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Case Report

A Report of Three Patients Surviving Near- Fatal Blunt Cardiac Rupture

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Abstract Blunt cardiac rupture is a rare condition that has a high mortality rate without prompt treatment. This paper reports three patients who survived blunt cardiac rupture, and a literature review was conducted as a reference for further management of this condition. The first patient was a man who sustained a motor-vehicle accident. Upon arrival, he appeared hypotensive and was found to have bilateral pleural effusion and cardiac tamponade with elevated cardiac enzymes. Bilateral chest tubes were inserted. He was brought to the operating room and went into cardiac arrest. Resuscitative thoracotomy was performed, as well as a definitive repair of the cardiac injury. The patient recovered and was discharged. The second patient was a woman, also in a motor-vehicle accident. She appeared hypotensive at the emergency department, where fractured ribs, a pneumothorax, and cardiac tamponade were detected. Chest tube insertion was performed and the patient taken to the operating room where definitive repair was done. She developed a clotted hemothorax for which a thoracotomy was performed to remove the blood clot. She recovered well and was discharged from the hospital. The last patient was a man who fell 7 meters. He had hypotension upon arrival as well as cardiac tamponade. He was brought to the operating room for definitive repair and recovered well and was subsequently discharged. All patients had multiple associated injuries. In conclusion, blunt cardiac rupture is a rare condition and difficult to diagnose. The mortality rate is high, but with prompt management, patients who survived to the hospital may have good outcomes. Prehospital management is also crucial.

Keywords: Blunt cardiac rupture, Cardiac tamponade

Introduction

In 2011, Yousef et al. reported that less than 10% of all trauma cases in the United States were traumatic cardiac injuries. However, the mortality rate for those who had a traumatic cardiac injury was the highest among all patients with major organ injuries[1]. The incidence of blunt cardiac injury (BCI) was 2.3% to 76%[2,3,4], while blunt cardiac rupture (BCR) occurred in 0.2% to 10%[5,6]. BCI is considered the most common cause of death at the scene of event, comprising 78% to 87% of all deaths in some reports[7,8]. Most patients die during their transfer to the hospital. Only 36% survived to the operating room, and 32% of those who underwent operation survived until discharge[9]. Most BCIs occurred in men with an average age of 45 $\pm$ 20 years. The overall mortality was more than 80%[9,10,11].

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We described 3 patients who survived BCR. We include information on the history, initial management, surgery, postoperative care, and management of complications. A literature review was conducted to provide a source of reference for physicians who may encounter similar cases.

A Report of 3 Cases

Case 1

A 32-year-old Thai man who was driving while under the influence of alcohol collided with an agricultural car. An emergency medical team transported him to the local hospital. At the scene, he was fully conscious, but with chest pain. The systolic blood pressure (SBP) was 50 mmHg, with a pulse of 130 bpm, respiratory rate of (RR) 28, and an oxygen saturation of 82%. Initial examination revealed decreased breath sounds on both sides. A bilateral chest tube insertion was performed as well as endotracheal intubation. The Focused Assessment Sonography for Trauma (FAST) scan revealed pericardial effusion. He was transferred to our hospital for definitive care. At the Emergency Department, his SBP was 68 mmHg, he had a small laceration on his face, a hematocrit (Hct) of 45%, and his Glasgow Coma Score (GCS) was $E_4V_TM_6$. A central venous cut down was performed, and central venous pressure (CVP) was 25 cmH_2O. FAST was repeated which confirmed the diagnosis of pericardial effusion (Figure 1). Arterial blood gas showed severe metabolic acidosis and severe hypoxemia. Troponin I level was 1241 ng/L. A chest X-ray (CXR) showed fractures of his left 6^{th} and 7^{th} ribs, with mild cardiomegaly.

