

Remifentanil enhances propofol hypnotic clinical and electroencephalographic effect in humans during loss of consciousness

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I.- Background:

General anesthesia is a reversible pharmacological state in which patients are unconscious making surgery possible. As part of balanced general anesthesia, it is common to use the synergy between the hypnotic (propofol) and the opioid (remifentanil) to achieve the desired clinical effect [2]. However, the electroencephalographic correlate of this synergy has not been fully studied. General anesthesia causes a slowdown in EEG activity with an increase in delta and alpha at the frontal level [3] as we can see in Figure 1.

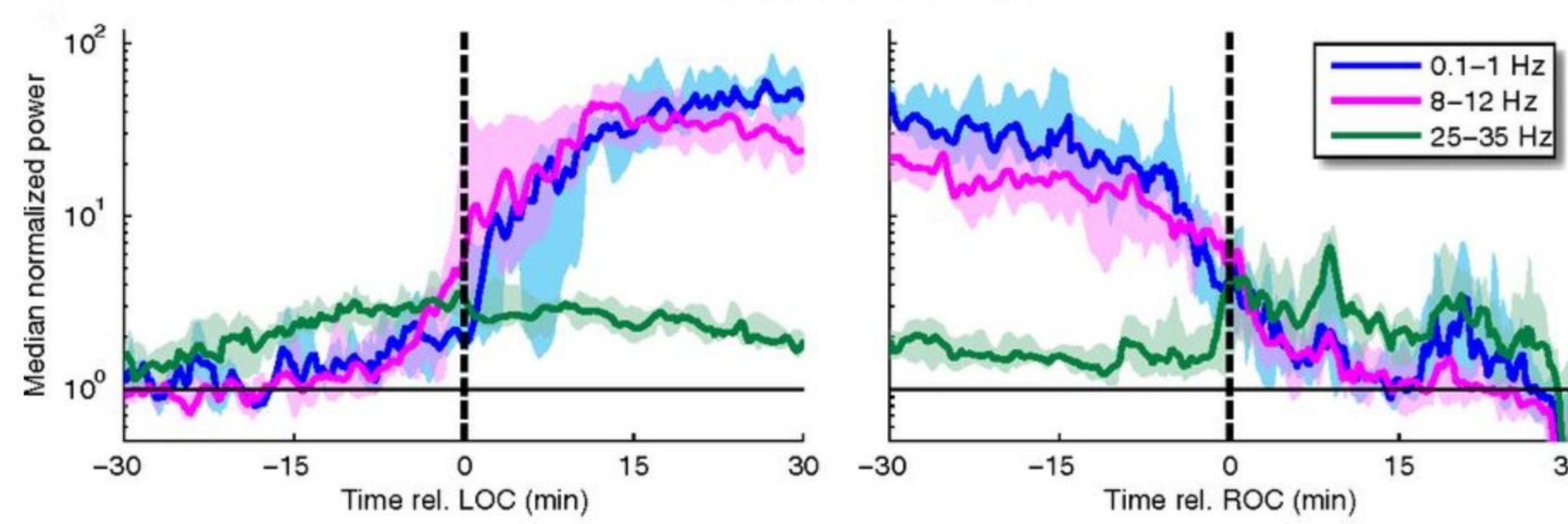


Fig.1: Expected changes when a person falls into LOC with general anesthesia. [3]

II.- Methods:

Twenty patients signed the informed consent and were registered during anesthesia induction with a 4-frontal electrodes EEG monitor (Sedline) using two protocols:

- 1) PROPO (n=10): propofol infusion (at 15 mg/kg/h) until Loss of Consciousness (LOC).
- 2) REMI-PROPO (n=10): remifentanil (7.5 ng/mL) and propofol (at 15 mg/kg/h) infusion until LOC.

