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Pankaj Kumar Patel

Division of Medicine ICAR- Indian
Veterinary Research Institute,
Izatnagar, India

Sonam Bhatt

Division of Medicine ICAR- Indian
Veterinary Research Institute,
Izatnagar, India

Sawita Kumari Patel

Division of Veterinary Public
Health Veterinary Research
Institute, Izatnagar, India

Brijesh Patel

Division of Livestock production
and Management Veterinary
Research Institute, Izatnagar,
India

Anshuk Sharma

Division of Pharmacology
Veterinary Research Institute,
Izatnagar, India

Naveen Kumar Verma

Division of Surgery, ICAR-Indian
Veterinary Research Institute,
Izatnagar, India

Mohar Singh

Division of Surgery, ICAR-Indian
Veterinary Research Institute,
Izatnagar, India

Akhilesh Kumar

Division of Medicine Veterinary
Research Institute, Izatnagar,
India

Sumit Mahajan

Division of Medicine ICAR- Indian
Veterinary Research Institute,
Izatnagar, India

SK Dixit

Division of Medicine ICAR- Indian
Veterinary Research Institute,
Izatnagar, India

Correspondence

SK Dixit

Division of Medicine ICAR- Indian
Veterinary Research Institute,
Izatnagar, India

Diagnostic and therapeutic approach to high-voltage electrocution in a free-range rhesus monkey (*Macaca mulatta*)

Pankaj Kumar Patel, Sonam Bhatt, Sawita Kumari Patel, Brijesh Patel, Anshuk Sharma, Naveen Kumar Verma, Mohar Singh, Akhilesh Kumar, Sumit Mahajan and SK Dixit

Abstract

A male monkey around 5 kg body weight was presented to the Referral Veterinary Polyclinic, IVRI Izatnagar in comatose condition having a history of fall from height (around 20 ft.) due to high voltage electric injury by electrical extension wire. Clinical examination revealed pale mucous membrane, absence of visual and pedal reflexes, normal body temperature, tachycardia, and tachypnoea as well as body injuries. The case was diagnosed as high voltage electrocution on the basis of history and clinical examination. The institution of treatment of monkey with fluid therapy and lifesaving drugs like adrenaline, nikethamide and dexamethasone along with supportive treatment including mannitol, neurobion, amoxicillin, vitamin C and povidone iodine ointment brought successful recovery in 5 days.

Keywords: High voltage electrocution, adrenalin, nikethamide, dexamethasone, mannitol

1. Introduction

Rhesus macaque (*Macaca mulatta*) is the most commonly found monkey in North India ^[1]. Due to its jumping habit, they usually come in contact with exposed electric power supply which results in severe systemic disturbances and massive local destruction leading to tissue loss ^[10, 12]. The passageway of electric current through the body leads to the traumatic physical state known as electric shock. The animal, in such cases, needs an emergency and critical care to survive. To stabilize vital functions, treatment includes cardiopulmonary resuscitation and intravenous administration of electrolytes ^[12].

2. Materials and methods

Based on history and clinical examination, the case was diagnosed as high-voltage electrocution.

2.1 Case History

A male monkey weighing around 5 kg was admitted to Referral Veterinary Polyclinic of Indian Veterinary Research Institute, Izatnagar in comatose condition having a history of fall from height (around 20 feet) due to electrocution by a high voltage electric extension wire. General body examination revealed physical injuries on the chest (Fig. 1) and thigh region, closed eyes, insensitivity towards external stimuli, recumbancy, severe weakness, dehydration and comatose condition (Fig. 2).

2.2 Clinical examination

Clinical examination revealed pale mucous membrane; absence of pupillary, menace and pedal reflex; dry mouth; normal body temperature (99.7°F); tachycardia (110 beat/min); tachypnoea (78 breath/min); and normal regional lymph nodes.

2.3 Haemato-biochemical examination

Detailed haemato-biochemical examination (Table.1&2) revealed elevation of haemoglobin concentration, TEC, PCV, neutrophil count, BUN and serum creatinine level.



