

Ruptured Anterior Communicating Artery Berry Aneurysm Presenting as Suspicious Sudden Death: A Forensic Autopsy Case Report

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Abstract

Background: Unexplained and sudden deaths in suspicious circumstances create a considerable medicolegal dilemma which usually requires a comprehensive medicolegal postmortem examination in order to establish whether such deaths are due to natural causes or some kind of injury like trauma, poisoning, strangulation, or any other kind of foul play. The rupture of an intracranial berry aneurysm is the commonest cause of spontaneous nontraumatic sub-arachnoid hemorrhage (SAH). **Case description:** A 62-year-old hypertensive male, irregular on antihypertensive treatment, suddenly collapsed while working at a resort in Jhajjar, Haryana, and was admitted to the Emergency Department of Pandit Bhagwat Dayal Sharma Post Graduate Institute of Medical Sciences (PGIMS), Rohtak. On admission, he was deeply unconscious with a blood pressure of 200/120 mm Hg. Non-Contrast Computed Tomography (NCCT) of the head demonstrated basal Subarachnoid Haemorrhage (SAH). Despite intensive conservative management, the patient remained unconscious and subsequently died. As the death occurred under suspicious circumstances, a medicolegal autopsy was performed. Postmortem examination revealed diffuse SAH with intraventricular extension secondary to rupture of a berry aneurysm arising from the anterior communicating artery. No evidence of external or internal injuries, neck compression, or gross findings suggestive of poisoning was identified. The subsequent police investigation also found no evidence of foul play. **Conclusion:** Ruptured anterior communicating artery berry aneurysm should be considered an important differential diagnosis in sudden unexpected deaths presenting under suspicious circumstances. Comprehensive medicolegal autopsy with treatment record correlation is essential for establishing the cause and manner of death and excluding competing unnatural causes.

Keywords: Sudden unexpected death; Subarachnoid hemorrhage; Berry aneurysm; Anterior communicating artery; Foul play

Introduction

Sudden death is defined as the unexpected death of a person who, prior to death, was not suffering from any dangerous disease, poisoning, or injury. Emphasis is placed on the unexpected nature of death rather than its suddenness [1,2]. In such cases, the cause of death is often not apparent on external examination alone; therefore, a complete medicolegal autopsy is essential to establish the cause and manner of death and to exclude the possibility of foul play [3,4].

Sudden deaths due to Central Nervous System (CNS) pathology are less common than sudden deaths due to cardiac causes, but still form an important part of forensic autopsy practice. These are not common compared to cardiovascular, respiratory, digestive or urinary systems cases yet CNS sudden unexpected deaths must be included for differential diagnosis considerations. The spectrum of CNS causes include intracerebral haemorrhage, aneurysmal subarachnoid haemorrhage, ischemic stroke, epilepsy, brain tumours and infections [5]. Among the common neurological causes of sudden unexpected death, spontaneous Subarachnoid Hemorrhage (SAH) is often quoted to be a major cause and described in forensic literature to be usually the second most common CNS cause of death after epilepsy [6], although individual autopsy

series may vary. In most cases (~85%) non-traumatic SAH results from rupture of an intracranial aneurysm [7]. Saccular/berry aneurysms are classically at arterial bifurcations within the circle of Willis, usually in the anterior circulation, including the region of the anterior communicating artery [8]. Hypertension and cigarette smoking are proven risk factors not only for aneurysmal formation but also for aneurysmal SAH rupture. Rupture of an aneurysm may result in precipitous neurological deterioration, coma, intraventricular extension of blood, acute hydrocephalus and death.

While neuroimaging can establish diagnosis in life, sudden collapse under suspicious circumstances calls for medicolegal autopsy to rule out other unnatural causes of death. This report stresses the importance of methodical medicolegal autopsy and clinicoradiological correlation in diagnosing the cause of death and differentiating between deaths due to foul play from those that happened under similar circumstances.

