



Case report

Four cases of orbital hyperdensity identified by postmortem computed tomography



Toru Oshima^{a,*}, Hiroshi Yoshikawa^b, Koji Dewa^c, Maki Ohtani^a, Kazuaki Nakauchi^d, Sohtaro Mimasaka^a

^a Department of Forensic Sciences, Akita University Graduate School of Medicine, Akita 010-8543, Japan

^b Department of Ophthalmology Graduate School of Medical Sciences, Kyushu University, Fukuoka 812-8582, Japan

^c Department of Forensic Medicine, Iwate Medical University, Iwate 028-3694, Japan

^d Department of Ophthalmology, Hyogo College of Medicine, Hyogo 663-8501, Japan

ARTICLE INFO

Article history:

Received 30 July 2014

Received in revised form 5 August 2014

Accepted 7 August 2014

Available online 20 August 2014

Keywords:

Postmortem computed tomography

Hyperdensity

Orbit

Ophthalmology

Forensic pathology

ABSTRACT

Postmortem computed tomography (PMCT) has become a common examination method in the field of forensic medicine. Head computed tomography provides information of the orbit and eyes, and forensic pathologists may come across abnormal intraocular findings of cadavers upon PMCT. Here, we present four cases in which we identified orbital hyperdensity by PMCT. The first case showed calcified senile scleral plaques (CSSP), whereas the second case showed foreign bodies in the palpebral fissure, which resembled CSSP upon PMCT. The third case showed signs of silicone oil injection in the eye, while the fourth case showed bilateral phthisis bulbi. In the first case, the presence of CSSP was found to be helpful for age estimation, whereas the findings of cases 3 and 4 aided in the personal identification of the subjects. As demonstrated by these cases, intraocular PMCT findings may provide highly useful information, and correct interpretation of the intraocular PMCT findings by forensic pathologists is hence crucial.

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1. Introduction

The importance of intraocular findings in forensic science has been previously reported [1,2]. However, intraocular investigations are not yet being routinely performed as part of forensic examinations. Postmortem corneal opacity may obscure the awareness of intraocular findings, and investigations of postmortem intraocular findings require expensive medical instruments, such as ophthalmic endoscopes. In recent years, the use of postmortem computed tomography (PMCT) has become relatively widespread in the field of forensic medicine [3–6]. Head CT examinations can reveal essential information of the orbit and eyes of subjects, even when this is not the focus of the investigation; however, as forensic pathologists, rather than ophthalmologists, conduct these investigations,

an increased awareness of the potential findings is needed among this professional group. Clinically, orbital hyperdensity identified upon CT may indicate calcified tumors [7], orbital implants (hydroxyapatite) [8], scleral calcification [9], phthisis bulbi [10], or foreign bodies in the eye [11]. Here, we present four cases in which orbital hyperdensity was identified by PMCT, and discuss the implications of these findings.

2. Case reports

2.1. Case 1

A house fire broke out during early morning in winter. The body of a burned woman was found in the rubble of the burned down house. The body was suspected to be a woman in her 90s who was living in the house. Autopsy revealed soot deposits mixed with mucus in the airways. The average carboxyhemoglobin (CO-Hb) concentration in her blood was 60%. The cause of death was determined to be death due to fire. PMCT before autopsy showed bilateral hyperdensity (Hounsfield units [HU] = 620) near the sclera (Fig. 1a). After enucleation, symmetrical yellow plaques were found in the sclera (Fig. 1b), and these were diagnosed as calcified senile scleral plaques (CSSPs) by pathological examination (Fig. 1c). This finding, along with others, indicated that the subject was of an

Abbreviations: PMCT, postmortem computed tomography; CSSP, calcified senile scleral plaque; CRVO, central retinal vein occlusion; HU, Hounsfield unit; CO-Hb, carboxyhemoglobin.

* Corresponding author. Address: Department of Forensic Sciences, Akita University Graduate School of Medicine, 1-1-1 Hondo, Akita, Akita 010-8543, Japan. Tel.: +81 18 884 6094; fax: +81 18 836 2610.

E-mail addresses: tooshima@med.akita-u.ac.jp (T. Oshima), yossey@med.kyushu-u.ac.jp (H. Yoshikawa), dewakuma@iwate-med.ac.jp (K. Dewa), mohtani@doc.med.akita-u.ac.jp (M. Ohtani), nakauchi@hyo-med.ac.jp (K. Nakauchi), mimasaka@med.akita-u.ac.jp (S. Mimasaka).