Both protocols are shown in Figure 2. A patient who did not respond to verbal and tactile stimuli was considered to have reached LOC. The EEG spectrum of 10-seconds from a clean recording window was obtained for both protocols during all induction until after LOC. We compared the spectra from both groups using bootstrapping analysis.

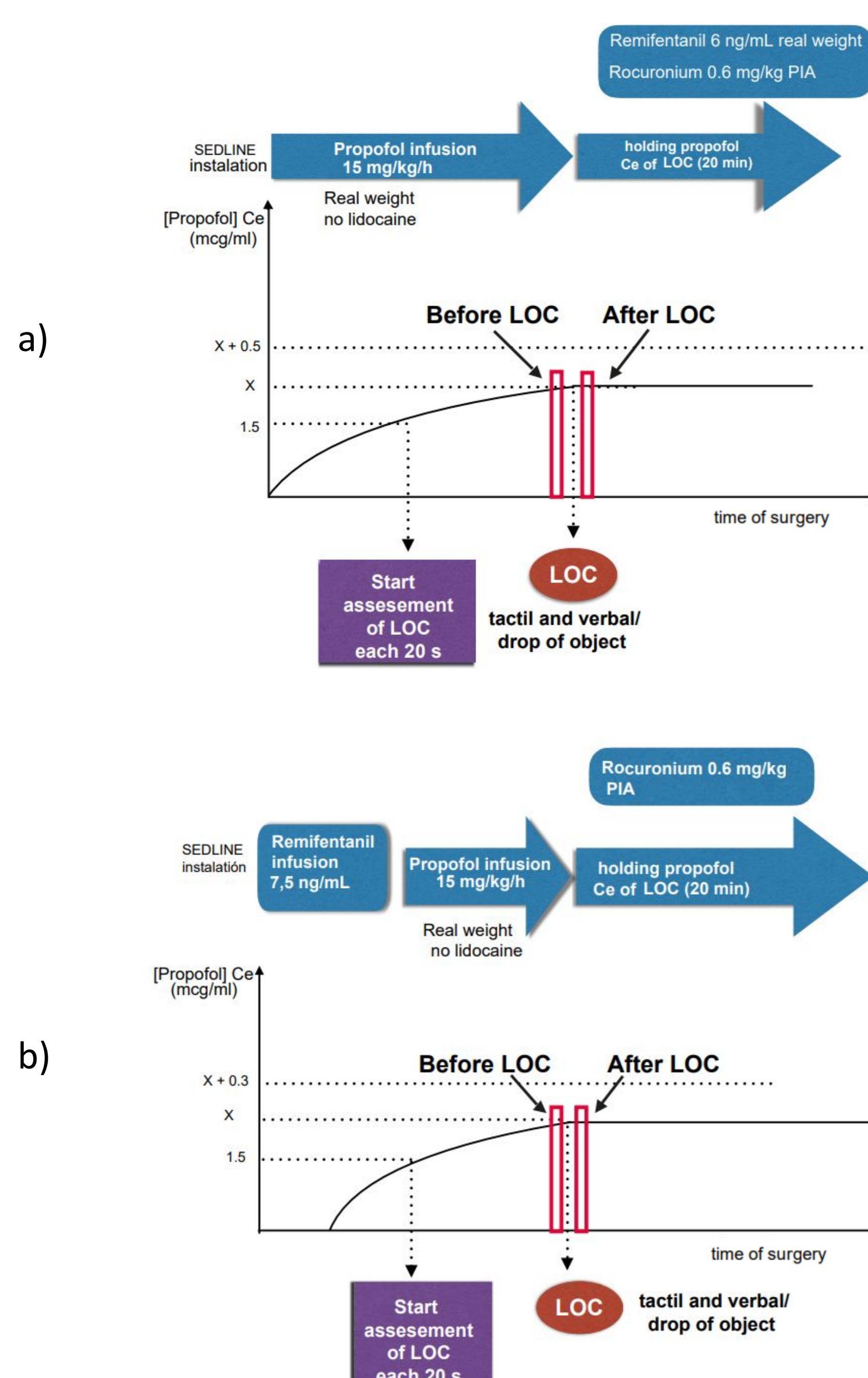


Fig.2: Anesthesia induction PROPO (a) and REMI-PROPO (b) protocols

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III.- Results

- 1) PROPO patients required higher propofol dose to achieve LOC compared to REMI-PROPO.

