

Blunt Trauma and R on T Phenomenon Causing Cardiac Arrest

Howard B Reinfeld*

Abstract

An injury inflicted by a blunt object, such as a car, a fist, or a bat, is referred to as blunt trauma. Usually, it causes tissue damage and discomfort. It also has the tendency to fracture bones. Blunt trauma can happen to the chest, head, abdomen, limbs, and other regions of the body. Lacerations (cuts), concussions (brain injuries), contusions (bruises), fractures (broken bones), and internal injuries are examples of blunt trauma injuries. The location of the trauma, the impact's force, and the victim's general health all got affected according to the severity of the damage. Blunt trauma to the chest can result in cardiac arrest or the abrupt blockage of the heart's pumping activity. Because the heart is a muscular organ, it needs oxygen to beat continuously. Blunt chest trauma can stop the heart from beating because of a lack of oxygen or blood supply, or because the heart muscle has been physically harmed. Pulmonary contusions (bruising of the lung tissue), rib fractures, injury to the heart or blood vessels, and other injuries caused by blunt trauma can result in cardiac arrest.

Keywords: Blunt trauma; Pulmonary contusions; Cardiac arrest.

Introduction

Blunt trauma is one of the most common reasons that lead to cardiac arrest. Blunt trauma can be conveniently caused by a minute force applied to any area that causes tissue damage and leads to minor blunt trauma [1]. Blunt trauma can occasionally be life-threatening and need immediate medical care. After a blunt force injury, it's critical to get medical attention if a patient experiences symptoms like trouble breathing,

excruciating pain, disorientation, or loss of consciousness.

Research has shown that a sudden cardiac arrest might be known as commotio cordis, which is often secondary to non-penetrating, blunt trauma to the chest wall. However, it is necessary to understand the difference between cardiac contusion and commotio cordis. Blunt chest wall trauma can be caused by commotio cordis, which is not related to structural cardiac damage. Yet, it might lead

Cardiology Graduate of Mount Sinai Hospital Miami Beach Florida and Cardiologist at Private Practice, Associates MD, PA and B.S Pharmacy, St. John's University, Jamaica, New York, USA

*Corresponding Author: Howard B Reinfeld, Cardiology Graduate of Mount Sinai Hospital Miami Beach Florida and Cardiologist at Private Practice, Associates MD, PA and B.S Pharmacy, St. John's University, Jamaica, New York, USA.

Received Date: 11-04-2023

Accepted Date: 11-10-2023

Published Date: 11-20-2023

Copyright© 2023 by Reinfeld HB. All rights reserved. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

to an electrical event [2]. It has been researched that ventricular fibrillation (VF) is one of the most common arrhythmias associated with commotio cordis [2]. However, heart block and polymorphic ventricular tachycardia also occur. It has been investigated that the ST segment and VF are more likely to be caused by higher impacts of energy over the precordium.

VF often results due to these higher energy impacts that appear 10-30 ms earlier than the T wave peak. It is quite complicated and difficult for patients to survive. Cardiac arrest who are affected by commotio cordis. Research has shown that around 35% of patients who got affected seem to be successful in the resuscitation attempts. Investigations revealed that patients affected by blunt trauma leading to cardiac arrest are usually young male athletes in the 20s [3].

Blunt trauma and R on T phenomenon

When the electrical impulses that regulate the heartbeat are delayed or blocked as that move through the conduction system of the heart, it results in the R on T phenomenon, also referred to as the Wenckebach phenomenon [4].

The atrioventricular (AV) node, the electrical link between the heart's atria and ventricles, is where this delay often manifests itself. This delay might cause the heart rhythm to slow down or for certain heartbeats to be missed. Many heart conditions, including ruptures, contusions, and arrhythmias, can result from blunt trauma.

One form of arrhythmia that can develop after forceful chest trauma, such as from a vehicle accident or a fall, is the R on T phenomenon. Damage to the conduction

system of the heart from the hit may result in electrical delays or blockages and the R on T phenomenon. After blunt trauma, the R on T phenomenon's severity and that of other cardiac problems might differ significantly depending on the amount of damage and the patient's general condition. Even if there are no evident indications of injury, it is crucial to seek medical care right away after a blunt chest trauma in order to assess the risk of cardiac problems and keep an eye out for any changes in heart function [5].

Causes of blunt trauma and R on T phenomenon leading to cardiac arrest

Blunt trauma is a sort of physical injury that happens when something hits the body and damages the tissue without going through the skin. Cardiac arrest, or when the heart abruptly stops pumping blood to the body, can result from blunt trauma [6].

