Retrosternal Hemomediastinum Caused by Internal Mammary Artery Injury: A Case Report and Review of the Literature

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We describe a 35-year-old multi-trauma patient who had a high-grade liver laceration with extensive retrosternal hemomediastinum. Extrapericardial tamponade secondary to the fracture of the sternum was followed by the instantaneous surgical evacuation of the hematoma. Computed tomography (CT) angiography helped diagnose this uncommon entity of blunt trauma-induced internal mammary artery bleeding. Despite a large amount of blood accumulation in the retrosternal space after a period of time, it may have been misdiagnosed as pericardiac hemorrhage before operation due to its rarity and the physician’s lack of experience for this kind of problem. To prevent such disastrous injuries from being unnoticed and thus unattended, consideration should be given to possible injuries to the internal mammary artery and early detection using CT of the anterior mediastinal hematoma that is associated with a fracture of the sternum is important. This can also avoid misdiagnosis and ensure prompt surgical or angiographic intervention.

Key words: blunt trauma, hemomediastinum, internal mammary artery

Anterior mediastinal hematoma secondary to sternal fracture is an uncommon complication of blunt chest trauma. An expanding hematoma may result in extrapericardial compression and compromised hemodynamics. To our best knowledge, there have only been a few reports on retrosternal bleeding caused by internal mammary artery (IMA) rupture. All the 10 reported cases suffered from blunt chest injury\(^{(1\text{-}5)}\). There were five cases involved in motor vehicle collisions\(^{(1\text{-}3)}\). One patient collided with another player while playing soccer game and one patient was severely beaten on the street\(^{(4,5)}\). The other three cases were brought to emergency center after falling from a height\(^{(3,5)}\). We report computed tomography (CT) angiographic evidence of an active IMA hemorrhage that caused an extensive retrosternal hemomediastinum, with a brief review of the current literature.

Case Presentation

A 35-year-old restrained female passenger in a motor vehicle collision was sent to our emergency department 40 minutes after the trauma. The speed of the collision was unknown. The patient’s vital signs were blood pressure of 120/80 mmHg and pulse rate of 98 beats/min with loss of consciousness and bilateral dilated pupils without light reflex. Physical examination after primary resuscitation showed crepitus in the right chest wall and de-
creased breathing sounds. Neither jugular vein was markedly turgid. In addition, no significant pulsus paradoxus was noted. Chest radiography after airway intubation revealed right multiple rib fractures with pneumothorax, which was followed up by performing emergent tube thoracostomy. Her abdominal wall was soft without obvious traumatic lesions found, and there were also no deformities of her extremities. Moreover, there was no free fluid accumulation over the Morrison pouch, splenic recess, pelvic floor or pericardium after performing focused assessment with sonography for trauma (FAST). The brain CT revealed a traumatic subarachnoid hemorrhage with rupture into the ventricle. Her laboratory serum data were within reference ranges except for aspartate aminotransferase 503 U/L (reference range < 35 U/L) and alanine aminotransferase 232 U/L (reference range < 40 U/L). The elevation in the patient’s liver enzymes was unexpected, and abdominal CT was performed with the suggestion of visceral injury. CT images demonstrated hemoperitoneum around the lacerated liver and focal fluid accumulation over the anterior mediastinum (Fig. 1). The patient was brought to the operating room for suggested ongoing hemoperitoneum and retrosternal hematoma causing significant cardiac compression. Emergent exploratory laparotomy for bleeding control was performed. Only sanguineous pericardial fluid was aspirated out by pericardiotomy, but a lot of blood clotting was discovered in the anterior mediastinum. Hepatic hemorrhage was controlled with packing. A drainage tube was left in the retrosternal space for decompression and continuous observation.