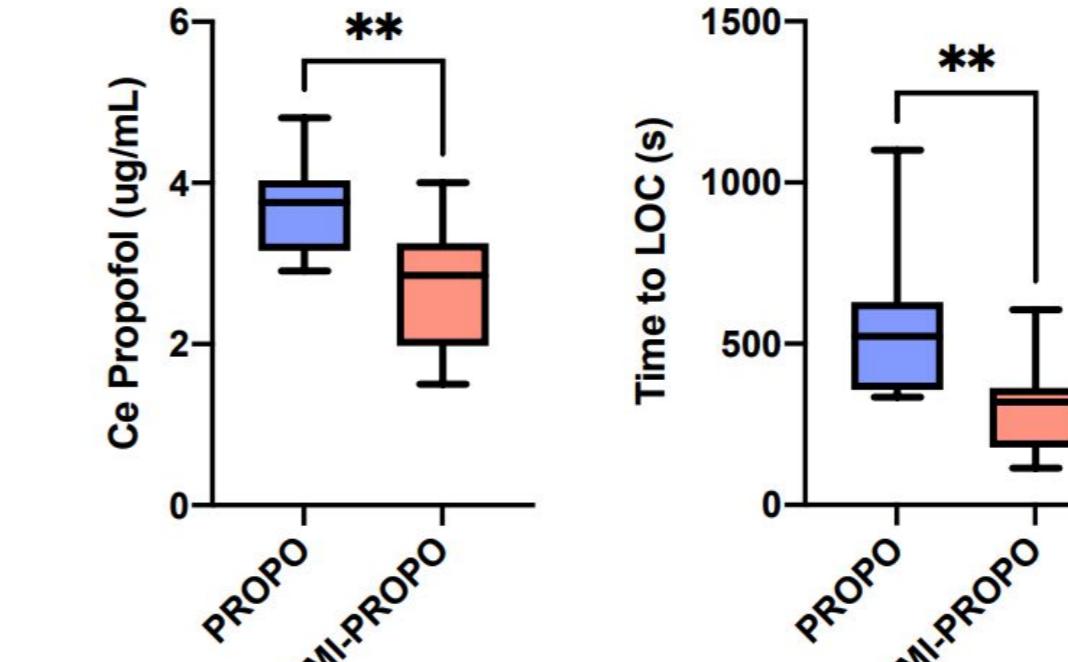


Fig.3: PROPO and REMI-PROPO Ce and Time to LOC.

- 2) REMI-PROPO patients have lower spectral alpha power before LOC, and higher delta power after LOC than patients in PROPO protocol.

