities to meet older patient in operating room. Aging is progressive physiologic process characterized by decreased cardiac output, decreased the functional capacity of the respiratory system, declining renal function and increasing imbalance of electrolytes.^[1,2] In these reasons, older patient would have more complications after surgery. Recently, the anesthesiologists have been interested in postoperative cognitive functions. Approximately 12 percent of older patients have a cognitive disorder after noncardiac surgery.^[3] The most common types of deterioration in cognitive function are postoperative delirium(POD) and postoperative cognitive dysfunction(PCOD).

However, we experienced an older patient with postoperative cognitive disorder, which is not suitable for POD and PCOD. We guessed the patient's symptoms were suitable for a sleep paralysis, a type of sleep disorder. Sleep paralysis is completely perceived surroundings but cannot move or talk temporarily. Now, we present a case of sleep paralysis after total knee replacement and arthroplasty.

CASE REPORT

A 76-year-old female was scheduled for total knee replacement and arthroplasty under general anesthesia. Her height was 145.6 cm and weight was 56.7 kg. She was taking regular medication for hypertension and major mood depression. There were no abnormal findings in preoperative laboratory tests, chest X-ray, pulmonary function test, electrocardiogram and transthoracic echocardiography. She had no premedication because she had no definite physical and psychological problems such as fear and anxiety about surgery and anxiety. When the patient entered the operating room, ECG, oxygen saturation(SpO₂), non-invasive blood pressure(NIBP) and BIS were monitored. Initial vital sign of the patient was NIBP

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150/80 mmHg, SpO₂ 100% and HR 98 beats/min. Preoxygenation with 100% oxygen was applied for 2 minutes. 250 mg of pentotal sodium, 80 mg of lidocaine and 50 mg of rocuronium were injected for general anesthesia. Mask ventilation was applied with N₂O/O₂ 6L/min (FiO₂: 0.5) and sevoflurane 4.0 volume%.

5 minutes later, oro-tracheal intubation was done. The anesthesia was maintained with N₂O/O₂ 2.5 L/min (FiO₂: 0.5) and sevoflurane 2 volume%. Arterial catheter was inserted for monitoring about invasive arterial blood pressure at Rt. radial artery. A peripheral catheter was inserted with 18G catheter at Rt. arm for fluid replacement. Epidural catheter was inserted at L3-4 for pain control. The operation was done in supine position. During operation, vital sign was maintained with ABP of 100-115/50-60 mmHg, heart rate of 60-80 frequencies/min and body temperature of 35.5-36.1°C. Total administered rocuronium was 70 mg. Total fluid input was 2,950 ml (Plasma solution A, CJ in KOREA) and the estimated blood loss was 1000ml. To reduce patient's pain for incision, 1% lidocaine 10 ml was administered at epidural catheter. For postoperative pain control, ropivacaine 150 mg, morphine 2.5mg, epinephrine 0.3 mg and ketorolac 30mg was injected through intra-articular 2 times before closure the incision at each knee. The operation was completed. Administration of anesthetic drugs were stopped and pyridostigmine 15mg and glycopyrrolate 0.4 mg were injected through peripheral line. The patient had spontaneous ventilation and tidal volume were over 6ml/kg. So endotracheal tube removed and the patient transferred to post-anesthetic care unit (PACU). When she arrived at PACU, initial vital signs were ABP of 98/42 mmHg, Heart rate of 100 beats/min, respiratory rate of 30 frequencies/min and SpO₂ of 100%. After 10 minutes later, an anesthesiologist in PACU saw the patient's mental status was stupor and she didn't obey command. The patient had irregular breathing pattern that was repeat of apnea and tachypnea like Biot's or Chayne-strokes pattern. We applied O₂ via mask ventilation with ambu-bag immediately. At that time, vital signs were ABP of 151/96 mmHg, SpO₂ of 100%, HR of 100 beats/min and RR of 30 frequencies/min. Arterial blood gas analysis was pH, 7.39; pCO₂, 36mmHg; pO₂, 149mmHg and O₂ saturation, 99%. We guessed that it was caused by overdosed injected morphine through intra-articular injection induced respiratory depression. For this reason, we gave her naloxone 2mg, but her status was not changed. We changed mask ventilation with ambu-bag to face mask with O₂ reservoir. We thought this was due to recurarization, so we gave her sugamadex 200mg. However, her mental status was still stupor and she had no response at verbal order and little response at pain.