Case Report

A 62-year-old male, working at a resort situated in Jhajjar, Haryana, was allegedly found lying unconscious at his workplace around 8:30 AM. As per the available history, there was a sudden onset of unconsciousness with no

history of previous trauma, physical assault, fall from height, altercation at the workplace, seizures, vomiting, chest pain, or consumption of any known poisonous substance. No history of alcoholic intake or substance abuse was given by the attendant prior to unconsciousness. He was immediately shifted to the Emergency Department of Pt BD Sharma Post Graduate Institute of Medical Sciences (PGIMS), Rohtak, Haryana, for further management.

The patient was a known case of hypertension for 5 years and was reportedly irregular in taking antihypertensive medication. No other major comorbid illness was documented in the available treatment records. On arrival in the emergency department, he was deeply unconscious, with a Glasgow Coma Scale (GCS) score of E1V1M1. His airway was secured by endotracheal intubation, and he was placed on mechanical ventilatory support. His blood pressure was markedly elevated at 200/120 mm Hg, pulse rate was 76 beats/minute, and random blood glucose was 138 mg/dL. The remaining systemic examination did not reveal any obvious abnormality. There were no clinically documented external injuries or findings suggestive of assault or mechanical violence at the time of admission.

An urgent Non-Contrast Computed Tomography (NCCT) Scan of the head revealed SAH predominantly involving the basal cisterns/base of the skull. Neurosurgical consultation was obtained. In view of the patient's very poor neurological status at presentation, deep coma, and grave prognosis, conservative management was advised. Definitive aneurysm clipping/coiling could not be undertaken because of the patient's poor clinical grade and hemodynamic/neurological condition. The patient was managed with ventilatory support, osmotherapy, antihypertensive therapy, anticonvulsants, and other supportive measures.

Despite intensive treatment, his neurological status did not improve, and he remained deeply unconscious throughout hospitalization. After approximately 6 days of hospitalization he developed cardiorespiratory arrest and could not be revived despite appropriate cardiopulmonary resuscitation. He was subsequently declared dead.

Although the treating clinicians informed the relatives that the probable cause of death was intracranial haemorrhage, the sudden collapse at the workplace and the unexpected nature of death raised concern regarding possible foul play. A request for a medicolegal autopsy was sent to find out the cause and manner of death and to rule out other unnatural causes of death such as assault, poisoning, mechanical asphyxia, or trauma.

Autopsy Findings

The medicolegal autopsy was conducted in the Mortuary at the Department of Forensic Medicine and Toxicology, Pt BD Sharma PGIMS, Rohtak.

External Examination

The body belonged to a moderately built and nourished 62-year-old male. No external injuries were seen. No abrasions, contusions, lacerations, defence injuries, marks of restraint, ligature marks or external findings of struggle, assault or mechanical violence or poisoning and corrosive ingestion were noted. Few external marks of injection were present.

Internal Examination

Scalp and skull bones were intact. No fracture or traumatic intracranial injury was seen. Skull was opened and abundant liquid and clotted blood was found present over the base of the brain due to SAH. There was also blood present in both the lateral ventricles (**Figure 1 and 2**). Circle of Willis was isolated and a ruptured aneurysm was observed around the anterior communicating artery.

Neck was opened and hyoid bone, thyroid cartilage, cricoid cartilage, larynx, trachea, large vessels and surrounding soft tissue were preserved. There was no haemorrhage in neck tissue to indicate throttling, strangulation or throttling.

Both lungs and abdominal viscera were congested. There was no visible abnormality of the heart. Grossly patent coronary artery was observed.

50 mL of yellowish green mucoid material was found in the stomach. The mucosa was pale and no erosion, congestion, corrosive change or unusual odour was noticed.

No evidence of assault, neck compression, poisoning, or traumatic intracranial injury was found from the clinical records, radiological findings, autopsy, and available facts of investigation. Thus, the cause of death was attributed to SAH with intra-ventricular extension due to rupture of a berry aneurysm of the anterior communicating artery and its complications.

