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Cardiac Injury as an Emergent Condition-Management and Treatment

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Abstract:

Background: Blunt cardiac injury (BCI) encompasses a broad spectrum of heart-related conditions, ranging from minor arrhythmias to fatal cardiac wall ruptures. The incidence of BCI is difficult to establish due to variations in clinical presentation and a lack of standardized diagnostic criteria. The most common form of BCI is cardiac contusion, although severe injuries like myocardial rupture can be life-threatening. Motor vehicle collisions (MVCs) are the primary cause, with rapid deceleration and direct trauma to the chest as the main mechanisms. Other contributing factors include rib fractures and high-impact trauma.

Aim: This article aims to review the management and treatment of blunt cardiac injury, focusing on diagnosis, clinical presentation, and intervention strategies. It highlights the mechanisms of injury, common pathologies, and challenges in diagnosing BCI.

Methods: A review of existing literature on BCI, including studies on the biomechanics of injury, clinical presentations, and diagnostic techniques such as echocardiography and biomarkers like troponin. The article also discusses treatment strategies and surgical interventions in managing severe cardiac injuries, particularly myocardial rupture and valvular injuries.

Results: Cardiac contusion is the most common injury, presenting symptoms such as chest pain, dyspnea, and arrhythmias. Severe cases may result in heart failure or require surgical intervention. Myocardial rupture and valvular injuries, though less frequent, carry higher mortality rates, particularly when patients do not reach medical care promptly. Surgical interventions such as pericardiocentesis and cardiorrhaphy are critical in stabilizing patients, with survival outcomes highly dependent on early diagnosis and timely surgical intervention.

Conclusion: BCI represents a significant challenge in trauma care due to its varied clinical presentation and the complexity of diagnosis and treatment complexity. Early recognition and intervention, including the use of advanced diagnostic tools like echocardiography, are essential for improving patient outcomes. Surgical repair techniques, including off-pump cardiorrhaphy, offer promising results in cases of severe myocardial rupture. Clinicians must maintain a high suspicion for BCI, especially in patients with high-risk trauma mechanisms such as MVCs.

Keywords: Blunt cardiac injury, myocardial rupture, cardiac contusion, trauma, echocardiography, cardiac surgery, motor vehicle collisions, diagnostic challenges, treatment strategies.

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Introduction:

Blunt cardiac injury (BCI) represents a diverse range of cardiac pathologies, from transient arrhythmias that are clinically insignificant to fatal cardiac wall ruptures. The actual incidence of BCI is challenging to determine due to variations in its clinical presentation. Among the diagnosed cases of BCI, cardiac contusion is the most prevalent. However, the lack of standardized diagnostic criteria and reliable tests complicates accurate reporting. Symptoms indicative of BCI are often nonspecific and can be unrelated to the condition, while some injuries remain asymptomatic. Cardiac rupture is the most severe complication of BCI, and the majority of patients experiencing heart chamber rupture succumb before reaching medical facilities. Motor vehicle collisions (MVCs) are the leading cause of BCI, with rapid deceleration as the primary mechanism. Direct trauma to the precordium is another significant contributor [1, 2]. Any patient involved in high-impact MVCs, sudden deceleration events, severe chest trauma, or polytrauma is at risk of developing BCI. Multiple forces contribute to BCI, including compression of the heart between the spine and sternum, sudden pressure changes in the thoracic and abdominal cavities, shear forces from rapid deceleration, and blast injuries [2]. Additionally, rib fracture fragments may directly damage the heart without causing penetrating injuries. The right heart is particularly vulnerable due to its anterior anatomical position. Injuries involving high-pressure ventricles are as frequent as those affecting low-pressure atria. Less common pathological manifestations include valvular tears, septal ruptures, and coronary artery lacerations or thrombosis [2].

