



The Successful Medical Treatment of Localized Tetanus in a Cat

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ABSTRACT

Tetanus is a rare cat disease that usually has predominantly localized clinical signs. This case report describes a 10-year-old female DSH cat that presented to the Kasetsart University Veterinary Teaching Hospital, Kamphaeng Saen campus. Cat has an ulcerative tumor in the mammary glands and persistent involuntary muscle rigidity in the pelvic limbs, which later progressed to the thoracic limbs. This cat was diagnosed with tetanus based on the clinical history, presence of a wound, and clinical signs. The treatment was symptomatic (antitoxin, metronidazole, diazepam, etc.) and supportive, resulting in rigidity improvement within one month.

Key words: Cat, Localized, Tetanus, Therapeutic.

INTRODUCTION

Tetanus is caused by the neurotoxins (tetanospasmin) released by *Clostridium tetani* bacteria, often presenting with muscle stiffness, spasm and pain (Swink and Gilsenan 2022). Tetanus toxins can cause disease in humans and animals. However, tetanus is a rare bacterial disease in cats. The transmission is caused by environmentally resistant spores introduced into wounds. Cats are approximately ten times more resistant to the infection than dogs and 7,200 times more resistant to tetanospasmin than horses (Cook et al. 2001; Greene 2012; Popoff 2020; de Melo and Ferreira 2022). Tetanospasmin binds to neuronal cells, blocking and releasing glycine and gamma-aminobutyric acid (GABA) from CNS inhibitory interneurons. In addition, irreversible binding occurs when tetanus toxin binds to the presynaptic sites of inhibitory neurons. Recovery requires the growth of new nerve terminals (Sandford 1995). These reasons make localized tetanus more common in cats with local muscle stiffness and rigidity, which can gradually spread from one limb to the entire body (Penderis 2012). The clinical sign can be a locally persistent contraction of the muscles that may persist for a long time. However, the specific symptoms can progress to the generalized. There are a few previous case reports of tetanus in cats (Lee and Jones 1996; Baral et al. 2002; Polizopoulou et al. 2002; De

Risio and Gelati 2003; Todorova et al. 2009; Langner et al. 2011; Maksimović et al. 2016; Farrar and Liebel 2019; Danciu et al. 2022). This case report describes the successful management of a cat with localized tetanus.

Case presentation

A 10-year-old neutered female domestic shorthair cat presented to the Kasetsart University Veterinary Teaching Hospital, Kamphaeng Saen campus, on the third of August 2022, with a two-day history of the rigid extension of the pelvic limbs, followed by the rigidity of the thoracic limbs the next day. There was a one-week history of an ulcerated tumor in the mammary gland. However, the onset of the tumor was unknown.

On clinical examination, the cat was able to eat. The pelvic limbs showed marked rigidity, and the thoracic limbs showed limited movement, but the elbow and metacarpal joint could still be flexed. The tail was stiff and extended (Fig. 1). Therefore, the cat was unable to get up and walk. An ulcerated tumor was 2 centimeters in diameter and located between the left 4th-5th mammary gland, covered with purulent discharge and necrotic tissue (Fig. 2).

Neurological examination revealed normal mental status and permanent spastic posterior paresis of the pelvic limbs. Postural reaction and flexor reflexes could not be elicited due to extensor rigidity. However, the thoracic



Fig. 1: Localized tetanus affects all limbs and the tail.



Fig. 2: An ulcerated wound on mammary gland tumor after debridement.

limbs showed spontaneous movement, and the muscle rigidity was less pronounced. The sensation was normal in all limbs. All cranial nerve reflexes were normal. No abnormalities were found in plain radiographs of the spine and limbs. A complete blood count (Sysmex XN-1000TM Hematology Analyzer; Sysmex; IL, USA) showed the result of leukocytosis (Table 1), possibly due to infection or inflammation of an ulcerated tumor. Serum blood chemistry (IL Lab 650 Chemistry System; Diamond Diagnostics, MA, USA) showed severely increased creatinine kinase (Table 1), probably related to damaged muscle. A feline leukemia virus and feline immunodeficiency virus combination test (Witness®; Lyon Cedex; France) was negative. Thus, the diagnosis of localized tetanus, in this case, is made by observing the clinical signs, the onset and progression of clinical signs, and the presence of a wound at the mammary gland.

