

## Comparison between computed tomography (CT) and autopsy findings in cases of abdominal injury and disease

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Available online 24 July 2006

### Abstract

We report 10 autopsy cases involving fatal pathological changes in abdominal organs, for which findings of computed tomography (CT) on admission or after death were compared with autopsy findings. Two of the cases were death due to natural causes and eight were death due to traffic accidents. From the findings at autopsy, the causes of death were considered to be rupture of an aortic aneurysm in one case, gastrointestinal bleeding due to gastric cancer in one case, retroperitoneal bleeding in two cases, laceration of the liver in three cases, and traumatic rupture of the small intestine in three cases. CT findings revealed ascites or retroperitoneal bleeding in eight cases. However, in the cases of small-intestinal rupture, CT findings on admission revealed no free air. Therefore, ascites on CT should be regarded as a useful indicator of blunt abdominal trauma. Hepatic portal venous gas, known to be a post-mortem change, was significantly evident on post-mortem CT in cases of traumatic liver or intestinal injury, and was also seen in cases where the period between the accident and CT examination was long.

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*Keywords:* Computed tomography; Autopsy; Abdominal injury; Disease

### 1. Introduction

When diseases and injuries of the abdominal organs occur, the symptoms and physical findings may not always be specific or severe, even though the outcome may be subsequently fatal. Therefore the diagnosis of abdominal trauma and disease is sometimes difficult at the time of onset. Computed tomography (CT) examination is a useful way to reveal abdominal injury [1] or disease, and is also performed in forensic examinations to determine the cause of death [2].

We report 10 autopsy cases involving fatal pathological changes in abdominal organs, for which CT findings on admission or after death were compared with autopsy findings. We also discuss diagnostic features in emergency and forensic

cases of abdominal trauma and disease, and evaluate postmortem changes such as hepatic portal venous gas (HPVG) [3] revealed by CT.

### 2. Case history

The cases included in this study are shown in Table 1. Among the 10 cases, two were death due to natural causes and eight were death due to traffic accidents (five of the victims being car drivers and three bicycle or motor bicycle riders). From the findings at autopsy, the causes of death were considered to be rupture of an aortic aneurysm in one case, gastro-intestinal bleeding due to gastric cancer in one case, retroperitoneal bleeding in two cases, laceration of the liver in three cases, and traumatic rupture of the small intestine in three cases.

CT revealed ascites or retroperitoneal bleeding in all cases except for the case of gastro-intestinal bleeding case (case no. 7) and one of the traffic accident cases (case no. 4)

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Table 1  
List of the cases

No	Age	Sex	Mechanism	Symptoms on admission	Cause of death (from autopsy finding)	Interval between onset and death	CT on admission	PMCT
1	70	M	Traffic accident (Car)	No symptoms, abdominal pain after 5 h from admission	Perforation of the small intestine	27 h	Ascites	Ascites, free air, HPVG
2	55	M	Traffic accident (Car)	Coma	Laceration of liver	2 h		Ascites, HPVG
3	69	M	Traffic accident (Motor bicycle)	Vomiting, abdominal distension on the day following accident	Perforation of the small intestine	55 h	Ascites	Ascites, LDA in the liver, HPVG
4	89	M	Traffic accident (Car)	Coma	Retroperitoneal hematoma	5 h	Pelvic bone fracture	
5	51	M	Traffic accident (Car)	CPA	Laceration of liver	1 h		Ascites, LDA in the liver
6	59	M	Traffic accident (Bicycle)	Coma	Laceration of liver	4 h		Ascites, LDA in the liver
7	75	F	Natural death	Gastrointestinal bleeding, loss of consciousness	Gastric cancer	30 h		HDA in the stomach
8	81	M	Traffic accident (Motor bicycle)	Slight abdominal pain, coma on the day following accident	Retroperitoneal hematoma	17 h	HDA in the retroperitoneal space, Pelvic bone fracture	HDA in the retroperitoneal space, Pelvic ring fracture, HPVG
9	57	M	Traffic accident (Car)	Slight abdominal pain at the time of accident, coma on two days following accident	Perforation of the small intestine	1 h		Ascites, free air, HPVG
10	61	M	Natural death	CPA	Rupture of abdominal aortic aneurysm	More than 2–3 hrs		HDA in the retroperitoneal space, HPVG

\*CPA: Cardio-pulmonary arrest; PMCT: Post-mortem CT; HPVG: Hepato-portal venous gas; HDA: High density area; LDA: Low density area.

(Figs. 1 and 2). In two of the cases of small-intestinal rupture (case nos. 1 and 3) (Figs. 3 and 4), post-mortem CT (PMCT) showed free air and ascites, although CT findings on admission had revealed only ascites. Also in the cases of liver injury (case nos. 2, 5 and 6) (Figs. 5 and 6), ascites was revealed by PMCT.

HPVG, which is known to be a post-mortem change, was significantly evident on PMCT in cases of traumatic liver or intestinal injury. However, HPVG was not evident in cases of

sudden death (case nos. 4, 5 and 6) or in the case of gastric cancer (case no. 7).

### 3. Discussion

The management and examination of patients with blunt abdominal trauma is sometimes difficult. In some cases, the period between the accident and death may be long (12 h or more). In such cases, the patients may have no significant



Fig. 1. Computed tomography (CT) of case no. 4. Pelvic bone fractures were seen (arrow), but other damages were hardly found.



Fig. 2. Autopsy findings in case no. 4. Pelvic bone fractures (arrow) and bleeding in peritoneal wall.

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