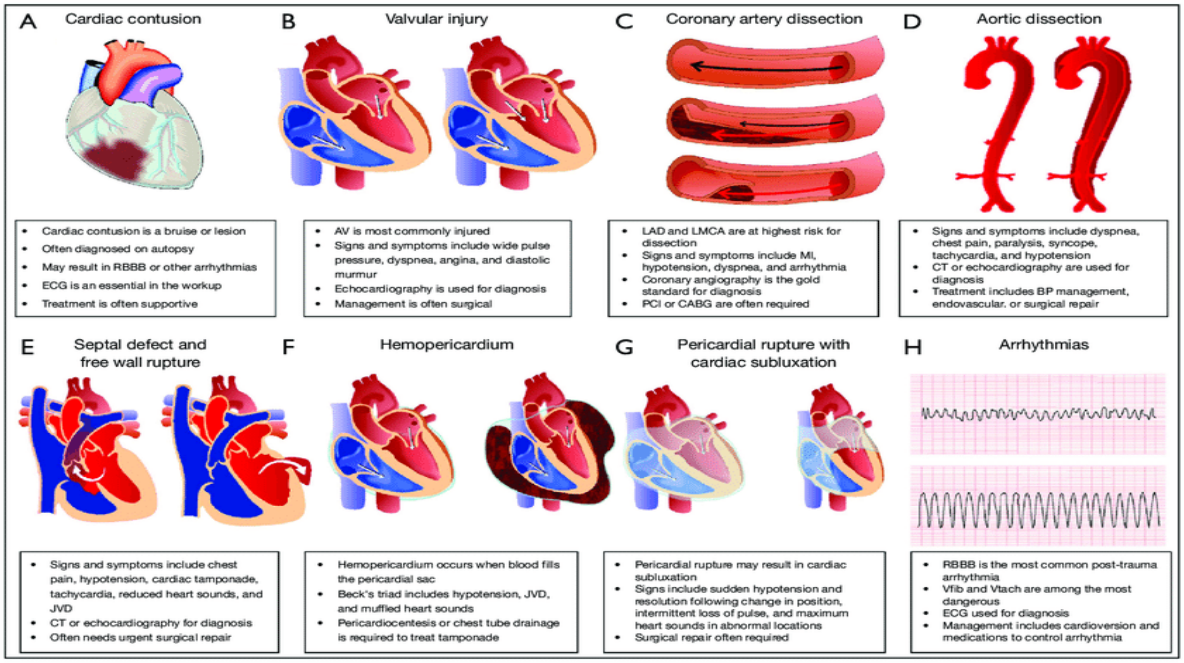

Figure 1: Blunt Cardiac Injury.

Cardiac Contusion

Cardiac contusion is the most common form of cardiac injury resulting from blunt trauma. Mild cases often resolve without long-term effects, whereas severe injuries are associated with significant morbidity and mortality [3]. Histologically, cardiac contusions are marked by localized myocardial damage, including hemorrhagic infiltration, necrosis, and edema. Clinically, cardiac contusions may manifest as chest pain, dyspnea, and arrhythmias, but diagnosis remains challenging due to the lack of standardized protocols. Presentations range from asymptomatic cases to those with mild chest discomfort, electrocardiographic (ECG) abnormalities, contractile dysfunction, or signs of heart failure. Right bundle branch block (RBBB) is frequently observed, while left bundle branch block (LBBB) is rare [4]. The proximity of the right ventricle to the sternum predisposes it to injury [4]. Various diagnostic tools aid in assessing cardiac contusions.

Biomarkers like creatine kinase and troponin, traditionally used for myocardial infarction, are also elevated in cardiac trauma and may indicate myocardial damage [3]. Imaging modalities, such as echocardiography, provide critical insights into structural and functional cardiac abnormalities, including valvular dysfunction, septal or free wall rupture, cardiac tamponade, and impaired myocardial function. Cardiac magnetic resonance imaging (MRI) is an alternative that offers detailed information about myocardial contusions and regional infarcts.

