Cardiac Tamponade from Slingshot Metal Darts in Chuuk: A Retrospective Review of cases.

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Abstract

We determined the immediate cause of death of patients with penetrating cardiac injuries from slingshot metal darts. This retrospective review of cases focused on those 7 patients with penetrating cardiac injuries from the period July 1999 to July 2005 .There were 6 patients who underwent emergency thoracotomy regardless of the type of operative approach . Five of the 6 patients who were operated underwent left Lateral Thoracotomy and 1 patient underwent Median Sternotomy. There were 11 patients who sustained cardiac injuries out of the 240 cases reviewed. The patient's with cardiac injuries had a higher mortality (27.3 %) than those who have penetrating thoracic injuries (3.5 %) without associated cardiac injury.

Of the seven patients who had penetrating cardiac injuries, 5 patients underwent left Lateral thoracotomy and 1 patient underwent median sternotomy. All 6 patients had chest tube thoracotomy insertion prior to surgery.

There were 2 deaths in this review of penetrating cardiac injuries. The other patient with 7 multiple slingshot injuries died of cardiac tamponade with hypovolemic shock.

Introduction

Penetrating cardiac wounds especially those on the anterior surface of the heart, present a major challenge to any trauma surgeon under any circumstance (1,2), but more so in resource poor jurisdictions like Chuuk. Surgical treatment of traumatic cardiac injuries requires courage and knowledge of multiple approaches and operative interventions (3, 4).

The majority of penetrating injuries to the cardiac chamber or the intra-pericardial vessels will result in pericardial tamponade (4,5, 6) and emergency operation will have to be performed without the benefit of pre-diagnostic studies(7, 8).

Traumatic cardiac injuries that are penetrating are one of the leading causes of death as a result of urban violence(4) The controversy concerning the mode of resuscitation in acute penetrating cardiac trauma has been resolved in recent years (6,7) .

Most large centers are aggressive and pericardiocentesis is used in life-threatening situations only as a temporary measure until thoracotomy can be performed (4,5). Obvious cardiac tamponade or massive hemothorax mandates a thoracic approach; a trans-diaphragmatic pericardiotomy or left anterolateral thoracotomy can be useful in these as well as a median sternotomy.

According to Kamel et al (6) the physician should be alerted when patients arrive with penetrating chest and upper abdominal wounds and cardiac injury must be ruled out as soon as possible because a few minutes may mean the difference between successful resuscitation and irreversible myocardial damage an death. Most penetrating chest wounds are easily managed in the ER with fluid resuscitation and chest tube drainage.

A physical examination directed toward detecting abnormalities of the heart should be performed and echocardiography obtained in the early post-operative period an all patients who have undergone repair of a penetrating injury to an intra-pericardial structure.

Background

The Federated States of Micronesia (FSM) has a geographical location with and scattered distribution of its many islands. FSM is quite different from countries like the USA and other developed countries. This is one of the reasons why provision of health care services in the FSM is difficult especially in Chuuk. The state of Chuuk consists of 7 major island groups , the largest being Chuuk Proper which is a complex group of 14 small mountainous islands inside the main lagoon which is surrounded by a coral ring forming a lagoon of over 800 miles . The total land area of Chuuk is 49 square miles. The average travel time between the the main island of Weno to its sorrounding islands inside the Lagoon is 30 minutes to 2 ½ hours up to the farthest island of Tol. It takes at least 30 minutes by car to get to the hospital on Weno.

The history of the slingshot metal darts dates back to the 70's and 80's during the era when Chuuk was still under the trust territories of the Pacific and that development in the neighboring islands were just starting. Filipino carpenters who were contracted to do construction jobs taught local people how to make metal darts out of these 6-8 inch nails.

These carpenters claimed that during the Marcos Martial Law years in the Philippines guns were banned and gangs have to look for alternative weapons to combat the rival gangs. Slingshot metal darts were created to by these gangs as alternative ways to inflict harm on other gangs. They were then called "Indian Pana ".

In Chuuk these slingshot metal darts were popularly called " Fillipin " in reference to the Filipino carpenters who taught them wayback in the 70's and 80's .It is more common in the islands around the lagoon especially the big island of Tol.

This paper reports the experiences to date with dart injuries especially cardiac injuries and describing the age and sex distribution, location and site of injury, time to reach the

hospital, the involvement of alcohol in the injury and the type of surgical intervention used and their outcomes. We also determined the immediate cause of death of patients with penetrating cardiac injuries from slingshot metal darts.

Materials and Method

Seven cases files of patients with cardiac tamponade from slingshot metal darts were reviewed at the Chuuk State Hospital records section. These included variables like age, sex, travel time, the presence or absence of alcoholic breath and outcome. The chest radiographs and post-mortem autopsy report were also evaluated. The patient charts were retrospectively reviewed for operative procedures, complications / comorbidities and the immediate cause of death.

Results

From the period July 1999 to July 2005 there were a total of 353 patients treated at Chuuk State Hospital for Impalement injuries from slingshot metal dart in different parts of their anatomy. The breakdown by site of injury is as shown on Table1

Table 1: Total number of Slingshot Metal Dart Injuries in Chuuk
(July 1999 to July 2005)

Anatomical Site of Injury	Number of cases	Frequency (%)
Head / Face	**22**	**6.2**
Neck	**29**	**8.2**
Upper Extremity	**114**	**32. 3**
Chest	**50**	**14.2**
Cardiac (t)	**7**	**2.0**
Abdomen (t)	**40**	**11.3**
Lower Extremity	**91**	**25.8**
Total	**353**	**100%**

(t) - with mortality

This retrospective review of cases focused on those 7 patients with penetrating cardiac injuries from the period July 1999 to July 2005 .There were 6 patients who underwent emergency thoracotomy regardless of the type of operative approach . The age range is 18 to 47 years old with a mean age of about 33 years. All were males with 5 from Tol and one each from Tonoas and Mechitiw (Weno).

