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CASE REPORT



## Failure of postexposure prophylaxis in a girl child attacked by rabid dog severing her facial nerve causing possible direct entry of rabies virus into the facial nerve

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### ABSTRACT

On January 4, 2019 an eight-year-old girl child was bitten by a suspected rabid dog over the left parotid region. After a 17-h delay, the child was brought for rabies postexposure prophylaxis (PEP) at Civil Hospital Theog and was administered complete PEP. On January 29, 2019, the child was again brought to Theog Hospital with complaints of having fever, difficulty in walking, neck drop, and ptosis. On examination, pediatrician found photophobia, phonophobia, and hydrophobia and subsequently the patient died of cardiac arrest. On postmortem examination, the facial nerve was found dissected and injured at the inner end of the parotid gland. A severed end toward the brain was swollen and edematous. The entire brain was extracted and sent to Central Research Institute Kasauli for confirmation of rabies, where it tested positive for rabies by Fluorescent Antibodies Test and Biological Test. In situations where sensitive parts such as the face are involved, a thorough wound wash with soap and water and application of antiseptics along with immediate PEP may save some lives by not allowing the virus enough time to attach to and infect the nerve cells.

### ARTICLE HISTORY

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### KEYWORDS

Rabies; PEP failure; facial nerve; rabies virus

### Introduction

Rabies is a viral zoonotic disease responsible for an estimated 59,000 human deaths and over 3.7 million disability-adjusted life years lost every year.<sup>1</sup> Most cases occur in Africa and Asia, with approximately 40% of cases in children aged < 15 years. Dogs are the most important reservoir for rabies viruses and dog bites account for > 99% of human cases.<sup>2</sup> Rabies can be prevented if timely prophylaxis is given to the bite victims in the form of rabies vaccine and rabies immunoglobulin (RIG) injection into the bite wounds.<sup>3,4</sup> From 2009 to 2017, there were 19 deaths due to clinical rabies reported at Indira Gandhi Medical College, Shimla, out of which 13 were from district Shimla mainly from Theog block due to suspected dog bites.<sup>5</sup> Rabies is endemic in Theog block, possibly due to some rabies focus in wild animals in the nearby forests.

### Methods

Staff at DDU Hospital Shimla in Himachal Pradesh started following new WHO rabies prophylaxis guidelines as soon as they were published in January 2018.<sup>6</sup> These essentially were comprised three intradermal injections of rabies vaccine on days 0, 3, and 7 and local wound infiltration of RIG where required. Subsequently, these guidelines were recommended to be followed throughout the state of Himachal Pradesh by the Director Health Services, Himachal Pradesh, through an official order dated May 29, 2018. Since February 2018, more than 6000 patients have been given PEP without any failure, even in children below 15 years. This case of a girl having PEP

failure alerted us and we decided to conduct a thorough investigation including postmortem examination to understand the reason for PEP failure.

### Case presentation

On January 4, 2019, an eight-year-old girl child was bitten by a suspected rabid dog at 5:30 PM. Next day at 10:30 AM, she was brought to the Civil Hospital Theog, in Shimla district of Himachal Pradesh. The parents of the girl child said that they did not wash the wound nor applied any antiseptic to the wound. Only superficial blood that oozed from the wound was wiped with a wet cloth. In the hospital, the wound was cleaned with normal saline, betadine, and then with spirit to remove any residual betadine so as not to interfere with the effectiveness of equine RIG (eRIG). The girl was administered 2 ml eRIG into the bite wounds until its depth that was sufficient to cover the entire surface of the wound as per the latest WHO guidelines 2018. The patient had deep lacerated wound over the left parotid region (**Figure 1**). While eRIG infiltration was being done, a white thread-like structure identified as a facial nerve was seen inside the wound and eRIG was infiltrated also around the nerve without disturbing the nerve itself. The child was administered three 0.1-ml doses of rabies vaccine intradermally in both deltoids skin on days 0, 3, and 7. The vaccine used was Vaxirab-N having potency of > 2.5 IU. The eRIG used was Premi-RAB having potency of 300 IU/ml.