Myocardial Rupture

The clinical identification of blunt myocardial rupture is often obscured by nonspecific symptoms and associated injuries. Features such as hypotension, distended neck veins, and muffled heart sounds may suggest pericardial tamponade in BCI, though these signs are not always present. In cases of hemorrhagic hypotension, distended neck veins may be absent, requiring immediate bedside ultrasound to confirm the diagnosis. Patients with severe BCI, such as uncontained myocardial rupture, rarely survive to reach medical facilities [5]. For those who do, the restoration of blood pressure during fluid resuscitation can exacerbate myocardial stress and worsen the injury. Prompt diagnosis through echocardiography or CT imaging, followed by surgical intervention, can be lifesaving in a limited number of cases [6]. Atrial ruptures are less common than ventricular ruptures due to the atria's anatomical position and compliance. Right atrial rupture occurs in approximately 10% of cases, while left atrial rupture is rare and often presents with delayed or less acute symptoms [7].

Septal and Valvular Injuries

Septal injuries are rare and may vary from minor tears to complete ruptures. These injuries can occur in isolation or alongside valvular damage [2]. Clinical findings often include acute valvular insufficiency, widened pulse pressure, and signs of acute heart failure. Isolated valvular injuries are similarly uncommon [8]. Among these, the aortic valve is most frequently affected, followed by the mitral and tricuspid valves [8]. Damage may involve leaflet tears, partial or complete ruptures of the papillary muscles, or chordae tendineae. Clinical presentations range from acute valvular insufficiency with heart failure to newly developed cardiac murmurs. Research by Ismailov et al. highlighted an increase in tricuspid and aortic valve dysfunctions, including regurgitation and insufficiency, in patients with a history of BCI. Mild cases often go undetected initially but may later present with chronic heart failure due to longstanding valvular dysfunction [9]. Although less prevalent, mitral valve insufficiency has also been reported in cases of BCI [10].

Concomitant Injury and Sternal Fracture

Blunt cardiac injury (BCI) frequently occurs alongside other traumatic injuries affecting various body regions, such as the head, thorax, abdomen, and spine. An autopsy study revealed that sternal fractures were present in 76% of cases involving cardiac injury, compared to only 18% of cases without BCI [11]. However, the presence of a sternal fracture does not necessarily indicate BCI. It is crucial to maintain a high level of suspicion for blunt cardiac injury and exclude it based on the specific mechanism of injury.

Myocardial Infarction

Although rare, myocardial infarction can be a complication of BCI, particularly in victims of motor vehicle accidents or minor trauma. The causes include coronary artery dissection, laceration, and thrombosis [12, 13], with the left anterior descending artery being the most commonly affected vessel [14].

Analysis of Different Conditions:

The precise incidence of BCI remains undetermined. Identifying the underlying cause of cardiac dysfunction in patients with BCI is often challenging, especially when these individuals present with multiple factors contributing to hypotension and hemodynamic instability. Cardiac chamber rupture following non-penetrating thoracic trauma has a high mortality rate, with the majority of patients succumbing at the accident scene. However, recognition of such injuries is becoming more common, and survival is possible for those who are promptly transported to trauma centers [15].

The biomechanics behind cardiac chamber rupture after blunt thoracic trauma are typically attributed to rapid deceleration or direct impact to the precordium [16]. Survival rates following single-chamber cardiac rupture are higher in cases involving the atria rather than the ventricles and are also more favorable when the right heart chambers are involved [17, 18]. Atrial ruptures, particularly at the junction of the atrium with the vena cava or pulmonary veins, are thought to result from rapid deceleration [18]. These structures have different deceleration rates based on their degree of fixation within the mediastinum, which leads to shearing forces during sudden deceleration [19]. Previous studies have suggested that right atrial ruptures are more common due to the relative weakness of the right atrial appendage [20]. However, Parmely et al. found that all four cardiac chambers experience rupture with equal frequency [8]. In contrast, ventricular rupture is more likely to result from a direct precordial injury, which compresses the heart between the sternum and the vertebral column. This type of rupture is most likely to occur at end-diastole, when the ventricle is maximally distended and subjected to greater compression forces [21].