The patient was brought to the operating room and an emergency subxiphoid pericardial window was performed which yielded bloody pericardial fluid. Suddenly, the patient went into cardiac arrest, and the decision was made to perform a resuscitative thoracotomy. A left anterolateral thoracotomy was made. The patient had a return of spontaneous circulation (ROSC) after 15 minutes of internal cardiac massage. There was fresh blood within the pericardial space. However, the bleeding site could not be identified, hence the incision was extended to a clamshell thoracotomy. We found an active bleeding site from the left atrial appendage tear which was 2 cm in length. The injury was controlled with a Satinsky clamp (Figure 2) and repaired with pledgeted 4-0 interrupted horizontal mattress sutures. (Figure 3).

Figure 1 FAST at the pericardium (Case 1)

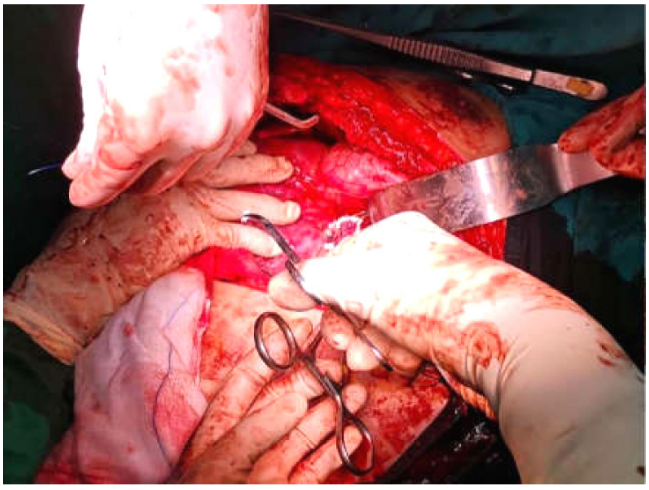

Figure 2 Controlling the left atrial appendage with a Satinsky clamp (Case 1)

The estimated blood loss was 5000 mL.

During the postoperative period, a CT brain scan and echocardiography were performed which yielded no significant abnormalities. The CXR indicated that his left lung was not fully expanded, with a clotted hemothorax. The clot was removed using video-assisted thoracoscopic surgery (VATS). The length of the hospital stay was 19 days. The patient was discharged, recovered well, and returned to living a normal life (Figure 4).

Case 2

A 27-year-old Thai woman was in a motor vehicle accident. Her car was hit by a truck from behind.

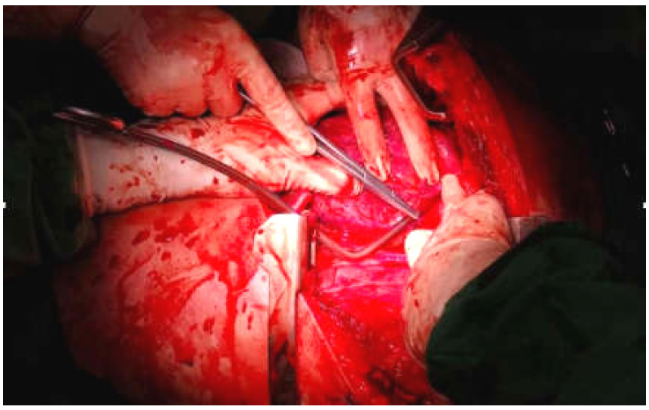

Figure 3 Repairing the ruptured atrium with interrupted horizontal mattress suture using 4-0 Prolene and reinforcing pledget (Case 1)

Figure 4 The patient at 1-month follow-up after discharge from the hospital (Case 1)

On initial examination, the GCS was E4V5M6, the SBP 90 mmHg, the pulse 136 bpm, the RR 34, with lacerated wounds at the face. CXR showed fracture of the right 1st to 2nd ribs with pneumothorax. Chest tube insertion was performed. She also had closed fractures of the right femur, tibia and fibula. She was transferred to our hospital for further management. FAST was positive for pericardial effusion (Figure 5). Pericardiocentesis was performed which yielded 175 mL of fresh blood (Figure 6).

The patient was brought to the operating room for emergency surgery. Median sternotomy was performed. There were 2 rupture sites at the superior cavo-atrial junction. The injury was repaired with interrupted horizontal mattress suture using 3-0 Prolene and reinforcing pledget (Figure 7).

