

Generalized and chronic form of tetanus in a cat - Its diagnosis and ethno-veterinary management

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Abstract

Tetanus in cats was very rarely recorded due to innate resistance, and localized tetanus was recorded with recovery within a few weeks up to 5 months. A 15-month-old domestic short-haired cat (*Felis catus*) was presented with signs of stiffness of the muscles and lateral recumbency. Microscopic examination of wound smear from oral mucosa revealed *Clostridium tetani* bacilli with spores. Haemato-biochemical analysis revealed alterations in the parameters. The case was parenterally treated with tetanus antitoxins, antibiotics, muscle relaxants and oral ethno-veterinary preparations for follow-up. Partial improvement was observed after five months of onset of tetanus, and the case succumbed to the disease.

Keywords: Cat, *Cicuta-virosa*, *Clostridium tetani* spores, Haemato-biochemical changes, Spastic paralysis

Highlights

- Generalized tetanus in cats was very rarely observed with scanty published reports in India.
- Tetanus was diagnosed by clinical signs and microscopic examination.
- Ethno-veterinary treatment was found to be useful to avoid serious complications.

Tetanus, a neurotoxic and life-threatening disease, is caused by tetanospasmin of *Clostridium tetani*, resulting in sustained spastic paralysis (Greene, 2012). Though it is a commensal, only certain strains of *Cl. tetani* that possess the plasmid containing antigenic toxins are known to cause infection (Platt, 2015). The disease is rare in dogs, which are numerous hundred times more resistant (Michael and Frederic, 2016), and cats are reported to be ten times more resistant than dogs (Greene, 2012; Farrar and Liebel, 2019). The neuronal binding of tetanus toxin is irreversible, and recovery depends on sprouting of new axonal terminals (Sanford, 1995), which may take 3 weeks to 5 months (Danciu *et al.*, 2022).

Published reports on the incidence of tetanus in cats in India are rarely available, though the incidence of tetanus in other species is high in India (Popoff, 2020), and the use of ethno-veterinary medicines in the clinical management of tetanus is not reported. This report describes an unusually more chronic form of generalized tetanus in a cat, its diagnosis, haemato-biochemical alterations, and ethno-veterinary management.

A 15 months old unvaccinated male domestic shorthair cat was presented to the Veterinary Clinical Complex, Tirunelveli, Tamil Nadu, with a history of lateral recumbency, spasm of jaw muscles followed by forelimbs, starvation, absence of defecation and infrequent urination for the past 10 days. The cat also had a history of vomiting and diarrhoea for a period of 2 days. The cat was non-ambulatory and manifested opisthotonus, severe spastic paralysis of thoracic limbs, stiffness of the neck, back and pelvic muscles with flexion of tarsal joints (Fig. 1), tetraparesis, trismus (lockjaw), risus sardonicus (Fig. 2), hyperaesthesia, hypothermia (36.6°C), normal heart and respiratory rate, and mildly sunken eyeball. A small necrotic wound inside the right cheek region of the mouth cavity could be noticed. A sterile swab from the necrotic wound was subjected to Gram's staining, which revealed very few Gram-positive rods with terminal spores of tennis-racket appearance, suggesting *Clostridium tetani* spores. Based on the history of wound, signs of spastic paralysis and microscopic diagnosis, the case was diagnosed as generalized tetanus.

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Hematological analysis revealed an elevated white blood cell count ($28.3 \times 10^3/\mu\text{L}$), neutrophil count (90.1%) and packed cell volume (48.0%), and a low lymphocyte count (6.0%), whereas haemoglobin (14.6 g/dL), red blood cell count ($9.76 \times 10^6/\mu\text{L}$), monocyte (3.0%) and platelet count ($294 \times 10^3/\mu\text{L}$) were found to be normal. Serum biochemical analysis revealed an increase in total protein (9.0 g/dL), globulin (5.7 g/dL), creatinine phosphokinase (1307 U/L), low sodium (127 mEq/L), potassium (2.8 mEq/L) and chloride (71.0 mEq/L) levels. Whereas alanine aminotransferase (69.0 U/L) and alkaline phosphatase (18.0 U/L), blood urea nitrogen (21.0 U/L), creatinine (1.0 U/L), phosphorus (7.3 mg/dL) and glucose (120.0 mg/dL) levels were found to be within range.

