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Case Report

Three cases of suprachoroidal hemorrhage associated with chest compression or asphyxiation and detected using postmortem computed tomography

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ABSTRACT

We report 3 cases of suprachoroidal hemorrhage (SCH) found to be triggered by increased intrathoracic pressure and detected using postmortem computed tomography (PMCT). Case 1 was a man aged in his 50s who was found dead at a landslide site. The autopsy showed clogging of the upper respiratory tract with soil debris from the landslide. The cause of death was determined to be asphyxia. PMCT showed SCH in both eyes, which was believed to be caused by chest compression or choking on the soil debris from the landslide. Case 2 was a woman aged in her 60s who was found dead in the sea. The autopsy revealed injuries primarily to her chest. We concluded that the cause of death was drowning. PMCT showed SCH in her right eye that was believed to be caused by chest compression. Case 3 was a woman aged in her 80s who was buried in a snowdrift and potentially died from hypothermia. PMCT showed SCH in both eyes, which was considered to be from an increase in intrathoracic pressure that might have been caused by the burial in the snow. Histological findings showed serous retinal detachment associated with retinal pigment epithelium damage due to SCH, which indicated that she was alive for several hours after the onset of SCH. The increase in intrathoracic pressure caused by dyspnea or chest compression was considered responsible for the onset of SCH in all of the present cases. PMCT might assist with the differential diagnosis of traumatic asphyxiation by SCH.

1. Introduction

The importance of intraocular findings in the forensic field has previously been reported [1–3]. However, postmortem corneal opacity has historically inhibited the ability to generalize intraocular examination results. Diagnostic imaging techniques, including computed tomography (CT) and magnetic resonance imaging (MRI), have recently become commonly used tools in the field of forensic medicine in many industrialized nations [4–7]. Head CT examinations facilitate orbital and intraocular findings, enabling forensic pathologists with limited knowledge of ophthalmology to identify abnormal intraocular findings in cadavers without having to rely on the expertise of an ophthalmologist.

Clinically, suprachoroidal hemorrhage (SCH) is defined as massive intraocular bleeding to the potential space situated between the choroid and sclera [8] and is detected by fundus examination and diagnostic imaging, such as B-scan ultrasonography, CT, or MRI [9,10]. The Valsalva maneuver as the cause of SCH has been reported previously [8,11]. The Valsalva maneuver inhibits venous return by increasing intrathoracic pressure; the resulting increase in venous pressure leads to SCH. Here, we report 3 cases of SCH triggered by increased intrathoracic pressure and detected using postmortem CT (PMCT).

2. Cases

2.1. Case 1

A man aged in his 50s was found dead at a landslide site. The left side of his face was bruised. The autopsy showed clogging of the upper respiratory tract with soil debris from the landslide. Congestion with petechiae was found on his head, neck, and upper trunk. The cause of death was identified as asphyxia, but the type

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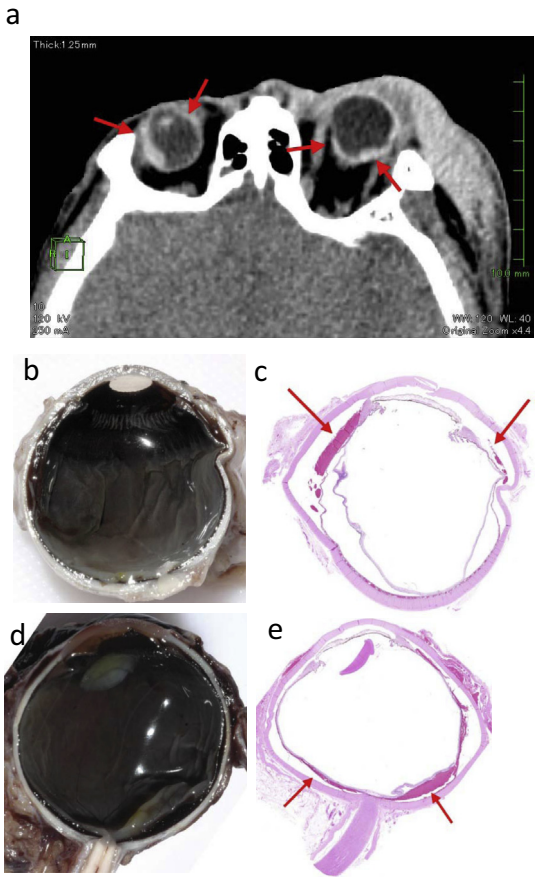

Fig. 1. Postmortem computed tomography and pathology findings of case 1, a man found dead at a landslide site. (a) Bilateral space-occupying lesions (arrows). (b) Macroscopic findings of the right eye. (c) Suprachoroidal hemorrhage in the right eye (hematoxylin and eosin [H&E] stain, arrows). (d) Macroscopic findings of the left eye. (e) Suprachoroidal hemorrhage in the left eye (H&E stain, arrows).

of asphyxia could not be determined, whether traumatic asphyxia or choking on the soil debris. PMCT showed space-occupying lesions in both eyes (Fig. 1a) that were determined as bilateral SCH (Fig. 1b–e) and believed to be caused by chest compression or choking on the soil debris.

