



**Figure 1** Lateral cervical spine radiograph showing absence of the posterior arches of the atlas.

## DISCUSSION

Congenital defects of the ring of the atlas may be asymptomatic or may present with neurological symptoms secondary to atlanto-axial instability and resultant cord compromise.<sup>1</sup> They may also be detected on plain radiographs after trauma as in this case. This case serves to emphasise that not all plain film cervical abnormalities, even in the setting of acute trauma, are traumatic in origin and the important adjunctive role of computed tomography in accurately delineating equivocal cases.<sup>2</sup> It also emphasises that treatment of these anomalies should be dependent on the presence or absence of atlanto-axial instability, with or without neurological symptoms.<sup>3</sup> Most patients can be managed conservatively, however a small number of patients with instability will require operative stabilisation. Instability can be shown on lateral flexion/extension plain radiographs or magnetic resonance



**Figure 2** Computed tomography of the atlas showing the absent posterior arches and failure of the anterior arches to fuse in the midline.

imaging of the cervical spine. The second method has the advantage of assessing any signal change of the cord during the manoeuvre and should be the investigation of choice.

## Authors' affiliations

A W O'Sullivan, F Mc Manus, National Spinal Injuries Unit, Mater Misericordiae Hospital, Dublin, Ireland

Correspondence to: Mr A O'Sullivan, 24 Queens House, Fennell Close, Maidstone, Kent ME16 0SZ, UK; awos@eircom.net

## REFERENCES

- 1 Currarine G, Rollin SW, Diehl JT. Congenital defects of the posterior arch of the atlas. *Am J Neuroradiol* 1994;**15**:249-54.
- 2 Bauchulis BL, Long WB, Hynes GD, et al. Clinical indications for cervical spine radiographs in the traumatized patient. *Am J Surg* 1987;**153**:473-8.
- 3 Clarke CR. Congenital malformations. In: *The cervical spine*. 3rd edn. Philadelphia: Lippincott-Raven, 1998:336-7.

# Hypovolaemic shock by rat bites. A paradigmatic case of social deprivation

A Donoso, J León, G Rojas, M Ramírez, B Oberpaur

*Emerg Med J* 2004;**21**:640-641. doi: 10.1136/emj.2003.004911

This report describes an unusual complication of a comparatively common problem of rat bites, causing a near fatal case of hypovolaemic shock. An 8 month old girl was bitten on her head and hands by Norway rats (*Rattus norvegicus*) while sleeping after falling from her parent's bed. She could not be attended to because of her parents' alcoholic condition. She was found in hypovolaemic shock. She required ventilatory and haemodynamic support for five days. At late follow up, the child had no medical problem. In this case, evident social risk factors include extreme poverty, poor hygiene, and rat infested environment, which are frequently associated in potential rat bite victims.

There is scarce information in the medical literature about death or significant complications attributable to house rat bites in children. We present an extraordinary case of hypovolaemic shock in a child, which illustrates a near fatal illness in some conditions of severe social deprivation.

## CASE REPORT

An 8 month old girl was left in bed the night before the admission to hospital while sleeping together with her parents who were drunk. She fell down during the night. Her aunt visited them the morning after and she noticed that the baby was lying under the parent's bed severely ill. Her parents did not give any warning of the situation or that the baby was crying. Upon reporting the case to the police she was brought to the emergency room. The parents had no police records and the family had not been evaluated by social services.

On physical examination, the patient had extensive frontal wounds, on the right (1×2.5×0.5 cm) and left sides (7.5×2.5×0.5 cm) of the forehead. Additionally, multiple puntiform wounds were found on the face, nose, mouth, scalp, and both hands (fig 1). The patient was drowsy, cold, pale, dehydrated, with decreased capillary refill time and heart rate of 180/min. Arterial blood pressure was 91/54 mm Hg. She weighed 8 kg. There was no clinical evidence of old injuries on the physical examination. The skeletal survey and brain CT scan showed no abnormality. Significant blood loss



**Figure 1** Multiple wounds on right hand caused by rat bites (*Rattus norvegicus*).

from her wounds was evident. Normal saline (20 ml/kg) was given by intraosseous infusion; blood gas measurements showed metabolic acidosis (pH 7.1).

The patient was transferred to the paediatric intensive care unit. Considering the history given by the relatives and the type of the wounds, she was diagnosed in hypovolaemic shock caused by rat bites and she was intubated and mechanically ventilated. Pulse, perfusion, and arterial pressure improved significantly with red cells transfusion, fresh frozen plasma, normal saline, and albumine infusions (total volume 70 ml/kg). Antimicrobial treatment with penicillin, clindamycin, and cefotaxime was started intravenously.

