RESEARCH ARTICLE

Pathological study of rabies in canine brain

Lalrinkima, Hemalatha, S., Nagarajan, K., Thangavelu, A., & Dhinakar Raj, G.

Abstract

A pathological study on canine brain tissue suspected with rabies was carried out on necropsy cases received at the Department of Veterinary Pathology, Madras Veterinary College Chennai, during April to September, 2019. Twenty-seven dogs presented for necropsy were considered for the study. The clinical history, age, breed and sex wise distribution were recorded. Gross changes if any was observed and samples of brain tissues were collected for histopathological studies. Brain impression smears were stained with William's modification of Van Gieson's stain and observed for presence of Negri bodies. Out of 27 dogs examined eight cases showed presence of Negri bodies. No significant gross changes were observable except for congestion, oedema and hemorrhages. Histopathological studies revealed subdural hemorrhages, marked gliosis, perivascular lymphocytic cuffing, neutrophilic vacuolation and presence of intracytoplasmic eosinophilic inclusions in neurons of cerebral grey matter.

Key words: Canine, rabies, brain, gross, histopathology

Ind J Vet Sci and Biotech (2025): 10.48165/ijvsbt.21.5.36

Introduction

Rabies is an infectious viral disease of mammals and the diseases is caused by a member of *Lyssavirus* under the genus *Rhabdoviridae* negative sense, non-segmented, single stranded RNA virus (Madhusudana *et al.,* 2012). It is estimated that 55,000 individuals worldwide pass away from rabies ever year (Pieracci, 2019). About 40% of cases involve children under the age of 15 with the majority occurring within poor populations in Asia and Africa (WHO, 2020). In India, rabies is an endemic disease and it is common throughout all of the states and union territories with the exception of the Andaman and Nicobar and Lakshadweep Islands. According to estimates by Hampson *et al*. (2015), 35% of the rabies cases worldwide reported in India. The purpose of this study was to screen brain tissue of canine suspected with rabies brought for necropsy to the Department of Veterinary Pathology, Madras Veterinary College, Chennai.

Materials and methods

The study on canine brain tissue was carried out at the Department of Veterinary Pathology, Madras Veterinary College, Chennai during the period from April 2019 to September 2019. Twenty seven dogs presented for necropsy to the Department of Veterinary Pathology were considered for the study. The detailed history including the breed, sex, age and clinical signs were recorded during the study.

Brain tissues were collected from 27 dogs. Detailed postmortem examination was conducted and gross lesions were recorded. Impression smears were taken on clean slides before fixation of the fresh specimens for cytological study. For histopathological study brain collected in 10 % neutral buffered formalin were routinely processed and embedded in paraffin. Paraffin embedded tissue sections were cut into sections of 4-5 µm thickness and stained with routine Hematoxylin and Eosin (H & E) (Suvurna *et al.,* 2018).

[1]Department of Veterinary Pathology

[2]Department of Veterinary Microbiology

[3]Department of Animal Biotechnology

[4]Madras Veterinary College, Chennai

Corresponding Author: Hemalatha, S., Department of Veterinary Pathology. e-mail: hemalathasenthilnayagam68@gmail.com

How to cite this article: Lalrinkima, Hemalatha, S., Nagarajan, K., Thangavelu, A., & Dhinakar Raj, G. (2025). Pathological study of rabies in canine brain. Ind J Vet Sci and Biotech, 21(5), 181-185.

Source of support: Nil

Conflict of interest: None

Submitted 11/07/2025 **Accepted** 12/08/2025 **Published** 10/09/2025

Results and Discussion

In the present study, a total of 27 numbers of brain tissues of canine were collected. Out of which 8 samples were found to be infected with canine rabies virus. Table 1 summarizes about the age, sex and breed wise distribution whereas Table 2 describes about the clinical history, gross, histopathology and postmortem diagnosis for the study.