Discussion

It presents a major medicolegal dilemma when faced with cases of sudden unexpected death in suspicious circumstances because a natural catastrophic event leading to unexpected death can emulate trauma, poisoning, mechanical asphyxia, and assault. In cases of this type, the forensic objective is not just identification of a disease process but determining if this explains the death, as well as excluding other competing unnatural causes. This is of particular importance when it occurs suddenly on work premises or at some public place where there would be no clear witnessed medical history leading to concern by members of relatives or investigation agencies. Thus, an evaluated approach of combined investigation from scene history, treated records from hospitals, radiology, external and internal dissection, and also aided by special and forensic investigations are used to establish a diagnosis for



Figure 1: Inferior view of the brain at medicolegal autopsy showing diffuse subarachnoid haemorrhage.

cause of death. Similarly, recent reviews from forensic literature recommended that sudden adult death cases require a systematic autopsy approach to differentiate death arising from natural disease (or if the disease is not in question) from traumatic or intoxication causes [2,5,9].

A traumatic cause for a death which otherwise might be due to natural causes may assume crucial forensic importance because SAH due to such rupture typically may produce

'abrupt collapse, deep coma, cardiorespiratory arrest and death' in a short interval that causes perplexity about whether SAH has led to unnatural causes for death. Non-traumatic SAH most commonly results from rupture of an intracranial aneurysm, a condition known as aneurysmal SAH. It represents a medical emergency that leads to considerable morbidity and may lead to serious complications and even result in mortality. In this regard,