Postoperative echocardiogram showed no residual pericardial effusion. CT of the abdomen revealed grade I liver injury. CXR showed loculated right pleural effusion. The right lung was not fully expanded.

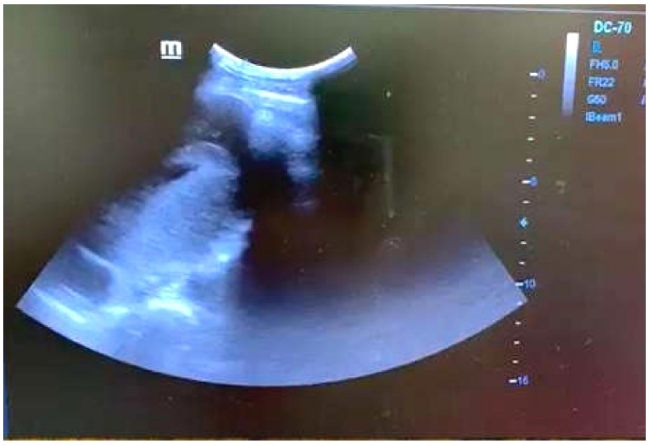

Figure 5 FAST at the pericardium (Case 2)

Figure 6 Pericardiocentesis at the emergency department (Case 2)

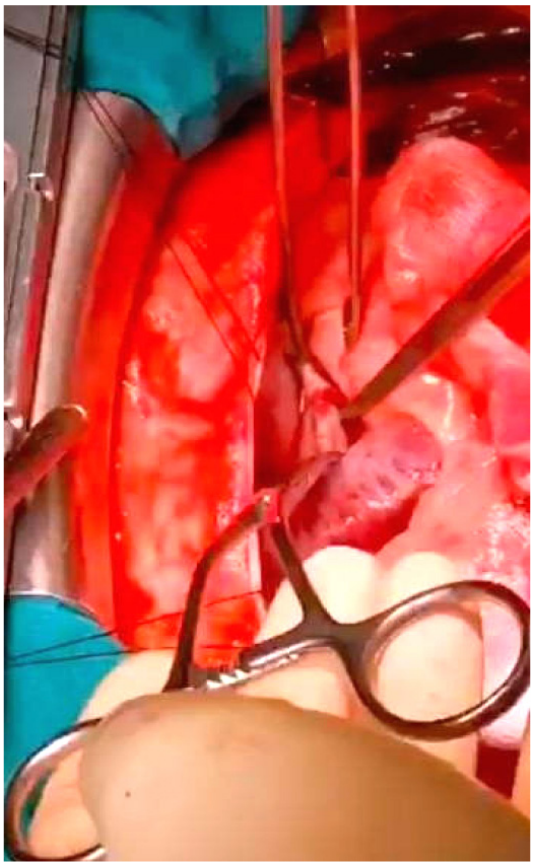

Figure 7 Repairing the superior cavo-atrial junction using 3-0 Prolene and reinforcing pledget (Case 2)

Figure 8 FAST at the pericardium (Case 3)

Figure 9 Pericardiocentesis at the emergency department (Case 3)

CT of the chest showed clotted hemothorax. Open thoracotomy and clot removal were done since CT findings suggested that VATS would not be successful. The patient was hospitalized for 29 days until discharge. She gradually recovered and returned to normal life.

Case 3

A 34-year-old Thai male fell from a 7-meter-high tree. The emergency medical service team brought the patient to a local hospital. The initial SBP was 65 mmHg, the pulse was 102 bpm, the RR was 28, and the GCS score, E4V5M6. FAST was positive for pericardial effusion (Figure 8).

CXR showed no widening of the mediastinum and no fractured ribs. X-rays showed fractures of both bones in both forearms. He was transferred to our hospital for further management. On examination the SBP was 78 mmHg. Venous cut down revealed a CVP of 13-14 cmH_2O, and the troponin I level was 3,860 ng/dL. We performed pericardiocentesis and 200 mL of fresh blood was retrieved (Figure 9). He was brought to the operating room for emergency surgery. A median sternotomy was performed and 300 mL of blood was found in the pericardium. There was one 5-mm rupture site at the superior cavo-atrial junction. The bleeding site was controlled with a vascular clamp and repaired with an interrupted horizontal mattress suture using 3-0 Prolene and reinforcing pledget.