Survival outcomes may improve in cases where a pericardial tear is present, as this could prevent immediate cardiac tamponade. However, decompression into the pleural space may lead to massive hemothorax, increasing the likelihood of mortality. Management strategies are ultimately determined by the clinical presentation and findings of the patient. If the patient survives the initial trauma and reaches a medical facility capable of providing appropriate care, timely and coordinated surgical intervention remains the most significant predictor of survival. The control of ruptured myocardium typically involves direct suturing following digital pressure, the application of a vascular clamp, or the use of prosthetic material anchored with surgical glue. In cases where these measures are ineffective, cardiopulmonary bypass may be employed, assuming it is available.

A well-coordinated plan to control massive blood loss, combined with established surgical techniques for repairing ventricular rupture, forms the foundation of surgical treatment. It is critical that patients exhibiting clinical or echocardiographic signs of severe cardiac injury, such as ruptured valves, septal defects, or ventricular wall rupture causing cardiac tamponade, receive immediate surgical consultation. If tamponade is suspected, either clinically or via ultrasound, pericardiocentesis may be performed. In cases where tamponade results from an atrial tear, periodic drainage via a pigtail catheter may be used until definitive surgical repair can be completed. For unstable patients who may not survive the transfer to an operating room, emergency department thoracotomy may be the most effective treatment for cardiac tamponade, though successful resuscitation following blunt trauma is rare. Despite rapid diagnosis, surgical management remains exceptionally challenging for several reasons. First, patients typically experience significant hemodynamic instability, making them high-risk surgical candidates. Induction agents with cardio-depressive effects and positive pressure ventilation following intubation may further compromise cardiac function in these patients. If feasible, delaying intubation until the patient reaches the operating room may be beneficial. According to available case series, preoperative hemodynamic instability appears to be the most significant factor influencing outcomes, with survival rates varying between 39% and 100% [23].

The precise location of the rupture is often difficult to identify and may be exacerbated by the use of cardiopulmonary bypass [24]. To assist in pinpointing the damaged myocardial area, surgical procedures are increasingly performed off-pump [24]. Once the lesion is identified, effective cardiorrhaphy, coupled with the appropriate selection and use of surgical materials, is critical for managing the acute surgical situation. Non-cutting sutures in a buttress technique, along with the use of artificial patches and surgical glue, have proven to be successful closure options [15, 25]. One of the major technical challenges in repairing a myocardial rupture lies in the weakened state of the surrounding myocardium, which provides a poor substrate for suturing. Modern techniques have addressed this issue by using Dacron or Teflon patches large enough to cover the rupture site and incorporate surrounding viable myocardium [24, 25, 26], as is seen in ruptures following myocardial infarction. These patches, which can be applied without sutures using cyanoacrylate glue, create a stable seal that halts myocardial leakage while maintaining the original left ventricular cavity size. The off-pump, sutureless patch technique is now considered the preferred approach for managing left ventricular free wall rupture.

Etiology

Blunt cardiac injury (BCI) resulting from blunt chest trauma is most frequently caused by motor vehicle collisions (MVCs), which account for 50% of cases, with 20% of all MVC-related fatalities involving blunt chest trauma. Other contributing mechanisms include falls, blast injuries, assaults, and other forms of blunt trauma [27-29]. The nature and magnitude of the force determine the specific cardiac injuries sustained. In severe cases, the heart may be compressed between the sternum and spine, while deceleration injuries can cause the heart to tear from its attachments. Such injuries are often fatal, with patients typically succumbing to the scene. While BCI may be associated with injuries to surrounding structures like the thoracic aorta, lungs, ribs, sternum, and spine, these injuries alone do not confirm the presence of BCI. Clinicians, however, should maintain a high clinical suspicion for BCI when managing patients with thoracic trauma [30-34].

Epidemiology

In the United States, trauma ranks as the fourth leading cause of death. The incidence of BCI varies widely due to a lack of universally accepted diagnostic criteria, inconsistent reporting, and the absence of a standardized definition. Misdiagnosis can occur when clinical features overlap with other conditions unrelated to BCI, such as arrhythmias caused by preexisting conditions. Additionally, diagnostic tools like elevated troponin levels may be elevated due to trauma not associated with chest injury [35-39]. The American Association for the Surgery of Trauma (AAST) has developed the AAST Cardiac Injury Scale to classify both blunt and penetrating cardiac injuries, though it is important for clinicians to recognize that patients with multiple penetrating wounds to a single cardiac chamber or multiple chamber involvement may increase the injury grade by a factor of 1.

