

## CASE REPORT

# Sudden Natural Death in a Suicide Attempt

Biagio Solarino,<sup>1</sup> William Ralston,<sup>2</sup> Kevin Younger,<sup>2</sup> and Donna M. Hunsaker,<sup>2</sup>

<sup>1</sup>Section of Legal Medicine, University of Bari, Bari, Italy; and <sup>2</sup>Office of the Chief Medical Examiner, Louisville KY

Address for correspondence  
and reprints:

Biagio Solarino  
Section of Legal Medicine  
University of Bari  
Bari 70125, Italy;  
E-mail: bisola@tin.it

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### Abstract

In this article, we report an unusual case of sudden death arising from a ruptured basilar artery aneurysm during a suicide attempt. A 72-year-old male was found dead in his home after sustaining superficial flesh gunshot wounds (entrance and exit) involving the forehead. The victim had been depressed for several months and had frank suicide intention. The pertinent autopsy findings revealed a superficial nonpenetrating bullet path of the scalp with no skull fractures or brain injuries. However, brain examination identified subarachnoid hemorrhage and subdural clot about the brainstem and within the posterior fossa linked to a basilar artery aneurysm rupture. The cause and manner of death and contributing factors of the “non-lethal” gunshot wounds are discussed.

**Key Words:** Forensic pathology; sudden natural death; basilar artery aneurysm rupture; gunshot wounds.

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## INTRODUCTION

Establishing the proper cause (COD) and manner of death (MOD) in a variety of unnatural cases are fundamental reasons for employing forensic pathologists (1,2). The determination of the MOD (how the COD came about) represents a complex analysis of autopsy findings systematically coupled with adequate circumstantial data and historical information. In deaths involving complicated gunshot wounds, a “skeptical” methodological approach in determining MOD requires both a close inspection of the wounds and a good understanding of the immediate circumstances of death, including the deceased’s psychopathological background (3).

The following self-inflicted gunshot wound case is proof that not all findings are initially evident until the autopsy is complete. The proposed MOD may even change from the initial impression yielded from the primary investigation of a case. We present this unique case of sudden death arising from a ruptured basilar artery aneurysm occurring during a self-inflicted injury in an attempted suicide.

## CASE REPORT

A deceased 72-year-old man was discovered in his apartment bedroom, holding a .22 caliber semi-automatic handgun in his dominant right hand, exhibiting what initially appeared to be fatal gunshot head wounds. He had a history of three

previous strokes and hypertension. According to relatives, he recently became depressed and desired to die.

The autopsy examination confirmed paired tangential superficial gunshot wounds of the left forehead (Fig. 1). The elongated near-contact perforating entrance wound at the left supraorbital forehead was associated with an obliquely oriented upward laceration, characteristic of tangential firing. The entrance laceration defect measured 4.5 × 0.5 cm. The inferior cutaneous margin of the wound exhibited soot deposition. The superiorly located exit wound measured 2.0 × 0.5 cm and exhibited multiple tiny, peripherally radiating cutaneous lacerations. Associated subjacent cutaneous and ipsilateral periorbital ecchymoses were present. Reflection of the scalp revealed underlying subgaleal hemorrhage without fracture of the skull. The superior surface of the brain showed no injury; but upon removal of the brain, massive subarachnoid hemorrhage and clot in the basal cistern from a ruptured 5-mm saccular aneurysm of the basilar artery approx 2 mm proximal to the basilar-vertebral arterial junction was discovered (Fig. 2). Extensive calcific atherosclerosis of the basilar system and arteries involving the circle of Willis was present. Other pertinent autopsy findings included cardiomegaly (570 g) with concentric left ventricular hypertrophy and moderate atherosclerosis involving the aorta and coronary arteries. Brain examination did not reveal gross evidence of previous strokes.



Fig. 1. The paired tangential superficial gunshot wound in the left forehead, with cutaneous and periorbital ecchymoses.

