

Title: **ADVOCACY OF CLINICAL CRITERIA FOR RABIES DIAGNOSIS IN LIVING DOGS**

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Keywords Rabies dogs, Clinical diagnosis, live dogs, 10 days observation

Abstract The authors studied the predictive value of five symptoms criteria for clinical diagnosis of rabies in living dogs.

Original Article

Advocacy of Clinical Criteria for Rabies Diagnosis in Living Dogs

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ABSTRACT

Objective: The authors studied the predictive value of five symptoms criteria for clinical diagnosis of rabies in living dogs.

Design: study of criteria in a retrospective and prospective study.

Material and Method: studies were conducted at Anti Rabies Clinic J.A.Group of Hospitals, G. R. Medical College, Gwalior. The authors evaluated 11987 dogs that were kept under observation for 10 days after their sin of bite. To test the predictive value of the five criteria, a prospective study of rabies suspected dogs was also evaluated.

Results and Conclusion: The five symptoms criteria explained 82% (95% CI, 81-83) sensitivity, 100% (95% CI, 100) specificity and 90% (95% CI, 91-93) accuracy for the clinical diagnosis of suspected rabies dogs. They can be used for a presumptive diagnosis and may suggest in prioritizing post-exposure treatment and stipulated urgent rabies control measures

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INTRODUCTION

Rabies is communicable during the period of salivary shedding of rabies virus. Experimental and historic evidence document that dogs, cats, and ferrets shed virus a few days prior to clinical onset and during illness. Clinical signs of rabies are variable and include impedence, dysphasia, cranial nerve deficits, abnormal behaviour, ataxia, paralysis, altered vocalization, and seizures. Progression to death is rapid¹.

The most important question concerning the actual risk after dog bite exposure and it is also essential for evidence-based post exposure treatment plan. The transmission of rabies risk from dogs to humans depends on the entry of infected saliva into the breached skin and the excretion of rabies virus is the precise time that excretion in the saliva begins¹. In most instances it is assumed that virus appears to be excreted in the saliva just before the onset of clinical signs of disease. Early investigators reported isolating rabies virus from experimentally infected dogs as early as seven days before signs of disease².

An evidence-based post exposure treatment plan requires assessment of the actual risk of the exposure³. The intravital diagnosis of rabies in humans is possible on the basis of the case history and the careful observation of clinical signs. It can often, be detected by techniques such as demonstration of

neutralizing antibodies in spinal fluid and virus detection by nucleic acid sequence based amplification (NASBA) or Polymerase chain reaction (PCR) in saliva, urine or CNS fluid and corneal impression or skin biopsy by fluorescent antibody test (FAT)^{4,5,6}. However, no reports have been published demonstrating the value of intravital laboratory diagnosis of rabies in dogs. It has been shown that post-mortem diagnostic techniques are of no value for intravital diagnosis of rabies in dogs and cats⁷. The definitive diagnosis in dogs is done by testing brain samples using laboratory methods recommended the WHO³. If there is a likely rabies exposure, WHO recommends immediate euthanasia of the responsible animal and examination of neural tissue using fluorescent antibody techniques³. This is difficult or even impossible in most Buddhist or Hindu societies which abhor killing the animal and prefer having it under observation for clinical signs. Lack of early recognition of an impending rabies epidemic can result in wider spread, human deaths and great difficulties in controlling the disease⁸.

Since a systematic approach to the clinical diagnosis of rabies in living dogs has been neglected by the literature, the authors described five cardinal clinical signs, method based on observing the animal and recording certain signs that allow or exclude a presumptive diagnosis of rabies.

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MATERIAL AND METHOD

Histories and clinical signs were analyzed from 11987 records of rabies suspected dogs that had bitten humans between 2000 and 2012. The authors selected five criteria of health status during observation: 1) Bite to two or more person without provocation, 2) Restless, and wandering aimlessly, 3) Excessive salivation 4) Unable to bark 5) Appear ill and don't eat & drink. These data were analyzed for sensitivity, specificity and the accuracy of clinical signs and symptoms suspected for the victim, if the dog had rabies infection and died during 10 days observation period. These five criteria were also used in a prospective study involving 2038 dogs observed from 2010 to 2012. The sensitivity, specificity and accuracy of these criteria were calculated according to the method described by Mausner and Bahn⁹. In addition to sensitivity and specificity the performance of this clinical finding screening is measured by its "predictive value" which reflects the diagnostic power for the presumptive rabid diagnosis in living dogs according to clinical symptoms present. The predictive value of a positive clinical finding indicates the probability that a dog will not survive up to 10 days after bite. In practice 100% sensitivity seldom occurs, so performance of this clinical findings is better measured by its predictive value of positive findings¹⁰

