Case report

Azygos vein lacerations, a rare injury from high-impact chest trauma: Two cases and a review of the literature

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ABSTRACT

Introduction: Thoracic trauma is a significant cause of mortality, being responsible for 25% of trauma deaths. Despite this, traumatic azygos vein injuries are a rare occurrence with only 35 previously published cases in medical literature. A review of the literature demonstrates a mortality rate of 43%. Management of this condition requires early recognition and surgical intervention. We present two cases of azygos vein laceration out of 15,897 major trauma patients over a 21-year period from 1999 to 2020 at a Level One Trauma Service in Australia. This case series is compliant with the SCARE Guidelines 2020 [2].

1. Introduction

Thoracic trauma is a significant cause of morbidity and mortality, being responsible for 25% of trauma deaths [1]. Despite this, traumatic azygos vein injuries are a rare occurrence with only 35 previously published cases in medical literature. A review of the literature demonstrates a mortality rate of 43%. Management of this condition requires early recognition and surgical intervention. We present two cases of azygos vein laceration out of 15,897 major trauma patients over a 21-year period from 1999 to 2020 at a Level One Trauma Service in Australia. This case series is compliant with the SCARE Guidelines 2020 [2].

2. Presentation of case one

The first case was a previously well 38-year-old male involved in a dirt-bike accident, falling approximately 8 m from a jump and landing prone. He lost consciousness at the scene, which spontaneously improved to a Glasgow Coma Scale (GCS) score of 14 on arrival of ambulance crew.

On arrival to the emergency department (ED), he was found to be haemodynamically unstable with a heart rate of 140 bpm, blood pressure of 70/40 mmHg and oxygen saturation of 98% on 15 L of oxygen. Additionally, his trachea was deviated to the right with decreased chest wall movement and air entry on the left and left-sided subcutaneous emphysema.

A left intercostal catheter (ICC) was inserted for presumed tension pneumothorax with slight haemodynamic instability. Both patients survived to hospital discharge. Discussion: Of the 37 cases of azygos vein injury, including our two, 36 were due to blunt trauma and one from penetrating trauma. Sixteen survived to hospital discharge, producing a 43% mortality rate. Only one of these survivors was managed non-operatively, the remainder underwent emergency thoracotomy and azygos vein ligation. The mortality rate reduced to 31% in those who underwent thoracotomy (n = 29). Presentation was predominantly with shock (83%) and right hemithorax white-out on chest x-ray (81%).

Conclusion: Azygos vein injuries are a rare but important cause of thoracic haemorrhage in high-impact blunt trauma. They are often fatal, so management relies on expedient transfer to theatre.
A literature search of Ovid Medline and PubMed was performed using keywords “azygos vein” and “trauma”. This identified 24 case reports and case series, describing 35 cases of traumatic azygos vein injuries. Table 1 presents a summary of the known cases since it was first identified in 1978 [4].

Azygos vein lacerations are predominantly a blunt force injury, with only one reported case due to penetrating trauma [5]. The mechanism of injury is believed to be a sudden deceleration force that causes, firstly, an abrupt increase in venous pressure by compression of the heart against the sternum, or compression of the abdominal cavity [6,7]. Secondly, an axial or rotational force on the mobile azygos arch as it is pulled by the decelerating heart while being fixed posteriorly by the intercostal veins [4,8,9]. Salizzoni [6] also proposed nearby vertebral fracture or subluxation as another mechanism, however most azygos vein injuries occur without associated vertebral injuries (Table 1).

This injury carries a 43% in-hospital all-cause mortality rate. By comparison, the mortality rate for those who underwent thoracotomy was only 31%, demonstrating the importance of urgent surgery in these patients. There has been only one case of successful conservative management of a presumed azygos vein laceration described by Medermott
where diagnosis was made on a CT scan demonstrating a right paratracheal haematoma at the level of the azygos vein.

The presentation of this injury is characterised by haemodynamic shock (83%) and right-sided chest whiteout on CXR (81%) following significant blunt trauma. Other CXR findings can include a widened mediastinum (n = 4) and bilateral chest whiteout (n = 4).

Most patients were managed operatively with a thoracotomy (78%). A number of documented approaches have been successful, including right anterolateral (n = 4), right posterolateral (n = 3), median sternotomy (n = 2) and clamshell (n = 2). All of these patients survived to discharge.

5. Conclusion

Traumatic azygos vein laceration is a very rare injury, with only two cases presenting to our service out of 15,897 major trauma patients over a 21-year period. However, this injury carries a significant mortality risk and the diagnosis must be considered in any blunt trauma patient who