These are a few potential sources of blunt trauma that might result in cardiac arrest Falls. Falling from great heights or from precarious places can cause serious injuries to the body and can cause cardiac arrest.

Motor vehicle accidents

Significant blunt-force damage to the chest can result from high-speed crashes or impacts, which can induce cardiac arrest.

Electrocution

Due to the shock to the heart caused by electrical damage, cardiac arrest might result.

Physical assault

Physical attacks that involve beatings, punches, or kicks to the chest can result in significant chest injuries that can induce cardiac arrest.

Sports injuries

Particularly if the chest is injured, some contact sports like hockey, football, or boxing may produce acute trauma that might result in cardiac arrest.

Crush injuries

The heart and other organs in the chest can sustain serious damage from crushing, leading to cardiac arrest.

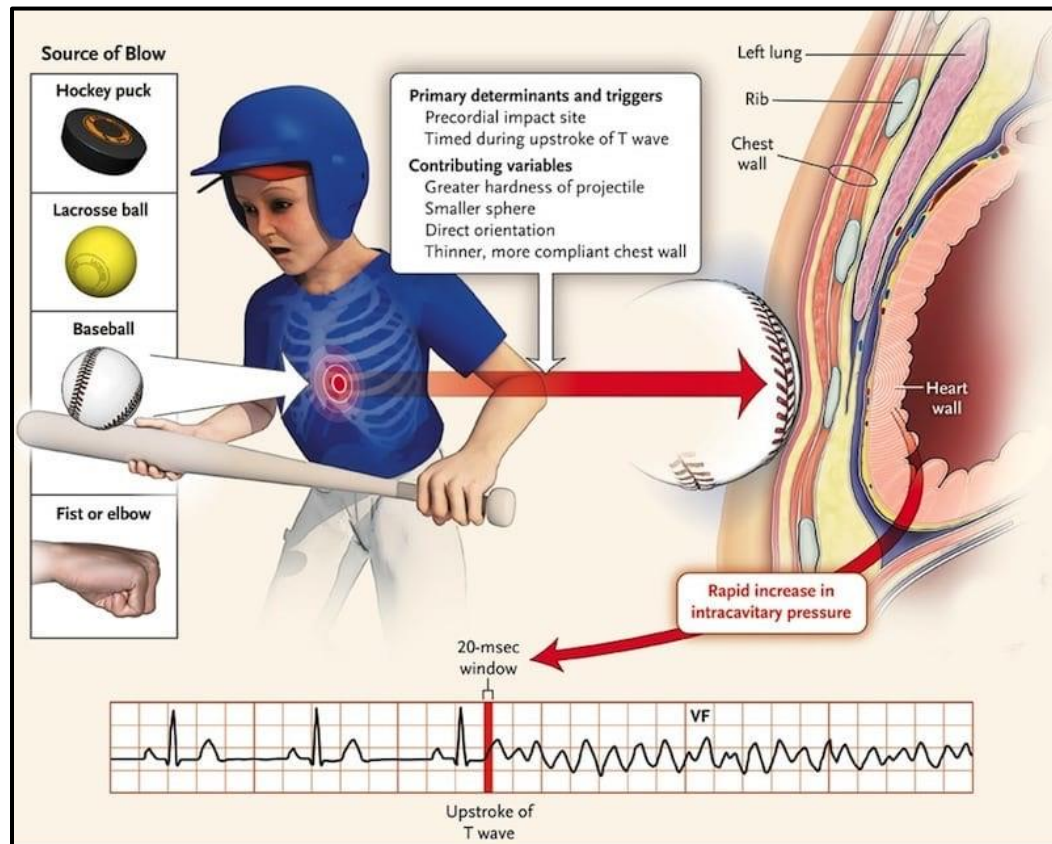


Figure 1: Primary determinants and triggers; upstroke of T wave.

Immediate treatment with cardiopulmonary resuscitation (CPR) and defibrillation can improve the chances of survival [6]. A certain type of irregular heart rhythm known as the R on T phenomenon can happen as a result of specific heartbeat patterns. In particular, it happens when an early atrial contraction (PAC) is followed by a longer-than-normal interval, which might subsequently cause an early ventricular contraction (PVC). The R on T phenomenon's specific explanation is unknown; however, it may be connected to variations in the electrical activity of the heart

during these irregular beats. The P-R phenomenon may emerge as a result of certain conditions, including stress, certain medications, and caffeine, which might increase the risk of developing PACs and PVCs [2].

Case study

A 25-year-old active male football player with no significant past medical history collapsed after a blow to the chest. Witnesses thought it a routine blow, but the football player collapsed. The emergency response team on

the sideline luckily recognized the blow was not routine. EMS started CPR, and the use of a defibrillator saved the player's life. Proper training in how to respond can make a huge difference. The player was transported to the hospital and stabilized and discharged.