On January 29, 2019, the girl child was again brought to Theog Hospital with complaints of having a single spike of



**Figure 1.** An eight-year-old girl with a deep lacerated facial wound over the left parotid region involving facial nerve.

fever four days previously, difficulty in walking for three days, and neck drop with ptosis for two days. On examination, the pediatrician found photophobia, phonophobia, and off and on hydrophobia along with frothing from the mouth and bruxism (tooth grinding). On examination, the child was conscious, obliging to command but not oriented to time, place, and person. Her heart rate was 104/min, respiratory rate was 42/min, and capillary refill time was less than 2 s. Glasgow Coma Scale (GCS) was E4M3V1, pupils were 2 mm sluggishly reacting to light bilaterally. GCS score of 8/15 was suggestive of encephalopathy requiring intubation. The intubation was done and the child was kept on manual intermittent positive pressure respiration (IPPR). On motor systemic examination, muscle bulk was normal bilaterally, and the child had generalized hypotonia involving neck flexors, shoulder muscles, and hip muscles more than wrist muscle, elbows, and knees. Child was having generalized a-reflexia with mute planters. Muscle power was more affected in proximal joints of shoulder (3/5), hip (2/5), and neck (0/5). Child was able to localize sensory stimulus but was unable to move her eyes toward the light source suggesting weakness of third, fourth, and sixth nerves. Gag reflex was absent. Chest was bilaterally clear without any added sounds. Heart sounds were normal. Abdomen was soft and no organomegaly was found. Considering flaccid paralysis involving proximal more than distal muscles with a-reflexia and mute planters and history suggestive of photophobia, phonophobia, and hydrophobia with history of dog

bite 25 days previously, a possibility of rabies encephalopathy was considered as the possible diagnosis. Since the child was given full rabies prophylaxis and had a history of fever four days previously with sudden onset of neurological deterioration, viral meningioencephalitis was probable. The child suffered a cardiac arrest and was immediately shifted to emergency care and started on manual IPPR with cardiopulmonary resuscitation as per defined protocol. Child also received three doses of adrenaline during this period but could not be revived. Patient died that same afternoon and her body was sent for postmortem examination to Indira Gandhi Medical College, Shimla. The postmortem report stated as follows: Partially healed laceration present over left side of face, 4 cm × 3 cm with base toward ear and apex toward angle of mouth. The skin of the defect is not present; muscles are visible. On dissection, facial nerve (main branch about 0.5 mm thickness) is found dissected and injured at inner end of parotid gland. Severed end (toward brain) is swollen and edematous. The laceration is consistent with canine bite. No active infection is present at healed wound. However, some superficial whitish slough is present on peripheries. There is a healed puncture wound over inferior border of left mandible, around 0.25 cm in circumference (may be by lower canines of dog). Other postmortem findings were that the brain was congested, larynx and trachea were normal, but both pleurae and lungs were grossly congested and edematous. Liver, spleen, and kidneys were congested. Peritoneum was congested but stomach mucosa, small intestine, large intestine, and genital were normal. Whole brain was extracted and sent to the Central Research Institute Kasauli for confirmation of rabies, where it tested positive for rabies both by Fluorescent Antibodies Test and Biological Test. Explicit written consent of mother of the girl was taken for both postmortem as well as using a picture of the girl for educational purposes only.

## Discussion

Some PEP failures have been reported even following administration of complete PEP to patients, especially in children bitten on the face.<sup>7,8</sup> Some experts advocate the use of pre-exposure prophylaxis (PrEP) to save children from rabies.<sup>9</sup> A recent modeling study<sup>10</sup> concludes that “PrEP as part of the EPI program is highly unlikely to be an efficient use of resources and should only be considered in extreme circumstances, where incidence of rabies exposures is high in populations which cannot access timely PEP.” Our case presentation underlines that even pre-exposure prophylaxis in endemic countries as being done by some countries<sup>11</sup> may be unable to save many such children after they have been bitten on the nerve by a rabid dog, in that case, rabies virus may attach directly to the nerve and hide itself in an immune-protected environment inside the nerve, to cause rabies. Our case is consistent with the findings of another study that an 18-h delay is enough for rabies virus to reach trigeminal ganglia<sup>12</sup> as in our case of girl where the delay for seeking PEP was 17 h. In such situations, thorough wound washing with soap and water and application of antiseptics along with immediate PEP may save some lives by not allowing the virus enough time to attach to the nerves. Since

February 2018, more than 6000 patients have been given PEP without any failure in the state of Himachal Pradesh, even in children below 15 years. Therefore, new WHO Rabies Prophylaxis guidelines are safe, time-saving, cost-saving, and life-saving except in rare situations like the current case with direct nerve involvement, no immediate wound care, and no access to immediate PEP. Even the WHO position paper has defined such failures due to delay in seeking PEP, improper wound care, unnoticed wounds, direct nerve inoculation, and lack of patient compliance with vaccination schedules among other factors, as contributing to PEP failure and subsequent death.<sup>13</sup> The WHO position paper recommends thorough washing and flushing of wounds with soap and water and application of viricidal agents. In this case, the parents did not perform thorough wound washing and flushing with soap and water nor the hospital staff did so, which may have implications in this PEP failure. Hospital staff did gently clean the wound with normal saline and antiseptics but without wound washing and flushing as prescribed.