The cat was hospitalized for over 29 days in a dark and quiet environment to minimize stimulation. The cat was gently turned every 6 hours since she could not move. Treatment consisted of extensive debridement of the necrotic wound with 4% chlorhexidine and intravenous infusion of isotonic solution [0.9% NaCl (NLPS Co., Ltd.; Thailand)]. Antibiotic therapy was given as 10mg/kg metronidazole (Mepagyl®, Thai Nakorn Pattana Co., Ltd.; Thailand) intravenously every 12 hours. In this case, the cat received initial pain relief by giving 4.5mcg/kg fentanyl (Siam Bioscience Co., Ltd.; Thailand) intravascularly every 12 hours along with a twice-daily oral administration of 5mg/kg gabapentin (Berlontin100®; Berlin Pharmaceutical Industry Co., Ltd. Thailand) and 0.3mg/kg

meloxicam (Metacam®; Boehringer Ingelheim Animal Health Inc.; USA) was also given subcutaneously on the first day. The cat was treated with muscle relaxation with 2mg/kg diazepam (Diazepam, The Government Pharmaceutical Org., Thailand) intravenously every 6 hours combined with 2mg/kg tolperisone (Biocalm®, Biolab Co., Ltd. Thailand) orally every 12 hours. Tetanus antitoxin (100IU/kg, Tetagam®, Zuellig Pharma CO., Ltd.; Thailand) was given intramuscularly daily for six days. Metoclopramide (0.2mg/kg, Met-sil®, T.P. drug Laboratories Co., Ltd.) intravascularly every 12 hours and cisapride (1.25mg, Cisapie®, Polipharm Co., Ltd. Thailand) orally every 12 hours were used as gastroprokinetic agent.

In addition, the cat was treated with physiotherapy four times a day. On the first day at the hospital, thoracic limbs became more rigid, but the cat could still eat. After four days of treatment, the flexion of the thoracic limbs and the stiffness of the tail were resolved slowly (Fig. 3). Blood analysis revealed normal limits (Table 1), including creatine kinase (CK) by day 15, and a marked decrease in the muscular rigidity of the pelvic limbs was observed. The caudal flexion of the leg was slowly resolved. The cat was discharged on day 29 with a normal complete blood count and continued treatment with physiotherapy, muscle relaxation, and analgesia. Finally, the muscular spasms and rigidity disappear, and the cat can regain the normal use of the thoracic and pelvic limbs. The abnormalities remaining were only a minor lameness of pelvic limbs (Fig. 4).

DISCUSSION

In companion animals, tetanus commonly affects young large-breed dogs. However, cats are more resistant to tetanospasmin than other species. Thus, tetanus in cats is considered a rare disease. In this case, the clinical symptoms can be localized or generalized, while localized tetanus is more common in cats (Greene 2012).

In this case, the ulcerated wound at the mammary gland was possibly the entry route for the clostridial organisms. The cat was presented with a two-day duration of pelvic limb rigidity, which then progressed to the thoracic limbs the following day.

Electromyography (EMG), measuring serum antibody titers to tetanus toxin, and isolation of *C. tetani* from the wound may be used to confirm a clinical diagnosis of tetanus (Greene 2012). However, EMG and serum antibody titers are not available in our hospital. Anaerobic culture is also difficult and negative results cannot rule out the disease. Therefore, in this case, the diagnosis was made from clinical signs and a history of a recent wound.

However, some studies have shown that tetanus in cats can resolve without antitoxin (Maksimović et al. 2016). In this case, the antitoxin was given because of acute and progressive signs and continued daily until the clinical signs were significantly improved. Even the recommended dosage for tetanus is only one injection because therapeutic levels persist for approximately 14 days (Greene 2012).

