Anesthetic-Induced Intraoperative Dream Associated With Remission of a Psychiatric Disorder: A Case Report

Harrison S. Chow, MD, MS,* Laura M. Hack, MD, PhD,†‡ Makoto Kawai, MD,†‡ and Boris D. Heifets, MD, PhD*†

Trauma is associated with debilitating acute and posttraumatic stress disorders, which have limited treatment options. We report on a patient undergoing surgical hand repair after a recent knife attack who experienced vivid dreaming and subsequent remission of acute stress disorder. After local anesthesia with propofol sedation she recalled a dream wherein she relived the attack, sought medical care, completed surgery, and returned home with a healed hand. While intraoperative dreaming is common, this case details potential associations between anesthetic state, dreaming, intraoperative electroencephalography, and remission of a psychiatric disorder. Our experience suggests a novel intervention for stress disorders. (A&A Practice. 2022;16:e01613.)

GLOSSARY

ASD = acute stress disorder; **ASDS** = acute stress disorder scale; **EEG** = electroencephalography; **HR**, heart rate; **MAP** = mean arterial blood pressure; **NIBP** = noninvasive blood pressure; **OR** = operating room; **PACU** = postanesthesia care unit; **POD** = postoperative day; **PSI** = patient state index; **PTSD** = posttraumatic stress disorder; **RR** = respiratory rate; **Spo_2** = peripheral oxygen saturation

Acute stress disorder (ASD) is a maladaptive reaction characterized by symptoms of reexperiencing a traumatic event, negative mood, dissociation, avoidance, and hyperarousal, and can lead to posttraumatic stress disorder (PTSD). First-line therapy for PTSD involves trauma-focused therapy, and serotonin selective reuptake inhibitors. Both modalities have similar, though low, efficacy for PTSD.[1,2] Some investigational therapeutic strategies are exploring the use of pharmacological adjuncts to assist psychotherapy[3,4]; however, it is unknown the extent to which pharmacologically assisted nonordinary states of consciousness may be associated with positive outcomes for stress disorders.

This report details a unique case where an anesthetic-induced dream state was associated with recovery from ASD. The patient's medical history, encephalographic (EEG) data, and notes on dream recall in the medical record were accessed as part of a retrospective chart review (Stanford IRB 61081). She gave consent for follow-up by phone to assess her postanesthesia recovery and agreed to our publication of her experience.

From the Departments of *Anesthesiology, Perioperative and Pain Medicine and †Psychiatry and Behavioral Sciences, Stanford University School of Medicine, Stanford, California; and ‡Sierra Pacific Mental Illness Research, Education, and Clinical Center (MIRECC), VA Palo Alto Health Care System, Palo Alto, California.

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Address correspondence to Boris D. Heifets, MD, PhD, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine, 300 Pasteur Dr, H3580 MC5640, Stanford, CA 94305. Address e-mail to bheifets@stanford.edu.

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CONSENT FOR PUBLICATION

The patient provided written Health Insurance Portability and Accountability Act Authorization.

CASE DESCRIPTION

A 26-year-old woman (1.57 m and 59 kg) presented to Stanford Outpatient Center (Redwood City, CA) for reconstructive surgical repair of her dominant right hand following a traumatic knife attack 12 days before. During the attack, she used her right hand to protect herself from the knife. In a local emergency room, she was diagnosed with multiple severed tendons and nerves on the third and fifth digits of her right hand. She was referred to Stanford Orthopedics for evaluation and subsequently scheduled for elective surgery.

Her medical history was significant for mild asthma and gastritis (American Society of Anesthesiologists Physical Status class II). She was not taking any regular medications. During the preoperative interview, the patient, initially calm, became agitated with inconsolable sobbing when discussing her attack. Her anesthetic was planned as Monitored Anesthesia Care, digital local anesthetic blocks by the surgeon, and an intraoperative "wake-up test" to assess tendon repair before surgical closure. The anesthesiologist (H.S.C.) discussed the possibility of intraoperative dreaming, EEG monitoring, and ascertaining dream recall after surgery, consistent with the standard of care at our facility. No prompts regarding the quality or content of dreams were given.

