Seizures in a California Sea Lion

Case Report

Epilepsy Suspected Seizure and Control in a California Sea Lion (Zalophus californianus)

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てんかんが疑われたカリフォルニアアシカ
Zalophus californianus の治験例
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ABSTRACT. A male young California sea lion (Zalophus californianus) suffered from epileptiform seizures many times from 1990. Because the symptoms of those seizures had been similar to epileptic seizures, the administration of oral medication of phenobarbital at about 2.0 mg/kg had begun, and the frequency of the seizures reduced drastically. The seizures are almost controlled by this medication at the same dosage at the present 1997. Blood samples were taken to check the serum concentration and side effects of phenobarbital. There is a moderate increase in Glutamyl Transpeptidase (GGT).

Key Words : Sea Lion, Zalophus californianus, epilepsy, seizure, phenobarbital

A juvenile male California sea lion (Zalophus californianus) was introduced to the aquarium in September, 1989. This animal was in captive breeding, born on June 22, 1988. After its introduction, it was kept in fresh water and has been training for show performances. The animal was maintained on a diet of four species of frozen fish (Scomber japonicus, Trachurus japonicus, Spirinchus lanceolatus, Cololabis saira) and one specie of squid (Todarodes pacificus) additionally, and received vitamin and mineral supplements (Sea -Vita, Mitaka Seiyaku Ltd. Mitaka-shi, Tokyo, Japan). Prior to the first seizure, the animal had had no significant medical history. The first seizure was noticed during the training session on April 16, 1990, when the animal was 1 year and 10 month of age. It began with sudden tonic convulsion without fore-runners. It stayed down on the floor and started trembling. During this seizure, the animal seemed as if though it were unconscious. Though it recovered after a few minutes, semi-unconsciousness continued for about 3 hours. Oral medication, vitamins and mineral supplements were added because vitamin or mineral
deficiency was suspected at that period. But this medication was not effective, its seizures continued to occur and the frequency of the seizures were increasing gradually. At last, it had had a total of 13 seizures until the epileptic medication started one year later (Fig.1).

All these seizures had almost the same patterns and situations. Normally, the seizures had forerunners; lethargy, nausea, vomiting, diarrhea, urination and slight trembling. Not all of these symptoms were shown every time, and sometimes only the forerunners were shown without a seizure. In one case, the animal demonstrated an emotional attitude that seemed to feel sudden panic or fear prior to the seizure.

The seizures and forerunners had a tendency to occur within a certain week of the month having periodic cycles. The seizures without forerunners often occurred in the afternoon during the training session, and the seizures with forerunners seemed to occur at around 5 o'clock in the evening.

The lesions of these seizures were not regular, showing tonic, clonic or tonic-clonic seizures. First, the seizures had a tendency to occur once a month, but its frequency was increasing gradually. Then on 17 April 1991, after just one year from the first seizure, it suffered from another serious seizure that seemed like status epileptics within a day. From this day, the oral administration of phenobarbital (Phenobar, Sankyo Ltd. Chuou-ku, Tokyo, Japan) had begun at 1.8 mg/kg DID, according to dog's therapy [1,2,3,4]. After this medication started, the occurrence of seizures reduced drastically (Fig.1).

The dosage of the drug altered as its condition changed. Currently the dose is about 2.0 mg/kg, and it can nicely control the occurrences of seizures. However, some problems still remain: When the dose was decreased under 2.0 mg/kg, the animal might suffer a serious seizure, always the form like status epileptics again, forerunners are still noticed, the occurrence of seizures and forerunners have a tendency to increase from spring to summer (Fig. 1) and the animal shows slight sedation because of the side effects from phenobarbital. When its forerunners are noticed,
Seizures in a California Sea Lion

Table 1 Administration dosage and serum concentration of phenobarbital of a California sea lion

<table>
<thead>
<tr>
<th>Date</th>
<th>Dose (mg/kg)</th>
<th>Serum Conc. (µg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>950630</td>
<td>1.99</td>
<td>15.50</td>
</tr>
<tr>
<td>950930</td>
<td>2.07</td>
<td>20.10</td>
</tr>
<tr>
<td>951230</td>
<td>2.10</td>
<td>16.30</td>
</tr>
<tr>
<td>960130</td>
<td>2.05</td>
<td>20.60</td>
</tr>
<tr>
<td>960610</td>
<td>2.05</td>
<td>14.10</td>
</tr>
<tr>
<td>961218</td>
<td>2.01</td>
<td>16.50</td>
</tr>
</tbody>
</table>

Table 2 Blood examination of a California sea lion

<table>
<thead>
<tr>
<th>Date</th>
<th>ALB (mg/dl)</th>
<th>ALP (U/l)</th>
<th>ALT (U/l)</th>
<th>AST (U/l)</th>
<th>TB (g/dl)</th>
<th>GGT (U/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>950119</td>
<td>2.9</td>
<td>77</td>
<td>27</td>
<td>30</td>
<td>1.3</td>
<td>-</td>
</tr>
<tr>
<td>950630</td>
<td>-</td>
<td>164</td>
<td>20</td>
<td>30</td>
<td>-</td>
<td>83</td>
</tr>
<tr>
<td>960130</td>
<td>3.4</td>
<td>152</td>
<td>24</td>
<td>47</td>
<td>0.6</td>
<td>105</td>
</tr>
<tr>
<td>960610</td>
<td>2.6</td>
<td>175</td>
<td>12</td>
<td>29</td>
<td>0.7</td>
<td>109</td>
</tr>
</tbody>
</table>

ALB: Albumin, ALP: Alkaline Phosphatase, ALT: Alanine Aminotransferase (SGPT), AST: Aspartate Aminotransferase (SGOT), TB: Total Bilirubin, GGT: Gamma Glutamyl Transpeptidase, - : not available

Increasing the dosage of phenobarbital often became effective for the prevention of the seizure, and once the serious seizures occurred, intramuscular injection of diazepam at 0.2 mg/kg was useful to stop the seizures.