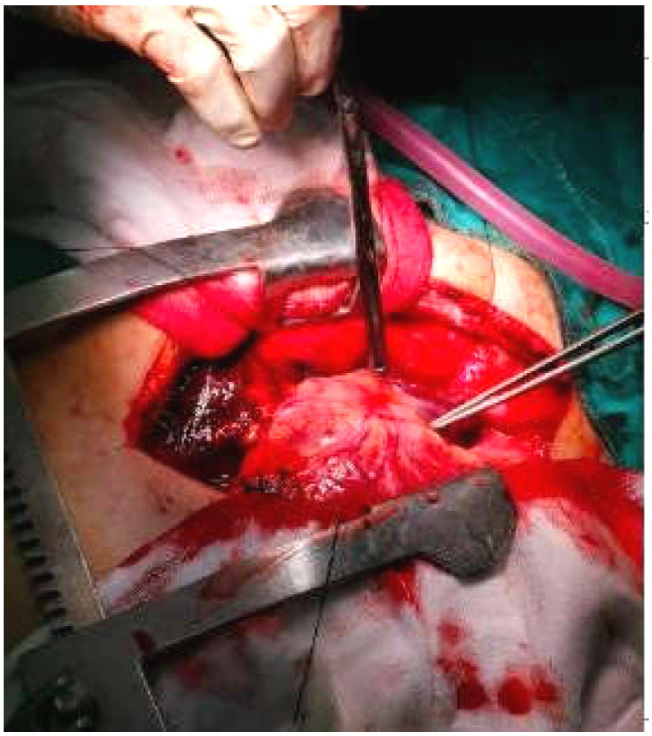

Figure 10 Repairing superior cavo-atrial junction using 3-0 Prolene and reinforcing pledget (Case 3)

The postoperative echocardiogram showed mild to moderate mitral regurgitation and good left ventricular function. His forearm fractures were repaired by an orthopedic surgeon. He was hospitalized for 29 days, and gradually recovered until his discharge from the hospital.

Discussion

An autopsy study from the United states found that the prevalence of traumatic cardiac injury was 6.4%. Eighty-six percent were men, with an average age of 36 years. BCI was found in 13%. In these, 96% was blunt cardiac rupture. The percentage of patients who died at the scene of the accident was 83%. Around 5% of patients survived to the hospital[12]. In Thailand, Kritaya et al. reported 44 patients with traumatic cardiac injury and a mortality rate of 14%, with BCI occurring in 4 patients (9%) and of these 3 (75%) had cardiac ruptures[13].

Most BCI cases result from motor-vehicle accidents (66%). Other causes include pedestrian accidents (9%), motorcycle accidents (9%), and falling from height (3%). Patients who fall from a height of more than 7 meters or have sternal fractures have a higher risk of BCI. Most patients have multiple injuries and including a high probability of associated head injuries[1,7,10,11,14]. BCR usually results from severe blunt chest injury and, similarly, associated injuries are common. Extremity injury occurs in 62% of cases, abdomen injury in 47%, and head injury in 36%[9]. Furthermore, autopsy findings found injuries to the lungs in 71% of cases, hollow viscus organs in 27%, intrathoracic aorta in 14%, and spinal injuries in 5%. High blood alcohol levels were detected in 16% of the victims[12]. In the present study, one patient had a high blood alcohol level. All patients had associated non-cardiac injuries.

Likely mechanisms of BCR in our patients include direct precordial impact, compression of the heart between the sternum and vertebral column, acceleration/deceleration forces, and direct penetration by the sternum or rib fractures[5], although it is difficult to determine which specific mechanism might apply in each case. The right atrium (RA) is the most common location of injury (40% to 51%). Other sites of injury include the right ventricle (RV) (17% to 31%), left atrium (LA) (25%), and left ventricle (LV) (9% to 13%). Two chamber ruptures can be found in 9% of all cases[3,5,9,10,13,15,16,17]. Autopsy findings in one report suggested that BCR occurred at the RA in 5% of patients, RV in 15%, LA in 10%, and LV in 10%[12]. Pre-existing pathology of the heart could be a risk factor of BCR, e.g., the presence of coronary artery disease[8].