In the operating room (OR), standard ASA monitors and Sedline EEG disposable leads were placed. After induction with intravenous fentanyl 100 mcg and propofol 60 mg, and transition to a propofol infusion (125 mcg/kg/min; Figure 1A), she maintained unobstructed spontaneous breathing with minimal response to digital blocks with lidocaine, tourniquet inflation, or incision. The Patient State

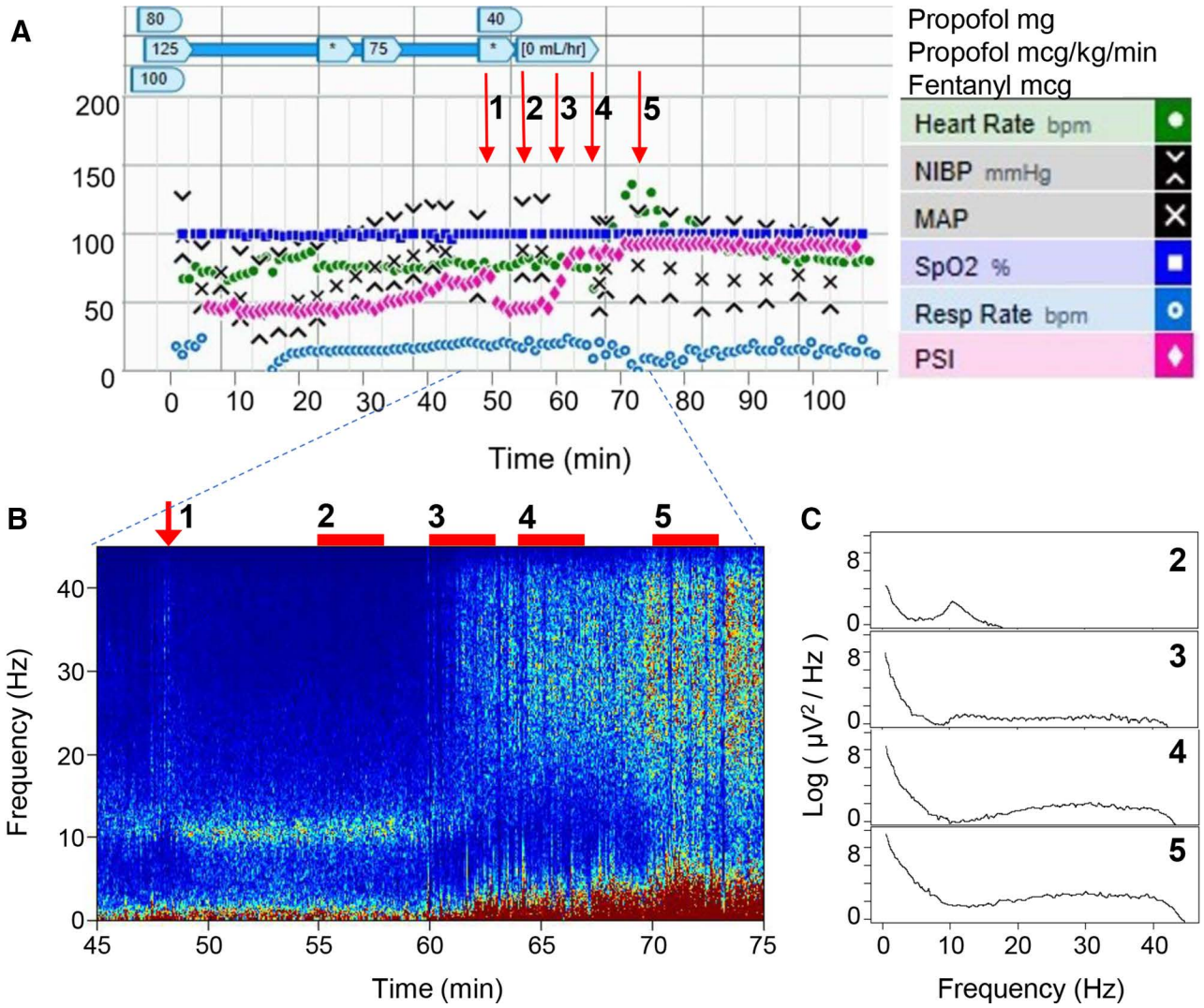

Figure 1. Synopsis of intraoperative events. A, Screen capture of drug administration record (top) and vital sign record (bottom). Patient State Index from Sedline in purple. Key events marked by arrows: 1: (0:48) spontaneous emergence and reinduction; 2: (0:55) patient sedated; 3: (1:00) EEG transition; 4: (1:04) potential dreaming epoch; and 5: (1:10) wake-up test, patient responsive. B and C, EEG was sampled at 187 Hz, gain at 10 μV/mm, and sweep speed at 30 s/mm. Fp2 lead (referenced to Fz) contained the least clipping artifact and was used for spectral analysis. Vital signs, color density spectral array, and power spectral density plots for key events for the entire case are shown. B, Color spectral density array spanning preemergence dreaming and wake-up test, derived from Fp2 lead referenced to forehead (Fz) lead. Same events noted in A are marked at top edge. C, Log-scaled power spectral density for 3-min epochs indicated by red rectangles in B. Trace 4 represents the best estimate for the dream state, characterized by enhanced high beta-band activity with suppression of alpha-band frequencies. EEG indicates electroencephalography; MAP, mean arterial pressure; NIBP, noninvasive blood pressure; PSI, patient state index; Spo_2, peripheral oxygen saturation.

