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### A Novel Anesthesia Technique For Electroencephalographic Monitoring During Resection Of Epileptic Focus.

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## Introduction

During anesthetic management of epileptic focus resection administration of anesthetic should be tailored to preservation of delta waves, prevention of burst suppression so that dome and spike epileptic activity can be monitored.

## Case Description

A 56 year old male with medically uncontrolled epilepsy presented for stereotactic left temporal craniotomy and cortico-amygdalohippocampectomy. Anesthetic goal was to maintain predominantly delta EEG waves without burst suppression so that dome and spike epileptic EEG waves can be monitored during surgical resection of the epileptic focus. After dexmedetomidine bolus of 1mcg/kg, anesthesia was induced with propofol and the patient was intubated following laryngotracheal spray with 2% lidocaine and bolus of remifentanil. Anesthesia was maintained with infusion of low dose of remifentanil 0.02-0.03 mcg/kg/min, dexmedetomidine 0.3-0.5mcg/kg/hr and 0.5%-0.6% expired sevoflurane during resection period. Surgical procedure was performed under adequate EEG guidance.

## EEG waves

EEG	Condition
Beta wave	Awake
Alpha wave	Adult relaxed state
Theta wave	Sleep & anesthesia
Delta wave	Sleep & deep anesthesia
Burst suppression	Goal of barbiturate/propofol administration in traumatic brain injury (TBI) and clipping in intracranial aneurysm surgery
Electrical silence	Overdose of propofol/barbiturates in TBI, should be avoided
Spike and dome activity	Seizure activity

Table 1 Description of Alpha, Beta, Delta and Theta waves.

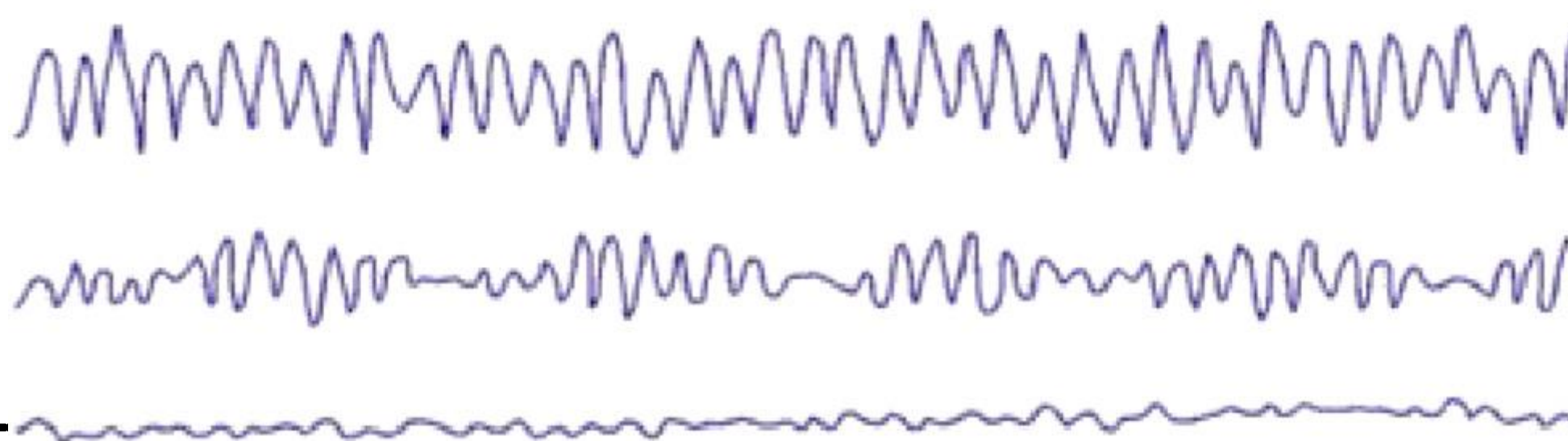



Wave type	Frequency Band $\delta$ Hz $\beta$	Brain Region	Person state	Example
Alpha ( $\alpha$ )	8–13	Occipital	Awake with eyes closed	
Beta ( $\beta$ )	13–30	Parietal, Frontal		
Delta ( $\delta$ )	0.5–4		Infants, sleeping adults	
Theta ( $\theta$ )			Children, sleeping adults	

Table 1 from Zahra A, Kanwal N, ur Rehman N, Ehsan S, McDonald-Maier KD. *Comput Biol Med.* 2017;88:132–141. Copyright 2019 Elsevier/ClinicalKey.

## EEG waves and Anesthesia

Surgical Anesthesia	Shows predominantly slow delta waves. Deep anesthesia is associated with burst suppression or isoelectric EEG.
Opioids	High dose opioids produce delta waves but not burst suppression on EEG.
Propofol	Deepening of anesthesia with propofol will result in delta waves, burst suppression and electrical silence.
Dexmedetomidine <sup>1,2</sup>	Produces alpha and theta activity, EEG resembles normal sleep, no delta waves or burst suppression observed. It is an ideal agent to administer during EEG monitoring.
Sevoflurane/Isoflurane <sup>3</sup>	Produces burst suppression around 1.5 MAC concentration and electrical silence at 2 MAC.

## Our novel Anesthesia Technique during EEG monitoring for resection of epileptic focus<sup>4</sup>

1. Avoid premedication with midazolam
2. Premedicate with 1 mcg/kg bolus of dexmedetomidine
3. Induction with propofol and remifentanil
4. Intubation following administration of remifentanil bolus and laryngotracheal spray with 2% lidocaine
5. Maintenance of anesthesia with dexmedetomidine/low-dose remifentanil infusion/less than 0.5 MAC of sevoflurane

## SPIKE WAVES



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## Conclusion

- We selected anesthetic agents which had the least effect on EEG monitoring.
- Maintenance of anesthesia with a combination of dexmedetomidine, low dose remifentanil and low expired concentration of volatile anesthetic agents allows monitoring EEG waves.
- This technique has least effect on dome and spike activity during epileptic focus resection.

## References

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