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Management of high-voltage electrocution in wild Rhesus macaque (*Macaque mullatta*): Diagnostic and therapeutic approaches

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Abstract

The study was conducted on five electrocuted wild monkeys that were brought to the Govt. Veterinary Hospital Kasdol, District-Balodabazar-Bhatapara (C.G.) in unconsciousness, comatose, and having fallen from heights due to high-voltage electrocution. Clinical examination has been showing wounds and injuries in different sites, absence of visual and pedal reflex, tachypnoea, and arrhythmia. A haematobiochemical examination has shown a marked elevation in hemoglobin concentration, TEC, neutrophil count, SGPT and BUN levels. The cases were successfully managed with adrenalin along with supportive treatment including fluid therapy, dexamethasone, and nervine tonics.

Keywords: Electrocution, Hanuman Langurs (Gray Langur), unconsciousness, tachypnoea, haematobiochemical examination

Introduction

The Rhesus macaque (*Macaque mullatta*) is the most commonly found in North India (Pirta *et al.*, 1995) [9]. Due to their jumping habit, playing, and searching for food, they usually involve contact with exposed parts of different types of electric power supplies. The intensity of the electric current, the type of current, and the duration and frequency of the current flow source result in severe systemic disturbance and massive local destruction leading to major amputations and tissue loss, which are characterized by small to deep necrotic lesions on cutaneous or oral mucosa (Sengar *et al.*, 2014; Tufani *et al.*, 2015; Ishikawa, 1986) [10, 11, 4]. Electrocuted monkeys can die instantly, or they may have been making an effort to relieve the pain by biting their wounds, and secondary infections can lead to death. The passage of electric current through the body leads to a traumatic physical state known as electric shock. In such cases, the animal needs emergency and critical care for survival. To stabilize vital functions, treatment may involve such things as cardiopulmonary resuscitation, defibrillation, and intravenous administration of electrolytes (Patel *et al.*, 2018a) [6].

Materials and Methods

Five monkeys weighing around 5-8 kgs were brought to the Govt. Veterinary Hospital Kasdol, District-Balodabazar-Bhatapara (C.G.) with a history of comatose condition after falling from height due to electrocution by a high-voltage electric extension wire. Inspection revealed unconsciousness, dehydration, recumbency, and no response to external stimuli. Clinical examination revealed pale mucous membranes, skin dehydration, closed eyes, the absence of pupillary reflex, menace reflex, and pedal reflex, dry mouth, normal body temperature, arrhythmia, tachypnoea, normal regional lymph nodes, injuries, wound formation on the various parts of skin surfaces, and shock conditions.

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Table 1: Detailed Haematological examination

Haematological parameter	Reference range (Andrade <i>et al.</i> , 2009 and Chen <i>et al.</i> , 2009) ^[1,2]	0 day	5 th day
Hb (g/dl)	12.769±1.09	18.34±2.13	11.2±1.08
PCV (%)	37.55±3.23	55.66±4.23	35.46±2.39
TEC (x10 ⁶ /ml)	5.062±0.539	7.30±1.06	4.78±1.06
TLC (x10 ³ /ml)	7.89±3.53	8.34±2.03	7.23±2.22
Neutrophils %	60.11±13.28	82.47±4.58	62.32±3.41
Lymphocytes %	36.70±12.76	32.67±2.37	34±4.20
Monocytes %	1.556±1.55	1.33±0.45	1.69±0.35
Eosinophils %	0.66±0.88	0.78±0.32	0.63±0.27
Basophil %	0.11±0.32	0.00±0.00	0.00±0.00
Plateletcount (10 ⁹ /l)	359.03±71.72	378.57±36.37	367.40±44.56

Table 2: Detailed Biochemical examination

Biochemical parameter	Reference range (Chen <i>et al.</i> , 2009) ^[2]	0 day	5 th day
SGPT(IU/l)	53.42±25.26	102.47±13.36	52.54±17.70
Serum Creatinine(micro mol/l)	69.64±10.24	75.49±12.80	60.35±3.56
BUN (mmol/l)	7.83±1.24	30.40±4.76	10.34±7.43
Serum total Protein (mg/l)	78.05±3.59	85.60±7.98	82.46±5.68
Serum Albumin (mg/l)	53.87±2.67	56.48±5.59	51.48±3.56
Serum Globulin (mg/l)	24.18±2.70	27.80±22.68	26.56±80