The cause of death was ruled “subarachnoid hemorrhage due to ruptured basilar artery aneurysm.” The gunshot wound was superficial and had not caused intracranial injury. The MOD, determined “natural” by one of the authors, prompted debate regarding the possible contributing mechanism of the self-inflicted injury to initiation of arterial rupture.

## DISCUSSION

Subarachnoid hemorrhage arising from spontaneous intracranial arterial aneurysm rupture is one of the leading causes of sudden death and represents significant morbidity and mortality in the United States (4–7). When coupled with atherosclerotic and hypertensive vascular disease, the prevalence increases, especially in the elderly. After rupture of an intracranial aneurysm, blood enters into the subarachnoid space, raising the intracranial pressure, causing widespread arterial spasm, and resulting in massive brain injury. Mortality rates from the initial bleeding episode are between 25 and 50% (8). Patients with ruptured aneurysms in the posterior circulation,

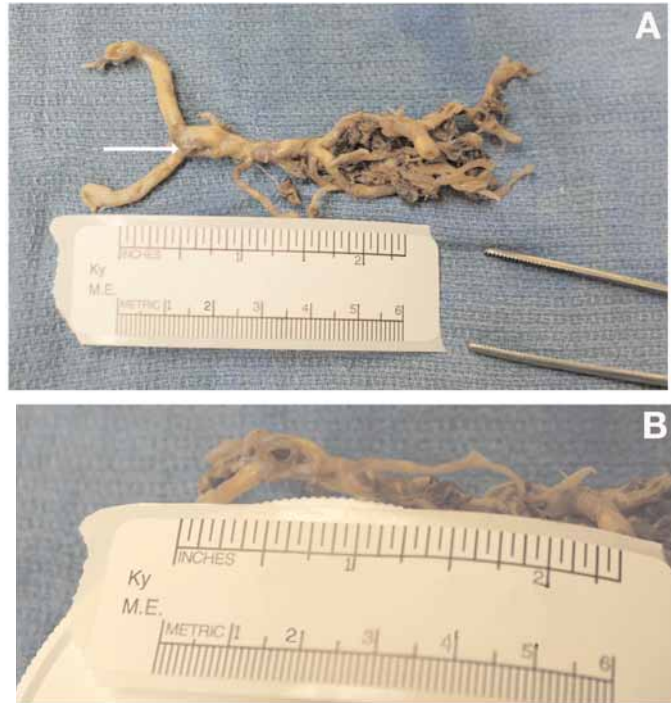


Fig. 2. The white arrow illustrates the saccular aneurysm proximal to the basilar–vertebral arterial junction (A); clear ruptured 5-mm basilar artery aneurysm approx 2 mm right to the vertebral artery (B).

especially in the basilar system, have an increased risk of sudden death compared with those who have aneurysms of the anterior and middle distribution (9–13). The rupture results from diversion of the arterial stream into a weakened and attenuated area of the arterial wall, causing transmural disruption (14). Minor cranial trauma or undue psychological or physical stress accompanied by a surge of endogenous catecholamines may precipitate an internal pathophysiological response creating an irreversible intravascular pressure increase exceeding the arterial wall resistance (1,15). Death often occurs within minutes of the onset of symptoms, which include headache, impaired consciousness, and coma. Common risk factors for fatal intracranial arterial aneurysm rupture are long-term hypertension and a sudden elevation in systolic blood pressure (12). Relative risk factors include cigarette smoking, atherosclerosis, genetic predisposition, and alcohol abuse.

Despite the proposed “natural” progression of the disease state associated with a ruptured basilar artery aneurysm, forensic pathologists may consider suicide as the ultimate MOD in this case. In separate accounts, Hirsch, Davis, Malik, Turner, and Prahlow speculated that emotional stresses witnessed in acts of violence, that is, homicides, acutely precipitate a lethal cardiac dysrhythmia or cause fatal intracranial hemorrhage from a spontaneous rupture of a preexisting arterial aneurysm (1,16–19).

