



Short Case Report

Unusual mode of death in case of cold water immersion

Ajay Kumar^{1*}, Jitender Kumar Jakhar², Piyush Jain³, S.K. Dhatarwal² and Saurabh Singh⁴

¹Inspector General of Police, Hisar Range, Hisar-125001, Haryana, India

²Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India

³Deptt. of Forensic Medicine, Pt. B.D. Sharma PGIMS, Rohtak, Haryana, India

⁴Inspector General of Police, State Crime Branch, Haryana

ajayadsoc@gmail.com

Available online at: www.isca.in, www.isca.me

Received 4th January 2018, revised 15th February 2018, accepted 27th February 2018

Abstract

Death due to drowning is one of the intricate situations confronted by the forensic medical specialist. Death in drowning can happen either due to asphyxia, ventricular fibrillation, laryngeal spasm, vagal inhibition, exhaustion and other injuries. Sudden death in cold water immersion can cause death from inhibition of heart due to vagal stimulation. Such death is usually known as instantaneous physiological death, vasovagal shock, vagal inhibition or neurogenic shock. As a result of this, cardiac and respiratory centres are suddenly paralysed with consequent stoppage of heart and respiration resulting in immediate loss of life. The cause of such vagal inhibition include: sudden fright or emotion and injury to trigger receptor areas, such as carotid sinus, various plexus, testicles, serous membrane, etc. even a trifling injury to these area may result in sudden death. Through this paper we explored as well as contemplated the evidences supporting the hypothesis that unexpected i.e. out of sudden a plunge and immersion of the body in the cold water could cause sudden death due to vagal inhibition. An autopsy case is discussed here in which dead body was found in the well of a village and post-mortem examination showed no antemortem injury.

Keywords: Asphyxia, cold water, minor trauma, sudden death, vagal inhibition.

Introduction

Submersion inhibition occurs in case of death from cardiac arrest due to vagal inhibition as a result of cold water stimulating the nerve endings at the surface of the body or water striking solar plexus or cold water entering the ears, nose, pharynx and larynx which causes stimulation of nerve endings of mucosa. It is also caused by shock due to vagal inhibition from the pressure on the vagus nerves or carotid sinus, or diving involving horizontal entry into the water with a consequent blow to the abdomen causes such accident¹. Alcohol owing to the general vasodilation of skin vessels increases effects as observed in 1% of cases of drowning².

In this paper we will be discussed a case which comes in this 1% category to answer the main question: should the trauma be excluded as a cause resulting in a human's death, in case when there were no ante mortem injuries, no common poison and no diatom were detected.

In cases like these there were no characteristic positive findings like injuries to vital organs and others so in this case the cause of death is inferred from negative findings: the history is typical viz. trauma to the receptor area which may not left a mark; death is instantaneous; there are no fatal injuries; there is no poisoning and there is no natural disease to account for the cause of death³⁻⁷.

Case Report

Autopsy observations: During the thorough post-mortem examination of the deceased. It was found out that the body was in decomposed state, no anti mortem injuries were appreciated over the body and there was no any significant post-mortem finding which could give us the clue regarding the cause of death. So, viscera has been preserved and sent for chemical analysis to FSL Madhuban and clavicle bone was sent for diatoms to FSL Karnal to ascertain the cause of death as presence of diatoms in the tissue is one of the reliable sign of drowning.

Chemical Analysis report: No common poison was detected in the viscera samples.

Diatoms Analysis report: Diatoms were not detected in the clavicle bone although diatoms were present in the water sample of the same well.

Scene of crime observed and reconstruction

Body of the deceased was recovered from a well near the pond in the northern direction of the village bass khurd on 25/02/2017. This well was stated to be used by the villagers for fetching water. Total depth of well i.e. up to the bottom was observed to be approx. 37 feet and depth up to the water surface

was observed to be 18 feet. Therefore the Well was having 19 feet of water. Diameter of well was approx. 80 inches. Height of wall of the well was approx. 31 inches and width of wall of the well was approx. 14.5 inches. Residential area was observed in the northern side of the well. Kacha path was observed on the western side of the well which was stated to be commonly used

by the villagers. It was observed that if anyone would be assaulted/ murdered at a place like this one, it would have great probability of being noticed by villagers. The villagers nearby informed that the deceased was a chronic alcoholic and remained out of his house mostly.



Picture-1: The dead body in the above mentioned well.



