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Short Communication

THERAPEUTIC MANAGEMENT AND PATHOMORPHOLOGY OF ELECTROCUTION IN LANGURS

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SUMMARY

Electrocution shock is a serious and very common problem in monkeys and it is an emergency situation. The present study was conducted to describe the diagnosis, treatment and histopathological findings in langur (*Semnopithecus entellus*) with electrocution shock. A total number of 32 langurs with different age, weight and sex were included in this study. General body examination revealed physical injuries on the chest, abdomen, fore and hind limb, thigh region, closed eyes, insensitivity towards external stimuli, recumbency, severe weakness, dehydration, charred, singed hairs and burnet skin. Symptomatic treatment was given. Following treatment, 10 langurs were cured within 10 to 20 days depend on wound healing and released into Jhalana forest area. Rest of 22 were died which further processed for necropsy and histopathological examination.

Keywords: Electrocution, histopathology, langurs

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Electrocution is the result of passage of electric shock into the body which can lead to death. The main cause of death in electrocution is generally believed to be a disruption in cardiac electric conduction leading to ventricular fibrillation (Zipes, 1975). There are some reasons which make the animals more susceptible to electrocution than humans such as they do not have foot wear, their feet are often wet, they have twice the ground contact that human beings have (Mills and Kersting, 1966). Apart from these major causes, there are some other associated causes such as fallen transmission wires, faulty electric wires, and chewing on electric cords (Radostitis et al. 2000). Accidental contact with either illegal electric wire fencing or from overhead live wire makes the wild animals electrocuted. Due to these reasons, electrothermal lesions are usually severe in these animals (Lehman et al. 2007; Vijay and Vipin 2015). Common langur and Rhesus macaques are more prone to electrocution from high voltage industrial supply as well as low tension domestic wires and overhead power lines because of their arboreal and climbing nature (Slatter, 1993; Vijay and Vipin, 2015).The type of injury and extent of an electric injury is depend on various parameters of the electric current such as voltage, current strength, and resistance to flow duration of contact with source (Price and Cooper, 2002). According to these parameters, conditions of the animal may vary. Sometimes lesions may be absent or may include early or localized development of rigor mortis, signs of acute circulatory failure, or severe thermo electrical burns. The objectives of this study were to determine diagnosis, treatment and histopathological findings found in electrocuted langur.

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The present study was conducted on 32 langur (Semnopithecus entellus) with different age, weight and sex brought to Help in Suffering, Animal NGO, Jaipur, India with the history of fallen from height and laid down on ground by a high voltage electric extension wire. The langurs showed different condition such as comatose, ataxia, convulsion, muscle spasm and impaired vision. General body examination revealed physical injuries on the chest, abdomen, fore and hind limbs, thigh region, closed eyes, insensitivity towards external stimuli, recumbency, severe weakness, dehydration, charred, singed hairs and burnet skin. Clinical examination and symptomatic treatment is depicted in the table 1.

Wound was clean with diluted 10% povidone iodine and followed with topical application of Lorexane® ointment (Virbac India Ltd.) on the affected skin injuries till recovered wound. Following treatment, 10 langurs were cured within 10 to 20 days depend on wound healing and released into Jhalana forest area. Rest of 22 were died which further processed for necropsy and histopathological examination. Table 2 showed total number and total dead electrocuted langurs.

Samples collection for histopathological examination: Detailed post-mortem examination was done on 22 langurs irrespective of sex, weight and age. Gross lesions were recorded and tissue samples of kidneys, lungs, liver and heart were collected in 10% buffered formalin.The parts of affected tissue measured 2-5 mm thickness and presenting the lesions with normal tissue, were used for fixation and histopathological examination. For histopathological examination, processing of tissue was done by paraffin embedding using acetone and benzene technique (Lillie, 1965). The tissue sections of 6 micron