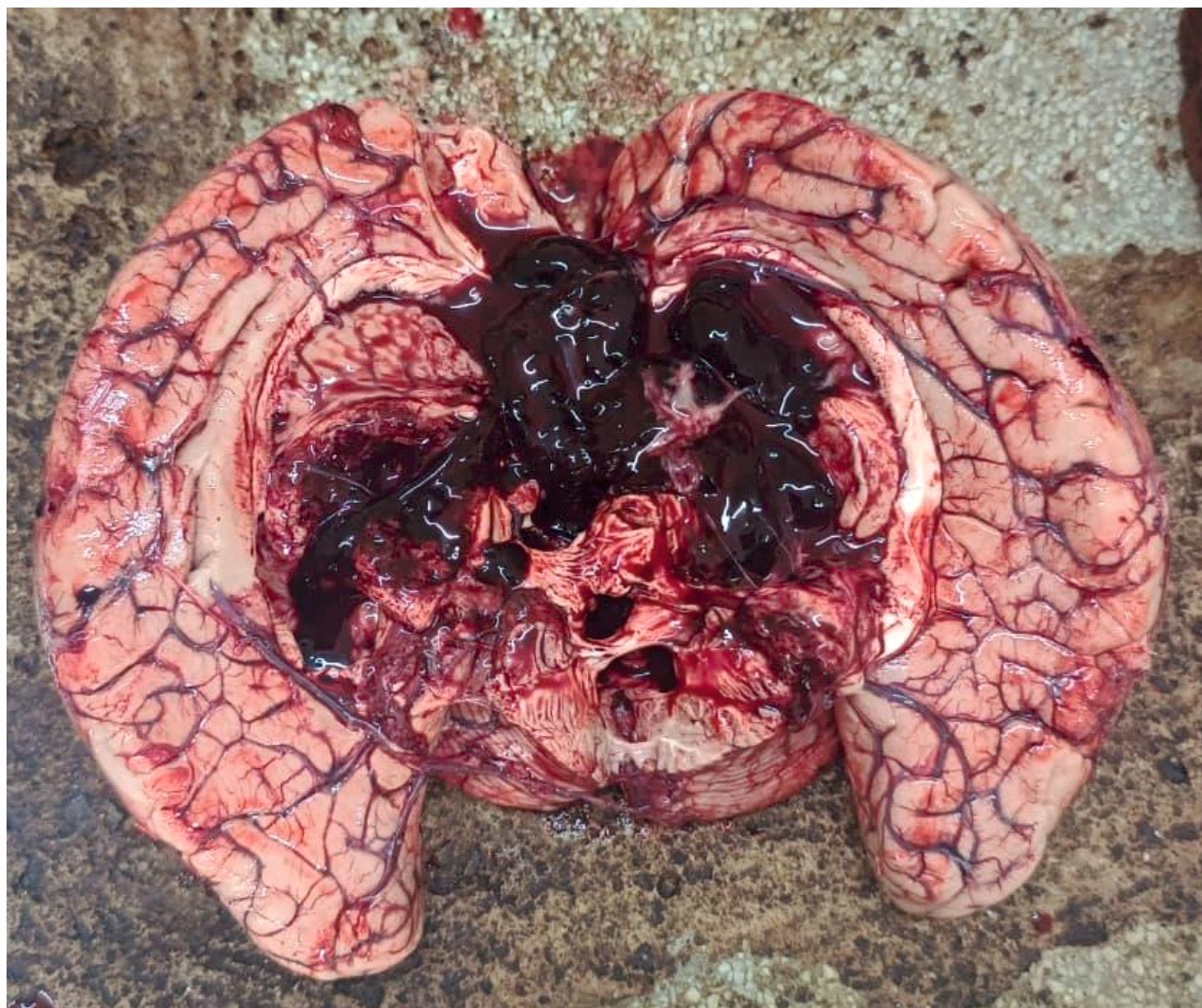


Figure 2: Right and left cerebral hemispheres after bisection showing extensive intraventricular hemorrhage involving both lateral ventricles.

Hydrocephalus, Increased intracranial tension, rebleeding, seizures, neurogenic pulmonary edema and sudden autonomic dysfunction (causing arrhythmias, etc. [10]) leads to death in aneurysmal patients. Low GCS at admission was accompanied by basal SAH as appreciated on NCCT brain imaging of a patient who died post-admission (within a few hours). Post-mortem study reveals diffuse SAH with intraventricular extension of the hemorrhage in the patient's brain, which explains the clinico-neurological findings. Therefore, the death in this case can be understood by referring to the description of aneurysmal SAH in a classic study which mentions rupture leads to a severe, often fatal type of SAH, and intraventricular extension is a common cause in fatal cases and so on.

From the pathophysiological perspective, his history of poorly controlled hypertension is significant. Intracranial saccular aneurysms often occur at arterial bifurcations where there are peaks of hemodynamic stress, and the chronic hypertension may increase wall stress, promote aneurysm formation, and contribute to SAH. Smoking,

though not noted in the present case, is another common modifiable risk factor for aneurysm formation and aneurysmal SAH. The anterior communicating artery is one of the causes of rupture of aneurysms of small sizes in some studies [11]. Hence, long-standing and uncontrolled hypertension, sudden episode of deep coma, basal SAH, intraventricular extension, and rupture of communicating arteries are strongly suggestive of a case of spontaneous rupture of an aneurysm. Moreover, this case also points out the need for a high index of suspicion in the assessment of sudden collapse when peculiar or suspicious circumstances attend presentation. In the Emergency Department, many cases may at the start present as cases of poisoning, assault, traumatic brain injury, seizure, mechanical asphyxia [12-21], or cardiac arrest. Resuscitation along with the attendant/witnesses' account, search for external injuries or toxicological clues, and early brain imaging with a systematic approach and accurate medicolegal documentation should be carried out in such cases.

In the present case, the initial suspicion of foul play was ultimately resolved through clinicroadiological correlation

and medicolegal autopsy, which established ruptured anterior communicating artery berry aneurysm with subarachnoid and intraventricular hemorrhage as the natural cause of death.