This case demonstrated the intent to harm oneself, both by verbal indication to family and the presence of the obvious

self-inflicted head wound. Suicide, as a manner of death, is a leading contributor to mortality in all Western countries and the elderly have a higher incidence of completed suicide than other age groups (20,21). The history of chronic debilitating illnesses, such as strokes and hypertension, combined with clinical depression, promote suicidal tendencies in some elders who do not have the resources to properly manage the adverse situation. Firearm injuries are the most common method of suicide in the United States, and the head is the most favored site of injury, however, despite the initial investigation report, the forehead flesh wound in this case made the true nature of the victim's COD less apparent until the autopsy was completed (17,22–27).

The presence of a ruptured intracranial artery and absence of specific gunshot-related trauma create an immediate “natural” mechanism of death. The proximate or underlying causative factors include cerebrovascular and cardiovascular diseases. The question about the timing of and the emotional stress related to the act of bringing the gun to his head in order to shoot himself come to the forefront in the MOD discussion in this particular case. Certainly, the psychological stress of carrying out a planned suicidal act could raise the systolic blood pressure while the handgun was handled and ultimately placed into a self-injurious position. As seen in multishot suicides characterized by one lethal and other sublethal wound(s), the bullet track in this individual was superficial and without intracranial trauma, thus theoretically allowing for alternative actions to self-harm (19,28). However, this case illustrates the acute progression and ultimate demise from a natural disease process that may have been induced by emotional stress and minor head trauma during a suicide attempt (1,29). Similarly, sudden cardiovascular death coexisting with a sudden psychological stressful event is routinely evaluated in clinical medicine and forensic pathology (18,29–31). People with atherosclerotic and hypertensive cardiovascular diseases may exhibit exaggerated sympathetic responses from emotional tension, which leads to an elevated systolic blood pressure and increases blood viscosity from enhanced platelet activation (29–31). The elderly are more prone to this type of sympathetic-driven sudden death when preexisting cardiovascular diseases are present.

Suicide is a volitional act causing harm or death, which innately induces intense emotions giving rise to hemodynamic and biochemical responses powerful enough to initiate arterial aneurysm rupture (1,6). Spontaneous intracranial aneurysm rupture resulting from minor head trauma causing sudden death is documented in forensic literature (1,32). In the case presented here, pertinent autopsy findings consist of non-lethal head trauma coexisting with a fatal intracranial arterial aneurysm rupture during the emotional and physical act of harming oneself, which best represents a suicidal MOD. The criteria by which a natural death changes to an unnatural MOD cited in refs. 1 and 19 are important, however, one must be very skeptical when linking natural diseases to acts of violence

without a well-documented temporal relationship. The forensic pathologist must take the victim as he or she is, considering all of the evidence and offering COD and MOD by weighing significant psychophysiological factors that uniquely affect each case.

## CONCLUSION

This case illustrates how emotional stressors may precipitate sudden death by exacerbation of a preexisting disease state. In delineating COD and MOD, the forensic pathologist performs a complete postmortem analysis, which typically includes an autopsy and a thorough investigation of circumstantial information pertaining to the case. Ruling the MOD can be problematic in certain unusual circumstances; therefore, it is vitally important that the forensic pathologist possess a skeptical methodological approach to every case to delineate whether the death occurred from an act of violence.

## Educational Message

1. The determination of the proper cause (COD) and manner of death (MOD) represents a complex analysis of autopsy findings systematically coupled with adequate circumstantial data and historical information.
2. Suicide is a volitional act that innately induces hemodynamic and biochemical responses powerful enough to initiate arterial aneurysm rupture.
3. Non-lethal head trauma coexisting with a fatal intracranial arterial aneurysm rupture during the emotional and physical act of harming oneself best represents a suicidal MOD.
4. In deaths involving complicated gunshot wounds forensic pathologists need a “skeptical” methodological approach in determining the proper COD and MOD.

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