Table 1

Clinical examination and treatment given to the electrocuted langurs

Severity	No. of electrocuted langur	Clinical condition	Treatment	Live langur	Dead Langur
Mild	6	Shock, dull, depressed, lethargic, dehydration, high temperature, dry mouth, small skin injury, pink mucus membrane	Inj. NS 300-400 ml IV BID, Inj. RL 400-500 ml BID, Inj. mannitol (20%) 2 ml/kg BW IV OD, Inj. flunixin 0.5 mg/kg BW IV QID, Inj. tribivet® (Vitamin B1+B6+B12) 1ml IM OD (for 5 days) and Tab. amoxicillin 11 mg/kg PO BID and antiseptic dressing of wound for 10 days	6	0
Moderate	7	Shock, low to normal temperature, dehydration, dry mouth,wound on whole body	Inj. DNS 250- 400 ml IV OD/ BID, Inj. NS 300-400 ml IV OD/BID, Inj. RL 400-500 ml BID, Inj. mannitol (20%) 2 ml/kg BW IV OD, Inj. amoxicillin 11 mg/kg BW IV OD, Inj. dexamethasone 1 mg/kg BW IM OD, Inj. tribivet® (Vitamin B1+B6+B12) 1 ml IM OD, Tab amoxicillin 11 mg/kg PO BID for 10 days and antiseptic dressing of wound for 20 days	4	3
Severely	8	Shock, severe dehydration, dry mouth, Muscular tetany, recumbence, deep wound on whole body, burnt skin, bone exposed fore and hind arm, white mucus membrane	Died during treatment	0	8
Critical	11	Shock, Severe dehydration, dry mouth, pale mucus membrane, recumbence sunken eye, muscular tetany, deep wound on whole body, deep wound with severe burnt muscle, skin and exposed fore and hind arm	Died on arrived	0	11
Total	32			10	22

thickness were cut and stained with hematoxylin and eosin staining method as a routine.

Some aspects of city life are very threatened due to treacherous roads, electric cable wires crisscrossing all over the place and of course the petty attitudes of some people and dogs. The injuries due to electrocution are common in rhesus monkeys (Singh *et al.*, 2003). Common langur wandering in search of food and water has chances to get electrocution injury. Electric current passing through the animal body may cause coma and death, if the current is sufficiently strong (Sengar *et al.*, 2014).

In the present cases we started with intravenous infusion of dextrose normal saline and corticosteroid along with antibiotic coverage to prevent the local and systemic sepsis. Fluid support is critical and corticosteroid plays an important role in condition of shock. It enhances blood pressure and there by accelerates cardiac output. The cell membrane are stabilized as such prevent spilling of myocardial depressive enzyme (Ogbum, 1976). Fluid therapy, corticosteroid, and analgesic resulted in successful management of electrocution. This was in accordance with Sengar *et al.* (2014) and Kashyap *et al.* (2011) who reported electrocution in a langur and followed similar treatment. Acute reduction of intravascular fluid volume must be offset to maintain cardiac output and peripheral tissue perfusion (Vijay and Vipin, 2015).

A detailed necropsy was done on 22 langurs died due to electrocution (Fig. 1) which showed different gross and

