

# Hide and Die Syndrome: Autopsy Detection of a Rare Case of Paradoxical Undressing & Terminal Burrowing

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## Abstract

Hypothermia is a condition in which core temperature of the body drops below that required for normal metabolism and body functions, which is defined as 35°C (95°F). “Hide and Die Syndrome” or “Terminal Burrowing” is a strange condition seen in fatal hypothermia, particularly in old persons. Long exposure to the severe cold produces paralysis of the thermo-regulatory mechanism, which leads to the aberrant feeling of a higher body temperature and the victim may take off some or all of his clothing known as ‘Paradoxical Undressing’. In the final stage of hypothermia, the brain stem produces a burrowing-like behavior in which the person hides himself in a strange and enclosed space. Subsequently his dead body may be found there itself, which could be either naked or partly dressed. In such cases, the scene of crime usually produces a great confusion and suggests the investigators that the deceased might have attempted concealment before coma and death, which is known as ‘Hide and Die Syndrome’. Such a rare case was brought to us for the autopsy examination in which completely naked body of an old age person was recovered from a partially enclosed tank in the vicinity of a non-functional railway station at Rajkot City of Gujarat. The investigating officers were suspicious of murder with possibility of sexual assault as well, but after meticulous autopsy examination and all other necessary investigations it was concluded as a case of Hide & Die Syndrome. This article is presented here with an aim to highlight the medico legal aspect of rare variety of death from exposure to extreme environmental temperature in India.

**Key-words:** Hypothermia, Paradoxical Undressing and Hide and Die Syndrome.

## Introduction

Hypothermia is characterized by the unintentional drop in a core body temperature to less than 95°F (35°C). [1] Even mild hypothermia is a medical emergency because of the rapid failure of thermoregulation and incremental decline of the neuropsychological awareness. An average of 689 deaths per year in the United States results from excessive environmental cold exposure. The highest mortality rates occur in the less temperate states of Alaska, Montana, North

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Dakota, and New Mexico. [2] It is noteworthy, nevertheless, that deaths because of environmentally caused hypothermia occur equally as frequently indoors as outdoors and are also recorded in temperate climates.[3, 4] Air temperature below 10°C is probably enough low to lead to hypothermia in vulnerable individuals, who are usually elderly persons with waning defenses to cold and the children with poorly developed thermoregulatory mechanisms. Similar ill effects are likely to ensue in individuals whose thermoregulatory mechanisms are already impaired, such as hypothyroid patients and those who are drunk. [5] In India, accidental hypothermia is usually seen during winter season in homeless old aged persons who are not having adequate clothing and proper shelter and when these persons expose to severe cold, they can be a victim of fatal hypothermia and may die due to 'hide and die syndrome'.

Hide and Die Syndrome is a strange condition, which is commonly seen in accidental hypothermia. The exact cause of the condition is not known but most of the authors believe that it may be due to a long exposure to severe cold conditions producing paralysis of the thermal regulatory mechanism. As the skin and core temperatures fall to a critical degree in severe exposures, hypothalamic control of body temperature fails, and the warm-blooded individual converts functionally to a poikilotherm. The ensuing peripheral vasodilatation results in a sudden rush of warmer blood to the extremities. This exaggerated heat sensation, as perceived by the mentally confused, severely hypothermic individual, paradoxically leads to the rare volitional act of undressing in which the person may take off some or all of his clothing known as 'Paradoxical-Undressing' or 'Reciprocal-Undressing', [6] while the other authors believe that the paralysis of the vasomotor center during the first stage of hypothermia is responsible for this behavior of paradoxical-undressing. [7] Twenty to fifty percent of hypothermia deaths are associated with the phenomenon of paradoxical undressing. This typically occurs during moderate to severe hypothermia, as the person becomes disoriented, confused, and combative and paradoxical removal of clothing by such victims further increases the rate of heat loss. [8, 9] In the final stage of hypothermia, the brain stem produces a burrowing-like behavior, which is similar to the hibernation behavior of animals and due to this tendency of "Terminal Burrowing" the person may hide himself in corners, in cupboard or under piles of furniture or household goods and may die there and then. [10, 11]