Atrial rupture occurs as a result of direct impact to the chest. The injury can be severe if the heart is compressed against the sternum in the late systolic phase, during which the mitral and tricuspid valves are closed. The rupture site is usually found at the appendage because of its thinness[9,15,17]. Left atrial rupture occurs less often but the mortality rate is higher, up to 66%. Patients with atrial rupture may survive to the hospital because the low chamber pressure may result in slower bleeding[18]. Rupture of upper cardiac chambers can occur from acceleration/deceleration forces causing tearing of the junction between the pulmonary vein and the left atrium or between the superior vena cava and the right atrium[1,5,19]. This latter type of injury occurred in two of our cases. Some reports found a left atrial tear at the base, tearing at the junction between the pulmonary vein and the left atrium with rupturing of the right lower lobe bronchus[16,20].

Common clinical manifestations of cardiac rupture include symptomatic hypotension, tachycardia, tachypnea, fracture ribs, hemothorax, and pneumothorax. These conditions were found in all our patients. Others manifestations include elevated CVP, distended neck

vein, cyanosis of head/neck/arm/upper chest from SVC compression, distant heart sound, associated chest injuries, new cardiac murmurs, congestive heart failure, cardiogenic shock, and clavicular or sternal fractures[4,10,21,22].

The diagnosis of this condition is challenging because it can be easily overlooked when the clinician is faced with multiple associated injuries, which was the case with our patients. Large amounts of blood loss, hypoxia and hypotension usually coexist in this situation[23]. Early diagnosis is required due to the high mortality. There is no gold-standard investigation. Accurate diagnosis relies on information obtained from history taking, physical examination, the EKG, blood cardiac enzyme levels, and echocardiography[4]. No diagnostic modality can be used as a single reliable tool to predict cardiac injury. Clinicians must be aware of this condition in all patients who have blunt chest injuries and present with cardiogenic shock, especially those requiring high dose inotropes out of proportion to amount of observed blood loss or those who have arrhythmia and abnormal echocardiography[2,24-26].

The EKG is commonly employed in these cases. Findings include atrial fibrillation, premature ventricular contraction, bundle branch block, or ST-segment elevation. The negative predictive value (NPV) of these findings may be as high as 80% to 95%, but this is not high enough to exclude cardiac injury. If abnormal EKG findings are detected in patients who are suspected of having BCI, he or she should be admitted to the hospital for close or continuous cardiac monitoring for at least 24 hours[1,4,19,23].

Serum troponin I level has a high specificity for myocardial injury. A positive result of > 1 ng/dL can occur in 60% to 70% of cardiac injuries. If the value is < 0.4 ng/dL at 4 to 6 hours after injury with a normal EKG, the NPV is almost 100%, and it should be safe to discharge the patient home. There is almost no role for CPK and CK-MB levels in the diagnosis of cardiac injury due to their low specificity[1,4,7,17,23,24].

Cardiac tamponade often occurs in BCR. This was the case in all of our patients, which aided the diagnosis and management. Beck's triad, however, can be found in less than 10% of cases in the presence of massive hemothorax or tension pneumothorax. The assessment of neck vein engorgement is difficult in patients with a protective cervical collar. Patients may have a pericardial tear in which blood can be decompressed into the intrapleural space, causing hemothorax. This can hinder the diagnosis, thus increasing mortality[7,9,10,14,17,19,26,27]. Pericardiocentesis can aid in the diagnosis of BCR and may temporarily improve patients' hemodynamics, but this procedure has a relatively high false positive and false negative rates [2,3,10,15,26].