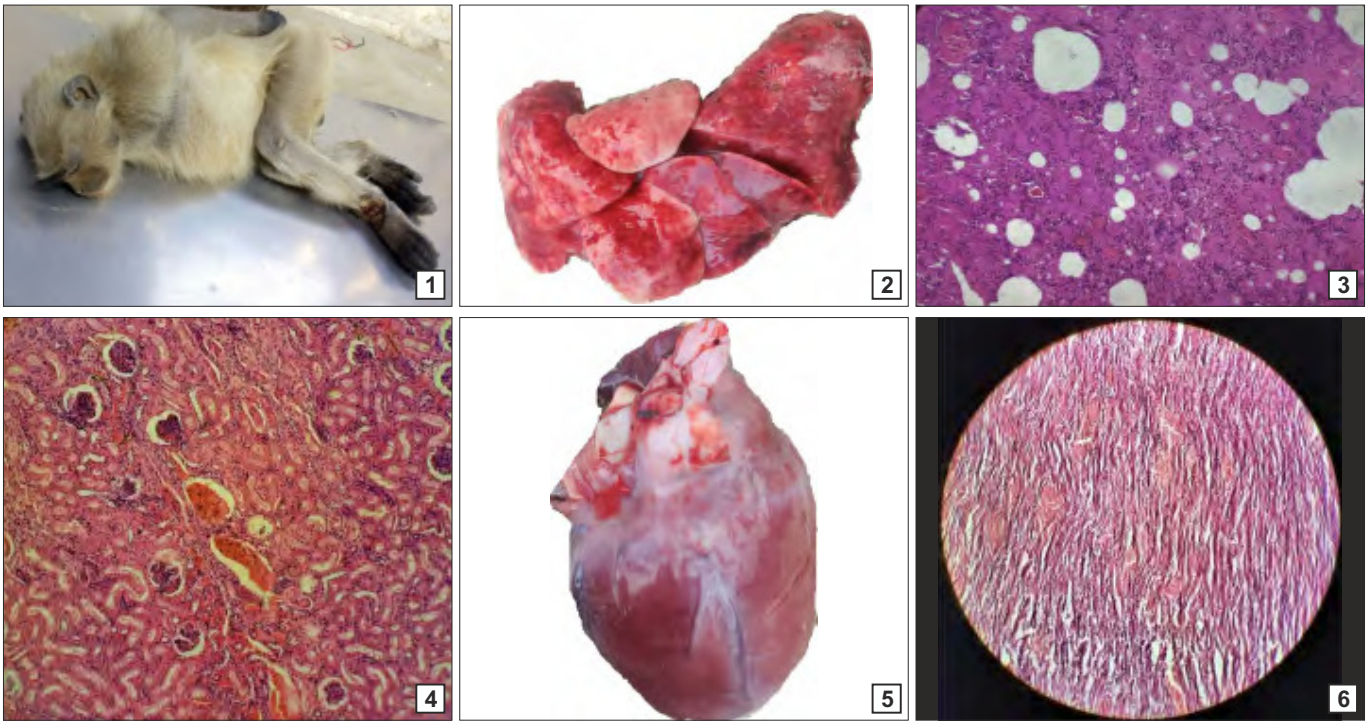

Fig. 1-6. **(1)** Photograph showing electrocuted langur; **(2)** Gross photograph showing haemorrhages on lung; **(3)** Microphotograph of lung showing oedema, congestion, emphysema and mononuclear cells and polymorphonuclear cells infiltration. H&E, 100X. **(4)** Microphotograph of kidney showing interstitial and glomerular haemorrhage along with cloudy swelling. H&E, 100X. **(5)** Gross photograph showing haemorrhage on heart; **(6)** Microphotograph of heart showing separation of myocardial fibres with haemorrhage and mononuclear cells and polymorphonuclear cells infiltration. H&E, 100X.

histopathological lesions in following table 3 tables and table 4. Externally, there was a clear entry and exit wound on the carcass of forelimbs and hind limbs.Skin and hairs were charred. Gross examination revealed congestion and haemorrhage of the liver. The visible mucous membrane was pale in color. The peritoneal cavity filled with sanguineous fluid (hemoperitoneum). Trachea was hemorrhagic and congested. Lungs showed congestion and haemorrhage (Fig. 2). There was haemorrhage on heart (Fig. 5). Kidneys revealed capsular hemorrhage. The mucosa of the stomach showed petechiae and the intestinal mucosa was congested. The necropsy findings were in accordance with report given by Bidfell *et al.* (1991) who reported 2 incidents of accidental electrocution in swine within production facilities. Necropsy examination revealed pulmonary congestion and edema and petechiation of epicardium and pleura. Likewise Boon Allwin *et al.* (2015) reported that a male leopard that was died due to an unfortunate electrocution. Necropsy examination revealed that Intestines was congested. Trachea and the lung were severely congested. Kidneys revealed hemorrhage. Histopathological changes were observed in following major organs.

Lungs: Microscopically, homogeneous, edematous fluid was observed in bronchioles and in alveoli. There were infiltration of mononuclear cells and polymorphonuclear cells in lungs which indicated interstitial pneumonia. The alveolar capillaries were highly engorged with blood along with haemorrhage was seen in lungs. The alveoli were over distended. Their walls were atrophied and then ruptured of some alveoli with confluence of neighbouring alveoli give rise to giant alveoli (Fig. 3). Raji *et al.* (2008) conducted autopsy on 64 cadavers of persons died as a result of electrocution and observed congestion and edema in lungs. Similar pathological lesions including pulmonary oedema and congested blood vessels were described by Kundu *et al.* (2018) on 22-year-old male who had been died due to electric shock.

Liver: Microscopically, there was haemorrhage, congestion and diffuse infiltration of mononuclear cells and polymorphonuclear cells seen in liver. Raji *et al.* (2008) conducted autopsy on 64 cadavers of persons died as a result of electrocution and observed congestion in liver. Similarly congestion in liver was observed by Kundu *et al.* (2018) on 22-year-old male who had been died due to electric shock.

Kidneys: Microscopically, kidney showed cloudy swelling, congestion and hemorrhage. There were seen infiltration of mononuclear cells and polymorphonuclear cells in interstitium of cortex and medulla (Fig. 4). Microscopically kidney showed congestion which is similar to finding of Raji *et al.* (2008).

Heart: Microscopically, heart revealed haemorrhage, infiltration of mononuclear and polymorphonuclear cells, and vacuolization of myocytes, congestion and separation of myofibrils (Fig. 6). These similar pathological findings were described by Shubha and Nirmala (2018), Ghandour (2013), Kundu *et al.* (2018) and Raji *et al.* (2008).

