Six Criteria for Rabies Diagnosis in Living Dogs

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Objective: *The authors studied the predictive value of six criteria for clinical diagnosis of rabies in living dogs.*
Design: *Identify and test the criteria in a retrospective and prospective study.*
Material and Method: *Both studies were conducted at the Rabies Diagnostic Unit, Queen Saovabha Memorial Institute, Thai Red Cross Society, Bangkok. The authors reviewed 1,170 dogs that were kept under observation for 10 days after they exhibited abnormal behavior. To test the predictive value of the six criteria, a prospective study involving 450 rabies suspected dogs was also performed.*
Results and Conclusion: *The six criteria demonstrated 90.2% sensitivity, 96.2% specificity and 94.6% accuracy for the clinical diagnosis of rabies. They can be used for a presumptive diagnosis and may help in prioritizing post-exposure treatments and institute urgent rabies control measures.*

Keywords: *Rabies, Clinical diagnosis, Live Dogs, Criteria*

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Rabies remains a public health problem and worldwide human deaths are underreported and probably exceed 50,000 cases annually[1]. In Thailand, the incidence of human rabies has decreased over the past decade but rabies is still endemic and there were 22 deaths in 2003[2]. Dogs are the primary reservoir for rabies in the Kingdom. Canine rabies exposed humans represent an emergency management problem for physicians, veterinary scientists and public health officials. An evidence-based post exposure treatment plan requires assessment of the actual risk of the exposure[3]. Lack of early recognition of an impending rabies epidemic can result in wider spread, human deaths and great difficulties in controlling the disease[4].

The intravitam diagnosis of rabies in humans is possible on the basis of the case history and the careful observation of clinical signs. It can often, but not always, be confirmed using sophisticated laboratory 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)[5-11]. However, no reports have been published demonstrating the value of intravitam laboratory diagnosis of rabies in dogs. It has been shown that postmortem diagnostic techniques are of no value for intravitam diagnosis of rabies in dogs and cats[9-12].

The definitive diagnosis in dogs is done by testing brain samples using laboratory methods recommended the WHO[3]. If there is a likely rabies exposure, WHO recommends immediate euthanasia of the responsible animal and examination of neural tissue using fluorescent antibody techniques. This is difficult or even impossible in most Buddhist or Hindu societies which abhor killing the animal and prefer having it caged and observed for clinical signs.

Since a systematic approach to the clinical diagnosis of rabies in living dogs has been neglected by the literature, the authors describe a step by step 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 1,170 records of rabies suspected dogs that had bitten humans between 1988 and 1996. The authors selected six criteria: 1) the age of the dog at the time of the bite, 2) the state of health during observation and various symptoms and signs and the sequence with which they presented. 3)- 6). When the dog died within 10 days of observation, brain tissues were examined by fluorescent antibody technique[3] and by mouse inoculation test. Data were analyzed for sensitivity, specificity and accuracy.

The six clinical criteria studied are:

1) Age of the dog?

a) Less than 1 month ----------> not rabies

b) One month or more or not known -----> go to 2)

2) State of health of the dog?

a) Normal (not sick) or sick more than 10 days ---> not rabies

b) Sick less than 10 days or not known -----> go to 3)

3) How did the illness evolve?

a) Acute onset from normal health --------> not rabies

b) Gradual onset or not known ----------> go to 4)

4) How was the condition during the clinical course in last 3-5 days?

a) Stable or improving (with no treatment) --> not rabies

b) Symptoms and signs progressing or not known --> go to 5)

5) Does the dog show the sign of "Circling"?

(It stumbles or walks in a circle and hits its head against the wall as if blind.)

a) Yes ----------> not rabies

b) No or not known ----------> go to 6)

6) Does this dog show at least 2 of the 17 following signs or symptoms during the last week of life?

a) Yes ----------> rabies

b) No or showing only 1 sign ----------> not rabies

1. Drooping jaw (Fig. 1).
2. Abnormal sound in barking.
3. Dry drooping tongue.
4. Licking its own urine.
5. Abnormal licking of water.
6. Regurgitation.
7. Altered behavior.
8. Biting and eating abnormal objects.
9. Aggression.
10. Biting with no provocation.
11. Running without apparent reason.
12. Stiffness upon running or walking.
13. Restlessness.
14. Bites during quarantine (Fig. 2).
15. Appearing sleepy.
16. Imbalance of gait.
17. Frequent demonstration of the "Dog sitting" position (Fig. 3).

These six criteria were also used in a prospective study involving 450 live dogs observed from 1997 to 2002. The sensitivity, specificity and accuracy of these criteria were calculated according to the method described by Mausner and Bahn[13].

Results

In the retrospective study, the authors found that these criteria had 90.3% sensitivity, 96.0% specificity and 94.6% accuracy (Table 1). In the prospective study, the sensitivity, specificity and accuracy were 90.0%, 97.0% and 94.7% respectively (Table 1). The combined results for the 2 studies are 90.2% sensitivity, 96.2% specificity and 94.6% accurate (Table 1). They indicate that approximately 10% false negatives and 4% false positives should be expected. It is likely that this is due to the broad/nonspecific nature of clinical signs listed in criteria 6. In addition, dogs presenting in a coma can not be examined using this method.