Pathophysiology

Several mechanisms can lead to BCI, including direct, indirect, bidirectional, deceleration, blast, crush, concussive, or combined forces [27][29][40]. The most common cause of cardiac injury is direct impact to the chest, with cardiac injury being most likely when the ventricles are fully distended at the end of diastole [33]. Indirect mechanisms, such as increased preload from abdominal or extremity veins, can rapidly increase intracardiac pressure, making the heart more susceptible to rupture [33]. Bidirectional forces result in compression of the heart between the sternum and spine, while deceleration forces can cause tears in the valvular structures, myocardium, or coronary arteries [27][33]. Cardiac chamber injuries are distributed based on the heart's anatomical position, with the right ventricle and atrium being more anterior than the left-sided chambers [33][41]. The most common fatal injuries from blunt trauma are cardiac chamber ruptures (64%), venous-atrial confluence tears (33%), and coronary artery tears or dissections, often in combination [34]. Commotio cordis, a sudden cardiac arrest induced by BCI in the absence of preexisting heart disease, is another fatal complication typically seen in young athletes. This is thought to result from ventricular fibrillation caused by an impact during ventricular repolarization [34]. Patients who survive BCI generally present with less severe injuries, including structural damage, electrical conduction disturbances, and arrhythmias [34]. One common structural injury is intramural hematoma, which typically resolves within 4 to 12 weeks but may cause premature ventricular contractions or bundle branch block. Papillary muscle rupture can result in valve regurgitation, requiring surgical repair. Septal injuries, which begin with contusion and progress to necrosis and delayed rupture, can be detected early and are often treatable. The most common dysrhythmias associated with BCI include sinus tachycardia, premature atrial or ventricular contractions, and atrial fibrillation. Tachycardia in trauma patients should primarily raise suspicion for ongoing bleeding rather than BCI, although BCI remains a key differential diagnosis once bleeding is ruled out.

History and Physical Examination

Rapid recognition of blunt chest trauma and the mechanism of injury is crucial. For example, patients involved in motor vehicle collisions should be questioned about direct impact with the steering wheel. In one study, 54% of patients who fell from a height greater than 20 feet sustained BCI [34]. The most common presenting symptoms are chest pain and shortness of breath [27], though some patients may report

palpitations or even display signs consistent with angina [42]. A thorough assessment of the patient's cardiac risk factors, such as a history of myocardial infarction or cardiovascular disease, as well as comorbid conditions, is essential. It is also important to obtain a detailed medication history, as cardiac medications like beta-blockers and calcium channel blockers may mask tachycardia, altering the clinical presentation. The physical examination should be comprehensive. Cardiac tamponade, indicated by jugular venous distention and hypotension, should be suspected in cases of blunt chest trauma. The focused assessment with sonography for trauma (FAST) exam is useful for detecting pericardial fluid and diagnosing cardiac tamponade. Nonspecific signs that may raise suspicion for BCI include tachypnea, irregular lung sounds, chest wall tenderness, abrasions or ecchymosis on the chest, rib or sternal fractures, and seatbelt marks [27]. Patients with severe BCI often have other significant traumatic injuries that may mask the full extent of the chest injury, complicating the diagnosis [42].

Evaluation

There is no established consensus regarding the definitive diagnosis of blunt cardiac injuries (BCI). However, in 2012, the Eastern Association of Trauma published guidelines recommending echocardiography (ECG) for all patients suspected of having BCI [34]. Patients exhibiting abnormal findings should be admitted for continuous cardiac monitoring, although it is important to note that a normal initial ECG does not entirely rule out BCI. Studies have shown that a significant number of patients who initially present with normal ECG findings may demonstrate elevated cardiac troponin I (cTnI) levels, indicating a possible cardiac injury within 24 hours [29]. Nevertheless, patients with both normal ECG results and normal cTnI levels can typically be discharged safely [29]. However, normal values in both tests do not exclude the presence of all types of BCIs, particularly those with delayed presentations, such as septal injury.

