

Autopsy imaging for cardiac tamponade in a Thoroughbred foal

Kazutaka YAMADA^{1,4*}, Fumio SATO², Noriyuki HORIUCHI¹, Tohru HIGUCHI³,
Yoshiyasu KOBAYASHI¹, Naoki SASAKI¹ and Yasuo NAMBO¹

¹Obihiro University of Agriculture and Veterinary Medicine, Hokkaido 080-8555, Japan

²Hidaka Training and Research Center, Japan Racing Association, Hokkaido 057-0171, Japan

³NOSAI Hidaka, Hokkaido 059-3105, Japan

⁴Present affiliation: Azabu University, Kanagawa 252-5201, Japan

Autopsy imaging (Ai), postmortem imaging before necropsy, is used in human forensic medicine. Ai was performed using computed tomography (CT) for a 1-month-old Thoroughbred foal cadaver found in a pasture. CT revealed pericardial effusion, collapse of the aorta, bleeding in the lung lobe, gas in the ventricles and liver parenchyma, and distension of the digestive tract. Rupture in the left auricle was confirmed by necropsy; however, it was not depicted on CT. Therefore, Ai and conventional necropsy are considered to complement each other. The cause of death was determined to be traumatic cardiac tamponade. In conclusion, Ai is an additional option for determining cause of death.

Key words: *autopsy imaging (Ai), cardiac tamponade, computed tomography, Thoroughbred*

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In Thoroughbred rearing, careful management, including prevention of diseases and the risk management of accidents, is required. Setting an appropriate countermeasure for diseases and accidents decreases economic loss. Cohen reported that out of 2,468 foals, 116 (4.7%) died in Texas in the 1990s, with the most frequent cause of death being pneumonia, followed by septicemia, and musculoskeletal trauma [2]. However, because these data were taken from medical records and were retrospectively evaluated, necropsy was not performed in all cases, and cases that died of unknown causes were included. It is important that we take into consideration the cause of accidents for improving production of horses.

Necropsy is an important procedure for identifying cause of death and evaluating therapeutic interventions. Autopsy imaging (Ai), which is postmortem imaging before necropsy, is primarily used in human forensic medicine [8]. Families find it difficult to accept forensic necropsy after the death of a family member, but Ai is relatively easily

accepted. Therefore, cross-sectional imaging techniques using computed tomography (CT) have been introduced into Ai. Interestingly, Ai is also used as a nondestructive inspection for Egyptian mummies [6]. In veterinary medicine, there are a few reports of Ai being performed in dogs [4], cats [5], a red kangaroo with oral osteomyelitis [7], and a lynx for forensic medicine [11].

A 1-month-old Thoroughbred foal cadaver was found in a pasture. The cadaver showed excoriation of the left thorax. The foal was transported and underwent Ai at Obihiro University of Agriculture and Veterinary Medicine 30 hr after it was found, and subsequently, a gross pathological examination was performed. Ai examination was performed using multidetector-row CT (Asteion Super4; Toshiba, Tokyo, Japan), and volume-rendering 3-dimensional images were acquired using image-processing software (VirtualPlace; Aze, Tokyo, Japan). Images were obtained with a tube voltage of 135 kV, slice thickness of 3 mm, and scan duration of 60 sec. The CT images revealed pericardial effusion (Fig. 1, asterisks), collapse of the aorta (Fig. 1a) in the soft tissue window, and bleeding in the left lung lobe (Fig. 1b) in the lung window. In addition, gas was detected in the ventricles and liver parenchyma (Fig. 2, arrows) in the soft tissue window. Furthermore, distension of the digestive tract because of gas accumulation was observed in the soft tissue window. Fracture was not confirmed in the 3-dimensional image (Fig. 3). Because identifying the site of a

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*Corresponding author. e-mail: kyamada@azabu-u.ac.jp