The laboratory tests showed a blood cell count with leucocytosis of  $81 \times 10^3/\mu\text{l}$ ; packed cell volume 20%; haemoglobin 70.0 g/l; platelet count  $416 \times 10^3/\mu\text{l}$ . Lactacidaemia initially was 0.74 mmol/l (normal value  $<0.22$  mmol/l), blood sugar 17.2 mmol/l and prothrombin time 26 seconds.

During the first day of the clinical course, haemodynamic stability was obtained. Rabies prophylaxis was given (intramuscular Verorab vaccine). Tetanus immunisation was not given. The surgical treatment was performed 36 hours after admission. Lacerations with associated soft tissue devitalisation were debrided. Blood cultures were negative. The remainder of the course was uneventful. She was finally discharged from the paediatric intensive care unit at the seventh day.

The medical history disclosed that the family lived in an urban slum in a single room house with dust on the floor, close to sewer ducts where the Norway rats (*Rattus norvegicus*) freely emerged onto the surface level.

The patient stayed under legal protection, for neglect and mistreatment.

## DISCUSSION

This patient represents a rare and dramatic case in which social deprivation, poverty, and alcoholic addiction in a rat infested environment led to a severe and potentially fatal disease of a child.

Domestic dogs and cats cause most of the animal bites in children. It is very unusual that rat bites can originate multiple and extensive wounds that cause hypovolaemic shock.

Previously, a similar case was reported by Yanai *et al.* In that case a 3 month old girl died because of blood loss resulting from multiple rat bites.<sup>1</sup> Usually the wounds caused by rat bites in children tend to occur after death.

Rat bites primarily affect children under 5 years old. Most bites are inflicted on the face and hands and usually occur at night while sleeping.<sup>2</sup>

Norway rat (*Rattus norvegicus*) is also known as the brown rat, house rat, wharf rat, or sewer rat. Its colour is dark brown to black and the total length is 30–45 centimetres. The tail is shorter than the length of head and body. Adult Norway rats weigh 400–500 g. These rats mature in 2–5 months, and live as an adult for 6–12 months. The pregnancy lasts three weeks. The average female rat has four to six litters a year, with 6 to 12 young. Rats have poor eyesight, relying more on their hearing and their excellent senses of smell, taste, and touch.

Norway rats are primarily nocturnal and live in close association with people as they depend chiefly on humans for food, then once established in a house they tend to remain, preferentially in warehouse, chicken houses, garbage dumps, and sewer. These rodents eat nearly any type of food and prefer cereal grains, meat and fish, nuts, and pet food.

Rats are an example of urban pest that transmit disease by several mechanisms, directly by contaminating food with their urine or faeces. Sometimes they transmit disease indirectly, as when fleas bite a disease infected rat, then a person or by biting people.

Frequently, rat bites cause local bacterial infection, which have good prognosis. Antibiotics such as cephalosporins or penicillinase resistant penicillins are usually adequate for treatment of infectious complications of rat bites.

Rats also have been associated with rat bite fever (by *Streptobacillus moniliformes* or *Spirillum minus*),<sup>3</sup> Haverhill fever,<sup>4</sup> tetanus,<sup>4</sup> multiple skin abscesses,<sup>5</sup> and rabies.<sup>6</sup>

In summary, this case shows a situation in which extreme poverty, poor hygiene, and rat infested environment are conditions frequently associated with the occurrence of potentially serious illness in children secondary to rat bites.

## Authors' affiliations

A Donoso, J León, G Rojas, M Ramirez, B Oberpaur, Paediatric Critical Care Unit, Padre Hurtado Hospital, Santiago, Chile

Correspondence to: Dr A Donoso, Paediatric Critical Care Unit, Padre Hurtado Hospital, Santiago, Chile; adonoso@hurtadohosp.cl

Accepted for publication 16 February 2003

## REFERENCES

- 1 Yanai O, Goldin L, Hiss J. Fatal rat bites. *Harefuah* 1999;**136**:611–13.
- 2 Hirschhorn RB, Hodge RR. Identification of risk factors in rat bite incidents involving humans. *Pediatrics* 1999;**104**:e35.
- 3 Hudsmith L, Weston V, Szram J, *et al.* Clinical picture, Rat bite fever. *Lancet Infect Dis* 2001;**1**:91.
- 4 Mathiasen T, Rix M. Rat-bite-an infant bitten by a rat. *Ugeskr Laeger* 1993;**155**:1475–6.
- 5 Brooks JE. A review of commensal rodents and their control. *Rev Environ Cont* 1973;**3**:405–53.
- 6 Marshall J, Sharp E, Barrison IG. Once bitten, twice shy. *BMJ* 1994;**309**:1694–5.