Index (Sedline) was maintained at levels consistent with deep sedation (Figure 1A). Intravenous prophylactic antiemetics were given (ondansetron 8 mg and dexamethasone 8 mg), and propofol infusion was reduced in preparation for a wake-up test. Due to early emergence, she was reinduced with propofol 50 mg and an increased propofol infusion rate. The surgery continued without incident until infusion was stopped (minute 57; Figures 1A and 2A) for the wake-up test.

Patient was responsive to her name 11 minutes after stopping propofol sedation and reported "waking up in a dream." She followed commands and could move her fingers. She described her dream first as reliving the attack and reported the following dream events to anesthesia, nursing, and surgical teams: being attacked by a knife in her apartment; presenting to the emergency room; proceeding to the OR for surgical repair; looking at her repaired hand; returning home and then completing errands with her repaired and now healed hand. During detailed recall of her attack, the patient became tachycardic (Figure 1A, arrow 5), which resolved with verbal reassurance and reestablishing visual contact with her surgical team by lowering the surgical drapes. She remained awake for surgical closure and transport to the postanesthesia care unit (PACU). In the PACU, she stated that she felt "wonderful" and relaxed and had the sensation of sleeping (in the OR) for the first time since her attack. She was discharged home the same day.

On postoperative day 1 (POD 1), she reported normal sleep for the first time since the attack, with resolution