Discussion

The authors had learned in a previous study that dogs suspected of being rabid due to abnormal behavior and submitted for observation did not remain

Table 1. Comparison the retrospective, prospective and combined results collected between 1988-1996, 1997-2002 and 1988-2002

		Laboratory diagnosis*	
		Positive	Negative
Six clinical in retrospective study 1988-1996	Positive	250 (90.3%)	36
	Negative	27	857 (96.0%)
	Total	277	893
Six clinical criteria in prospective study 1997-2002	Positive	135 (90%)	9
	Negative	15	291 (97.0%)
	Total	150	300
Combined results of retrospective and prospective studies 1988-2002	Positive	385 (90.2%)	45
	Negative	42	1148 (96.2%)
	Total	427	1193

* If the dog stayed alive more than 10 days it was not rabies. If the dog died before 10 days of observation, the authors confirmed brain by FAT and MIT

Fig. 1 Drooping jaw

Fig. 2 Bites during quarantine

Fig. 3 "Dog sitting" position

alive for more than 10 days[14]. 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 six criteria may have special significance. Circling (criterion 5), strongly suggests that the dog is not rabid but has dog distemper; a paramyxovirus-caused encephalitis. A dog that is less than 1 month old and still has a healthy mother, has never been found to be rabid at our institution. The same can be said for a dog that has been ill but stable for more than three days prior to admission.

The authors conclude that the "six step" 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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References

1. World Health Organization: World survey of rabies No 34 for the year 1998. WHO/CDS/CSR/APH/99.6.
2. Rabies statistics. Annual Epidemiology Surveillance Report, Division of Epidemiology, Ministry of Public Health, Thailand, 1980-2003.
3. WHO Expert Committee on Rabies. Eighth report. WHO Technical Report Series. Geneva: World Health Organization, 1992; 824: 7-8.
4. Windiyaningsih C, Wilde H, Meslin FX, Suroso T, Widarso HS. The rabies epidemic on Flores Island, Indonesia 1998-2003. J Med Assoc Thai 2004; 87: 1389-93.
5. Hemachudha T. Human rabies: clinical aspects, pathogenesis and potential therapy. In: Rupprecht CE, Dietzschold B, Koprowski H, eds. Lyssaviruses. Berlin, Germany: Springer-Verlag, 1994: 121-44.
6. Bingham J, Mlambo P. Ante-mortem diagnosis of human rabies by the skin biopsy technique: three case reports from Zimbabwe. Cent Afr J Med 1995; 41: 258-60.
7. Crepin P, Audry L, Rotivel Y, Gacoin A, Caroff C, Bourhy H. Intravitam diagnosis of human rabies by

PCR using saliva and cerebrospinal fluid. J Clin Microbiol 1998; 36: 1117-21.
8. Zaidman GW, Billingley A. Corneal impression test for the diagnosis of acute rabies encephalitis. Ophthalmology 1998; 105: 249-51.
9. Wacharapluesadee S, Hemachudha T. Rapid diagnosis of human rabies using nucleic acid sequence based amplification. Lancet 2001; 358: 892-3.
10. Wacharapluesadee S, Hemachudha T. Urine as a source of rabies RNA detection in human rabies diagnosis. Clin Infect Dis 2002; 34: 874-5.
11. Bourhy H, Sureau P. Laboratory methods for rabies diagnosis. Paris, France: Institut Pasteur, 1991.
12. Hemachudha T, Phanuphak P, Sriwanthana B, Manutsathit S, Phanthumchinda K, Siriprasomsup W, et al. Immunologic study of human encephalitic and paralytic rabies. Am J Med 1988; 84: 673-7.
13. Mausner JS, Bahn AK. Epidemiology and introductory text. Philadelphia, London, Toronto: WB Sauders, 1974: 245.
14. Tepsumethanon V, Lumlertdacha B, Mitmoonpitak C, Sitprija V, Meslin FX, Wilde H. Survival of naturally infected rabid dogs and cats. Clin Infect Dis 2004; 39: 281-3.

เกณฑ์ 6 ข้อที่ใช้ในการวินิจฉัยโรคพิษสุนัขบ้าในสุนัขที่ยังมีชีวิตอยู่

วีระ เทพสุเมธานนท์, เฮนรี ไวล์ด, ฟรองซัวส์ เมสลิน

วัตถุประสงค์*: เป็นการศึกษาเกณฑ์ 6 ข้อที่ใช้ในการวินิจฉัยโรคพิษสุนัขบ้าในสุนัขที่ยังมีชีวิตอยู่*
ความมุ่งหมาย*: นำเกณฑ์มาทดสอบแบบศึกษาย้อนหลังและศึกษาไปข้างหน้า*
วัสดุและวิธีการ*: ทำการศึกษาที่หน่วยชันสูตรโรคพิษสุนัขบ้า สถานเสาวภา สภากาชาดไทย กรุงเทพฯ โดยใช้เกณฑ์ 6 ข้อศึกษาแบบย้อนหลังกับรายงานการตรวจโรคพิษสุนัขบ้าในสุนัขที่มีชีวิตอยู่ทั้งหมด 1,170 ตัว และศึกษาแบบไปข้างหน้ากับสุนัขที่ยังมีชีวิตอยู่ที่นำมาฝากขัง 10 วัน เพื่อสังเกตดูอาการของโรคพิษสุนัขบ้าหลังจากที่แสดงความผิดปกติ จำนวน 450 ตัว*
ผลและสรุป*: พบว่าเกณฑ์ 6 ข้อที่ใช้ในการวินิจฉัยโรคพิษสุนัขบ้าในสุนัขที่ยังมีชีวิตอยู่นี้ มีความไวคิดเป็นร้อยละ 90.2, ความจำเพาะคิดเป็นร้อยละ 96.2 และมีความแม่นยำคิดเป็นร้อยละ 94.6 ซึ่งสามารถนำไปใช้วินิจฉัยเบื้องต้นในสุนัขที่สงสัยโรคพิษสุนัขบ้าได้ และอาจนำไปช่วยประกอบในการตัดสินใจรักษาผู้สัมผัสโรค หรือ การควบคุมโรคให้ได้เร็วขึ้น*