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CASE REPORT

Delayed hemopericardium due to non-penetrating chest trauma: a report of new case and literature review

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Abstract
To our knowledge, only 15 cases of delayed traumatic hemopericardium resulting from non-penetrating chest trauma have been reported. We present the case of a 63-year-old man with delayed hemopericardium, 2 months after striking the anterior chest on a mailbox when he fell down three steps during a postal delivery. Our case and review of the previously reported cases suggest that some cases might show quite slow progression of blood accumulation. Therefore, careful observation of patients who have experienced blunt trauma of the anterior chest is necessary.

Keywords Trauma · Blunt · Injury · Cardiac tamponade · Hemorrhagic pericardial effusion

Introduction

Delayed traumatic hemopericardium is an infrequently reported sequela of non-penetrating chest trauma. Traumatic cardiac hemopericardium is an uncommon but life-threatening condition that is usually caused by penetrating cardiac injuries. Cardiac tamponade is extremely rare and occurs in less than 0.1% of cases after non-penetrating chest trauma. In almost all cases, hemopericardial effusion appears immediately after injury, but some cases show quite slow progression. According to a review of previously reported cases, time from incident to diagnosis ranged from 7 to 120 days (median 19 days). Here, we report a case of hemopericardium detected 2 months after injury, and we summarize the other previously published reports of non-penetrating traumatic hemopericardium.

Case report

A 63-year-old man was admitted to our hospital because of dyspnea that persisted for 2 days. The patient had no history of cardiac disease and had taken no medication such as an anticoagulant agent. Two months before admission, he struck his anterior chest on a mailbox when he fell down three steps during a postal delivery. Since his precordial pain was ameliorated in several days, he did not consult a medical institution. He visited his general practitioner, who pointed out cardiomegaly (cardiothoracic ratio 81%) on his chest X-ray. He was referred to our hospital for further evaluation. He had normal vital signs (systolic blood pressure 133 mmHg, diastolic blood pressure 81 mmHg, pulse rate 88 bpm), and his jugular vein was not distended. There was no evidence of a typical cardiac tamponade manifestation of Beck's triad (hypotension, distended neck veins, and diminished heart sounds). Pulsation was intact in all extremities, and his chest showed no local bruising, tenderness, or abnormality on auscultation. Laboratory examination revealed that white blood cells of 10.8×10^9/L, C-reactive protein 9.3 mg/dL, hemoglobin 11.3 g/dL, and brain natriuretic peptide 45 pg/mL, and the other cardiac markers were within the normal range. Electrocardiogram showed sinus rhythm without low

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electrocardiographic voltage. Chest computed tomography showed hemopericardium but no evidence of aortic dissection, pulmonary embolism, or fracture. A large amount of pericardial effusion was confirmed by transthoracic echocardiography (TTE) (Fig. 1; Day 0). Pericardial drainage was performed, which drew 1000 mL of dark red serous pericardial effusion. After the procedure, TTE showed no pericardial effusion and normal cardiac function (Fig. 1; Day 1). Cytological examination revealed no evidence of malignancy, and diagnostic imaging such as chest computed tomography and gallium scintigraphy showed no findings suggesting malignancy. Coronary angiography showed no evidence of significant stenosis. Other causes of hemopericardium including bacteria, virus, collagen disease, tuberculosis, uremia, hypothyroidism, myocardial infarction, iatrogenesis, and drug were excluded. Finally, he was diagnosed with a non-penetrating hemopericardium. He fully recovered without complication, and TTE and chest computed tomography showed no re-storage of pericardial effusion. He was discharged from our hospital 17 days after admission. Six months later, TTE revealed no pericardial effusion and normal cardiac function (Fig. 1; Day 180).

Discussion

Blunt chest trauma can cause a variety of cardiac injuries, including minor contusion, or rupture of the heart and pericardium. These injuries often result in hemopericardium and cardiac tamponade.