The case was initially treated with ceftriaxone at a dose of 25 mg/kg bwt, IV, pantoprazole at a dose of 1 mg/kg bwt IV, ondansetron at a dose of 0.2 mg/kg, IV, metronidazole at a dose of 15 mg/kg bwt, IV, dextrose normal saline (50 mL) and Ringer's lactate (50 mL), IV, for three days. The necrotic wound in the oral cavity was cleaned with 1 per cent potassium permanganate. Tetanus antitoxins-human (Tetglo[®]Bharat Serums and Vaccines Ltd., India) at a dose of 500 IU were administered once subcutaneously in the neck region (Sykes 2014). Diazepam as an anticonvulsant was administered at a dose of 0.5 mg/kg bwt, IV, at a constant rate of infusion. The case recovered from signs of gastroenteritis 3 days after treatment. The case was then recommended oral administration of metronidazole suspension (Metrogyl[®], J.B. Chemicals & Pharmaceuticals Ltd. India) at a dose of 15 mg/kg bwt, orally, for 7 days, to inhibit the growth of *Cl. tetani* in the wound. For antispasmodic, neurostimulant, anxiolytic and immunomodulatory actions, oral administration of ethno-veterinary preparations, *Cicuta virosa*/ Water hemlock (SBL, India)-200C and *Withania somnifera*/ Ashwagandha (SBL, India) were recommended at the dose of 5 drops twice daily, orally (Candelario *et al.*, 2015; Mishra *et al.*, 2021). Five months post onset of tetanic signs, partial recovery could be noticed without any serious complications. The cat was still non-ambulatory with stiffness of the cervical and dorsum muscles. However, partial relaxation of jaw muscles, flexion of elbow and carpal joints with sitting posture are remarkable (Fig. 4a and 4b).

Gram's staining was found to be useful in demonstration of the bacterial rods though detection of this bacteria at the wound site is often difficult (Greene, 2012; Popoff, 2020). Previously, Baral *et al.* (2006) reported the predisposing factors as deep

penetrating wounds (15 cases), limb caught within hunting traps (eight cases), compound bone fractures (four cases), chemical burns (one case), vehicle trauma (One case), ovariohysterectomy (four cases) and castration (six cases). Since then, there have been rare reports of tetanus in cats attributed to trauma and castration (de Risio and Gelati, 2003; Alan *et al.*, 2016; Danciu *et al.*, 2022).

Young cats with localized tetanus (Sykes, 2014) were often reported, leaving the clinical diagnosis difficult (De Risio and Gelati, 2003). The initial stiffness of jaw muscles in this case could be associated with the proximity of the wound (Greene, 2012), followed by stiffness in other body muscles (Danciu *et al.*, 2022). Hypothermia could be associated with signs of gastroenteritis, in contrast to hyperthermia (Sanford, 1995). Tachycardia could be due to the increased release of catecholamine caused by adrenergic stimulation (Saravanan and Palanivel, 2018). Elevation of creatinine phosphokinase (CPK) and aspartate aminotransferase (AST) could be associated with hypertonicity of muscles (Adamantos and Boag, 2007). Hypochloremia, hypokalemia, hyponatremia and increased PCV could presumably be due to gastroenteritis. Leukocytosis and neutrophilia could be attributed to the necrotic wound (Greene, 2012; Saravanan and Palanivel, 2018).

Though antitoxin neutralizes toxin that is unbound to the CNS, the timing of administration is important for its efficacy (Platt, 2015). Metronidazole was effective owing to its good penetration into purulent tissues (Ahmadsyah and Salim, 1985; Greene, 2012). The *Cicuta virosa* (CV) modulates GABAergic neurotransmission, potassium conductance, reduces epilepsy and favours the antioxidant defense mechanism (Mishra *et al.*, 2021). It recently gained greater attention, as phenobarbitones in long-term use may lead to hepatotoxicity (Andrić *et al.*, 2010; Saravanan *et al.*, 2019). The *Withania somnifera* is a potent agonist of GABAP receptor, antispasmodic, anxiolytic, immunostimulant and promotes dendrite formation and synaptogenesis (Singh *et al.*, 2011; Candelario *et al.*, 2015), however its use in pet animals has not been studied. Hence, these herbal medicines were found to be useful in preventing secondary bacterial infections and postponing the life of a cat.