Table 1

| Case | Author (year) | Age/sex | Mechanism | Haemodynamic status | CXR | VB fractures | Location | Management | Outcome |
|------|---------------|---------|------------|---------------------|-----|--------------|----------|------------|---------|
| 1    | Spagliardi (1978) | 50F     | MVC       | Shock               | RHTx | -            | -        | OT         | Discharged |
| 2    | Salizzoni (1980) | 50F     | MVC       | Shock               | RHTx | -            | -        | OT         | Discharged |
| 3    | Baldwin (1984)  | 28F     | MVC       | Shock (SBP 80)      | WM  | Azygos/SVC junction | OT (R thoracotomy & median sternotomy) | Discharged |
| 4    | Shera (1986)    | 25F     | MVC       | Shock               | RHTx | -            | -        | OT         | Discharged |
| 5    | Coates (1987)   | 63F     | MVC       | Shock               | RHTx | Azys/SVC arch 3 cm from SVC | OT (R anterolateral) | Discharged |
| 6    | Snyder (1989)   | 52F     | MVC       | Shock (SBP 80)      | RHTx | -            | -        | OT         | Discharged |
| 7    | Walsh (1991)    | 41M     | Fall (9 m) | Shock               | RHTx | -            | -        | OT         | Death     |
| 8    | Shkrun (1991)   | 23M     | Fall (17 m)| Shock               | WM  | Level of T5  | OT       | Death      |
| 9    | Baldwin (1992)  | 19M     | MVC       | Shock               | RHTx | None         | Level of T4 | OT         | Death     |
| 10   | Coates (1993)   | 41F     | MVC       | Shock (SBP 60)      | RHTx | Mid-azygos arch | OT (R anterolateral) | Discharged |
| 11   | Butler (1995)   | 23F     | MVC       | Shock (SBP 76)      | RHTx | Azys arch    | OT        | Discharged |
| 12   | Sugimoto (1994) | 44M     | Ped vs car | Shock (SBP 80)      | WM  | None         | Azys arch | OT         | Discharged |
| 13   | Cagin (1998)    | 18F     | MVC       | Shock               | RHTx | -            | -        | OT         | Discharged |
| 14   | Sharma (1999)   | 75F     | MVC       | Shock (SBP 56)      | RHTx | None         | OT       | Discharged |
| 15   | Bowles (2000)   | 36F     | MVC       | Shock (SBP 76)      | RHTx | -            | -        | OT         | Discharged |
| 16   | Endara (2001)   | 26M     | Cross bow | Stable              | RHTx | -            | -        | OT         | Discharged |
| 17   | Nguyen (2006)   | 21M     | MVC       | Shock               | RHTx | None         | Azygos/intercostal veins | OT (R postero lateral) | Discharged |
| 18   | Drac (2007)     | 36M     | Ped vs car | Shock (SBP 70)      | RHTx | -            | Azys arch 1 cm from SVC | OT (R anterolateral) | Discharged |
| 19   | Bowles (2009)   | 36F     | MVC       | Shock (SBP 130)     | RHTx | -            | -        | OT         | Discharged |
| 20   | Endara (2010)   | 28M     | MVC       | Shock (SBP 90)      | RHTx | -            | -        | OT         | Discharged |
| 21   | Cao (2012)      | 60M     | Hit by heavy object | Shock      | RHTx | -            | -        | OT         | Discharged |
| 22   | McDermott (2012)| 48M     | MVC       | Stable (SBP 100)    | WM, RHTx | None         | -        | Conservative | Discharged |
| 23   | Yang (2014)     | 52F     | CPR       | -                   | RHTx | None         | -        | OT         | Death     |
| 24   | Papadomanolakis (2016) | 50F | MVC       | -                   | HTx  | C6, T6 | -        | Dead on arrival |
| 25   | Endara (2010)   | 28M     | MVC       | Stable (SBP 115)    | HTx  | None         | -        | Dead on arrival |
| 26   | Cao (2012)      | 60M     | Hit by heavy object | Shock      | RHTx | -            | -        | OT         | Discharged |
| 27   | McDermott (2012)| 48M     | MVC       | Stable (SBP 100)    | WM, RHTx | None         | -        | Conservative | Discharged |
| 28   | Bowles (2009)   | 36F     | MVC       | Stable (SBP 90)     | RHTx | -            | -        | OT         | Discharged |
| 29   | Cao (2012)      | 60M     | Hit by heavy object | Shock      | RHTx | -            | -        | OT         | Discharged |
| 30   | Laohathai (2019)| 33F     | MVC       | Stable              | RHTx (CT) | None         | Azys arch | OT (R postero lateral) | Discharged |
| 31   | Case 1          | 38M     | MVC       | Shock (SBP 70)      | RHTx | T3, L4 | Azys arch | OT (clamshell) | Discharged |
| 32   | Case 2          | 81F     | MVC       | Stable (SBP 115)    | RHTx | None         | Azys arch/superior intercostal vein junction | OT (clamshell) | Discharged |

MVC: motor vehicle crash; MBC: motorbike crash; RHTx: right haemothorax; WM: widened mediastinum; SVC: superior vena cava; OT: operating theatre; -: not stated.

[10], where diagnosis was made on a CT scan demonstrating a right paratracheal haematoma at the level of the azygos vein.

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Traumatic azygos vein laceration is a very rare injury, with only two cases presenting to our service out of 15,897 major trauma patients over a 21-year period. However, this injury carries a significant mortality risk and the diagnosis must be considered in any blunt trauma patient who
presents with haemodynamic instability and right-sided chest white-out on CXR. The mainstay of treatment is an urgent thoracotomy.

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Ethical approval

Case reports are exempt from ethical approval in our institution.

Consent

Written informed consent was obtained from the patients for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Christine Li – data collection, literature review, manuscript writing.
David Read – critical revisions.
Katherine Martin – critical revisions.

Research registration

N/A.

Guarantor

Christine Li.

Declaration of competing interest

No conflicts of interest are declared.

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