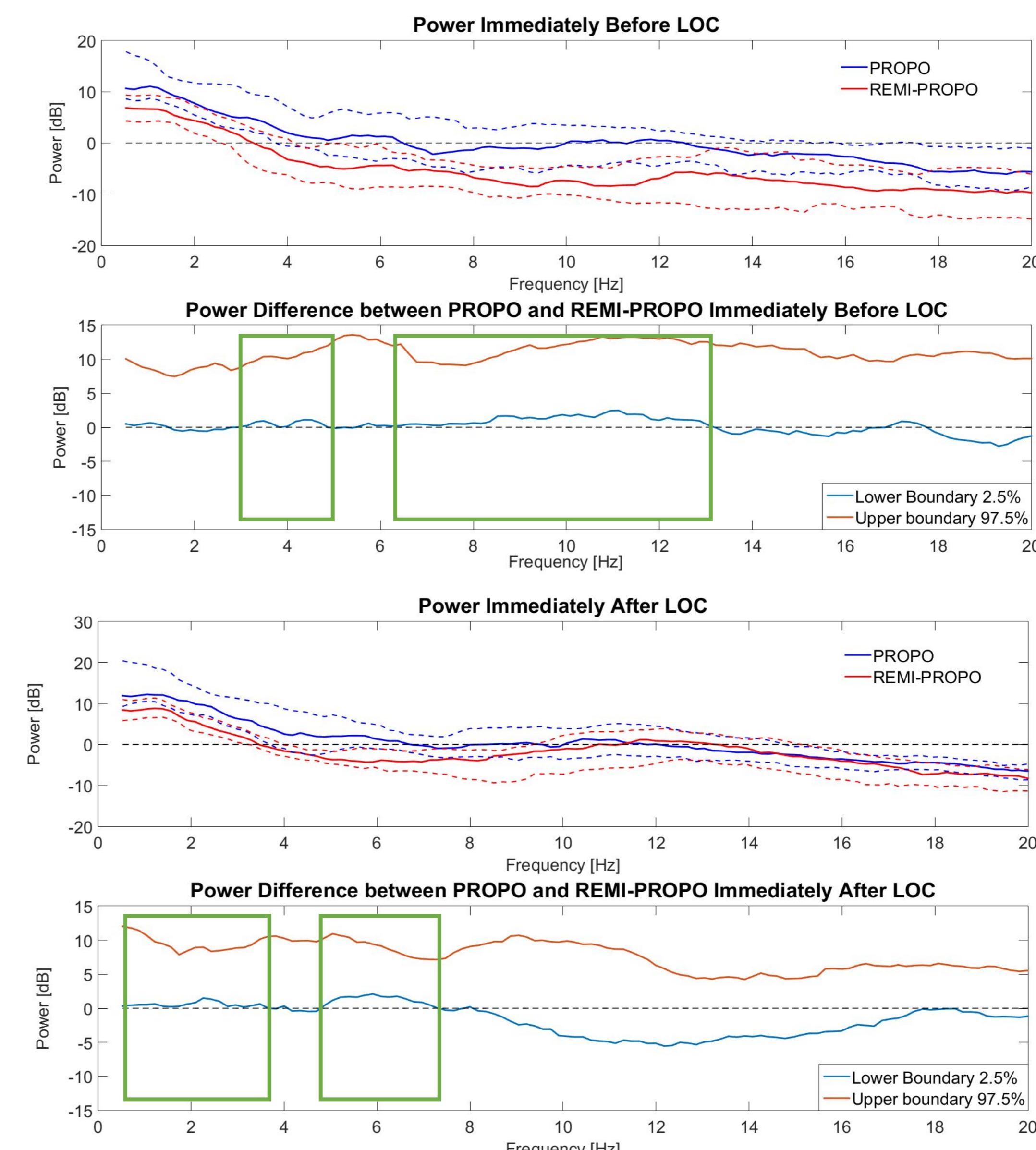


Fig.4: Power and Power Difference immediately before (a) and immediately after (b) LOC.

- 3) When PROPO had the same propofol concentration of REMI-PROPO after LOC onset, PROPO had lower alpha power compared to REMI-PROPO.