Traumatic cardiac hemopericardium is an uncommon but life-threatening condition. It is usually caused by penetrating cardiac injuries. After non-penetrating chest trauma, cardiac tamponade is extremely rare and occurs in less than 0.1% of cases [1]. From 1988 through 2018, 16 cases of delayed hemopericardium after non-penetrating chest trauma were described (Table 1). Including our patient, delayed hemopericardium has been diagnosed in 13 men and four women (age range 0.6–81 years, median 19 years). Patients under 12 years of age were relatively prevalent (6 cases, 35%), possibly due to inadequate thoracic wall formation [2–6]. The cause was falls in five cases [3, 4, 7, 8], struck by object in five [2, 6, 9, 10], automobile accident in three [11–13], and other causes in three [5, 14, 15]. The time from index incident to diagnosis of hemopericardium ranged from 7 to 120 days (median 19 days). The normal pericardium contains less than 50 mL of intra-pericardial fluid. Accumulation of as little as 100–200 mL of intra-pericardial blood may increase intra-pericardial pressure, impair diastolic filling, increase venous pressure, and decrease cardiac output. The amount of pericardial effusion ranged from 100 to

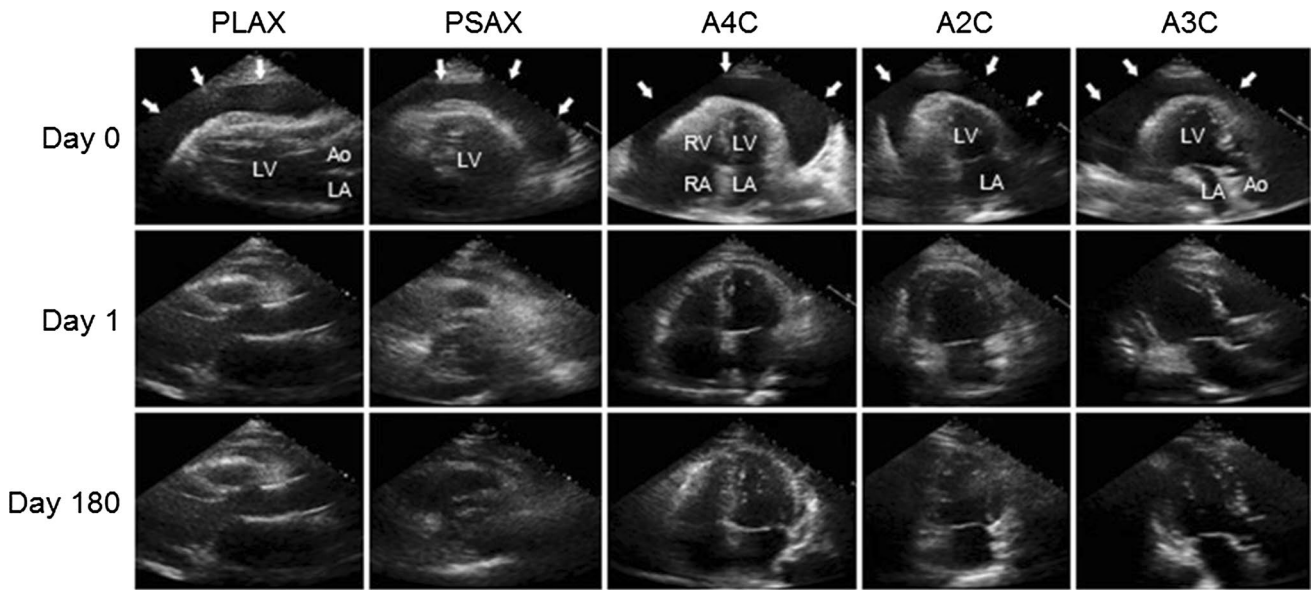

Fig. 1 Transthoracic echocardiograms. Large amount of pericardial effusion surrounds all cardiac chambers (arrow). Compression of the right ventricle is seen, and the interventricular and interatrial septa are normal on admission (upper panels). There is no pericardial effusion and cardiac function is normal after pericardial drainage (middle panels). No pericardial effusion is seen at 6-month follow-up (lower panels). *PLAX* parasternal long-axis view, *PSAX* parasternal short-axis view, *A4C* apical four-chamber view, *A2C* apical two-chamber view, *A3C* apical three-chamber view, *LV* left ventricle, *LA* left atrium, *Ao* aorta, *RV* right ventricle, *RA* right atrium