Table 2

Showing total number and total dead electrocuted langurs

Total no. of langur	Electrocutated dead langur
32	22

Table 3

Showing different gross lesion

S.No.	Organs	Gross lesions	No. of langur
1.	Lungs	Congestion and haemorrhage	22
2.	Liver	Congestion and haemorrhage	5
3.	Kidneys	Capsular haemorrhage	10
4.	Heart	Congestion and haemorrhage	16
5.	Intestine	Congestion and haemorrhage	12

Table 4

Showing different histopathological lesions

S.No.	Organs	Microscopic lesions
1.	Lungs	Oedema Inflammatory cells infiltrations Emphysema
2.	Liver	Congestion and haemorrhage Inflammatory cells infiltrations
3.	Kidneys	Cloudy swelling Inflammatory cells infiltrations Congestion and haemorrhage
4.	Heart	Haemorrhage and congestion Inflammatory cells infiltrations
5.	Intestine	Congestion and haemorrhage

CONCLUSION

Electrocution occurs most often accidentally and causes severe injuries in animals. Hence, it is important to provide therapeutic management with lifesaving drugs including fluids and electrolytes, dexamethasone and antibiotics as well proper nursing care. The histopathological changes in the various major organs definitely provide an additional clue in the diagnosis of electrocution.

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REFERENCES

Bildfell, R.J., Camat, B.D. and Lister, D.B. (1991). Posterior paralysis and electrocution of swine caused by accidental electric shock. *J. Vet. Diagn. Invest.* **3**: 364-367.

Boon A., Vedamanickam, S., Sathish, G. and Manoj, K. (2015). Incidence of Electrocution of a Leopard (Pantherapardus) in the Nilgiris, Tamil Nadu. *EC Vet. Sci.* **2(1)**: 60-65.

Ghandour, N.M., Refaiy, A.E. and Omran, G.A. (2013). Cardiac histopathological and immunohistochemical changes due to electrical injuryin rats. *Mansoura J. Forensic Med. Clin. Toxicol.* **XXI(1)**: 67-79.

Kashyap, D.K., Tiwari, S. and Giri, D.K. (2011). Management of electrocution in a langur. *Intas Polivet.* **12(II)**: 187-188.

Kundu, R., Punia, R.S. and Harish, D. (2018). Death Due to Low Voltage Electric Shock Induced Myocarditis. *Cardiol. Angiol. Int. J.* **7(2)**: 1-4.

Lehman, R.N., Kennedy, P.L. and Savidge, J.A. (2007). The state of the art in raptor electrocution research: a global review. *Biol. Conserv.* **136**: 159–174.

Lillie, R.D. (1965). Histopathological technique and practical histochemistry, McGraw Hill Book Co.; New York and London.

Mills, J.H. and Kersting, E.J. (1966). Accidental electrocution of farm animals. *J. Am. Vet. Med. Assoc.* **48(6)**: 647- 654.

Ogbum, P. (1976). The role of vasoactive agents in shock therapy. *Vet. Clin. N. Am.* **1**: 287-295.

Price, T. and Cooper, M.A. (2002). Electrical and lightning injuries. In: Marx, J., Hockberger, R. and Walls, R. Rosen's Emerg. Med. (5th Edn.), Mosby. pp. 2010-2020.

Radostitis, O.M., Gay, C.C., Blood, D.C. and Hinchcliff, K.W. (2000). Diseases caused by physical agents. In: Veterinary Medicine: A Textbook of the Diseases of Cattle, Sheep, Pigs, Goats and Horses. (9th Edn.),WB Saunders, London. pp. 1565-1567.

Sengar A., Shrivastav, A.B., Rokde, A. and Singh, S. (2014). Electrocution management in a Langur (*Semnopithecus entellus*). *J. Wildl. Res.* **2(1)**: 07-08.

Shubha, H.V. and Nirmala, C. (2018). A study of the histopathological changes in heart in electrocution deaths. *Trop. J. Path. Micro.* **4(3)**: 236-241.

Singh, T.B., Sharma, A.K. and Kumar, N. (2003). Forelimb amputation in a Rhesus monkey. *Vet. Pract.* **4**: 27.

Slatter, D.H. (1993). Burns: electrical, chemical and coldinjuries. Text Book of Small Animals Surgery. *W.B. Saunders Company, Philadelphia*. p. 526.

Vijay, K. and Vipin, K. (2015). Seasonal electrocution fatalities in free-range rhesus macaques (*Macacamulatta*) of Shivalik hills area in northern India. *J. Med. Primatol.* **4**: 137-142.

Zipes, D.P. (1975). Electrophysiological mechanisms involvedin ventricular fibrillation. *Circulation*. **52(6)**: 120-130.