The standard diagnostic workup for BCI includes ECG, echocardiography, cardiac biomarkers, and radioisotope scanning. If the initial 12-lead ECG appears normal, a follow-up ECG after 4 to 6 hours, accompanied by cardiac biomarker measurements (such as troponin and creatine kinase), is recommended. Further biomarker assessments and additional imaging, including echocardiography or radioisotope scans, should be determined based on clinical observations, ECG results, and biomarker levels. However, the diagnostic approach varies significantly depending on hospital protocols, and diagnosing BCI and its associated complications remains a challenging clinical task [43]. While computerized tomography (CT) and magnetic resonance imaging (MRI) do not serve as initial diagnostic tools for BCI, they may be useful in cases where symptoms persist without a clear clinical diagnosis and may be employed on a case-by-case basis [29]. The Focused Assessment with Sonography for Trauma (FAST) is a bedside ultrasound technique recommended for patients who are hemodynamically unstable, particularly those with blunt abdominal trauma, penetrating trauma at the thoracoabdominal junction, or unexplained instability. The traditional FAST protocol examines four areas: the pericardium (to detect cardiac tamponade), the right upper quadrant, the left upper quadrant, and the pelvis (for hemoperitoneum) [31]. The extended FAST (e-FAST) also includes an assessment of the pleural spaces to identify hemothorax or pneumothorax [31].

Treatment and Management

The initial assessment of trauma patients should follow the guidelines outlined by the American College of Surgeons' Advanced Trauma Life Support (ATLS) course. In cases of shock, all potential causes must be explored, particularly in patients with thoracic trauma, where cardiogenic and compressive cardiac issues are common. Physical examination, ECG, and e-FAST are crucial to identify critical conditions such as pericardial tamponade and severe hemodynamic dysrhythmias. Patients with abnormal ECG results or elevated cTnI levels should be admitted for 24 to 48 hours of cardiac monitoring, as life-threatening arrhythmias or cardiac failure are most likely to develop during this period [29]. These patients may require admission to the intensive care unit or telemetry units, depending on the nature of their injuries, ECG findings, and the extent of hemodynamic instability. Not all patients with sternal fractures and normal ECG results require hospitalization to rule out BCI. Typically, patients with isolated abnormal ECG results or elevated cTnI levels have a favorable prognosis with minimal risk of long-term functional impairment [27]. Dysrhythmias in patients with BCI should be managed similarly to those in patients without such injuries.

This includes correcting electrolyte imbalances, preventing hypoxia and acidosis, and administering antidysrhythmics and advanced life support interventions when appropriate. Although rare, a complete heart block in these patients may necessitate the placement of a pacemaker. ST-segment elevations may either be attributed to myocardial contusion or traumatic myocardial infarction, which would require coronary angiography to confirm the diagnosis [29]. Patients presenting with severe, clinically diagnosed, or imaged structural cardiac injuries require urgent cardiology consultation for further management. In the interim, temporizing measures such as fluid resuscitation, inotropes, or vasopressors may be indicated, depending on the specific clinical findings and associated injuries. In cases involving cardiac tamponade, most commonly seen in cardiac rupture, emergent surgical intervention is necessary [29]. Timely cardiothoracic intervention is critical, as delays can worsen patient outcomes. In refractory cases of cardiogenic shock, the use of an intra-aortic balloon pump may be beneficial to enhance coronary blood flow, promoting recovery of the myocardium over days to weeks [27].