2.2. Case 2

A woman aged in her 60s was found dead and slightly decomposed in the sea. The autopsy revealed that the injuries, including bruises and fractures, were mainly to her chest. The white edema fluids in her airways could not be confirmed because of the decomposition. A diatom test performed on her lung tissue was positive, and her injuries were not fatal. We concluded that the cause of death was drowning. PMCT showed space-occupying lesions in her right eye (Fig. 2a). These were considered to be SCH (Fig. 2b–d) as a result of chest compression.

2.3. Case 3

A woman aged in her 80s was buried in snow, and her lower body was injured by a snowplow (Fig. 3a). Judging from the scene, the cause of death was suspected as traumatic asphyxia brought on by her burial in the snow. At autopsy, antemortem injuries were not detected. The blood in her heart contained a lardaceous clot, petechiae were not evident, and we considered that her death might have resulted from hypothermia rather than traumatic asphyxia. PMCT showed space-occupying lesions in both eyes (Fig. 3b), which were found to be bilateral SCH (Fig. 3c and d). The cause of the SCH was believed to be an increase in intrathoracic pressure caused by temporary chest compression as a result of her burial in the snow. Histological findings showed serous retinal detachment associated with retinal pigment epithelium (RPE) damage due to SCH (Fig. 3e and f), which suggest that she had been alive for several hours after the onset of SCH. We could not determine that the cause of her death was traumatic asphyxia, owing to a lack of petechiae or fluidity of the blood. We concluded that she suffered from a short period of chest compression and that she had been alive for several hours under the snow pile that had fallen from the roof, and she died from hypothermia.

3. Discussion

On CT, SCH appears as a dome shape in the eye, and the choroid is elevated from its normal position [10]. The differential diagnosis of SCH includes choroidal detachment and choroidal tumor [10,12]. To distinguish these characteristics in clinical practice, fundus examination, ultrasonography, MRI, and single photon emission CT are performed [13,14]; however, the use of only PMCT for the purpose of distinguishing SCH from other diseases is limited with a cadaver. When a dome shape is detected by PMCT in the eye, a pathological examination should be performed.

SCH is a complication during and following ocular surgery and trauma in clinical practice, and it can also be caused by an excessive pressure gradient across the vessel wall due to hypotonia [15]. Previously, bilateral SCH has been reported in only one clinical case [16], in which the cause of SCH was considered to be lower respiratory tract infection and coughing (Valsalva maneuver) combined with a raised prothrombin time-international normalized ratio [16]. The Valsalva maneuver inhibits venous return by increasing intrathoracic pressure; the resulting increase in venous pressure leads to SCH (Fig. 4).

In our experience with PMCT in approximately 1200 cases, we have observed SCH in only the 3 present cases. Although SCH is not a common finding on PMCT, increased intrathoracic pressure was suspected as the cause of death in all of the present cases. Two of the 3 present cases had bilateral SCH. Although the left side of the face was bruised in case 1, there was no evidence of traumatic hypotonia (e.g., globe rupture, giant retinal tear, or goniodialysis). Furthermore, all of the present cases had not been taking any anticoagulant therapy and had no choroidal pathogenesis, which is a cause of SCH. Therefore, we considered the SCH to be triggered by increasing intrathoracic pressure as a result of dyspnea or chest compression.

In case 1, we concluded that the cause of death was asphyxia. Although we were not able to determine the type of asphyxia, an increase in intrathoracic pressure was suspected, caused by chest compression or choking on soil debris, based on the mechanism of bilateral SCH.

In case 2, there were no injuries around the orbit of the right eye, in which SCH was detected. Moreover, the histological examination showed no source of the SCH in her eyes. Although we have encountered a number of drowning cases that were reviewed by PMCT, we had not encountered a case with SCH, nor had we observed a case with SCH that occurred postmortem in a decomposed body in our experience with a number of cases with decomposition. We concluded that the cause of SCH was increased intrathoracic pressure caused by traumatic chest compression, which occurred prior to drowning.

In case 3, histological findings showed serous retinal detachment associated with RPE damage due to SCH. The RPE acts as the outer blood-retinal barrier and prevents subretinal leakage