Picture-2: The dead body of the deceased in putrefied condition and facial featured were bloated and unidentifiable.

Discussion

Immersion represents globally the third commonest cause of accidental death in adults global. Worldwide, every year approximately five lakh immersion related deaths are observed. In such conditions the trauma may be very trivial and the real mechanism is a physiological process, anatomical changes are not discernible. Therefore, there are no characteristic post-mortem appearances. Hence the death as caused by and associated to numerous factors and circumstances is an occurrence which involves legitimate medicinal as well as public concern about its being natural or unnatural. It is often a challenging task to identify the cause of death in case of a sudden arisen of a death, specifically in cases of trauma and of any present known or unknown or even hidden pathology. Generation of the cause of death on the basis of the immature judgement may actually be harmful. Generally It is not happened however there are cases in the medico legal investigation when a physical confrontations occurs, even with the post-mortem examination, toxicological, microbiological and biological examination, still the estimation of cause of death is not clear and still controversial; when there is no sign of violence over the body of victim observed⁸⁻¹⁰.

Many cases of sudden death after immersion in cold water like one example of a swimmer who died immediately after jumping in domestic swimming pool are reported¹¹. Death occurring suddenly within seconds or minutes caused by minor trauma or harmless peripheral stimulation may be cause by vagal inhibition. One of the possible causes of vagal inhibition is sudden immersion of body in cold water. This mechanism is similar to our case, because it is about minor traumas as result of a fall from a considerable height into the cold water. In this case death occurs within seconds or minutes as a result of minor trauma due to vagal inhibition which may be occurred as a result of sudden immersion of body in cold water¹².

Conclusion

In this case no antemortem injuries involving vital organs like brain, heart, liver, spleen, kidney and any major vessel which was fatal to life and may suggestive of case of assault/ homicide was not appreciated on post-mortem examination. No common poison or any drug was detected in the viscera which were sent to RFSL for chemical analysis. Diatoms were also not detected in the bone sent for analysis although they are present in the well sample. As this incident happen in the month of December and patient is known alcoholic. So, by exclusion we can probably think that in our case vagal inhibition must be the cause of death as a result of sudden impact with cold water as patient is known alcoholic which can also lead to exaggeration of vasovagal inhibition.

References

1. Rao D. *Drowning*. Available from: <http://www.Forensicpathologyonline.com/E-Book/asphyxia/drowning> [Accessed 28th September 2017].
2. Giertsen J.C. (1970). Drowning while under the influence of alcohol. *Medicine, Science and the Law*, 10(4), 216-219.
3. Bierens J.J., Knape J.T. and Gelissen H.P. (2002). Drowning. *CurrOpinCrit Care*, 8, 578-586.
4. Spitz W.U., Spitz D.J. and Fisher R.S. (2006). Spitz and Fisher's medicolegal investigation of death: guidelines for the application of pathology to crime investigation. Charles C Thomas Publisher.
5. Golden F.S., Tipton M.J. and Scott R.C. (1997). Immersion, near-drowning and drowning. *Br.J.Anaesth*, 79, 214-225.
6. Tipton M.J. (1989). The initial responses to cold-water immersion in man. *Clinical Science*, 77(6), 581-588.
7. Tipton M.J., Golden F.S.C., Higenbottam C., Mekjavic I.B. and Eglin C.M. (1998). Temperature dependence of habituation of the initial responses to cold-water immersion. *European journal of applied physiology and occupational physiology*, 78(3), 253-257.
8. Tipton M.J., Mekjavic I.B. and Eglin C.M. (2000). Permanence of the habituation of the initial responses to cold-water immersion in humans. *European journal of applied physiology*, 83(1), 17-21.
9. Conn A.W., Miyasaka K., Katayama M., Fujita M., Orima H., Barker G. and Bohn D. (1995). A canine study of cold water drowning in fresh versus salt water. *Critical care medicine*, 23(12), 2029-2037.
10. Segarra F. and Redding R.A. (1974). Modern concepts about drowning. *Canadian Medical Association Journal*, 110(9), 1057.
11. Nasrabadi Z.N., Ghorbani M. and Marashi S.M. (2011). Sudden Death After Immersion In Cold Water. *Webmed Central Forensic Medicine*, 2(11), WMC002426.
12. Reddy K.S.N. and Murty O.P. (2017). Death and its cause. In: *The essential of forensic medicine and toxicology*. 34thed. New Delhi: Jaypee Brothers Medical Publishers Pvt Ltd., 128.