CXR can be normal even though the patient already has cardiac tamponade and a worsening condition[3]. This clinical picture was seen in our third case. If widening of the mediastinum occurs concomitant with hemothorax in a patient with blunt chest injury, clinicians should keep in mind that the patient may have BCI[5]. A CT scan of the chest and echocardiography should be performed in this situation.

A CT scan of the chest can detect great vessel injury, pericardial effusion, hemopericardium, pneumopericardium, via extravasation of radiologic contrast media, if a cardiac chamber rupture occurs. But in an emergency setting, echocardiography may be safer, especially in the diagnosis of valvular abnormality, chamber contractility, intracardiac shunting, cardiac tamponade, and pericardial effusion. However, echocardiography is operator-dependent and may have a poor acoustic window in trauma patients[4,23]. Echocardiography should be performed in patients who have a clear history of blunt chest injury with arrhythmia or hypotension[24]. All of our patients were diagnosed as having BCR via echocardiography.

If surgically significant cardiac injury is suspected, a sternotomy incision should be used. Almost all intrathoracic injuries can be accessed via this incision. The incision can be extended from a subxiphoid window or an abdominal incision. The patient can be connected to a heart-lung machine if needed[5,7]. The thoracotomy wound has limited exposure and clinicians should not be reluctant to extend the incision into a clamshell or convert to median sternotomy if difficulties occur. However, extending a thoracotomy incision into a clamshell may create a flail chest or risk of postoperative bleeding from internal mammary artery injury. Clinicians should carefully check for bleeding from the site of both internal mammary arteries before closing the incision[5,17,18,28]. Cardiac ruptures that occurred in our patients were repaired without using cardiopulmonary bypass. This greatly reduced bleeding diathesis from systemic heparinization. Repair can be achieved using 3-0 or 4-0 Prolene sutures with or without reinforcing pledgets. Applying a vascular clamp to the injury site can stop bleeding and facilitates suturing.

In cases of BCR involving an upper cardiac chamber, one should be aware of the risk of air embolism which can occur during the surgery. Balloon occlusion of the left atrial tear using a Foley catheter can impede blood flow to the left ventricle[6,16,18,23]. If there is injury to other intracardiac structures, repair should be deferred if possible, to avoid the use of a heart-lung machine in an emergency setting. The exception is when patients are not hemodynamically stable, in which cardiopulmonary bypass may be necessary[7].

Two of our patients had postoperative loculated pleural effusion. Other common postoperative complications include post-pericardiotomy syndrome, embolic stroke, and re-bleeding. Dysrhythmia occurs in 24% to 73% of cases. Late complications include coronary-pulmonary fistula, pericardial effusion, and constrictive pericarditis[26]. A follow up period of 3 to 6 months after surgery is recommended.

Conclusion

EKG and troponin I levels should be obtained to screen for BCI in patients who incurred blunt chest injury, even if symptoms are not severe and the likelihood of BCI is low. If abnormalities are detected, close cardiac monitoring should be performed, for at least 24 to 48 hours. If no abnormalities are detected within 8 hours, the patients can be discharged home. Transthoracic echocardiography (TTE) should be done if the patient develops arrhythmia, hypotension, or heart failure. If the probability of BCI is high, EKG, Troponin I level, and TTE should be obtained and the patient be closely observed in the ICU[4,29].

BCR has a high mortality rate. Possible factors associated with mortality include hypotension, physiologic index < 15, cardiac arrest, high velocity mechanism of injury, presence of associated injury, and intra-cardiac injury[9,14,29,30]. Early diagnosis and management are crucial, and these patients should be transferred to a tertiary care hospital. If the patient survives to the hospital, there is a good chance of saving the patient's life.