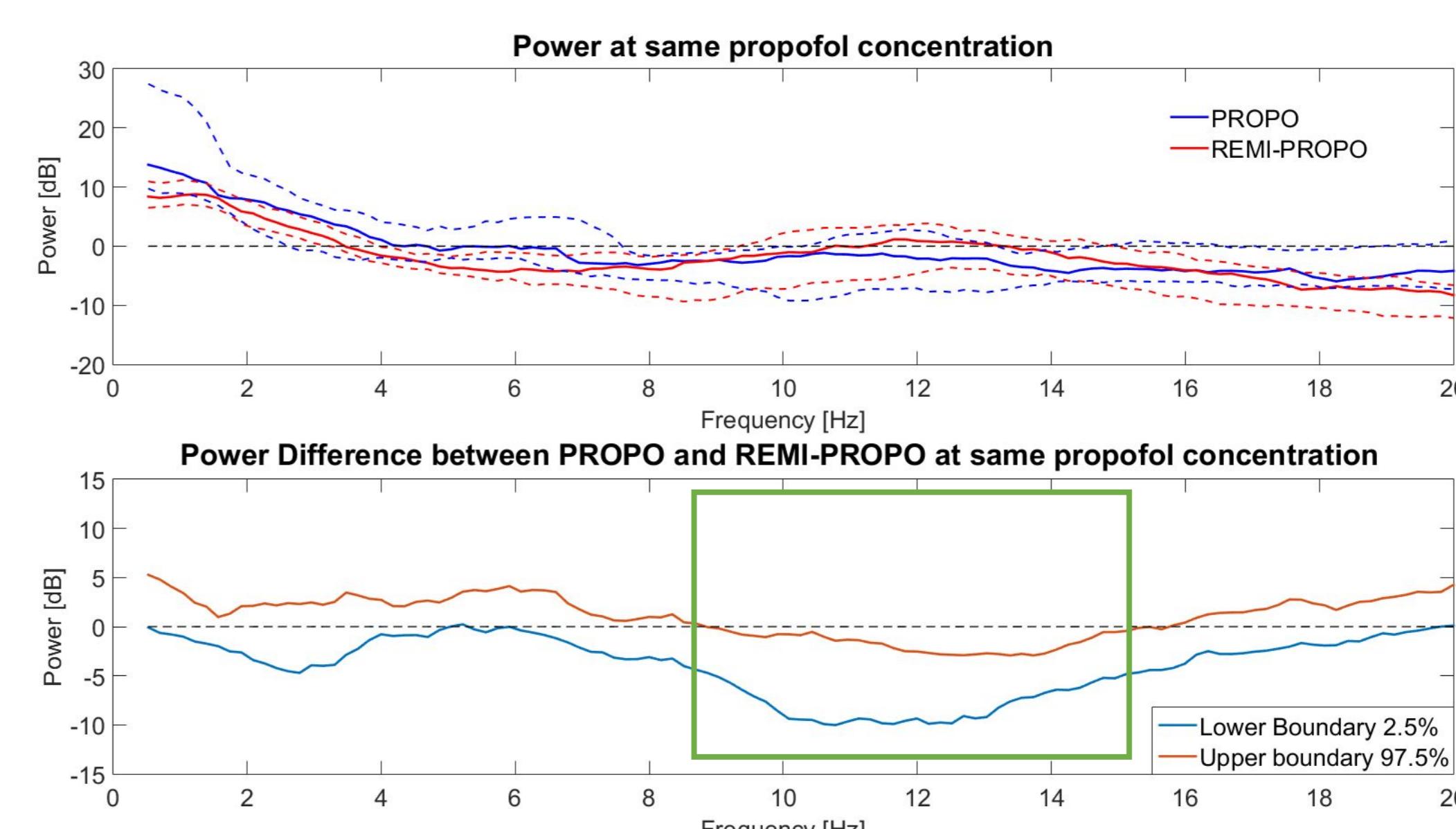


Fig.5: Power and Power Difference at same propofol concentration.

IV) Discussion and conclusions:

- 1) Remifentanil enhances propofol hypnotic clinical effect, which is correlated with electroencephalographic activity.
- 2) Electroencephalographic synergy persists once the LOC is reached, evidenced by a higher delta power in those patients who only reach LOC with propofol, which is consistent with the higher concentration of propofol required to reach LOC.
- 3) Lower alpha power in PROPO at the same dose of propofol in REMI-PROPO is consistent with the fact that PROPO patients have not reached the LOC at this dose.

References

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