



Case #111

NAME Educational Activities Committee

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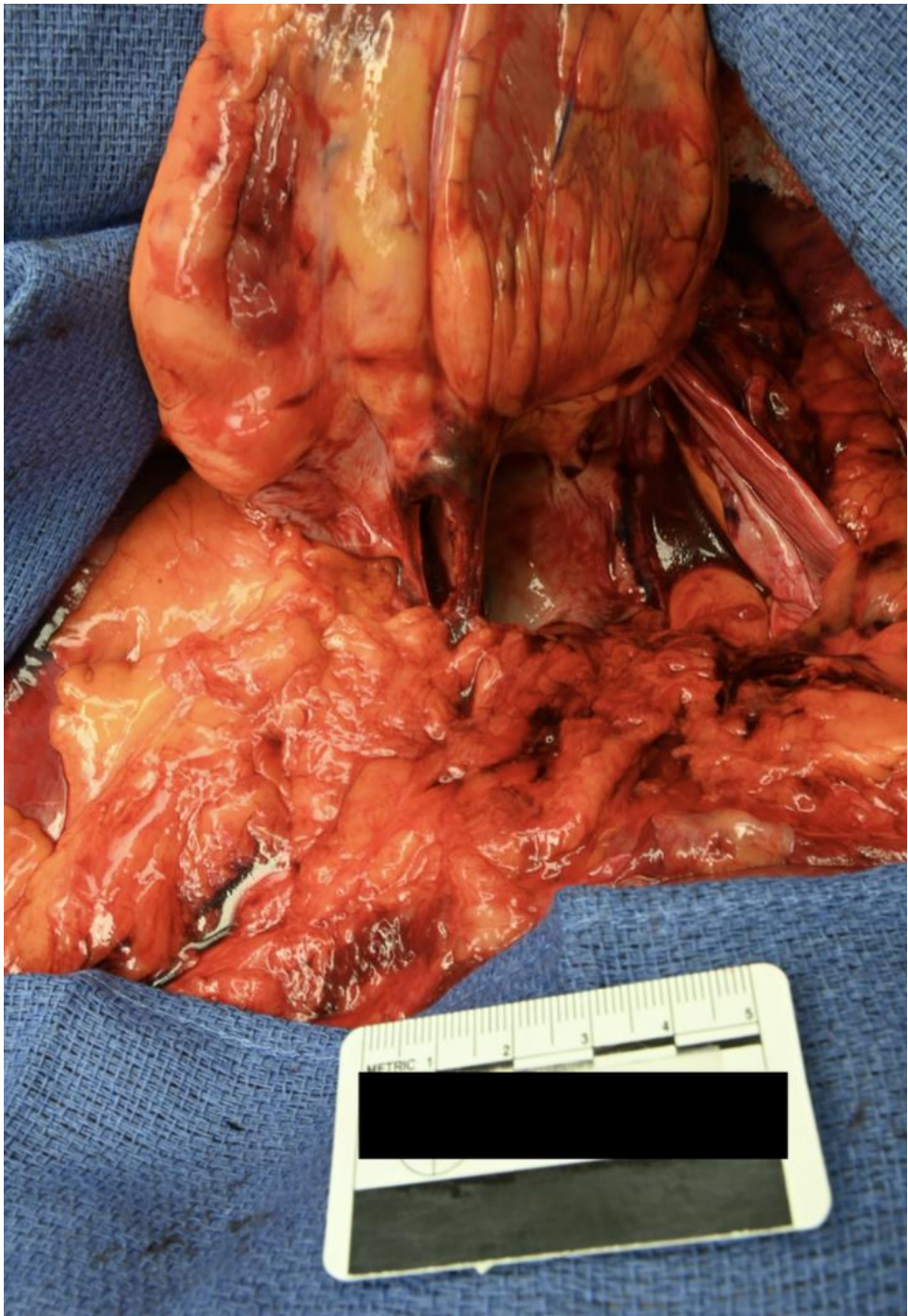
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1. This week's case involves a 75-year-old man who was the seat-belted driver of a motor vehicle that rolled through a stop sign and was subsequently T-boned, on the driver's side, by another vehicle traveling at high rate of speed. Per paramedics, he was immediately unresponsive at the scene but had a strong pulse. After resuscitative attempts, he was pronounced dead approximately 1 hour after the accident, upon arrival to the emergency department.

Pertinent autopsy findings are presented above. The cardiac findings are best explained by which of the following?

