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# Accidental Trismus Leading to Failed Endotracheal Intubation and Abandoned Surgery Following Rapid Sequential Induction of General Anesthesia: A Case Report

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**ABSTRACT**

A 64-year-old female patient was scheduled to have the left tibial intramedullary needle removed under general anesthesia. General anesthesia induction was performed using intravenous sufentanyl, propofol and cis-atracurium after mask administration of oxygen by artificial ventilation. The anesthesiologist planned to intubate the trachea and found that her mandible and jaw joint were fixed. Her masseter muscle was stiff, and her mouth could not open even after deep anesthesia with propofol. The surgical procedure was then cancelled. After waking up from anesthesia, the patient recovered with spontaneous mouth opening. During this period, the patient's nasopharyngeal body temperature was unchanged. In recent years, there have been sporadic cases of pure masseter muscle spasm (MMS) induced by general anesthesia, and the mechanism is still unclear. This sudden MMS due to general anesthesia induction led to mental tension among the anesthesiologists and failure of endotracheal intubation. In such an emergency, if the anesthesiologist's skills and equipment to solve difficult airways are inadequate, the patient should be decisively awakened from anesthesia, and the operation should be abandoned.

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## Case History

The patient was a 64-year-old female, weighing 46 kg, 156 cm tall, with a body mass index (BMI) of 18.9 kg/m². She was admitted to the hospital on August 2, 2024. The patient had a history of low back pain and planned to undergo a lumbar magnetic resonance imaging (MRI). Since the patient had undergone intramedullary needle fixation surgery for a left tibial fracture 37 years ago, the surgeon recommended removing the tibial intramedullary needle first.

During the preoperative evaluation, the anesthesiologist found that the patient was in a good mental state, had barrier-free language communication. Her cardiopulmonary function was normal, and neck movement and body condition were good. Laboratory results showed that hemoglobin (Hb) was 102 g/L, blood glucose (GLU) was 8.77 mmol/L, glycated hemoglobin was 7.1%, alkaline phosphatase was 44.9 U/L, erythrocyte sedimentation rate (ESR) was 52 mm/h, and D-dimer was 0.86 mg/L. Other laboratory test results were within the normal range. Chest X-rays, cardiac ultrasound, and lower extremity venous ultrasound had no abnormalities. The patient had a long history of low back pain, which had worsened in the last month, along with numbness in both lower extremities. The evaluation recommended avoiding new damage from intraspinal puncture; therefore, a general anesthesia with endotracheal intubation or laryngeal mask placement was planned.

At 10:35 on August 05, 2024, the patient entered the operating room and routinely monitored cuff blood pressure (BP), electrocardiogram (EKG), and pulse oxygen saturation ($SpO_2$). A mixture dose of sufentanil (15 μg), propofol (120 mg), and cis-atracurium (10 mg) was administered intravenously for general anesthesia induction. Artificial mask oxygen was used to control ventilation smoothly and to ensure good chest compliance. After 2.5 min, the mask was removed in order to move her mandible and to open her mouth. However, she was found to have mandible fixation; her jaw joint was completely immobile, and her masseter muscle was stiff (Figures 1-2). An additional dose of propofol (50 mg) was used to deepen the anesthesia, but the

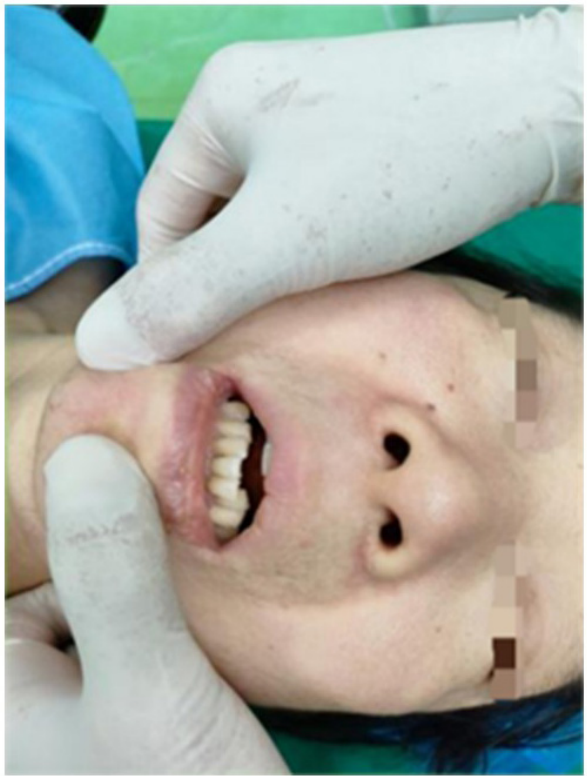

**Figure 1:** The patient's head is tilted back, her jaw was held with both hands, and the mandible was down to open the mouth. The mandible joint was fixed; the mandible could not be moved to open the mouth.

**Figure 2:** The anesthesiologist used the left-hand finger to push the mandibular horn up to move the mandibular joint and pulled the chin down with the right hand to try to open the patient's mouth without success.

masseter muscle was not relaxed, and her mandible was not mobile. Another anesthesiologist also failed to solve the problem. Manual ventilation was continued with a face mask. Although nasal fiberoptic bronchoscopy-guided tracheal intubation was attempted, but abandoned due to a lack of video accessories. After consulting with the orthopedic surgeon and informing the patient's family about the emerging situation and potential MMS risks (including malignant hyperthermia), it was decided to cancel the operation. Approximately 30 minutes later, the patient recovered with spontaneous breathing. Intravenous administration of neostigmine (1.0 mg) and atropine (0.5 mg) was utilized to antagonize the residual muscle relaxant effect. Subsequently, she regained conscious with the ability to open her mouth and reached a maximum opening of 3.3 cm (Figure 3). There was no change in the nasopharyngeal temperature monitoring during the period. The patient and her family did not have any similar situation in their medical history.