Prognosis

The prognosis of blunt cardiac injury (BCI) is highly contingent upon the nature of the injury, its association with concomitant injuries, and any prior history of cardiac disease or previous cardiac trauma [42]. Patients with isolated BCI, typically presenting with abnormal ECG findings or elevated cTnI levels, generally have a more favorable prognosis than those who exhibit hemodynamic instability due to a structural cardiac injury, particularly when accompanied by a high trauma injury score [42]. Since the majority of BCI patients fall into the former category, the overall prognosis for BCI is typically positive. A prospective study comparing 12 patients who had sustained a myocardial contusion 12 months prior to the study with 12 matched patients who had experienced blunt chest trauma without myocardial contusion found no significant differences between the two groups in terms of ECG results or right and left ventricular function. A more recent prospective study that followed patients with blunt thoracic trauma at 3 and 12 months post-injury reported that among those with myocardial contusion and wall motion abnormalities, 10 out of 17 still exhibited wall motion abnormalities at 3 months, and 4 out of 17 at 12 months. Despite this, exercise testing revealed no ECG abnormalities, and no cardiac-related limitations were reported during follow-up.

Complications

BCI complications are generally rare [42]. Acute complications resulting from severe cardiac injuries often necessitate immediate intervention, and those patients who survive may develop long-term complications related to the specific nature of their injury. However, most individuals with BCI do not experience lasting sequelae. Some late complications, although uncommon, have been reported, including delayed cardiac rupture, complete atrioventricular block, heart failure, pericardial effusion, and constrictive pericarditis [34]. As a result, it is considered good practice to reevaluate these patients within 3 to 6 months after the initial injury [34].

Deterrence and Patient Education

Although long-term outcomes for patients with blunt cardiac injury are generally excellent after discharge, it is important that patients are instructed to return for a follow-up appointment 3 to 6 months post-trauma. This follow-up visit should focus on reassessing any potential signs of ongoing cardiac injury or dysrhythmias.

Enhancing Healthcare Team Outcomes

The diagnosis of BCI remains complex due to its variable presentation and diverse range of injury patterns. Moreover, there is a lack of clearly defined diagnostic criteria for BCI. Nonetheless, a key component in managing these patients is maintaining a high index of suspicion in trauma cases. Initial screening can be conducted using ECG and cardiac enzyme levels, with further evaluation through echocardiography for any abnormalities, recognizing that BCI may not manifest until up to 48 hours post-injury. It is crucial for healthcare teams to develop an interprofessional consensus to effectively identify BCI based on the nature of the specific injury. Collaboration among physicians, advanced practitioners, nurses, pharmacists, and other healthcare professionals is essential to enhance patient-centered care, optimize outcomes, ensure

patient safety, and improve team performance. Effective interprofessional communication and care coordination are vital to swiftly identify and manage BCI. Although the majority of BCI cases may be clinically inconsequential, the true significance of the diagnosis remains debated due to insufficient long-term outcome data. Patients suspected of having BCI, but who are hemodynamically stable and free of dysrhythmias, should undergo at least a brief observation period. Further consensus and research among clinicians are necessary to more clearly define the management and long-term implications of BCI, ultimately enhancing patient care and improving clinical outcomes.

Conclusion:

Blunt cardiac injury (BCI) remains a critical concern in trauma care, particularly due to its ability to cause significant morbidity and mortality. While cardiac contusion is the most common manifestation, it can range from mild, self-limiting cases to severe forms that result in long-term complications. The diagnosis of BCI is often complicated by nonspecific symptoms and a lack of standardized diagnostic criteria. As a result, clinicians must rely on a combination of clinical suspicion, biomarkers such as troponin, and advanced imaging techniques like echocardiography to accurately diagnose and assess the extent of the injury. Myocardial rupture and valvular injuries, though less frequent, pose a higher risk to patient survival. These injuries often present with acute symptoms that require rapid intervention. Early identification and surgical management are key to improving survival rates. In cases of myocardial rupture, the use of off-pump surgery with sutureless patches and digital pressure has shown promising outcomes. Additionally, pericardiocentesis and emergency thoracotomy may be necessary to manage cardiac tamponade in unstable patients. The management of BCI is not limited to immediate surgical repair but also involves comprehensive postoperative care to address potential complications, such as heart failure or arrhythmias. Furthermore, the use of standardized protocols for diagnosis and treatment, including the American Association for the Surgery of Trauma's Cardiac Injury Scale, can help guide clinicians in their management approach. In conclusion, while blunt cardiac injury is a complex condition requiring timely intervention, advances in diagnostic tools and surgical techniques have significantly improved patient outcomes. A multidisciplinary approach, including trauma surgeons, cardiologists, and intensivists, is essential for managing these high-risk injuries effectively. By maintaining a high level of clinical suspicion and utilizing advanced diagnostic technologies, healthcare providers can enhance their ability to manage BCI and improve survival rates in affected patients.