After 10 minutes later, we thought it was probably caused by psychiatric problem because she had a history of major mood disorder. The patient was given midazolam 1mg intravenous injection. As a result, she dramatically recovered mental status and breathing pattern. She could obey at verbal order and had pain responses. At that time, vital sign was ABP, 155/80 mmHg; HR 85, beats/min and RR, 15-20 frequencies/min. We made a decision to discharge the patient from PACU and the patient was transferred to intensive care unit to monitor whether the patient's status would get worse. At POD 1, she had no significant event and was transferred to general ward. On postoperative day 4, we asked the patient about the event in post anesthetic care unit. She was aware of the event. She felt no discomfort about breathing and heard that anesthesiologists talked about the state of the patient, but she could not move her body. The patient guessed that she had electrical shock but she didn't have it. That was the stimulation that anesthesiologists twitch her skin for response. The patient knew that she administered to intensive care unit and transferred to general ward. She didn't have as much severe pain after operation as other patients who had total knee arthroplasty and replacement. However, the patient said she experienced the event of armed communist guerrilla. Sometimes, she had irregular breathing pattern when she had anxiety such like PTSD.

DISCUSSION

In this case, the patient had no abnormal findings except abnormal breathing pattern and confused mental status. After administered midazolam 1 mg through intravenous, she dramatically recovered mental status and breathing pattern. First, this case was the first to be suspected of being caused by recurarization. At PACU, recurarization happens sometimes due to inadequate duration of reversal agents against neuromuscular blocking agents. When recurarization occurred, the patient was hypoxic state. However, in this case, SpO₂ of the patient was 100% and PaO₂ was 149mmHg. The patient's symptom was not change after administration of sugamadex, but, SpO₂ of the patient and ABGA result implicated this case is not suitable for recurarization. Second, this case was able to be thought about hyperventilation syndrome. Hyperventilation syndrome is a disorder with no widely accepted diagnostic criteria, but is usually defined as symptoms which are hyperventilation, hyperpnea, tachypnea and a feeling of anxiety.^[4] Almost the ABGA result of hyperventilation syndrome patient is low PaCO₂ around 29 mmHg.^[5] However, in this case, the results of ABGA are not appropriate at hyperventilation that is

present when PaCO₂ decreases below the 36 mmHg. In addition, almost hyperventilation patients had chest discomfort and dyspnea, but this patient had no chest discomfort and dyspnea. In these reasons, we thought that this patient was less likely to have hyperventilation syndrome. Third, we presumed postoperative delirium. Its prevalence has been estimated to be 10%.^[6] However, this case was not appropriated at diagnostic criteria on DSM-V[Table 1]^[7] Also, administration of midazolam resolved the patient's symptom and recovered mental status of patient, not aggravating delirium as we know[8]. Furthermore, Symptoms of delirium also last for a day or longer with repeated relief and deterioration. In these reasons, we ruled out postoperative delirium. Fourth, we guessed panic attack due to anxiety. She had anxiety sometimes after the event of armed communist guerrilla. If the patient was scheduled to undergo surgery, she might have been under more stress and anxiety. Postoperative pain, unfamiliar environment in the PACU, and stress would cause panic attack. After administration of midazolam 1mg, she recovered from her symptom. It was panic attack that supports these symptoms. However, according to DSM-V, four or more of the 13 symptoms exist to diagnose panic attack. The patient didn't have less than 4 of the 13 symptoms of panic attack[Table 2]^[7] The patient had no discomfort with breathing, no fear about death and no anxiety and was fully aware of the situation in PACU. In conclusion, panic attack is not suitable to explain this symptom. Finally, we guessed this symptom assembles sleep paralysis which is partial or total paralysis combined with awareness. It is caused by psychologic factors that are PTSD, panic disorder, anxiety disorder, etc. It is related to REM sleep.^[9] In this case, the patient heard conversation among anesthesiologists and was aware of the situation, but she could not move. There are no diagnostic criteria, but exclusive diagnosis. This case is

