A Case of Dreaming During Light Sedation
Improving Traumatic Memories

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Overview of Trauma-related Disorders

Symptoms: re-experiencing, hyperarousal, altered mood and cognition, and avoidance

Acute stress disorder (ASD) □ post-traumatic stress disorder (PTSD) as high as 83%

PTSD has a lifetime prevalence of 6-8%

$232.2 billion in US in healthcare costs, disability, and lost productivity
Treatments for PTSD are Inadequate

• Only two FDA approved medications
  • Remission rates are just 20%-30%\(^1\)

• Prolonged exposure therapy = gold standard psychotherapy for PTSD
  • Trained therapist supervises imaginal exposure
  • Highly effective\(^2\)
  • Time intensive -> 9-12 90-minute sessions
  • High dropout rate (22%)\(^3\)

\(^1\)Alexander et al., 2012, *Pharmacy & Therapeutics*; \(^2\)Powers et al., 2010, *Clin Psychol Rev*; \(^3\)Lewis et al., 2020, *Eur J Psychotraumatol*. 
“Beth” is 26-year-old woman with multiple prior traumas but no PTSD

November 2021: attacked by her sister-in-law with a knife
  • Severed tendons in right hand

Developed Acute Stress Disorder
  • Prominent symptoms of nightmares, poor sleep, avoidance of knives, easy startle
Beth's Surgery

• Tendon repair of right hand 12 days after attack

• Anesthesiologist Dr. Harrison Chow noted Beth to be calm at first, crying inconsolably when describing the attack

• Deep sedation with propofol and pain control with fentanyl during repair – “wake-up test” to assess tendon repair before surgical closure – closure while awake was completed without incident

• Upon emerging from anesthesia, Beth reported “waking up in a dream”
Beth’s Dream
Monitoring During Surgery

• EEG monitoring with frontal leads

• Peaks in the delta (1–4 Hz) and alpha (8–12 Hz) frequency bands marked by moderate sedation

• Propofol infusion stopped around 56 minutes; EEG transition to higher frequency (light sedation)

• Dreaming just prior to waking up marked by beta waves (13-35 Hz)
  • Seen in rapid eye movement (REM) sleep

• In the PACU, Beth reported having the sensation of sleeping (in the operating room) for the first time since her attack
Post-Operative Course

- Post-Operative Day 1
  - Normal sleep for first time since attack

- Post-Operative Day 7
  - No nightmares
  - Able to calmly describe attack to family

- Post-Operative Day 15
  - Did not meet criteria for ASD since attack, reduction in symptoms by 65%

- Denies return of symptoms 9 mos. later
Possible Mechanisms of Symptom Resolution

• Natural course of symptoms

• Placebo effect

• Prolonged anti-anxiety effects of propofol, fentanyl, and/or oxygen

• Specific effect of propofol-induced dreaming
  • Known to commonly induce recalled dreams\(^1\)
  • Dr. Chow has observed dreaming in 50% of propofol cases

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\(^1\)Leslie et al., 2009, Anesthesiology
Propofol-induced Dreaming

- **THREAD** = Therapeutic pRe-Emergence Anesthesia Dream

- Accelerated fear extinction process through dreaming?
  - Same process that occurs in prolonged exposure therapy

- Extinction memory is formed without negative emotional tone that competes with fear memory

- Evidence of fear extinction during dreaming in healthy subjects
Fear Extinction During Dreaming

- More fearful dreams lead to less emotional arousal and activation of fear-related regions (insula and amygdala) during waking with increased prefrontal cortex activity.

- Fear during dreaming is associated with increased insula activity during dream\(^1\).

- Individuals with PTSD may not have the same benefit due to insomnia.
  - Nightmares differ from bad dreams: often awaken during nightmares.

\(^1\)Strepenich et al., 2020, *Hum Brain Map*
Patients with PTSD

• “Jill”: middle-aged female with PTSD and depression, on disability
  • Multiple assaults
  • Prominent symptoms: insomnia, agoraphobia
  • Dreamt about being in open, green, and flowery garden
    • Normally would be very fearful of this experience due to agoraphobia
  • After surgery, she had normal sleep and was able to be in open areas without fear

• “Hannah”: female in 20’s with history of combat-related PTSD
  • Dreamt about running errands prior to Thanksgiving
  • Reduction in CAPS-5 scores

• Symptom resolution only lasted days to weeks in both cases

Chow, “Broken-Hearted You: Propofol Dreams of Love, Betrayal and Reconciliation in Silicon Valley”
Many Remaining Questions

• Is a lasting therapeutic effect dependent on how long symptoms have been present?

• What is the relationship between dream content, emotional valence, and therapeutic effect?

• Can an EEG signature of propofol dreams be identified and used to induce THREADs?
Current and Future Projects in Surgical Patients

- Assess psychiatric symptoms in hand surgery patients with acute trauma and anesthesia-induced intraoperative dreams
- Assess psychiatric symptoms in cancer patients with anesthesia-induced dreams during surgery
- Evaluate EEG signatures of anesthesia-induced intraoperative dreams
- Screen surgical patients for depression and refer for mental care health
Thank you!

The Dream Team

Patients

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