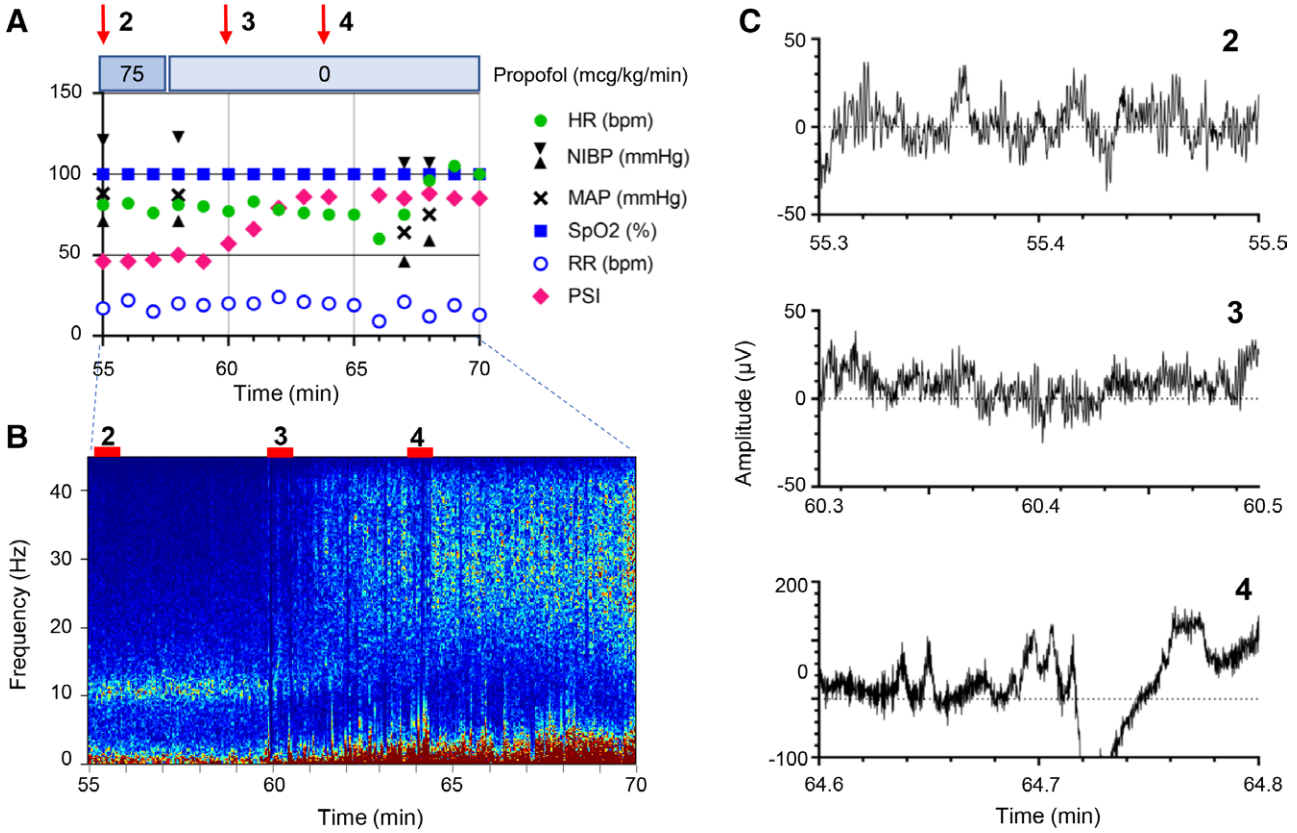

Figure 2. A detailed view of the patient's transition from sedation to waking, showing vital signs, propofol adjustments, color density spectral array, and representative raw EEG traces. A, Recreated record of drug administration record (top) and vital sign record (bottom). Patient State Index from Sedline in purple. Key events marked by arrows as in Figure 1. 2: (0:55) patient sedated; 3: (1:00) EEG transition; and 4: (1:04) potential dreaming epoch. B, Color spectral density array spanning same period depicted in A, derived from Fp2 lead referenced to forehead (Fz) lead. Same events noted in A are marked at top edge. C, Representative raw EEG traces, 20-s epochs, from times indicated by red rectangles in B. Artifact visible in Trace 4 most likely represents eye movement artifact. Note also, expanded y-axis scale for Trace 4. EEG indicates electroencephalography; HR, heart rate; MAP, mean arterial pressure; NIBP, noninvasive blood pressure; PSI, patient state index; RR, respiratory rate; Spo_2, peripheral oxygen saturation.

of attack-related nightmares. She related feeling relaxed enough to discuss the attack with her family members for the first time. At POD 7, she reported "normal" dreams at night, no attack-related nightmares, and no residual fear symptoms. At PODs 1 and 7, she maintained consistent recall of her intraoperative dream.

On POD 15, a psychiatrist (L.M.H.) assessed her using the Acute Stress Disorder Scale-5 (ASDS[5]), indicated for symptoms occurring between 3 days and 1 month after a trauma. ASDS scores increase with severity, ranging from 14 to 70. Based on her retrospective report of the period between the attack and surgery, the patient met criteria[6] for ASD with an ASDS = 55. At POD 15, she no longer met criteria for ASD, had an ASDS = 19, and no longer exhibited observable signs of distress when describing her attack. The patient's psychiatric history was notable for other lifetime traumatic events, including physical abuse and verbal death threats, but she did not meet lifetime PTSD criteria. On further evaluation, the patient met criteria for current adjustment disorder with depressed mood related to a situation with her father, panic attacks, and alcohol use disorder in full sustained remission. These diagnoses predated the knife attack. The patient reported abstinence from all substances during the time of the attack and thereafter.