The average duration of time from the time of injury to the time of surgery is at least 1 to 2 hours by boat for the 6 patients and 30 minutes by car for 1 patient All of these patients reached the Emergency Room at Chuuk State Hospital with their metal darts still embedded in the chest .

Table 2. Geographical distribution and alcohol use of the Patients with cardiac injuries.

Place of Injury	**Presence of Alcohol in the breath**	**number of patients**
Island of Tol	**(+)**	**5 (7)**
Island of Tonoas	**(-)**	**1 (7)**
Mechitiw , Weno	**(+)**	**1 (7)**

Six of the cases had alcohol in their breath (see Table 2). The average size of the metal darts were about 6-8 inches. Five of the 6 patients who were operated underwent left Lateral Thoracotomy and 1 patient underwent Median Sternotomy. Only 3 of the 6 patients operated on underwent Pericardiocentesis at the ER prior to the thoracotomy procedure.

All the 6 patients underwent Chest tube thoracostomy prior to surgery at the ER /OR .Most of these cases of penetrating chest/cardiac wounds were managed and stabilized in the emergency room by resuscitation and definitive repair of cardiac injury .

In a study presented by JC Vasquez et al (4) reviewed 240 cases of penetrating thoracic injuries at a general university hospital in Lima, Peru. There were 11 patients who sustained cardiac injuries out of the 240 cases reviewed. The patient's with cardiac injuries had a higher mortality (27.3 %) than those who have penetrating thoracic injuries (3.5 %) without associated cardiac injury .

There were 2 (28%) mortalities from the 7 patients in this retrospective review. One patient died of hypovolemic shock and acute renal shutdown 2 days post surgery and 1 patient died just upon arrival at the emergency room after resuscitative measures done for multiple slingshot darts in the different parts of the body.

Five of the 6 patients who underwent Thoracotomy went home without associated morbidity and 1 patient died of post-operative complications The average blood loss was 1.5 L for 4 patients ; 2.9 L for the Median Sternotomy patient and 3.5liters or more for the 2 patients that died.

Table 3. Type of Surgical Intervention and Outcomes.

Surgical intervention	Outcome	Average Blood Loss
4 (L) Lateral Thoracotomy	Alive	1.5
1 Median Sternotomy	Alive	2.0
1– (L) Lat Thoracotomy / + hypovolemic shock/ARF	Died	> 3.5 L
1- + multiple slingshot dart	Died	>3.5 L

An autopsy was performed on the patient who died just upon arrival at the emergency room The autopsy revealed a 0.5 cm wound at the anterior surface of the left ventricle with the wound about 4 cm in depth penetrating into the pericardium . There was 160 ml of hemopericardium noted with about 2 liters of blood in a left hemothorax and another 1.5 liters retained in a right Hemothorax. The other patient also underwent autopsy with findings of severe left hemothorax .

Discussions and Conclusion

In this retrospective review of 7 patients with penetrating cardiac injuries from the period July 1999 to July 2005 all of them were males. The age range was from 18 to 47 years old with a mean age of 32.5 years. Majority of the patients came from the islands; 5 of them were from the big island of Tol and 1 each from the island of Tonoas and Mechitiw on the main island of Weno.

The average travel time for these cases from the time of injury to the time of surgery is 1 to 2 hours by boat for 6 patients from the islands and 30 minutes by car for 1 patient on Weno.

Cardiac injury from slingshot metal darts and can cause massive hemopericardium, an accumulation of blood inside the pericardial sac, especially if it pierces deep into the cardiac musculature.

Operative intervention varies from midsternotomy, to left Anterior Lateral Thoracotomy depending on the site of injury. Of the seven patients who had penetrating cardiac injuries, 5 patients underwent left Lateral thoracotomy and 1 patient underwent median sternotomy. Only 3 of the 6 patients operated on underwent pericardiocentesis at the ER/OR prior to the thoracotomy procedure. All 6 patients had chest tube thoracotomy insertion prior to surgery.

There were 2 deaths in this review of penetrating cardiac injuries. One patient who underwent left lateral thoracotomy died of severe hypovolemic shock and acute renal failure. The other patient with 7 multiple slingshot injuries died of cardiac tamponade with hypovolemic shock.

A rapid intra-operative assessment and appropriate control of the injury is critical to the successful management of cardiac injury (6,7). The key to the successful resuscitation of the traumatized heart are a high index of suspicion, early recognition and rapid intervention (7).

The immediate cause of death is cardiopulmonary arrest secondary to tamponade and its pressure effect on the heart causing it to cease its pumping action thereby compromising the circulation an thus the delivery of oxygen to tissues. These results in instantaneous death of the patient coupled with massive blood loss and severe hypovolemia and shock.

Recommendations

1. To enact legislation into law to completely ban the use of these Slingshot metal (Filippin) darts regardless of age .

2. That possession of these deadly weapons is a crime and should be Punishable by law with a jail term.

3. Creation of an emergency response team to handle cardiac /critical Care injuries.

4. To upgrade the facilities at the current Surgical Intensive Care Unit with new monitoring equipments in order to handle post-operative critical care patients properly and training of personnel.

5. Creation of youth oriented sports /academic activities as a diversion From these alcohol-related violence.

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