REFERENCES

1. Yousef R, Carr JA. Blunt cardiac trauma: a review of the current knowledge and management. Ann Thorac Surg 2014;98:1134-40.
2. Martin TD, Flynn TC, Rowlands BJ, et al. Blunt cardiac rupture. J Trauma 1984;24:287-90.
3. Sliker CW, Mirvis SE, Shanmuganathan K, Meyer CA. Blunt cardiac rupture: value of contrast-enhanced spiral CT. Clin Radiol 2000;55:805-8.
4. Mikhael F, El-Chami, Nicholson W, Helmy T. Blunt cardiac trauma. Ulus Travma Acil Cerrahi Derg 2008;35:127-33.
5. Akar İ, İnce İ, Aslan C, et al. Left atrial rupture due to blunt thoracic trauma. Ulus Travma Acil Cerrahi Derg 2015;21:303-5.
6. Salooja MS, Singla M, Srivastava A, Mukherjee KC. Isolated tear in left atrial appendage due to blunt trauma chest: A rare case report. J Saudi Heart Assoc 2013;25:95-7.
7. Nan YY, Lu MS, Liu KS, et al. Blunt traumatic cardiac rupture: therapeutic options and outcomes. Injury 2009;40:938-45.
8. Wang Q, Yang L, Zhang Y, et al. Forensic-pathological analysis of blunt cardiac rupture involving the relationship between injury and disease: 2 case reports and review of the literature. Forensic Med Anat Res 2016;4:23-8.
9. Teixeira PG , Inaba K, Oncel D, et al. Blunt cardiac rupture: a 5-year NTDB analysis. J Trauma 2009;67:788-91.
10. Brathwaite CE, Rodriguez A, Turney SZ, et al. Blunt traumatic cardiac rupture. Ann Surg 1990;212:701-4.
11. Ball CG, Peddle S, Way J, et al. Blunt cardiac rupture: isolated and asymptomatic. J Trauma 2005;58:1075-7.
12. Fedakar R, Türkmen N, Durak D, Gündoğmuş UN. Fatal traumatic heart wounds: review of 160 autopsy cases. Isr Med Assoc J 2005;7:498-501.
13. Kritayakirana K, Sriussadaporn S, Pak-Art R, et al. Cardiac trauma: has survival improved? A university hospital experience in Bangkok, Thailand. J Med Assoc Thai 2013;96:196-202.
14. Marsh RH, Levine AC, Noble VE, et al. Case Presentations of the Harvard Affiliated Emergency Medicine Residencies. J Emerg Med 2010;39:337-40.
15. Leavitt BJ, Meyer JA, Morton JR, et al. Survival following non-penetrating traumatic rupture of cardiac chambers. Ann Thorac Surg 1987;44:532-5.
16. Ryu DW, Lee SY, Lee MK. Rupture of the left atrial roof due to blunt trauma. Interact Cardiovasc Thorac Surg 2013;17:912-3.
17. Al Ayyan M, Aziz T, El Sherif A, Bekdache O. Blunt cardiac injury: case report of salvaged traumatic right atrial rupture. Ulus Travma Acil Cerrahi Derg 2015;21:527-30.
18. Alameddine AK, Alimov VK, Alvarez C, Rousou JA. Unexpected traumatic rupture of left atrium mimicking aortic rupture. J Emerg Trauma Shock 2014;7:310-2.
19. Byun CS, Park H, Park H, et al, Cardiac rupture of the junction of the right atrium and superior vena cava in blunt thoracic trauma. Korean J Crit Care Med 2015;30:27-30.
20. McKeown PP, Rosemurgy A, Conant P. Blunt traumatic rupture of pulmonary vein, left atrium, and bronchus. Ann Thorac Surg 1991;52:1171-2.
21. Podboy MM, A case of blunt cardiac rupture. Air Med J 2003;22:41-43.
22. Calhoon JH, Hoffmann TH, Trinkle JK, et al. Management of blunt rupture of the heart. J Trauma 1986;26:495-502.
23. Sybrandy KC, Cramer MJ, Burgersdijk C. Diagnosing cardiac contusion: old wisdom and new insights. Heart 2003;89:485-9.
24. Clancy K, Velopulos C, Bilaniuk, et al. Screening for blunt cardiac injury: an Eastern Association for the Surgery of Trauma practice management guideline. J Trauma Acute Care Surg 2012;73:s301-s306.
25. Orlando Regional Medical Center. Blunt cardiac trauma. Avail-