Given the prognostic importance of nightmares in stress disorders, the patient was further assessed by a sleep specialist (M.K.). While she could not recall having had nightmares before the attack, she had multiple nightly nightmares after the attack, always starting with a replay of the perpetrator approaching her with a knife and ending with her hand stabbed. The nightmares substantially disrupted her sleep and her daytime function through POD 0. While the patient's description fulfilled the criteria of a primary nightmare disorder,[7] these symptoms are also an element of the ASD diagnostic criteria.[6] During surgery, the patient reexperienced the same nightmare with the new element of repetition. After surgery, she reported no further nightmares.

We assessed her intraoperative EEG (obtained from the Sedline monitor) for correlates of dreaming (Figures 1 and 2). Time points for key events are marked with the same numbers in Figures 1 and 2. We observed typical EEG characteristics of moderate sedation before her documented awakening events (time point 2), including peaks in the delta (1–4 Hz) and alpha (8–12 Hz) frequency bands. This alpha-delta dominant pattern transitioned to a pattern particularly enriched in beta band activity (13–35 Hz), consistent with arousal, at time points 3 and 4. She subsequently reported having dreamed.

DISCUSSION

We report a case of ASD remission after anesthetic-induced intraoperative dreaming. Dreaming during surgical anesthesia is a well-known but poorly understood phenomenon, and previous reports have detailed a wide range of dream content associated with anesthesia.[8] However, to our knowledge, this account is the first published description where an anesthesia-induced dream state is associated with a therapeutic effect for a psychiatric disorder.

Several potential mechanisms could explain the reduction in this patient's ASD symptoms after surgery. First, we cannot exclude the possibility of spontaneous remission as part of the natural course of disease. Second, she may have experienced a "placebo effect," though this explanation appears to be inadequate in this case. Placebo therapeutic effects are treatment-nonspecific improvements in symptoms attributable to patients' positive expectations regarding treatment.[9] In this case, no suggestions were made before anesthesia and surgery that treatment for her mood and anxiety symptoms would be offered; therefore, it seems unlikely that she formed any expectation about a therapeutic effect. A third possibility is that the anesthetic agents used (fentanyl, propofol, and inhaled oxygen), either alone or in combination, induced a long-lasting anxiolytic response. Like many anesthetic agents, those used in this case are frequently used to reduce acute procedural anxiety. However, despite their widespread use, we could not identify reports that these agents, alone or in combination, can produce long-term therapeutic effects in stress disorders. A related fourth possibility is that anesthetic drugs produced a physiological state that interrupted reconsolidation of the patient's traumatic memory, reactivated as a dream. The gold standard for psychotherapy in ASD and PTSD, based on the known pathophysiology of these disorders, involves a process of habituation and extinction of the emotional responses to fear memory known as prolonged exposure therapy.[1,10] This treatment involves 9 to 12 90-minute sessions where a trained therapist supervises imaginal exposure to the trauma.[11] Notably, it has been reported that propofol, at doses comparable to those used in this case, can selectively inhibit retrieval of emotional episodic memories after anesthesia,[12] though this process was not specifically associated with dreams, nor has it been investigated in patients with diagnosed stress disorders.

Dream experience is closely linked to memory consolidation and emotional regulation.[13] We speculate that, in this case, dreaming under anesthesia recreated and accelerated an exposure-like process that interrupted reconsolidation of fear memories. Deliberate induction of dreaming with anesthesia is a potentially novel therapeutic strategy for mental health disorders that could benefit both surgical and nonsurgical patients.

DISCLOSURES

Name: Harrison S. Chow, MD, MS.
Contribution: This author delivered intraoperative care, patient follow-up, and drafting of the case report.
Name: Laura M. Hack, MD, PhD.
Contribution: This author helped with patient follow-up and drafting of the case report.
Name: Makoto Kawai, MD.
Contributions: This author helped with patient follow-up and drafting of the case report.
Name: Boris D. Heifets, MD, PhD.
Contribution: This author helped with patient follow-up, electroencephalography analysis, and drafting of the case report.
This manuscript was handled by: Markus M. Luedi, MD, MBA.

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