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Case Report of Neurocardiogenic Vasovagal Shock: “A Medicolegal Masquerade”

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ABSTRACT

Autopsy plays a significant role in determining the cause of both natural and unnatural deaths. Identifying the cause of death becomes more challenging when it occurs suddenly and rapidly, particularly in cases involving trauma, whether known or unknown, or in a case of concealed underlying pathology. The role of cardiac inhibitory reflex as a potential cause of death remains debatable. This case report describes a fatal incident of such nature. The reasons for such neurocardiogenic vasovagal shock can be attributed to sudden shock or strong emotions and injury to specific areas such as the carotid sinus, various plexuses, testicles, and serous membranes. Even minor trauma to these areas can lead to sudden death. This case report describes a 43-year-old male who was assaulted by his neighbour as a result of a long-standing feud and died almost immediately after minor trauma to the neck and chest.

Introduction

Forensic pathologists should accurately identify the cause of death and assess the impact of external and internal factors. This process provides solid evidence of the legal accountability of the deceased and the involved party. Forensic pathologists routinely perform medicolegal autopsies to achieve autopsy objectives and to solve the dilemma of investigating agencies. Determining the precise cause of death through postmortem examination is essential for both natural and unnatural fatalities. The vagus nerve is critical for maintaining physiological balance, including regulating cardiac function through reflex pathways. (1) An abnormal or exaggerated autonomic response to various

triggers, primarily standing and emotional stimuli, is responsible for neurocardiogenic syncope. (2, 3) Vasovagal syncope, also referred to as neurocardiogenic syncope, is the primary cause of fainting episodes in both paediatric and adult populations. This condition is responsible for 50-66% of cases in which the reason for syncope is not immediately apparent. (4, 5) To exclude death as a potential outcome, it is essential to comprehend the underlying mechanisms of neurocardiogenic syncope. (6) The heart can be stopped by vagal inhibition when the vagus nerve in the neck is activated. This can occur due to sudden fear, emotional shock, or damage to sensitive areas, such as the carotid sinus, various nerve plexuses, testicles, and serous membranes. Even minor injuries to these regions may lead to immediate death. Vagus

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nerve stimulation can result from various triggers, including fright, intense emotions, or physical trauma to receptor-rich areas. (7) Whether the cardiac inhibitory reflex plays a significant role in the cause of death remains controversial. (8) This article examines an autopsy case in which medical professionals were unable to determine the definitive scientific cause of death. We investigated and considered evidence supporting the theory that sudden death could result from vagal inhibition triggered by seemingly minor trauma or innocuous peripheral stimulation. This unexpected outcome challenges our understanding of how relatively harmless stimuli can lead to fatal consequences.

Case Report

A 43-year-old male individual was physically assaulted by his neighbour because of a long-standing feud. Subsequently, he was immediately brought to a tertiary care hospital in Prayagraj but was found dead on admission. The patient's body was then transferred to the mortuary for autopsy to fulfil the necessary legal procedures. The autopsy was performed on the same day. There were some irregular, reddish-abraded contusions over the left side of the neck and chest at the level of the 4th intercostal space. Apart from this, no other signs of violence or injury to the victims' bodies were observed. External examination revealed no significant findings, and the findings were largely unremarkable. Upon internal examination, the organs appeared to be congested. These injuries were found to be nonfatal, as there was no underlying tissue damage. Viscera were sent for chemical analysis to rule out poisoning. Opinions regarding the cause of death was reserved until the pending reports of chemical analysis. Histopathological analysis of the heart did not reveal any noteworthy findings and toxicological screening yielded negative results. Following discussions with senior police officials, the court opted to request a medicolegal opinion regarding the cause of death. The head of the department constituted a panel of doctors to determine the cause of death. Based on a comprehensive assessment of the findings and supporting documentation from autopsy, the cause of death was thought to be neurocardiogenic vasovagal shock.

Discussion:

Neurocardiogenic vasovagal shock is an abrupt event that can occur within moments due to minor injuries or seemingly harmless peripheral stimuli such as contact with the neck area. It is suggested that the cardiac inhibitory reflex should be considered as a potential factor in unexpected deaths that meet three specific criteria: (1) the circumstances

surrounding the death align with the cardiac arrest hypothesis, (2) a typical peripheral trigger is present, and (3) a comprehensive autopsy cannot exclude the involvement of the cardiac inhibitory reflex in causing death. This reflex mechanism should be considered when investigating sudden and unexplained fatalities that fulfill these conditions. ⁽⁹⁾ No common poisoning or drug was detected in the viscera, which were then sent to the FSL for chemical analysis. Thus, the cause of death is inferred from negative findings: the history is typical, viz. trauma to the receptor area, which may not leave a mark; death is instantaneous; there are no fatal injuries; and there is no poisoning to account for the cause of death. In this case, minor trauma to the neck caused increased pressure on the baroreceptors situated in the carotid sinus, carotid sheath, and carotid body, which in turn caused a transient increase in blood pressure locally in the sinus. Afferent impulses are transmitted through the nerves of the small herring to the glossopharyngeal nerves, which are further transmitted to the tractus solitaries in the medulla, stimulating the vagus and causing a reflex slowing of the heart rate, which in turn causes dilatation of blood vessels and, ultimately, a fall in blood pressure. ⁽¹⁰⁾ So, by exclusion, we opined that in our case, neurocardiogenic vasovagal shock must be the cause of death as a result of relatively minor trauma over the neck area, which can lead to exaggeration of vasovagal inhibition.

Conclusion:

Determination of the assailant's culpability relies on *mens rea*, which is the guilty mind and mental component of the offence. The fact that the injuries were non-serious does not automatically imply that the assailants did not intend to cause death. The judiciary often raises concerns regarding the accuracy of autopsies, particularly in developing nations. Errors or misinterpretations are unwelcoming in medicine but pose a significant risk in forensic medicine. A mistaken conclusion could lead to either the wrongful acquittal of a perpetrator or the wrongful conviction of an innocent individual. Consequently, expert opinion is always necessary before reaching a verdict. Hence, in most cases, courts anticipate that the forensic pathologist will assess the impact of minor injuries, thus posing a challenge to prove beyond reasonable doubt.

Author contributions:

All authors contributed to the design and conception, manuscript drafting, and final draft approval.

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The authors have no conflict of interest to declare.

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Not applicable

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