It is essential to debride any suspicious wound, and hydrogen peroxide should be used to flush the wound because of the ability of hydrogen peroxide to increase oxygen levels, which leads to the inhibition of obligate anaerobes (Greene 2012; Deniz and Erat 2023).

Table 1: Hematological and serum biochemistry parameters during the treatment

Blood Profiles/Date	Units	Blood/Serum Sampling Days with Date										Reference Range
		0 3/8/22	1 4/8/22	2 5/8/22	3 6/8/22	5 8/8/22	9 12/8/22	12 15/8/22	15 18/8/22	28 31/8/22	42 14/9/22	
Hematology												
RBC	10 ⁶ /μL	6.5	-	-	7.32	6.59	6.12	6.31	5.81	5.92	5.96	5 – 10
HGB	g/dL	10.6	-	-	11.6	10.3	9.3	9.5	9.1	9.8	9.8	10 – 15
PCV	%	33	-	-	32	30	26	28	30	30	28	30 – 45
WBC	10 ³ /μL	38.69	-	-	38.82	21.22	28.11	26.42	37.17	15.13	21.97	5.5 – 19
Plt	10 ³ /μL	272	-	-	371	411	680	738	781	422	221	200-900
Serum biochemistry												
ALT	U/L	34	-	-	-	-	34	34	40	-	47	28 – 76
AST	U/L	-	-	-	-	-	-	-	-	-	-	12 – 40
ALP	U/L	-	-	-	-	-	16	-	-	-	-	0 – 62
GGT	U/L	-	-	-	-	-	0	-	-	-	-	0 – 1
BUN	mg%	15.9	-	-	-	-	-	13.3	-	-	-	15 – 34
Creatinine	mg%	1.06	-	-	-	-	-	0.88	0.84	-	1.33	< 2.0
CK	U/L	>2036	-	-	>2036	1491	203	151	156	-	45	54-440
Na	mmol/L	149.8	153.3	154.3	-	-	-	-	-	-	-	151-158
K	mmol/L	2.65	3.03	3.58	-	-	-	-	-	-	-	3.6-4.9
Cl	mmol/L	115.1	116.2	116.6	-	-	-	-	-	-	-	113-121

RBC=Red blood cell; HGB=Hemoglobin; PCV=Pack Cell Volume; WBC=White blood cell; PLT=Platelet; ALT=Alanine aminotransferase; AST=aspartate aminotransferase; ALP=Alkaline phosphatase; GGT=Gamma-Glutamyl Transferase; BUN=Blood urea nitrogen; CK=Creatine kinase; Na=Sodium; K=Potassium; Cl=Chloride.



Fig. 3: The thoracic limbs and tail flexion were slowly resolved on day four at the hospital. Noted: the extensor rigidity of pelvic limbs.



Fig. 4: The cat was discharged with full recovery of all limbs.

For patients with tetanus, intensive nursing care is necessary. This study's results suggested that cats should be isolated and placed in a dark, quiet room for effective treatment. In addition, the therapeutic procedure should be done with minimal handling, and cotton wool balls may be placed in the external ear canals to reduce stimulation from the external noise (Silverstein and Hopper 2015).

Conclusion

In the present case, the localized form of tetanus was diagnosed by the medical history, the presence of a wound, and neurologic findings. However, the definitive diagnosis of tetanus is obtained by measuring serum

tetanospasmin antibodies, but this test is only available in some laboratories. Even though tetanus in cats is rare, it is crucial to consider it a possible differential diagnosis for cats with the rigidity of the extensor muscle but with normal mentation. Symptomatic treatment, including antitoxin, antibiotics, wound dressing, physiotherapy, muscle relaxation, pain relief, supportive care, and prevention of secondary complications, leads to favorable outcomes.

Author's Contribution

All authors contributed to this work. SP wrote the manuscript, and NL, NS, PK, and ST contributed

substantially. All authors approved the final version and are accountable for this work.

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Conflict of interest

The authors declare that there is no conflict of interest.

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