The exclusion of trauma, poisoning, mechanical asphyxia, and assault is the medicolegal issue herein. Trauma SAH may occur following head injury, and SAH itself may cause sudden collapse followed by fall-related injury; hence, correlation of the external features of injuries, the scalp-skull findings and brain appearances, and circumstances of collapse needs to be carefully examined. In the present case, the absence of abrasions, contusions, lacerations, defence injuries, restraint marks, skull fracture, traumatic intracranial injury, or neck-structure injury argued against assault or mechanical asphyxia. The stomach contents and gastric mucosa did not show gross features suggestive of corrosive or toxic ingestion. However, in suspicious sudden deaths, the decision regarding toxicological preservation should be aligned with local medicolegal protocol and the degree of investigative suspicion. Where toxicology is not performed, the manuscript should clearly justify this decision by emphasizing the concordance of clinical, radiological, and autopsy findings with a demonstrable lethal natural lesion. Forensic literature notes that SAH may occur in natural, accidental, homicidal, suicidal, or undetermined settings, making scene investigation and autopsy correlation crucial [22-23].

The findings of this case are consistent with previous forensic autopsy studies of fatal spontaneous SAH. In a review of forensic autopsies conducted in Edinburgh, reported that most fatal SAH cases were spontaneous and due to ruptured cerebral artery aneurysms, with aneurysms

commonly arising from the anterior part of the circle of Willis [24]. Earlier forensic literature also documented sudden or unexpected natural death due to ruptured intracranial aneurysms in a large forensic case series, supporting the long-recognized medicolegal relevance of this entity [25]. Similarly, it has been emphasized that accurate forensic evaluation of SAH requires integration of autopsy findings with clinical and investigative information because SAH may occur in both natural and unnatural contexts [22]. These studies support the approach adopted in the present case, where the final opinion was based on concordance between hospital records, neuroimaging, autopsy findings, and available investigative information.

Conclusion

A ruptured anterior communicating artery berry aneurysm is an important natural cause of sudden unexpected death and may present under circumstances suspicious for foul play. This case highlights the need on the part of emergency physicians and forensic experts to have a high grade of suspicion, properly document and correlate the clinical imaging and autopsy findings, thoroughly perform the medicolegal autopsy in cases where the possibility of trauma looms large, as in this case, in the mind of either of the two. This not only rules out any kind of complicity that may have been caused by family and acquaintances for hiding the real cause of the fall but also brings out the cause and nature of death to its logical conclusion. Careful examination of the circle of Willis and exclusion of trauma, poisoning, asphyxia, or assault are essential for scientifically establishing the cause and manner of death.

CLINICAL, ETHICAL AND SOCIAL IMPLICATIONS

1. This case is described here to stress the medicolegal importance of a complete autopsy, diligent examination of the circle of Willis and correlation with treatment records in sudden deaths, where a foul play is suspected.
2. A ruptured berry aneurysm of the anterior communicating artery can be a significant natural cause of sudden collapse amongst the elderly and those on hypertensive medication.
3. However one should pay attention and dissect out the circle of Willis correctly if a basal subarachnoid hemorrhage with intraventricular extension is observed, to find a ruptured aneurysm.
4. Imaging alone cannot confirm a natural intracranial cause of death this must be confirmed by a full medicolegal autopsy. However before giving out the final medicolegal opinion, cross match with the clinical records, radiological findings, autopsy findings, scene history and investigative information.
5. Sudden natural deaths seem to fall under suspicion and be a mimic to assault, poisoning, mechanical asphyxia, trauma of different forms or other unnatural causes.
6. The medicolegal interest of this case is to show how a death initially suspected of having been foul play can be scientifically classified into natural death based on the congruence of the findings of the clinic, Radiology, post-mortem and investigation. This should therefore provide clinicians and the forensic expert with a balanced, evidence-based opinion to comment on sudden suspicious deaths.
7. Such clinicoradiological correlation and proper medicolegal autopsy protects the dignity of the body, gives clarity to the grieving family, saves any untoward allegation of foul play in the death of the deceased and finally supports fair and reasonable course of the investigation and justice.

Declarations

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Author Contribution: HC and A conceptualized the case report, prepared the initial draft, performed the literature review, interpreted the clinical and autopsy findings, and critically revised the manuscript for important intellectual content. Both authors approved the final version of the manuscript and HC accepts responsibility as the primary guarantor for the integrity and accuracy of the work.

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