The initial dosage of phenobarbital was monitored only by mg of the drug considering its body weight, because it might suffer a serious seizure by physical restraint from taking blood samples. From July 1995, when the condition of the animal seemed to be settled, the blood samples of the animal began to be taken every three months to check the serum concentration of phenobarbital (Table 1). The samples were taken from the hind flipper of the animal at the same time of day. The correlation between the dosage and the serum concentration is not clear yet. The other blood parameters seem to have no problems except a slightly high level of Gamma Glutamyl Transpeptidase (GGT) (Table 2). Its side effects from the drug are only its low ability to concentrate and behavior.

In common, epilepsy characterized recurrent seizures. Many epileptiform seizures have been reported in domestic animals [3, 5, 6, 7], but more frequently in dogs [3]. As for wild animals, only several recurrent seizures and their treatments were reported in monkeys and bears [8], only one case of a Himalayan bear (Ursus thibetanus) was diagnosed as idiopathic epilepsy according to the histological findings [9].

In this case, the definition of diagnosis is not clear enough because examinations have not been done. Only from the appearance of seizures of this sea lion, it is likely to be epilepsy, complex partial seizures that generalize to tonic-clonic seizures according to the classification of human epilepsy by WHO [10]. Because it is not clear whether the animal was conscious or not, its partial seizures could not be identified as simple or complex types.

Epilepsy is divided into two types, one is idiopathic and the other is symptomatic according to cause of the seizure. But in many cases in animals clinical examinations such as blood examinations, urination, and neurological examinations do not unveil the definite diagnosis, these are just ancillary tests for narrowing the
possibilities [2]. Taking an ECG pattern is one of the most effective examinations, but it is usually very difficult to take ECG pattern from animals, especially from wild animals.

There are many causes of symptomatic epilepsy such as metabolic, toxic, traumatic, inflammatory, vascular and neoplastic agents [4,11,12]. It is widely known that in pinnipeds hyponatremia and vitamin B1 deficiency cause epileptiform seizures [13], but in this case, any treatment for nutritive deficiency was not effective and only oral administration of phenobarbital could reduce the frequency of its seizures.

This sea lion is captive born in a zoological garden in Japan, so its medical history and family history is clear. There was no evidence that the animal suffered from any infectious disease, trauma, vascular disorders or neoplasia. There were also no history of sedative or anesthetic treatment. In addition, the animal’s age when the first seizure was noticed was very young, so there is a slight possibility that the seizure occurred because of neoplasia or infraction. In dogs there are some genetic agents that have a tendency to cause idiopathic epilepsy [14]. There is no epileptic history in the relatives of this sea lion.

Although it could not identify any underling diseases, from the appearance the seizures of this sea lion are very similar to a idiopathic epilepsy according to Thomas [4]. The reason is because its nutritious, toxic or infectious treatment did not work well and frequency of the seizure can be controlled by phenobarbital, seizure itself has a tendency of periodical cycles.

Phenobarbital is the first choice drug for dog epilepsy [4,5,15,16,17]. Although there are some kinds of recommended dosages for dogs by several authors [4,5,15,17,18], at first the administration of the drug began with a comparatively lower dosage in the dog, and it worked successfully to stop its seizure like status epileptics.

About the serum concentration of phenobarbital, it is not clear if there is a correlation between the dosage shown in Table 1. In dog phenobarbital administration must be monitored by serum concentration than dosage because correspondent relation between the dosage and the concentration was reported in the dog [15,18,19,20]. In this case, though only 6 samples have been taken, correspondence between the frequency of the seizure is much clearer in the dosage than in the serum concentration. When the dosage of the drug lowered under 2.0 mg/kg, the animal’s condition turns worse. It is good for the animal to estimate its condition by the dose for the present.

Many dogs that receive long-term antiepileptic drug therapy have increases in Alkaline Phosphatase(ALP) and Alanine Aminotransferase(ALT) [2]. The side effects of phenobarbital have not been detected yet in this case without a slight high level of GGT. In the dog, acute dramatic hepatitis is reported [21]. So the blood examination must be continued to check the condition of the animal.

The seizure of this sea lion is controlled successfully with low dosages for more than 5 years, but the dosage is increasing gradually. In the future it may be necessary to increase the dosage to almost near toxic levels or to change the drug. Monitoring the concentration and blood examinations must be continued to control the seizures. The aim of this treatment is to develop the animal’s quality of life. Though the seizure or forerunners of this animal are not controlled perfectly, for now 1997 the animal recovered enough to perform easy tricks in front of the audience.

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要 約

飼育下の雄のカリフォルニアアシカ Zalophus californianus にてかんれんの発作が頻回認められた。この症例に試験的にフェノバルビタールを日量約 2.0 mg/kg で投与したところ、発作の発生頻度が大幅に減少し、現在も同様
Seizures in a California Sea Lion

の投与量で発作を抑制することに成功している。定期的に採血を行い、血清フェノバルビタールと肝機能のモニターを行った結果、GGT(γ-Glutamyl Transpeptidase)の軽度な上昇が認められた。

キーワード：カリフォルニアアシカ Zalophus californianus, てんかん, けいれん発作, フェノバルビタール

REFERENCES