Table 1 : Canine brain pathology - Age, sex and breed wise distribution

Sl.No.	Date of postmortem examination	Age	Sex	Breed
1.	13/04/19	6 yrs	Female	Dachshund cross
2.	13/04/19	11 months	Male	Labrador
3.	10/06/19	3 yrs	Female	Labrador
4.	15/06/19	11 yrs	Female	Dobermann
5.	19/06/19	13 yrs	Male	Non –descript
6.	26/06/19	6 yrs	Male	Rottweiler
7.	6/07/19	8 yrs	Female	Dobermann
8.	8/07/19	7 month	Female	Non – descript
9.	25/06/19	6 yrs	Male	Dachshund
10.	11/07/19	-	Male	Non-descript
11.	12/07/19	5 yrs	Male	Golden retriever
12.	13/07/19	-	Female	Non – descript
13.	15/07/19	3 yrs	Male	Non – descript
14.	15/07/19	6 yrs	Male	Non – descript
15.	16/07/19	6 months	Male	Non – descript
16.	16/07/19	12 yrs	Male	Labrador
17.	18/07/19	6 yrs	Female	German shepherd
18.	26/07/19	10 yrs	Female	Spitz cross
19.	26/07/19	4 yrs	Female	Non –descript
20.	29/07/19	7yrs	Male	Non – descript
21.	29/07/19	2 months	Male	Non – descript
22.	02/08/19	7 yrs	Female	Spitz
23.	21/08/19	3 yrs	Male	Non- descript
24.	22/08/19	8 yrs	Male	Non – descript
25.	29/08/19	10 yrs	Female	Non – descript
26.	29/08/19	11 yrs	Male	Spitz
27.	12/09/19	1.5 yrs	Male	German Shepherd

Table 2: Canine brain pathology - Clinical history, gross, histopathology and postmortem diagnosis

Sl. No.	Clinical history	Gross changes in brain	Histopathology changes in brain	Postmortem diagnosis
1.	The animal had temporal twitching and paraplegia	Revealed mild meningeal congestion	Marked multifocal perivascular cuffing of lymphocytes and vacoulation	Canine distemper
2.	The animal had malena and respiratory distress with lateral recumbancy	NAD	NAD	Pneumonia
3.	The animal had reduced feed intake and haematuria	Revealed mild meningeal congestion	Perivascular lymphocytic cuffing	Rabies
4.	The animal was weak, dull and reduced feed intake	Revealed mild menigeal congestion	NAD	Pyometra
5.	The owner brought the animal in dead conditon	NAD	NAD	Renal failure
6.	The owner reported that the animal eat at morning and was found dead at noon time	NAD	NAD	Gastric dilation

7.	The animal was showing hematochezia and hematuria	NAD	NAD	Renal failure
8.	The animal was showing excessive salivation, vocalization and biting of inanimate object	Revealed severe meningeal congestion	Marked gliosis	Rabies
9.	The animal had paraplegia and difficulty in walking	NAD	NAD	Ehrlichiosis
10.	The carcass was brought for disposal	NAD	NAD	Enteritis
11.	The animal was undergoing castration and there was swelling on the scrotal region	NAD	NAD	Babesiosis
12.	The carcass was brought for disposal	NAD	NAD	Pneumonia
13.	The animal was showing dyspnea,tremor and excessive salivation	Revealed severe meningeal congestion	Neuronal necrosis with scattered gliosis	Rabies
14.	The animal was brought in dead condition	Revealed mild meningeal congestion	Perivascular lymphocytic infiltration	Rabies
15.	The animal was undergoing euthanasia and sent for postmortem examination	NAD	NAD	Pneumonia
16.	The animal was brought in dead condition	NAD	NAD	Hepatitis
17.	The animal was brought in dead condition	NAD	NAD	Pleural mesothelioma
18.	The animal was brought for postmortem examination	NAD	NAD	Lymphoma
19.	The animal was showing aggressive behavior	Revealed mild meningeal congestion	Cerebellum showed round nucleated and vacoulated cytoplasm	Rabies
20.	The animal was showing unusual barking and difficulty in respiration	Revealed mild meningeal congestion	Perivascular lymphocytic infiltration with neutrophilic vacoulation and diffuse mild gliosis	Rabies
21.	The animal was limping, showing aggressive behavior and frequent barking with unsual voice	Revealed mild meningeal congestion	Perivascular lymphocytic infiltration, subdural haemorrhages	Rabies
22.	The animal was brought in dead condition	NAD	NAD	Ehrlichiosis
23.	The animal was showing aggression and pedaling of limbs	Revelaed severe meningeal congestion	Subdural haemorrhages	Rabies
24.	The animal was brought in dead condition	NAD	NAD	Poisoning
25.	The animal had vomition and diarrhoea	NAD	NAD	Gastritis
26.	The animal had difficulty in respiration	Revealed mild meningeal congestion	Subdural haemorrhages	Pneumonia
27.	The animal had respiratory distress	Revealed meningeal blood vessel enlarged	NAD	Pneumonia & glomerulonephritis

Grossly, meningeal congestion and hemorrhages were the common lesions observed in brain tissues during the study period (Figure 1). Abd El Rahman *et al.* (2015) and Andadari *et al.* (2024) reported meningeal congestion in canine affected with rabies virus which concurred with our findings.