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إصابة القلب كحالة طارئة - الإدارة والعلاج

الملخص:

الخلفية: إصابة القلب الرضحية (BCI) تشمل مجموعة واسعة من الحالات المرتبطة بالقلب، تتراوح من اضطرابات النظم القلبية الطفيفة إلى تمزقات جدار القلب المميتة. يصعب تحديد معدل حدوث إصابات القلب الرضحية بسبب تباين العروض السريرية وعدم وجود معايير تشخيصية موحدة. الشكل الأكثر شيوعًا من إصابة القلب الرضحية هو الكدمة القلبية، على الرغم من أن الإصابات الشديدة مثل تمزق عضلة القلب يمكن أن تكون مهددة للحياة. تعتبر الحوادث المرورية (MVCs) السبب الرئيسي، حيث إن التباطؤ السريع والصدمات المباشرة على الصدر هما الآليتان الرئيسيتان للإصابة. تشمل العوامل الأخرى المساهمة كسور الأضلاع والصدمات ذات التأثير العالي.

الهدف: يهدف هذا المقال إلى استعراض إدارة وعلاج إصابة القلب الرضحية، مع التركيز على التشخيص والعرض السريري واستراتيجيات التدخل. ويسلط الضوء على آليات الإصابة، والأمراض الشائعة، والتحديات في تشخيص إصابات القلب الرضحية.

الطرق: مراجعة الأدبيات الموجودة حول إصابة القلب الرضحية، بما في ذلك الدراسات المتعلقة بعلم ميكانيكا الإصابات، والعروض السريرية، والتقنيات التشخيصية مثل تخطيط صدى القلب والعوامل الحيوية مثل التروبونين. يناقش المقال أيضًا استراتيجيات العلاج والتدخلات الجراحية في إدارة الإصابات القلبية الشديدة، خاصة تمزق عضلة القلب والإصابات الصمامية.

النتائج: الكدمة القلبية هي الإصابة الأكثر شيوعًا، مع ظهور أعراض مثل ألم الصدر، وضيق التنفس، واضطرابات النظم القلبية. قد تؤدي الحالات الشديدة إلى فشل القلب أو تتطلب تدخلًا جراحيًا. تمزق عضلة القلب والإصابات الصمامية، رغم ندرتها، تحمل معدلات وفيات أعلى، خاصة عندما لا يصل المرضى إلى الرعاية الطبية بسرعة. التدخلات الجراحية مثل سحب السائل من التامور وخياطة القلب أساسية في استقرار المرضى، وتعتمد نتائج البقاء على التشخيص المبكر والتدخل الجراحي في الوقت المناسب.

الاستنتاج: تمثل إصابة القلب الرضحية تحديًا كبيرًا في رعاية الصدمات نظرًا لعروضها السريرية المتنوعة وتعقيد التشخيص والعلاج. يعد التعرف المبكر والتدخل، بما في ذلك استخدام أدوات التشخيص المتقدمة مثل تخطيط صدى القلب، أمرًا أساسيًا لتحسين نتائج المرضى. تقدم تقنيات الإصلاح الجراحي، بما في ذلك خياطة القلب بدون جهاز مضخة، نتائج واعدة في حالات تمزق عضلة القلب الشديد. يجب على الأطباء الحفاظ على شكوك عالية بشأن إصابة القلب الرضحية، خاصة في المرضى الذين يعانون من آليات صدمات عالية المخاطر مثل الحوادث المرورية.

الكلمات المفتاحية: إصابة القلب الرضحية، تمزق عضلة القلب، الكدمة القلبية، الصدمات، تخطيط صدى القلب، جراحة القلب، الحوادث المرورية، التحديات التشخيصية، استراتيجيات العلاج.