How to avoid cardiac arrest after blunt trauma and R on T phenomenon?

R on T phenomenon with cardiac arrest following severe trauma can be extremely dangerous and life-threatening. The following actions can help prevent cardiac arrest.

Medical assistance

It is important for patients to seek emergency medical assistance if they have suffered physical trauma and are struggling with symptoms, including breathing problems, chest discomfort, or an irregular heartbeat.

Avoid strenuous activities

Healthcare professionals urge patients to stay away from strenuous activities that might place additional strain on the hearts, depending on the severity of the problem.

Get a correct diagnosis

To choose the best course of therapy for the disease, a precise diagnosis of the condition is necessary. An electrocardiogram (ECG) may be performed by a healthcare practitioner to evaluate the cardiac rhythm of a patient and spot any irregularities, such as PR prolongation [7].

Recommendations

Depending on the diagnosis, the healthcare provider will suggest a treatment strategy that may involve drugs, surgery, or other

treatments. It is crucial to carefully adhere to the suggestions and show up to all follow-up visits.

Watching symptoms

One should keep an eye on the symptoms and let the doctor know if that changes. Get prompt medical help if observing fainting, breathing difficulties, or chest discomfort.

Prescribed medications

It is researched that patients need to follow the directions on any prescription drugs that the doctor has given. Beta-blockers and other medications may be used to control the heart rate and stop arrhythmias [3].

Healthy lifestyle

It is critical to keep up a healthy lifestyle to lower the chance of cardiac arrest. This includes working out often, maintaining a healthy weight, getting enough rest, and eliminating cigarettes and alcohol.

Conclusion

Blunt chest trauma can impair the cardiac conduction system and result in rupture of the heart or major vessels, cardiac contusion, and other heart conditions. The emergence of pulseless electrical activity (PEA), a kind of cardiac arrest defined by the presence of electrical activity on an electrocardiogram (ECG) but no detectable pulse, is one of the potential effects of these injuries.

Specifically, blunt trauma tends to damage the conduction system's collection of components, impairing the electrical signals that regulate the heart's rhythm. Abnormal heart rhythms, usually dysrhythmias being sinus tachycardia with ST segment changes and PR prolongation which can result in PEA

and cardiac arrest, can be caused by this disturbance. In conclusion, blunt trauma to the chest can lead to cardiac arrest through a variety of mechanisms, including damage to

the cardiac conduction system and the development of PEA. Early recognition and treatment of the underlying cause of the arrest are crucial to improving outcomes.

References

1. Vaidya R, Scott AN, Tonnos F, Hudson I, Martin AJ, Sethi A. Patients with Pelvic Fractures from Blunt Trauma. What Is The Cause Of Mortality And When? *Am J Surg.* 2016;211(3):495-500. [PubMed](#) | [Crossref](#)
2. James MK, Schubl SD, Francois MP, Doughlin GK, Lee SW. Introduction of a Pan-Scan Protocol for Blunt Trauma Activations: What are the Consequences? *Am J Emerg Med.* 2017;35(1):13-9. [PubMed](#) | [Crossref](#)
3. Liman ST, Kuzucu A, Tastepe AI, Ulasan GN, Topcu S. Chest Injury Due to Blunt Trauma. *Eur J Cardiothorac Surg.* 2003;23(3):374-8. [PubMed](#) | [Crossref](#)
4. Oertel MF, Korinth MC, Reinges MH, Krings T, Terbeck S, Gilsbach JM. Pathogenesis, Diagnosis and Management of Pneumorrhachis. *Eur Spine J.* 2006;15:636-43. [PubMed](#) | [Crossref](#)
5. Yanagawa Y, Nagasawa H, Jitsuiki K, Omori K. Successful Observational Management of a Patient with Blunt Abdominal Trauma with the Traumatic Vacuum Phenomenon. *J Emerg Trauma Shock.* 2021;14(1):58-60. [PubMed](#) | [Crossref](#)
6. Liang HM, Chen QL, Zhang EY, Hu J. Sternal Fractures and Delayed Cardiac Tamponade Due to a Severe Blunt Chest Trauma. *Am J Emerg Med.* 2015;34(4):758-e1. [PubMed](#) | [Crossref](#)
7. Link MS. Commotio Cordis: Ventricular Fibrillation Triggered by Chest Impact-Induced Abnormalities in Repolarization. *Circ Arrhythm Electrophysiol.* 2012;5(2):425-32. [PubMed](#) | [Crossref](#)