VEHICULAR HYPERTHERMIA IN DOGS AND ITS MANAGEMENT

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Vehicular hyperthermia is common in dogs left unattended intentionally or accidentally in closed vehicles. Emergency treatment was mainly aimed to reduce core body temperature. Prognosis was guarded or poor depending on exposure time and intensity of treatment.

Key words: Vehicular hyperthermia, Dogs, Treatment.

Hyperthermia is an elevation in body temperature that is above the generally accepted normal range. Although normal values for dogs vary slightly, it usually is accepted that body temperatures above 103° F (39° C) are abnormal. Heat stroke, meanwhile, is a form of non-fever hyperthermia that occurs when heat-dissipating mechanisms of the body cannot accommodate excessive external heat. Typically associated with temperature of of 106°F (41° C) or higher without signs of inflammation, a heat stroke can lead to multiple organ dysfunction. This condition can lead to multiple organ dysfunction. Temperatures are suggestive of non-fever hyperthermia.

Vehicular hyperthermia occurs when a dog is left unattended in a vehicle on a warm day. Incidence is high during summer months when temperature and humidity are high. Heat stroke in dogs occurs in confined vehicles where excess heat absorption within the body overwhelms the heat dissipation (Stanley, 1980). Heat stroke is associated with a marked elevation in core body temperature, often resulting in cellular damage as temperature reaches 106°F. Heat stroke in dogs is a potentially life threatening condition that requires immediate medical treatment (Krum and Osborne, 1977). In the present paper, management of eight dogs with hyperthermia due to confinement in cars was taken into study.

Materials and Methods

The study was conducted during March 2013-February 2014 in dogs suffering from hyperthermia. Out of twenty two dogs with hyperthermia, eight dogs suffered with vehicular hyperthermia which was due to confinement in the vehicles kept accidentally or intentionally by the owners. All the dogs were presented to TVCC, Gannavaram on an emergency basis in recumbent condition with symptoms of panting, seizures, excessive drooling (ptyalism), thick salivation, Production of only small amounts of urine or no urine. On clinical examination, high rectal temperature (>106°F) with brick red gums, dry mucous membranes, severe dehydration, Rapid heart rate/ Irregular heartbeats; Fluid build-up in the lungs; sudden breathing distress (tachypnea); Blood-clotting disorder(s); Vomiting blood (hematemesis) and elevated vital parameters were noticed.

Treatment was mainly targeted to reduce the core body temperature by administration of antipyretics like Meloxicam @ 0.5mg/kg b.wt, intravenously followed by surface cooling with application of ice packs and cold enema. When the temperature reduced to 104°F, large doses of Ringers solutions @ 90ml/kg/b.wt./hr were given to correct dehydration and hypovolemia and Dexamethasone @ 0.1mg/kg b.wt. to prevent shock and cerebral edema. Out of eight dogs, six dogs showed recovery and two dogs died during the therapy.

Results and Discussion
Haematological findings revealed decreased PCV, Hb, TEC levels with a normal TLC & DLC. Serum biochemical findings revealed normal total protein, decreased glucose and elevated creatinine and hepatic enzymes (Table 1).

**Table 1: Mean Haematological and biochemical findings.**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>PARAMETER</th>
<th>RESULT</th>
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<tbody>
<tr>
<td>1.</td>
<td>Hb (g/dl)</td>
<td>9.0 ±0.30</td>
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<tr>
<td>2.</td>
<td>PCV (%)</td>
<td>30 ±1.18</td>
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<td>3.</td>
<td>TEC (x 10^6/ml)</td>
<td>4.2 ±0.22</td>
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<td>4.</td>
<td>TLC (x10^3/ml)</td>
<td>20.04±0.70</td>
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<td>5.</td>
<td>Neutrophils (%)</td>
<td>68.5±2.04</td>
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<td>6.</td>
<td>Lymphocytes (%)</td>
<td>31±2.45</td>
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<tr>
<td>7.</td>
<td>Total Protein (g/dL)</td>
<td>6.0±0.40</td>
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<tr>
<td>8.</td>
<td>Serum glucose (mg/dL)</td>
<td>60±2.04</td>
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<tr>
<td>9.</td>
<td>Serum creatinine (mg/dL)</td>
<td>2.9±0.11</td>
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<tr>
<td>10.</td>
<td>ALT (U/L)</td>
<td>220±25.7</td>
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</table>