Stiffness is reported to be persistent, generally up to 3 to 4 weeks and occasionally up to 16 weeks (Greene, 2012). However, in this report, tetanus was found to be unusually more chronic, resulting in death that could probably be due to cardiac involvement. Previously, complications (Greene, 2012) like

Generalized and chronic tetanus in a cat



Fig. 1. Spastic paralysis of muscles of forelimbs, facial region, neck and dorsum (Opisthotonus) on the day of presentation

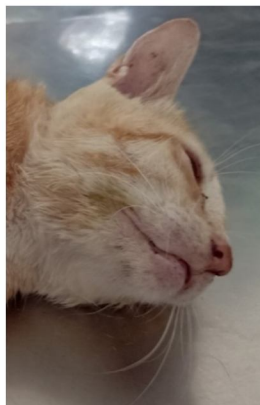


Fig. 2. Sardonic facial expression in cat with tetanus

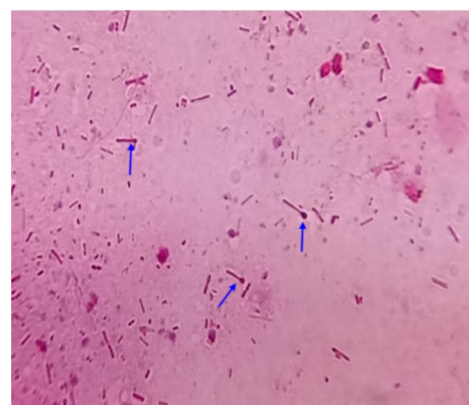
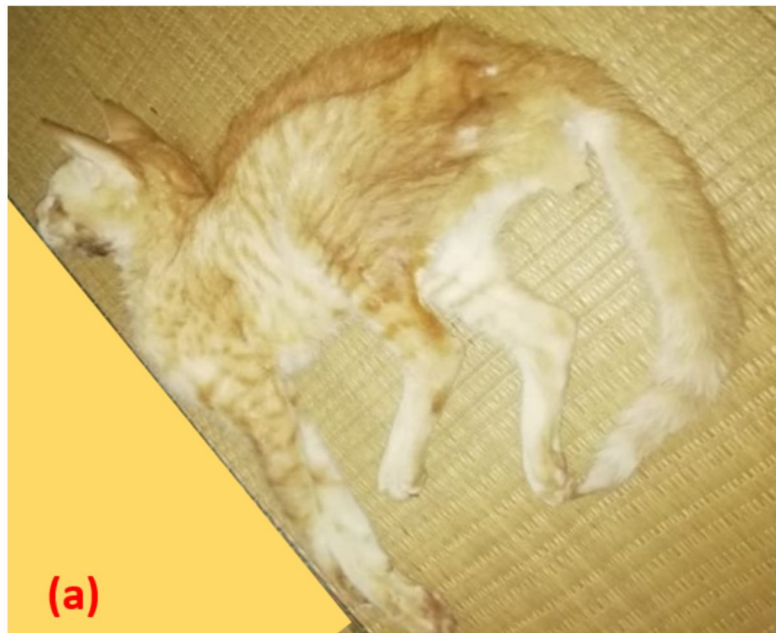


Fig. 3. *C. tetani* bacilli with dark stained terminal spores by Gram staining (x100)



(a)



(b)

Fig. 4. (a) Spastic paralysis of muscles of face and neck, flexion of forelimbs and moderate emaciation and (b) Sitting posture on a soft bed with flexion of forelimbs only, 5 months post onset of tetanic signs

fractures, luxations, aspiration pneumonia and cardiac signs (Danciu *et al.*, 2022) were reported to be associated with tetanus (Greene, 2012).

Most of the cases of generalized tetanus show guarded prognosis due to prolonged hospitalization for recovery, owner's unwillingness for hospitalization, cost of treatment, complications and lack of continuous attention. Early identification of wound and treatment are very important to prevent the onset of tetanus.

Conflict of interest: Authors have no conflict of interest in this study.

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Data availability statement: All the data supporting the research findings have been presented in this paper. The corresponding author is willing to provide the raw data upon reasonable request.

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