## Conclusion

The delay in seeking PEP in cases of injury to the facial nerve may prove fatal if thorough wound care is not taken and PEP is not administered immediately. In situations where sensitive parts such as the face are involved, thorough wound washing with soap and water and application of antiseptics along with immediate PEP may save some lives by not allowing the virus enough time to attach to the nerves and cause rabies.

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## Disclosure of potential conflicts of interest

No potential conflicts of interest were disclosed.

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## References

- Hampson K, Coudeville L, Lembo T, Sambo M, Kieffer A, Attlan M, Barrat J, Blanton JD, Briggs DJ, Cleaveland S, et al. Estimating the global burden of endemic canine rabies. *PLoS Negl Trop Dis*. 2015. <https://www.ncbi.nlm.nih.gov/pubmed/25881058?dopt=Abstract>.
- Fooks AR, Cliquet F, Finke S, Freuling C, Hemachudha T, Mani RS, Müller T., Nadin-Davis S, Picard-Meyer E, Wilde H, Banyard AC. Rabies. *Nat Rev Dis Primers*. 2017;3. <https://www.nature.com/articles/nrdp201791#rightslink>.
- Bharti OK, Madhusudana SN, Gaunta PL, Belludi AY. Local infiltration of rabies immunoglobulins without systemic intramuscular administration: an alternative cost effective approach for passive immunization against rabies. *Hum Vaccin Immunother*. 2016; <https://www.ncbi.nlm.nih.gov/pubmed/26317441>.
- Bharti OK, Madhusudana SN, Wilde H. Injecting rabies immunoglobulin (RIG) into wounds only: a significant saving of lives and costly RIG. *Hum Vaccin Immunother*. 2017; <https://www.ncbi.nlm.nih.gov/pubmed/28277089>.
- Bharti OK, Chand R, Chauhan A, Rao R, Sharma H, Phull A. "Scratches/abrasions without bleeding" Cause rabies: a 7 years rabies death review from Medical College Shimla, Himachal Pradesh, India. *Indian J Community Med*. 2017;42(4):248–49. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5682730/>.
- Rabies vaccines and immunoglobulins: WHO positionSummary of 2017 updates. [accessed 2019 April 25] [https://www.who.int/rabies/resources/who\\_cds\\_ntd\\_nzd\\_2018.04/en/](https://www.who.int/rabies/resources/who_cds_ntd_nzd_2018.04/en/).
- Wilde H. Failures of post-exposure rabies prophylaxis. *Vaccine*. 2007;25:7605–09. <https://www.ncbi.nlm.nih.gov/pubmed/17905484>.
- Tinsa F, Borgi A, Jahouat I, Boussetta K. Rabies encephalitis in a child: a failure of rabies post exposure prophylaxis? *BMJ Case Rep*. 2015;bcr2014206191. doi:10.1136/bcr-2014-206191.
- Harish Rekha. Rabies vaccine: a case for optional childhood vaccination. *Indian Pediatr*. 2007;44:792–93. <https://www.indianpediatrics.net/oct2007/793.pdf>.
- Hampson K., Abela-Ridder B., Bharti O., Knopf L, L chenne M, Mindekem R, Tarantola A, Zinsstag J, Trotter C. Modelling to inform prophylaxis regimens to prevent human rabies. *Vaccine*. 2018. doi:10.1016/j.vaccine.2018.11.010.
- Kessels JA, Recuenco S, Navarro-Vela AM, Deray R, Vigilato M, Ertl H, Durrheim D, Rees H, Nel LH, Abela-Ridder B, et al. Pre-exposure rabies prophylaxis: a systematic review. *Bull World Health Organ*. 2016;95(3):210–219C. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5328107/>.
- Shankar V, Dietzschold B, Koprowski H. Direct entry of rabies virus into the central nervous system without prior local replication. *J Virol*. 1991;65(5):2736–38. <https://pdfs.semanticscholar.org/335c/de0a23d70bc48a604a320142fb8228c6654f.pdf>.
- Rabies vaccines: WHO position paper – april 2018. *Who Weekly Epidemiological Record*. 2018 APRIL 20;16(93):201–20. <https://apps.who.int/iris/bitstream/handle/10665/272371/WER9316.pdf?ua=1>.