**Figure 3:** After the patient was awake and before leaving the operating room, the patient spontaneously opened her mouth to 3.3 cm wide.

After 3 days, the surgery to remove the intramedullary needle was completed under spinal anesthesia at the patient's request.

## Discussion

During the preoperative visit, the patient showed normal communication without difficulty in mouth opening and mandibular joint pain, indicating that the endotracheal intubation process is accessible. However, after routine general anesthesia induction, there was an accidental trismus and difficulty in mouth opening, which is a typical unpredictable intubation difficulty [1]. Of the 3391 cases of difficult endotracheal intubation, 3154 cases (93%) were non-predictive difficulties [1]. This unexpected difficulty in mouth opening, which occurs after induction of general anesthesia, is usually attributed to masseter spasm [2,3]. A previous report showed a case (33 years old, 165 cm tall, weight 49 kg) with lower limb osteomyelitis debridement surgery [2]. The patient had her first operation with sufentanil, midazolam, etomidate, and cis-atracuronium for general anesthesia induction, followed by a second operation with propofol and sufentanil for induction anesthesia without a muscle relaxant six days later. The patient showed trismus and a diffiuculty in moving the jaw during these two general anesthesia procedures. In the same report, there was another case of a smaller primipara (24 years old, 139 cm tall, weight 55 kg), who also exhibited masseter muscle spasm (MMS) and limited mouth opening after general anesthesia induction. This patients was diagnosed with Becker congenital myotonia [2]. In addition, there were three cases were reported with unpredicted difficult intubation after general anesthesia induction after routine induction of general anesthesia using sufentanyl, propofol, and cis-atracurium [3]. These patients also presented difficulty in mandibular mouth opening. However, endotracheal intubation was successfully performed with the transnasal fiber bronchoscopy. In these 3 cases, remifentanil, propofol, and cis-atracurium were used for maintaining intraoperative anesthesia. The muscle relaxation monitoring showed a train-of-four (TOF) ratio of 0, indicating a good relaxation of other skeletal muscles. These three patients had a continuous trismus until their mouth opening activity recovered only after awaking from anesthesia.

In this report, our case's situation was similar to the previous cases [2-3]. The factors were excluded, such as over shallow anesthesia, succinylcholine, and inhalant anesthetics [4]. Other factors were not presented, including local anatomic abnormalities, temporomandibular joint disorders, masseter muscle dysfunction, and oral psychotropic drugs. These MMS cases after induction of anesthesia were most likely caused by the anesthesia drugs; however, it is unclear which one caused the MMS responses. Depolarizing muscle relaxant succinylcholine and inhaled anesthetics may trigger the uncontrolled release of calcium ions in the sarcoplasmic reticulum in patients with Ryanodine receptor or CACNA1S (calcium voltage-gated channel subunit alpha 1S) gene mutations, leading to tonic contraction of skeletal muscle (including masseter muscle), increased oxygen consumption, carbon dioxide production, increased body temperature, resulting in malignant hyperthermia (MH). Other stimuli and some local anesthetics can also induce MH in a similar manner to succinylcholine and inhaled anesthetics [5]. MMS always precedes the subsequent potential occurrence of MH, so MMS is clinically regarded as a precursor to MH, which makes the anesthesiologist highly alert. Thus, succinylcholine and halothane inhalation anesthetics were rarely used in recent years. The incidence of MMS in the induction of general anesthesia is very low, and there is a paucity in the literature about the mechanism of MMS response. Our case was unrelated to succinylcholine and inhaled anesthetics, and the body temperature was not elevated, suggesting that the MMS response was not due to mutations in the Ryanodine receptor or CACNA1S genes.

Non-depolarized muscle relaxants pancuronium, atracuronium, vecuronium, and rocuronium were reported in MMS cases during the induction and intubation of general anesthesia [6-8]. We used cis-atracurium in the rapid induction of general anesthesia, as reported by [2-3]; therefore, the MMS response in our case is likely associated with cis-atracurium. In addition, MMS condition was reported during general anesthesia with remifentanil or fentanyl compound propofol, while the fentanyl series usually causes chest wall muscle stiffness [9-10]. Sedatives usually relieve the somatic tension and induce the masseter muscle relaxation through the central action to contribute to the endotracheal intubation [11]. Propofol is a major candidate for masseter spasm response, as a previous report showed that the MMS occurred and the masseter muscle did not relax after intravenous injection of midazolam (2 mg), fentanyl (0.1 mg), and propofol (130 mg), followed by additional propofol (70 mg) to deepen anesthesia in a patient with a ma-

jor depression patient who was taking Sertraline (200 mg/d) for half a year during a colonoscopy for chronic colitis [12]. It was stated in the report that muscle stiffness may be associated with high preoperative anxiety [12]. The masseter muscle belongs to skeletal muscle; theoretically, whether analgesic or sedative anesthetic, skeletal muscle spasm will relax under the action of a muscle relaxant. The exact factor or medicine that causes the MMS and its mechanism remain to be studied.

This was the only case of masseter spasm induced by general anesthesia during our 40 years of anesthesia practice. This sudden MMS after general anesthesia induction causes a difficult airway management dilemma and mental tension, resulting in tracheal intubation failure. However, endotracheal intubation can be performed by nasal guidance or through nasal blind exploration under topical anesthesia of the airway after the patient is awake. If the equipment is not available or if multiple attempts at intubation are unsuccessful, the patient should be recovered from the anesthesia, and the operation should be terminated for patient safety.

**The authors declare:** The patient has verbally agreed to use her portrait rights for publication. There are no conflicts of interest in this article.

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