Table 1 Summary of 16 reported cases of delayed non-penetrating cardiac hemopericardium

References	Age (year), sex	SBP/DBP (mmHg)	HR (bpm)	Cause of trauma	Duration of trauma (days)	Volume (mL)	Associated injuries	Location of fracture
Indrani et al. [2]	9, M	NA	NA	Struck bicycle handlebar	7	NA	NA	NA
Solomon et al. [11]	44, F	100/60	120	Car accident	13	600	None	Ribs and humeral
Bowers et al. [3]	1.8, F	96/70	158	Fall	13	200	NA	NA
Ombrellaro et al. [14]	19, F	104/76	94	Kicked by boyfriend	120	100	NA	None
Cil et al. [4]	0.6, M	60/40	180	Fall from bed (75 cm)	14	120	NA	NA
Cil et al. [4]	12, M	110/80	100	Fall (chair)	28	1200	None	NA
Herbots et al. [12]	15, M	110/70	NA	Car accident	120	650	Tricuspid valve	5th metacarpal
Lin et al. [13]	21, M	84/58	NA	Car accident	13	600	NA	None
Hermens et al. [9]	70, M	70/40	110	Struck heavy door	28	200	None	None
Davey et al. [7]	63, M	70/50	112	Fall (ladder)	42	900	None	2 ribs
Taylor et al. [5]	0.8, M	120/70	130	Child abuse	120	300	NA	Femur
Tabansi et al. [6]	12, F	60/30	120	Struck edge of bed rail	21	1500	None	NA
Khidir et al. [8]	19, M	88/56	120	Fall (12 m)	19	550	NA	Pubic rami, sacrum, tibia and fibula
Liang et al. [10]	58, M	120/78	112	Struck heavy and high-speed wood	14	800	None	Sternal
Ryu et al. [15]	81, M	70/50	NA	Cultivator accident	14	200	Ascending aorta	3rd to 5th ribs
Current case	63, M	133/81	88	Struck mailbox	60	1000	None	None

NA not available

1500 mL (median 600 mL). Multiple rib fracture is common in blunt chest trauma, and leads to various injuries of intrathoracic organs such as pneumothorax, hemothorax, and injuries to neighboring organs. Among the reviewed cases, seven (41%) had fractures [5, 7, 8, 10–12, 15], and four (23%) of them were rib fractures [7, 10, 11, 15]. Diagnosis of a patient who has experienced a penetrating chest trauma is obvious and easy, but the same is not true for non-penetrating chest trauma, because clinical manifestations of cardiac tamponade after injury may be subtle. Beck's triad of hypotension, distended neck veins, and diminished heart sounds, typically found only in 35% of patients, may not be evident [16]. Focused Assessment with Sonography for Trauma (FAST) is useful for diagnosis of hemopericardial effusion [17, 18]. Hemopericardium may result from displacement of a thrombus that had temporarily closed the cardiac wound [19]. We believe that this mechanism might be the cause of the delayed hemopericardium in our patient, although it is just speculative.

Conclusions

We presented a patient with delayed hemopericardium after non-penetrating chest trauma, who had no recurrence of pericardial effusion for as long as 6 months. Our case and the previously reported cases suggest that accumulation of pericardial fluid in some cases can be quite slow. Although recurrence of pericardial effusion might be rare, careful observation is needed.

Compliance with ethical standards

Human rights statement This article does not contain any studies with human or animal subjects performed by any of the authors.

Conflict of interest The authors declare no competing financial interest.

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