A thoracic CT angiography was performed on the next day to diagnose associated injury which caused postoperative bleeding from the drain in the retrosternal space. A laceration of the left IMA surrounded by a large hematoma and associated sternum depressed fracture were demonstrated (Fig. 2). Repeat celiotomy and median sternotomy were performed. Perihepatic packings and the mediastinal hematoma were removed and all bleeding sources were ligated meticulously. Subsequently, the patient recovered smoothly and all the drains were removed on the 6th day after the operation. However, the patient remained in a comatose status due to extensive intracranial injuries.

**Discussion**

Extensive retrosternal hemomedastinum
caused by blunt traumatic IMA bleeding is very rare, and it may lead to serious consequences. The possible mechanism of injury to the IMA is fracture of the sternum and the shearing force acting on the vessel\(^1\). Rapid and exact diagnosis of IMA injury is difficult preoperatively\(^4\). In our case, continuous clinical deterioration with enlarged retrosternal hematoma was misinterpreted as pericardiac hemorrhage using the results of the first CT scan. The patient was sent to the operating room under the impression of cardiac tamponade and intra-abdominal bleeding with liver laceration. Continuous hemorrhage from the anterior mediastinal drain urged the performance of a diagnostic CT angiography and finally IMA bleeding was identified. Although, primary CT scans can help early depiction of fluid accumulation in the thoracic and abdominal cavities, disastrous blood loss may not be discovered and the presence of expanding retrosternal hematoma may be misinterpreted as cardiac tamponade due to its rarity and the physician’s lack of experience with this kind of problem.

Sternal fractures may result in mediastinal hematoma secondary to bone marrow oozing\(^6\). Venous bleeding in retrosternal spaces should not produce cardiac chamber collapse, but it is conceivable that a combination of venous filling and hemorrhaging from IMA may encourage accumulation of blood at higher pressure, compressing the right ventricle and limiting cardiac filling. Most IMA injuries are intraoperative or angiographic findings prove IMA, however, characteristic CT findings may help make the diagnosis. For example, retrosternal hemmediastinum may cause the mass effect, which is the “focal” rather than “global” compression usually associated with cardiac tamponade (Fig. 1B, 2B). This atypical form of cardiac tamponade is a warning clue and can be distinguished from a localized pericardial effusion or hematoma\(^7\).

Continuous arterial bleeding may cause the hematoma to reach a significant size, presenting a dual threat to hemodynamic stability first as a source of blood loss, and second as a potential source of compression of mediastinal structures. Thoracotomy is the standard treatment for IMA injuries, particularly for patients in a state of profound shock\(^8\). However, this technique is more invasive. The less invasive management is diagnostic angiography followed by embolotherapy which is also useful in selective patients after consultation with the cardiovascular surgeons responsible for the thoracotomy\(^5,9\).

Continuous clinical and imaging evaluations with considerations of differential diagnoses are especially needed when assessing an unconscious trauma patient. We should be aware of the life-
threatening arterial injury-associated anterior mediastinal hemorrhages related to sternal fracture in trauma patients. Warning clues on chest CT scans are valuable in evaluating retrosternal hemomediatinum. Selective angiographic embolization appears to be a viable option for treating patients with these injuries and emergency surgery is warranted when there are signs of instability.

References

內乳動脈損傷引發的胸骨後縱隔腔血腫：
一個病例報告與文獻回顧

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我們描述有廣泛的胸骨後縱隔血腫與高度肝臟撕裂的一名35歲的多重外傷患者。其中傷員外的填塞導致於胸骨的骨折，我們緊接著由外科方式吸出此血腫。藉由電腦斷層血管攝影的幫助下診斷出這不常見的由鉤傷引起的內乳動脈出血。儘管在一段時間以後胸骨後的空間有儲積很多血液，手術前仍然會由於醫師的缺乏此類罕見傷害的經驗而被誤認為是心包膜出血。為了防止未注意與未處理如此嚴重的傷害，應特別考慮可能的內乳動脈傷害與及早使用電腦斷層偵測出前縱隔腔血腫與相關聯的胸骨骨折是很重要的。這也能避免誤診和保證及時的外科或動脈攝影介入。

關鍵詞：鉤傷，血腫隔腔，內乳動脈