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Subdural ECoG Recordings of High-frequency Activity from a Wireless Implantable BMI Device

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Introduction: Brain machine interfaces (BMIs) are a promising tool to assist communicating and motor functions for individuals with severe motor disability[1]. Prior to clinical application, recording performance must be sufficiently confirmed by animal experiments. In this study, we aimed to evaluate the performance of a customized BMI wireless device for recording ECoG signals in two nonhuman primates.

Material, Methods and Results: We customized a wireless device for implantable BMIs for clinical application[2]. We implanted thirty-two electrodes subdurally over the left temporoparietal cortex on two monkeys. We evaluated the recording performance of the wireless device by ketamine-induced responses. Result: The devices successfully recorded and transmitted broadband frequency activities. Spectral analysis of raw signals demonstrated that the devices detected characteristic results of high-frequency band activity induced by ketamine injection (Figure1).

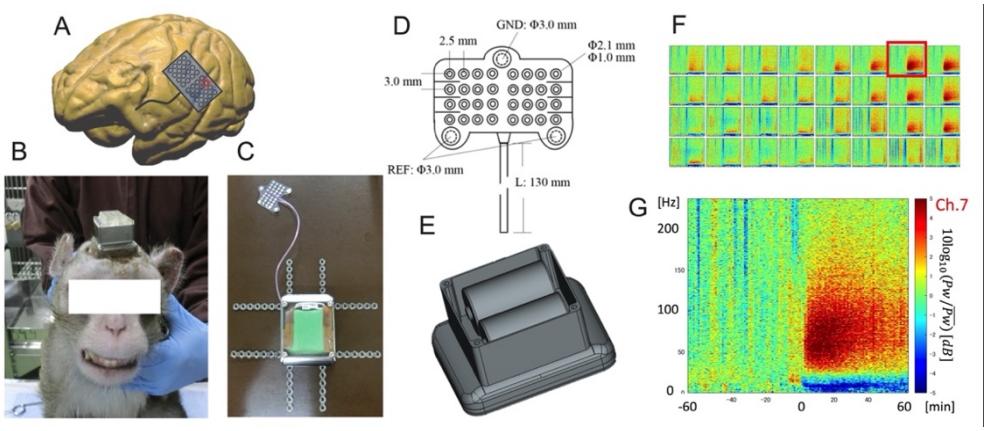

Figure: (A) The location of the 32 implanted electrodes. (B)The monkey with implanted device. (C) A photograph of the device ready for implantation. (D) The 32-electrode silicone-based array. (E) Computer-aided design model showing the assembly of the device. (F) Spectrograms results of all 32 electrodes showing the power changes after ketamine. Each subgraph represents the one electrode in (D). (G) Representative spectrograms of channel 7 (surrounded by a red outline in F). The time course included a 60-min baseline and 60-min recording after ketamine.

Discussion: We confirmed the functionality of the wireless device in recording and transmitting electrocorticography (ECoG) signals with required bandwidth and recording stability.

Significance: These results provide confidence that this wireless device can be a translational tool for other fundamental neuroscientific studies in free-moving models.

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