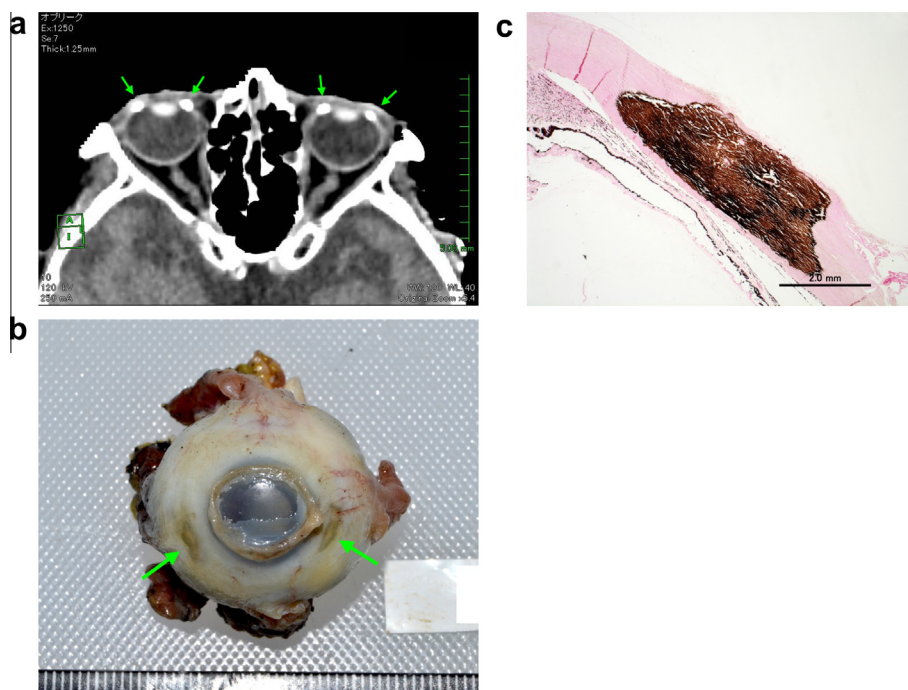


Fig. 1. Postmortem computed tomography and pathology findings of case 1. (a) Bilateral hyperdensity (HU = 620) near the sclera (arrows). (b) Symmetrical yellow plaques in the sclera (arrows). (c) Calcified senile scleral plaques (von Kossa stain).

advanced age. Finally, she was identified as the woman living in the house by DNA analysis.

2.2. Case 2

A woman in her 50s was found dead on a sandy beach. Autopsy revealed white edematous fluid present in her airways. The Diatom test was positive in her lungs, and the cause of death was determined to be drowning. PMCT before autopsy showed bilateral hyperdensity (HU = 560) near the sclera (Fig. 2a). Grains of sand were found in the palpebral fissure (Fig. 2b). No plaques were observed in her sclera. After carefully washing out the sand, the PMCT did no longer show bilateral high-density areas near the sclera (Fig. 2c).

2.3. Case 3

A slightly decomposed body was found in a lake. The body was suspected to be a man in his 70s based on a driver license found alongside the body. The autopsy revealed hemorrhagic pulmonary edema and pleural effusion. The Diatom test in his lungs was positive, and the cause of death was determined to be drowning. PMCT before autopsy showed hyperdensity (HU = 120) in his right vitreous cavity (Fig. 3a). After enucleation, silicon oil was found in his vitreous cavity. In his retina, massive bleeding and a photocoagulation spot were observed (Fig. 3b). Accordingly, the pathological findings showed massive bleeding in his retina (Fig. 3c). Berlin blue stain-positive cells were observed in the nerve fiber and ganglion cell layers (Fig. 3d), and he was hence suspected to have undergone surgery for central retinal vein occlusion (CRVO) in his right eye. According to the suspected subject's medical records, he had undergone surgery due to vitreous bleeding secondary to CRVO 1 week before he died, and had been discharged early from the hospital owing to delirium on admission. Thus, the use of PMCT combined with medical records was useful for identification of the subject in this case.

2.4. Case 4

A house fire broke out in the afternoon. The body of a burned woman was found in the rubble of the burned down house. The body was suspected to be a blind woman living in the house. Autopsy revealed soot deposits mixed with mucus in the subject's airways. The average CO-Hb concentration in her blood was 80%, and the cause of death was determined to be death due to fire. The subject was believed to be in her 60s, but had edentulous jaws. She had no family members to provide DNA for a comparative DNA analysis. PMCT before autopsy showed hyperdensity (HU = 1230) corresponding to the lens, retina, choroid, and ciliary body (Fig. 4a–d), suggesting phthisis bulbi. These findings indicated that she was blind, and she was hence identified as the woman living in the house.

3. Discussion

According to previous studies, CSSPs are unexpectedly observed in 3–6% of all cranial CT scans [12–14]. The prevalence of CSSP increases considerably with age: Gordon et al. [12] reported a prevalence of 22.6% for patients aged >70 years, Moseley [13] recorded a prevalence of 3.5% for those aged 70–79 years and 21.9% for patients aged ≥80 years, and Gossner et al. [15] reported that the prevalence increased from 2% in patients aged <70 years to 7.2% in those aged 70–79 years and 22.6% in those aged ≥80 years. The plaques most frequently involve the insertions of the medial rectus muscles (77.7%) and are commonly symmetrical (55.5% of cases) [15]. Moreover, CSSPs are usually asymptomatic, and are not progressive [13]. On pathological examination, CSSPs show sharply demarcated areas of acellular hyaline change, with or without calcification, a few millimeters lateral to the limbus [13]. The plaques do not elicit an inflammatory response and rarely extrude [16]. The yellow plaques observed in case 1 were diagnosed as CSSP, and, as demonstrated in this case, CSSPs, among other findings, allow identification of elderly subjects.

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