### **Case-History & PM Examination**

In May 2005, naked dead body of an Un-identified male aged about 70 years was recovered from the partly closed tank of size 2X3X2 feet<sup>3</sup> under piles of pieces of bricks and stones from the vicinity of a non-functional railway station at Rajkot City of Gujarat. Body was brought to us for autopsy examination with a suspicion of murder and possibility of sexual assault as the body was completely naked and recovered from an unusual place. During autopsy, we found that the body was that of a poorly built and poorly nourished male aged about 65-70 years. The deceased was not wearing any clothes over the body and was apparently looking like a beggar with poor body hygiene. The mixed changes of mummification and decomposition were present over the different areas of the body and were coinciding with the time since death about 3-4 months before the date of autopsy examination. Time since death was suggesting that the victim would have died during the previous months of winter season i.e. during January or February, which was looking contrary to the absence of clothing over the body, as the victim was completely naked. No evidences of any ante mortem injury or sexual offence were observed during

the autopsy examination. Routine viscera for chemical analysis and necessary swabs for detection of sexual offence were preserved and sent to Forensic Science Laboratory for the further examination and samples of tissues were also sent for the histo-pathology examinations. FSL reports were negative and histo-pathology examination reports were also not suggestive to conclude the cause of death. Though the medico legal cause of death was not detected in present case, but the history, circumstantial evidences and the findings of paradoxical-undressing and attempted concealment before death with typical behavior of terminal-burrowing were suggesting that it was a case of "Hide and Die Syndrome".

## **Discussion**

'Hide and Die Syndrome' is one of the rarest of rare cause of death especially in the temperate climatic zone like India. In most of the cases usually the victims are homeless old aged persons who are having inadequate clothing and inadequate shelter to protect them from severe cold. When these persons get exposed to low temperature environmental conditions they may become a victim of lethal hypothermia, which consequently leads to a typical behavior of terminal burrowing. Alcohol intoxication and mental illness may enhance the chances further. Early detection of such cases is difficult due to obscure scenes of crime which are also difficult to interpret as we have observed in this case in which the deceased selected a small tank of size 2X3X2 feet<sup>3</sup> to hide him in the final stage of terminal burrowing. The reason for this frequent obscurity is mainly because of the phenomenon of hide-and-die syndrome, which is also explained by almost all other authors [1, 3, 4, 5, 6, 7, 10, 11, 12] Apparently in around 50% of deaths attributing to hypothermia, the body is found either partially or fully undressed, which often results in the erroneous assumption that the deaths are associated with some sexual attack and this mystery of paradoxical undressing can mislead the investigating agencies as well as autopsy surgeon. In present case also there was a presumption of sexual assault by the investigating agencies as there was no clothing over the body of the victim, but the meticulous autopsy examination and negative FSL reports with knowledge of paradoxical undressing helped us to resolve the case.

The determination of the cause of death from exposure to extreme temperatures is a diagnosis of exclusion as there may not be any specific findings diagnostic of death. Hence, in cases of deaths due to hypothermia, circumstances of death may also be important to establish the diagnosis with a degree of certainty. A thorough investigation of the history, background and the scene of crime, evaluation of temporally relevant environmental conditions, and assessment of the victim's underlying state of health with appropriate laboratory studies and of course the meticulous autopsy examination, are essential to establish the cause of death with reasonable medical probability. In case presented here, absence of any fatal injury over the body, negative reports of toxicological analysis and non-conclusive histopathology examination report with evidences of paradoxical undressing and terminal burrowing in an old aged victim were the reasons to conclude the cause of death as "Hide and Die Syndrome".

## **Conclusion**

Incidences of deaths due to exposure to extreme environmental temperature are increasing. Hypothermia is a common incidence but the death due to hypothermia is rare especially in the temperate zones like India. Morbidity and mortality attributing to hypothermia are preventable and most of the victims of accidental hypothermia can survive after the appropriate primary treat-

ment, if the diagnosis is possible within mean time. Autopsy diagnosis of fatal hypothermia and 'Hide and Die syndrome' can be made out on the basis of the theory of exclusion of other medico-legal causes of deaths like drowning, epilepsy, electrocution etc. and awareness among the autopsy surgeon about the features of paradoxical undressing and terminal burrowing may help them to reply on the various medico legal aspects of this rare entity of death. This article is presented here with an aim to highlight the need and demand of appropriate awareness and guidelines for forensic investigations into environmental temperature extremes that contribute to an important seasonal grouping of morbidity and mortality in the India.

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