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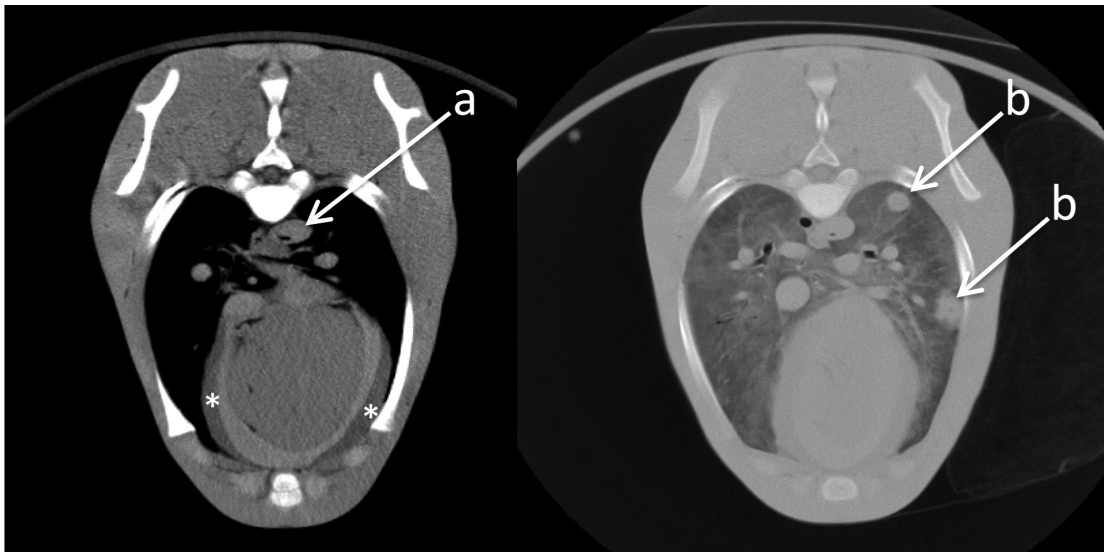


Fig. 1. Transverse sections in the soft tissue window (left) and lungs window (right). Pericardial effusion (asterisks), collapse of the aorta (a), and bleeding of the lung lobe (b) were observed.

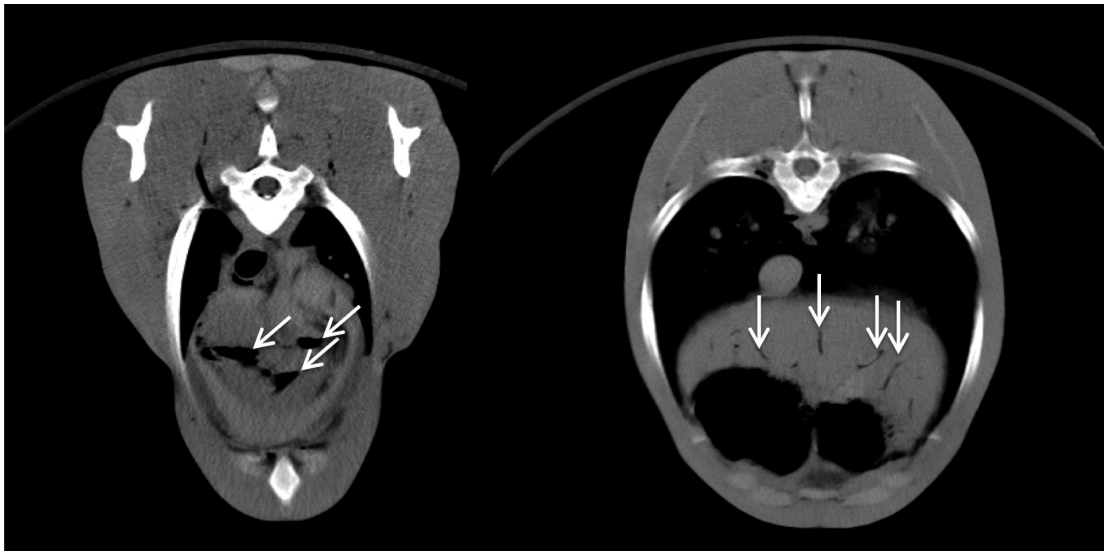


Fig. 2. Transverse sections at the level of the thorax (left) and cranial abdomen (right) in the soft tissue window. Gases, which indicated postmortem changes, were detected in the ventricles and liver (arrows).

fracture on gross pathological examination is difficult, CT would be helpful for detecting a skeletal abnormality. The collapse of vessels and the gas in the vessels and intestine were postmortem changes. The presence of gas in vessels and the extent of gas accumulation in the intestine might be helpful for estimating the time of death [4]. Necropsy was performed following the CT examination. The gross pathological examination revealed subcutaneous bleeding in left chest wall (Fig. 4), bleeding in the left lung lobe (Fig. 5), and pericardial effusion (Fig. 6). The site of the rupture

was determined to be in the left auricle (Fig. 7, arrow), which was not depicted on CT. From the combined findings of Ai and the gross pathological examination including excoriation and subcutaneous bleeding, the cause of death was determined to be traumatic cardiac tamponade. The detection of gas in the vessels and ventricles was difficult through necropsy, but it could be detected through CT. However, CT did not reveal the subcutaneous bleeding and left auricle rupture. Therefore, Ai and conventional necropsy are considered to complement each other. Furthermore, Ai