able at: www.surgicalcriticalcare.net/Guidelines/Blunt%20Cardiac%20Trauma%202016.pdf. Accessed Dec 27,2019
26. May AK, Patterson MA, Rue LW 3rd, et al. Combined blunt cardiac and pericardial rupture: review of the literature and report of a new diagnostic algorithm. Am Surg 1999;65:568-74.
27. Helling TS, Duke P, Beggs CW, Crouse LJ. A prospective evaluation of 68 patients suffering blunt chest trauma for evidence of cardiac injury. J Trauma 1989;29:961-5.
28. Oizumi H, Suzuki K, Hoshino H, et al. A case report: hemothorax caused by rupture of the left atrial appendage. Surg Case Rep 2016;2:142.
29. Pinni S, Kumar V, Dharap SB. Blunt cardiac rupture: A diagnostic challenge. J Clin Diagn Res 2016;10:27-8.
30. Henderson VJ, Smith RS, Fry WR, et al. Cardiac injuries: analysis of an unselected series of 251 cases. J Trauma 1994;36:341-8.

บทคัดย่อ **รายงานผู้ป่วย 3 รายที่รอดชีวิตจากหัวใจแตกจากแรงกระแทกที่หน้าอก**

คมกฤษณ์ โกมุทรินทร์, นิสิต พูลธนะนันท์, อารยา ฐิติสุรวัฒน์, วิชญุตร์ ธีระภิญโญ

กลุ่มงานศัลยกรรม โรงพยาบาลมหาราชนครราชสีมา จังหวัดนครราชสีมา

ภาวะหัวใจแตกจากแรงกระแทกที่หน้าอกพบได้ยาก แต่มีโอกาสเสียชีวิตได้สูง หากไม่ได้รับการรักษาที่ทันท่วงที ผู้นิพนธ์นำเสนอกรณีศึกษาผู้ป่วย 3 รายที่มาถึงโรงพยาบาล และทบทวนวรรณกรรมเพื่อเป็นแนวทางในการรักษาต่อไป

ผู้ป่วยรายแรกเป็นผู้ชายประสบอุบัติเหตุรถยนต์มีอาการเจ็บหน้าอกที่โรงพยาบาลพบความดันต่ำ การสืบค้นพบ bilateral pleural effusion และ cardiac tamponade ผู้ป่วยได้รับการใส่ intercostal drainage ทั้ง 2 ข้าง และเข้าห้องผ่าตัด ก่อนผ่าตัดมี cardiac arrest แต่ได้รับการทำ resuscitative thoracotomy แล้ว จึงผ่าตัดรักษาจนสามารถกลับบ้านได้

ผู้ป่วยรายที่สองเป็นผู้หญิงประสบอุบัติเหตุรถยนต์มีอาการเจ็บหน้าอก แรกรับที่โรงพยาบาลพบความดันต่ำ การสืบค้นพบ fracture rib และ cardiac tamponade ได้รับการผ่าตัด หลังจากนั้นมีภาวะ Clotted hemothorax ได้รับการผ่าตัด thoracotomy with clot evacuation สามารถกลับบ้านได้

ผู้ป่วยรายที่สามประสบอุบัติเหตุตกต้นไม้ แรกรับที่โรงพยาบาลพบความดันต่ำ การสืบค้นพบ cardiac tamponade ได้รับการผ่าตัดสามารถกลับบ้านได้ผู้ป่วยทั้ง 3 ราย มีอาการบาดเจ็บที่ ตำแหน่งอื่นร่วมด้วย ใช้เวลานอนโรงพยาบาล 19 ถึง 29 วัน

ภาวะหัวใจแตกจากแรงกระแทกที่หน้าอกพบได้น้อย วินิจฉัยยาก โอกาสรอดชีวิตต่ำ หากไม่ได้รักการรักษาทันที แต่ทั้งนี้ ผู้ป่วยที่ได้รับการผ่าตัดมีผลการรักษาที่ดี ดังนั้นผู้ป่วยที่รอดชีวิตมาถึงโรงพยาบาลได้ สมควรที่จะมีโอกาสรอดชีวิตกลับบ้านได้สูง