- Commotio cordis
- Cardiopulmonary resuscitation
- Laceration of the thoracic aorta from side impact
- Laceration of the inferior vena cava from side impact
- Ruptured myocardial infarct





Spinal cord at the level of C5

Answer...

B. Cardiopulmonary resuscitation (CORRECT ANSWER, 16.02 % of responses)

A major difficulty many forensic pathologists face is discerning the difference between injury due to blunt force trauma vs. artifact from cardiopulmonary resuscitation (CPR). While CPR is an affective life-saving technique, it may also impose many injuries ranging from external contusions and abrasions to internal rib fractures and lacerations of the heart and other organs. This poses a significant challenge for the forensic pathologist when determining cause of death.

The cardiac findings shown in the image are better explained by CPR for multiple reasons. The decedent's advanced age (75-years-old) and decreased bone density put him at a higher risk for rib fractures resulting from resuscitative efforts. Moreover, the major point of impact during this motor vehicle accident came from the lateral vector as his vehicle was T-boned by another on the driver's side. This is more likely to manifest as lateral contusions and abrasions, lateral rib fractures, pulmonary contusions, and lacerations to other organs corresponding to the side of impact. In contrast, our decedent exhibited anterior rib fractures and hemorrhage isolated to the mediastinum, which are better explained by an anterior force such as CPR.

The histological section of cervical spinal cord reveals significant intramedullary hemorrhage. Hematomyelia is a rare phenomenon that most commonly occurs due to trauma. Risk factors include advanced age and anticoagulation therapy. In this case, the decedent's intramedullary hemorrhage was associated with a fracture of the C5 spine. This piece of information is significant because it explains why the decedent's pulse remained strong at the scene. Had the patient's lacerated inferior vena cava happened from the motor vehicle accident, his pulse would have been diminished from rapid hemorrhage. In contrast, his pulse remained strong because the true cause of his unconsciousness was the cervical spine fracture and subsequent intramedullary hemorrhage which rendered him brain dead instead. This indicates that the lacerated inferior vena cava didn't happen until after paramedics arrived and CPR was performed.

Other Answers...

A. Commotio Cordis (4.33 % of responses)

Commotio Cordis, latin for “agitation of the heart,” describes the phenomenon where blunt trauma to the chest precipitates a fatal arrhythmia. The result is sudden cardiac death without any structural damage to heart tissue. This most commonly occurs in athletes after impact to the left chest.

Commotio Cordis is a rare phenomenon as the timing of impact must occur during ventricular repolarization and have enough force to generate ventricular depolarization. The inappropriate timing of this depolarization is thought to precipitate a ventricular arrhythmia. On autopsy, cardiac tissue appears normal both morphologically and histologically. There must be a lack of congenital or acquired structural heart disease that could otherwise explain any abnormalities in the cardiac electrical conduction circuit. Additionally, there must be an absence of other physical injury such as cardiac contusion, rupture, rib fractures, hemothorax, or hemopericardium.

C. Lacerated thoracic aorta from side impact (15.15 % of responses)

The laceration shown in the image is located in the inferior vena cava, not the thoracic aorta. However, traumatic aortic injury is a common cause of death in motor vehicle accidents due to the rapid acceleration-deceleration that occurs. The shearing force that results from abruptly coming to a complete stop after traveling at a high speed most commonly tears the ligamentum arteriosum at the aortic isthmus. This is because the attachment point of the ligamentum arteriosus causes the aorta to be relatively immobile and vulnerable to shearing at this location. Due to the aggressive nature of internal hemorrhage that ensues, most cases of thoracic aorta laceration die at the scene of the accident. A hemothorax and/or hemopericardium will be noted on postmortem examination.

D. Lacerated inferior vena cava from side impact (60.61 % of responses)

While the laceration shown in the image is in the inferior vena cava, it is better explained by CPR rather than from side impact on the driver's side. As mentioned earlier, the decedent's rib fractures were localized anteriorly with associated hemorrhage in the mediastinal area, indicating an anterior source of trauma such as resuscitative efforts. In addition, his pulse was strong when paramedics arrived, which would not be the case had he been hemorrhaging from this laceration.

E. Ruptured myocardial infarct (3.90 % of responses)

Ruptured myocardial infarctions most commonly occur at the terminal distribution of the left anterior descending artery, between the junction of the anterior wall and septum or apex. On autopsy, pertinent findings include hemopericardium, atherosclerosis, and calcification of the coronary arteries. The laceration will also occur in an area of infarction, which may appear yellow/tan on gross examination

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