RESULTS

In the retrospective study, the authors found 100percent dogs died within 10 days of observation

Table 1
Sensitivity and specificity of the clinical sign criteria for predicting the dog survival after their bite to human

Study	Status of Clinical signs	Death in 10 days		Total
		Yes	No	
In retrospective reports 2000-2010	Clinical signs present (Abnormal behaviour)	4422	0	4422
	Clinical signs absent (Normal behaviour)	965	4562	5527
In prospective reports 2011-2012	Clinical signs present (Abnormal behaviour)	917	0	917
	Clinical signs absent (Normal behaviour)	191	930	1121
In combined report 2000-2012	Clinical signs present (Abnormal behaviour)	5339	0	5339
	Clinical signs absent (Normal behaviour)	1156	5492	6648

period those who had five cardinal clinical signs (Table 1) and that these criteria had 82% sensitivity, 83.0% specificity and 90.0% accuracy (Table 2). In the prospective study, the sensitivity, specificity and accuracy were 83.0%, 100.0% and 91.0% respectively (Table 2). The combined results for the 2 studies are 82.0% sensitivity, 100.0% specificity and 90.0% accurate (Table 2). It also shows the predictive value of positive clinical findings was calculated to be 100percent (95%CI, 100percent) in retrospective, prospective and combined study. They indicate that dogs showing abnormal behaviour as explained do not have any possibility to survive after 10 days, in one million cases of dog bites ($p < 0.0000$). They also indicate with accuracy that approximately 17% false positives should be expected. It is likely that this is due to the broad/nonspecific nature of clinical signs listed in criteria.

DISCUSSION

The authors had learned in a previous study that dogs suspected of being rabid due to abnormal behaviour and submitted for observation did not remain alive for more than 10 days¹¹

The 10-day quarantine period ensures that the dog or cat remains available for observation of signs of rabies. If the animal remains healthy during the 10 days, it's an indication that the animal did not have the rabies virus in its saliva at the time of the bite and the victim does not have to receive an expensive and unpleasant series of vaccinations to prevent rabies. It is important that the animal be strictly confined at all times so that it cannot run away, be injured or infected by another animal.

The treatment should be started immediately after the bite. The treatment may be modified if animal involved (dog or cat) remains healthy throughout the observation period of 10 days by converting post-exposure prophylaxis to pre-exposure vaccination by

Table 2
Statistical Analysis of different study for dog status

Statistical Parameter	Retrospective study	Prospective study	Combined study
Sensitivity (95% CI)	0.82 [0.81,0.83]	0.83 [0.80,0.85]	0.82 [0.81,0.83]
Specificity (95% CI)	1.00 [1.00,1.00]	1.00 [0.99,1.00]	1.00 [1.00,1.00]
Accuracy (95% CI)	0.90 [0.90,0.91]	0.91 [0.89,0.92]	0.90 [0.90,0.91]
Predictive value of +ve result (95% CI)	1.00 [1.00,1.00]	1.00 [0.99,1.00]	1.00 [1.00,1.00]
p-value	0.000000	0.000000	0.000000

skipping the vaccine dose on day 14 and administering it on day 28 while using Essen Schedule. The observation period is valid for dogs and cats only. The natural history of rabies in mammals other than dogs or cats is not fully understood and therefore the 10-day observation period may not be applicable¹².

The authors conclude that the “five cardinal signs diagnosis” method can be an aid for an early presumptive diagnose of rabies in live dogs. It should not be used as sole basis for treatment decisions of a possibly rabies exposed patient. It can, however, help the physician, veterinarian and public health official to prioritize treatment and to decide whether sacrificing and laboratory examination of the dog is indicated. This can be of value in aborting a new rabies outbreak before it spreads further

We conclude that our study supports the current World Health Organization recommendations for 10 days of observation of dogs and cats suspected of having rabies, if euthanasia is inappropriate or not accepted¹³

This would then represent an additional clinical criterion against a diagnosis of rabies which would be of particular interest where necropsy and reliable laboratory diagnoses is not possible. It should be noted that several of the five criteria may have special significance and absence of them strongly suggests that the dog is not rabid. The same can be said for a dog that has been ill but stable for more than 10 days. The authors conclude that the “five cardinal signs present” method can be an aid for an early presumptive diagnose of rabies in live dogs. It should not be used as sole basis for treatment decisions of a

possibly rabies exposed patient. It can, however, help the physician, veterinarian and public health official to prioritize treatment and to decide whether sacrificing and laboratory examination of the dog is indicated. This can be of value in aborting a new rabies outbreak before it spreads further.

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