not suitable for panic attack, postoperative delirium and postoperative cognitive dysfunction. After administration of midazolam 1 mg, she had awareness. Generally, administration of midazolam induces sedative effect. In this case, however, she had awareness after administration of midazolam unusually. Benzodiazepines decrease the latency to sleep onset and REM sleep.^[10,11] We guessed low dose midazolam reduced anxiety and REM sleep mediated GABA_A receptors but was not enough to make the patient sleep. Administration of midazolam resolve her anxiety and she recovered. As a result, we guessed this case is suitable for sleep paralysis. Anesthesiologist used to neglect the patient's psychological problems. In this case, symptoms of patient were unusual and it is very unusual for the administration of midazolam to awaken the patient's consciousness. Although in this special case, if we were interested in psychiatric problems, she had more comfortable in PACU earlier. Preoperative medication such like midazolam would be helpful to resolve anxious in this patient, but administration of benzodiazepine might induce postoperative delirium. We would have liked to engage her with more conversation, music therapy and humor to reduce her anxiety.^[9] What consider for this case is sleep paralysis after the operation. It's known to use TCAs and SSRIs for treat sleep paralysis.^[12] Like this case, we would consider low dose midazolam for treat sleep paralysis that may reduce patient's anxiety which is the cause of sleep paralysis. In conclusion, psychological symptoms, especially in elderly, would happen in PACU during postoperative period. The lessons in the present case, anesthesiologist must be concerned about psychological problems. Therefore, when vital signs and other laboratory test of patient are non-specific findings, we should concern about psychologic problems.

Table 1: Diagnostic criteria of delirium in DSM-V

Delirium

Diagnostic Criteria

- A. A disturbance in attention (i.e., reduced ability to direct, focus, sustain, and shift attention) and awareness (reduced orientation to the environment).
- B. The disturbance develops over a short period of time (usually hours to a few days), represents a change from baseline attention and awareness, and tends to fluctuate in severity during the course of a day.
- C. An additional disturbance in cognition (e.g., memory deficit, disorientation, language, visuospatial ability, or perception).
- D. The disturbances in Criteria A and C are not better explained by another preexisting, established, or evolving neurocognitive disorder and do not occur in the context of a severely reduced level of arousal, such as coma.
- E. There is evidence from the history, physical examination, or laboratory findings that the disturbance is a direct physiological consequence of another medical condition, substance intoxication or withdrawal (i.e., due to a drug of abuse or to a medication), or exposure to a toxin, or is due to multiple etiologies.

Table 2: Diagnostic criteria of panic attack in DSM-V

Panic attack specifier

Note: Symptoms are presented for the purpose of identifying a panic attack; however, panic attack is not a mental disorder and cannot be coded. Panic attacks can occur in the context of any anxiety disorder as well as other mental disorders (e.g., depressive disorders, posttraumatic stress disorder, substance use disorders) and some medical conditions (e.g., cardiac, respiratory, vestibular, gastrointestinal). When the presence of a panic Attack is identified; it should be noted as a specifier (e.g., “posttraumatic stress disorder with panic attacks”). For panic disorder, the presence of panic attack is contained within the criteria for the disorder and panic attack is not used as a specifier. An abrupt surge of intense fear or intense discomfort that reaches a peak within minutes, and during which time four (or more) of the following symptoms occur:

Note: The abrupt surge can occur from a calm state or an anxious state.

1. Palpitations, pounding heart, or accelerated heart rate.
2. Sweating.
3. Trembling or shaking.
4. Sensations of shortness of breath or smothering.
5. Feelings of choking.
6. Chest pain or discomfort.
7. Nausea or abdominal distress.
8. Feeling dizzy, unsteady, light-headed, or faint.
9. Chills or heat sensations.
10. Paresthesias (numbness or tingling sensations).
11. Derealization (feelings of unreality) or depersonalization (being detached from oneself).
12. Fear of losing control or “going crazy.”
13. Fear of dying.

Note: Culture-specific symptoms (e.g., tinnitus, neck soreness, headache, uncontrollable screaming or crying) may be seen. Such symptoms should not count as one of the four required symptoms.

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