The constitution of treatment was started with adrenalin 1 ml slow IV along with fluid therapy, 20% manitol @ 2 ml/kg BW IV OD, DNS 150 ml IV OD for 3 days, and supportive treatment including dexamethasone @ 1 mg/kg BW IV BID for 3 days, injection of chlorpheniramine maleate (Avil) @ 0.5 mg/kg BW IM OD, injection of nervine tonics including B-complex (neurobion) 1 ml IM OD, broad spectrum antibiotics ceftriaxon @ 25 mg/kg IV OD, and omeprazole 1 mg/kg BW IV OD for 3 days, and topical application of povidon. The slight improvement was seen in the monkey one hour after treatment, and complete recovery was seen after the fifth day of the treatment.

Results and Discussion

A hemobiochemical examination (Table 1 and Table 2) revealed elevations of Haemoglobin concentration, TEC, neutrophil count, SGPT and BUN level. A blood smear examination with Giemsa's staining technique was negative for any hemoprotozoan disease. Based on history, the case was diagnosed as a high-voltage electrocution. Electrocution is an emergency and critical condition that can be managed successfully with treatment as soon as possible (Tufani *et al.*, 2015; Sengar *et al.*, 2014) ^[11, 10]. In this study, treatment with intravenous infusion of Manitol solution for management of pulmonary and cerebral edema. Fluid therapy, dexamethasone, and adrenaline play an important role in treating shock and restoring blood pressure and cardiac output (Patel *et al.*, 2018a) ^[6]. Broad-spectrum antibiotics can prevent secondary bacterial septicemia, along with other supportive therapies. The electrocuted wounds were present in the hands, head, neck, and thorax and were managed with the local application of povidon Iodin ointment. In high-voltage accidents with prolonged (seconds) contact, current may pass throughout the body and injure internal organs and muscles, causing a clinical sign of shortness of breath, chest pain, or abdominal pain in humans (Tufani *et al.*, 2015) ^[11]. The monkey suffered electrocution injuries due to electrical current as well as falling to the ground from a height. The symptomatic treatment was started without delay after a clinical and physical examination. Electrocuted monkeys were successfully managed with sufficient fluid therapy and corticosteroids, physiotherapy performed to enhance blood

supply, and antiseptic dressing and antibiotic therapy. Electrocution deaths are usually due to the heart or respiratory paralysis associated with cardio-respiratory arrest, ventricular fibrillation, and autonomic injury within the brainstem (Kumar, 2015) ^[5]. Electrothermal tissue injury leads to tissue oedema and the progression of compartment syndrome, which can occur in any body compartment. Nerves are specifically designed with high electrolyte and water content to efficiently carry electrical signals, as are muscles and blood vessels (Ungureanu, 2014) ^[12]. In electrical accidents, atrial or ventricular fibrillation leads to cardiac arrest and abnormal electrocardiographic (ECG) changes like transient ST segment elevation, reversible QT segment prolongation, premature ventricular contractions, and bundle branch block (Tufani *et al.*, 2015) ^[11]. Respiratory muscle paralysis is due to the current pathway being from head to limbs; tetanic contraction of respiratory muscles causes asphyxia (Patel *et al.*, 2018a) ^[6]. The pulmonary and cerebral oedemas were managed using manitol (Patel *et al.*, 2018a) ^[6]. Therapeutic management of electrocuted condition was advised with the use of parenteral administration of respiratory and cardiac stimulants (Kumar, 2015) ^[5]. Dexamethasone reduces spinal pain and has anti-inflammatory action as well (Gilroy and Perreti, 2005) ^[3]. Omeprazole is a proton pump inhibitor that inhibits the H⁺-K⁺ ATPase pump leads to diminished hydrochloric acid production from gastric parietal cells and enhanced gastrokines gene regulations that further provide anti-inflammatory effect and maintain gastric homeostasis (Patel *et al.*, 2018c) ^[8]. Broad-spectrum antibiotics are used to check for secondary bacterial infections in stressed and dexamethasone-treated patients. B-complex vitamins help carry electrical signals efficiently (Patel *et al.*, 2018b; Ungureanu, 2014) ^[7, 12].

Conclusion

Electrocution in wild monkeys is most commonly reported in free-range monkeys, and it is an emergency condition. It can be successfully managed with fluid therapy, along with life-saving drugs like adrenaline and dexamethasone, and proper supportive care and management.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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