Fig 1: External wound on chest



Fig 2: Comatose condition

Table 1: Detailed Haematological examination

Haematological parameter	Numbering range (Andrade <i>et al.</i> , 2009 and Chen <i>et al.</i> , 2009)	0 day
Hb (g/dl)	12.769 ± 1.09	14.6
PCV (%)	37.55 ± 3.23	41.2
TEC (x10 ⁶ /ml)	5.062 ± 0.539	7.1
TLC (x10 ³ /ml)	7.89 ± 3.53	9.5
Neutrophils%	60.11 ± 13.28	73
Lymphocytes%	36.70 ± 12.76	26
Monocytes%	1.556 ± 1.55	0
Eosinophils%	0.66 ± 0.88	1
Basophil%	0.11 ± 0.32	0
Platelet count(10 ⁹ /l)	359.03 ± 71.72	412

Fig 2: Detailed Biochemical examination

Biochemical parameter	Numbering range (Chen <i>et al.</i> , 2009)	0 day
SGPT(IU/l)	53.42 ± 25.26	49.2
Serum Creatinine(micro mol/l)	69.64 ± 10.24	85.0
BUN (mmol/l)	7.83 ± 1.24	10.31
Serum total Protein (mg/l)	78.05 ± 3.59	76.0
Serum Albumin (mg/l)	53.87 ± 2.67	50.2
Serum Globulin (mg/l)	24.18 ± 2.70	25.8

2.4 Treatment

The symptomatic treatment was started without delay after physical and clinical examination. Following the diagnosis of the case, treatment was started with fluid therapy with 20% mannitol 2ml/kg BW IV OD, DNS 250ml IV OD along with supportive therapy including injection amoxicillin 10mg/kg BW IV OD, inj. adrenalin 1ml IM OD for one day and inj. Nikethamide (25% w/v) 1ml IV OD, inj. dexamethasone 1mg/kg BW IM OD, inj. chlorpheniramine maleate 0.5mg/kg BW IM OD, inj. neurobion (Vitamin B1+ B6+ B12) 1ml IM OD, tab amoxicillin 10 mg/kg PO BID and ascorbic acid 30 mg/kg BW PO BID for 5 days and topical application of povidone iodine ointment on the affected skin injuries.

3. Results

The condition of the monkey began to improve one hour after treatment and complete recovery was observed by caring person five days after onset of treatment.

4. Discussion

Electrocution is an emergency and critical condition that can be managed successfully by treatment as soon as possible [12]. In high-voltage accidents with prolonged (seconds) contact, current may pass throughout the body and causes injury to internal organs and muscles associated with clinical signs as shortness of breath, chest pain or abdominal pain in humans [12]. In the present study, haematological examination revealed elevation of haemoglobin concentration, TEC, PCV and neutrophil count and significant tachycardia and tachypnoea with dehydration was also recorded. Tufani *et al.*, 2015 also found similar physical condition and neutrophil level but normal level of other haematological parameters except the haemoglobin and lymphocyte level, which were found less than normal value.

The monkey suffered electrocution as well as physical injuries from fall to the ground resulting in pulmonary and cerebral edema associated with cardio-pulmonary arrest was successfully managed with sufficient fluid therapy, corticosteroids, physiotherapy (performed to enhance blood supply), antiseptic dressing and antibiotic therapy. Electrothermal injury leads to tissue edema and on progression to a compartment syndrome that can occur in body compartment [13]. Electrocution deaths are usually due to pulmonary arrest and cerebral edema which should be managed with mannitol along with a respiratory and cardiac stimulant [8]. Mannitol (hyperosmolar) solution generally used as a diuretic to relieve edema from the visceral organs especially cerebral edema [11]. Adrenaline is a cardiac stimulant that increase the force of contraction as well as helps in balancing between ventilation and perfusion on cerebral and myocardial tissues to improve arterial diastolic pressure, coronary perfusion pressure, rate of resuscitation, and neurologic outcomes [2]. Nikethamide is a central respiratory stimulant [5] used to manage pulmonary insufficiency by improving central nervous system depression due to carbon dioxide retention and respiratory acidosis. Dexamethasone has anti-inflammatory property that causes relief from pain stimuli [4]. Broad spectrum antibiotics and local application of Povidone Iodine were used to prevent secondary bacterial infection. Nervine tonic (Vitamin B1+ B6+B12) was also used as a supportive therapy as nerves are specifically designed having high electrolyte and water content that carries efficiently electrical signals [13]. Ascorbic acid promotes collagen formation and prevents oxidative stress [9] and enhances wound healing.

5. Conclusion

Electrocution shock is an emergency condition and most commonly reported in free range monkeys. It can be successfully managed with fluid therapy along with lifesaving drugs like adrenaline, nikethamide, dexamethasone along with supportive treatment including mannitol, antibiotics, antioxidants and proper nursing and management.

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