

Treatment Strategy Studies in Canine and Feline Refractory Epilepsy

Abstract of Doctoral Thesis

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Epilepsy is one of the most common brain disorders and is encountered most frequently in humans, cats, and dogs. In veterinary medicine, epilepsy is almost exclusively treated with antiepileptic drugs (AEDs) therapy, while surgery has yet to be performed in dogs and cats with drug-resistant epilepsy. Additionally, the operative procedure and complication of epilepsy surgery have not been reported in veterinary medicine. Therefore, the surgical indication criteria and methodology to detect the epileptogenic zone (EZ) are essential to be explored in veterinary medicine. The purpose of this study was to develop epilepsy surgery as a new treatment for dogs and cats with refractory epilepsy. Therefore, the risk factors for survival in dogs and cats with epilepsy were investigated in the referral hospital in Japan to create indications for epilepsy surgery, and advanced magnetic resonance imaging (MRI) techniques were evaluated to detect the EZ using an animal model of mesial temporal lobe epilepsy (MTLE). Additionally, anterior temporal lobectomy (ATL), which is a common epilepsy surgery in humans with MTLE, was performed in healthy dogs in order to assess the surgical procedure and complications. This retrospective study proposed the indication criteria for epilepsy surgery in dogs as “cases with high-frequency epileptic seizures (≥ 0.3 seizures/month) who do not respond to applicable AEDs and/or who have a detectable EZ (i.e., focal epilepsy).” Additionally, the present study showed that the voxel-based morphometry and diffusion and perfusion MRIs were useful for detecting the EZ. Proton Magnetic Resonance Spectroscopy showed the ability to evaluate the EZ laterality and indicated functional changes in the epileptic brain following treatment with zonisamide, which is a commonly used AED. Among the seven healthy dogs who were subjected to ATL, five (71%) had a successful resection of the hippocampus and amygdala, while the remaining two were euthanized during the operation due to uncontrollable hemorrhage from the middle cerebral artery. The most common surgery complications were atrophy of the ipsilateral temporal muscle and absent or decreased contralateral menace response. However, following successful ATLs without detectable iatrogenic injury on postoperative MRI, there were no complications. The results of the present

study suggested that ATL may be an applicable technique in dogs with MTLE. Although further studies are still needed in order to investigate the efficacy of ATL in dogs and cats with MTLE and improve the surgical precision, we assume that epilepsy surgery can be established in veterinary medicine. In addition, epilepsy surgery for companion animals with epilepsy will allow histopathological evaluations of resected tissues, which will contribute to our understanding of epileptogenesis.