The decreased values of TEC, PCV and Hb obtained in this study may be due to harsh environmental conditions which cause damage to erythrocyte membrane by increased generation of oxygen radicals that leads to lipid peroxidation and protein degradation. The observed increase in total leucocyte count may be due to stress in hot environment which activates the hypothalamo-pituitary-adrenal axis, resulting in the release of glucocorticoids from the adrenal axis, similar reports have been given by Schalm (1975).

Hypoglycemia produced at high body temperature was due to an elevated insulin secretion which increases the overall utilization of glucose by the peripheral tissues also reported by Omar (1977). During heat stress, vasodilation of cutaneous blood vessels and redistribution of blood away from the internal circulation to the skin to maximize the heat dissipation may contribute to hypoxia and cell injury to hepatic cells and muscle cells leading to increased levels of ALT and serum creatinine, which was in accordance to the report of Abdullaziz (1997).

Stationary cars or enclosed vehicles in direct sunlight heat up very rapidly which is called as hot house effect. Basically the atmosphere and the windows of a car are relatively transparent to the sun's shortwave radiation and are warmed little. However, this shortwave energy heat the objects that it strikes as suggested by Sudhir and Jalal Marhoon (2013). The objects like dashboard, steering wheel will heat the adjacent air by conduction and convection and also give off long wave radiation which is very efficient at warming the air trapped inside a vehicle. The windows of a car act as a catalyst for rapid temperature increase inside the vehicle as also mentioned by Dadour et al. (2011).

When the temperature rises above neutral range, the temperature sensors in hypothalamus respond by stimulating the systems involved with thermoregulation to maintain core body temperature as also opined by Schall (1980). In dogs vasodilatation is limited to the tongue and ears. As dogs have no sweat glands except in foot pads, heat dissipation occurs by panting. Heavy panting utilizes much energy and increases the water loss this was in agreement with the report of David (2005).

Dehydration, previous to heat exposure or as a result of prolonged panting impair the thermoregulatory mechanism and results in vasoconstriction and decreased cardiac output which eventually result in decreased tissue perfusion and tissue hypoxia which lead to complications such as hemorrhagic anemia, disseminated intravascular coagulation (DIC),
arrhythmias and renal failure as also reported by Ettinger and Feldman (2010). In the present study the two dogs died inspite of therapy due to multiple organ failure even after the core body temperature returned to normal.

Henker (1999) narrated that the combination of antipyretics with sponging was significantly more effective in decreasing the body temperature. Hence we have tried external cooling as the treatment of choice for heat-related illness. It is very important to avoid ice or very cold water, as this may cause blood vessels near the surface of the body to constrict and may decrease heat dissipation. A shivering response also is undesirable, as it creates internal heat. Lowering the temperature too quickly can lead to other health problems, a gradual lowering is best. The same guideline applies to drinking water. Allow the dogs to drink cool, not cold, water freely. However, do not force the dog to drink. When the use of cold is prolonged or intense, a cold induced vasodilatation follows the initial period of vasoconstriction. During cold-induced vasodilatation, blood flows through arteriovenous anastomoses. This shunting accounts for reduced hemorrhage through the damaged capillaries. The decreased tissue temperature slows down metabolic process in the cell thus decreases the capillary exchange and prevent the animal to enter in shock.

The prognosis for heat stroke is guarded, good or poor, depends on the extent of organ system failure, the duration of exposure to high ambient temperatures, and the aggressiveness of treatment. Client education is essential in preventing this condition.

References