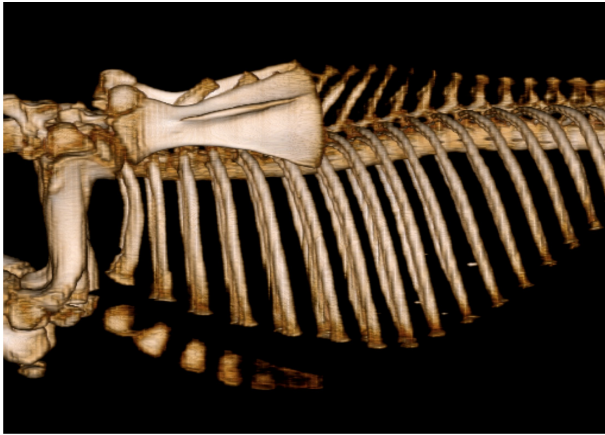


Fig. 3. A three-dimensional image did not reveal fracture.



Fig. 5. Bleeding in the left lung lobe was observed.



Fig. 4. Subcutaneous bleeding in the left chest wall was observed.

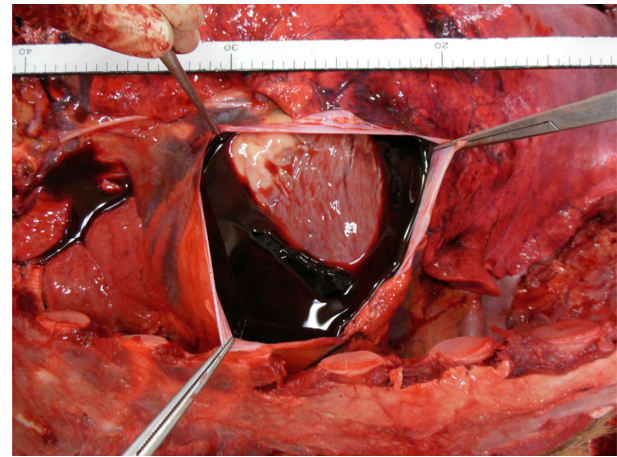


Fig. 6. Pericardial effusion was observed.

provides potentially useful additional information for a subsequent necropsy.

There have been several reports about cardiac tamponade, secondary to patent ductus arteriosus [1], pericarditis [3, 9], or aortic aneurysm [10], in horses, but these cases involved primary cardiovascular disorders, and there were no reports in foals. We report here a case of traumatic cardiac tamponade in a foal, indicating that traumatic cardiac tamponade should be included in the differential diagnosis for sudden death of foals in the pasture.

Facilities for equine CT are not widely available, and delivery fees may apply. If CT is available, there are additional limitations with respect to gantry size. The diameter of the CT gantry used in this study was 72 cm, which was the limit for scanning the entire body of this foal. Therefore, the development of a wide-gantry CT capable of evaluating

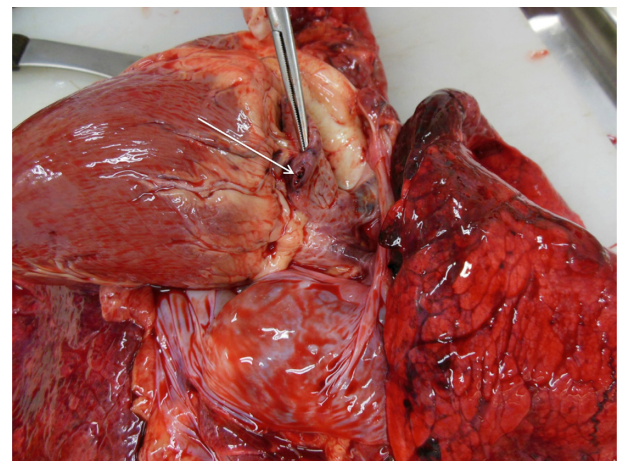


Fig. 7. The site of the rupture was determined to be in the left auricle (arrow).

the entire body of a fully grown equine is expected in the near future.

In conclusion, Ai is an additional option with CT for determining cause of death.

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