Histopathological changes observed were sub-dural haemorrhages, multifocal gliosis and marked perivascular cuffing of lymphocytes (Figure 2). Intracytoplasmic inclusion bodies were observed in the cerebrum of dog affected with canine rabies virus (Figure 3). Perivascular lymphocytic infiltration was the common histopathological change observed in brain tissues suspected for rabies and the observation concurred with the findings of earlier workers (Galan *et al.,* 2014, Beck *et al.,* 2017, Markbordee *et al.,* 2024). Neuronal necrosis, subdural haemorrhages and gliosis were observed in brain tissues of dogs clinically affected with rabies virus and the finding was also reported by earlier worker (Abd El Rahman *et al.,* 2015). Presence of intracytoplasmic inclusion bodies was the most frequent histopathological lesion observed associated with canine rabies virus (Beigh *et al.,* 2017, Ashwini *et al.,* 2024, Markbordee *et al.,* 2024) however inclusion bodies could be observed in 1/8 brain tissue sample although the examination of brain impression smears from hippocampus were positive for the presence of negri bodies of rabies virus (Figure 4) in the eight clinically suspected cases of rabies which was similar to that reported by Pharande *et al.* (2017) and Ramkumar *et al.* (2025)

Fig. 1: Dog – Brain – Severe meningeal congestion

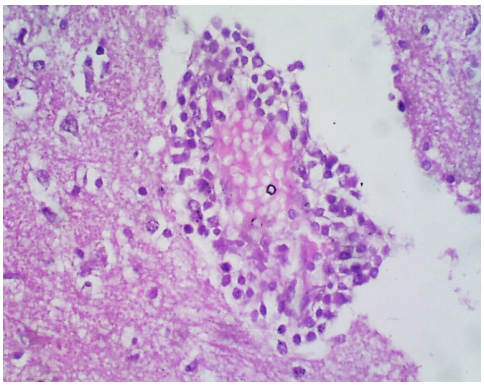

Fig. 2: Dog - Brain - Rabies - Perivascular lymphocytic infiltration -H&E x400

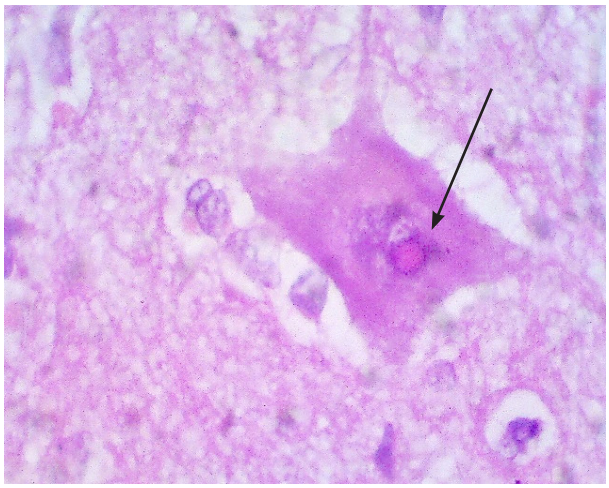

Fig. 3: Dog – Brain – Rabies – Intracytoplasmic inclusion bodies, HE x 1000

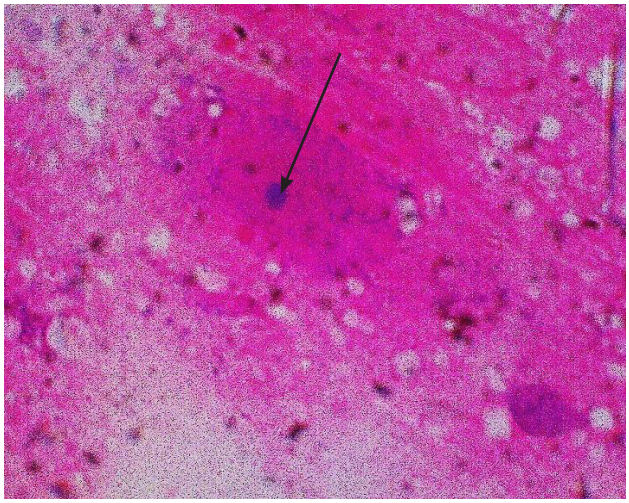

Fig. 4: Dog – Brain impression smear – Negri body in cytoplasm of neuron – Van Gieson's stain x 1000

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