Accuracy of Emergency Physicians in Diagnosis of Thoracic Aortic Dissection; a Retrospective Study Examining the Incidence and Outcome of Patients with TAD

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Abstract

Objective: This study is a retrospective study looking at the incidence, management and outcome of patients with thoracic aortic dissection, and the accuracy of emergency physicians in diagnosing thoracic aortic dissection.

Background: Thoracic Aortic Dissection (TAD) is associated with a high mortality rate, more so if there is missed or late diagnosis (1-2% per hour). This makes the early diagnosis and prompt management a crucial component in mortality reduction.

Methods: A retrospective cross-sectional data analysis of adults presenting to three Monash Health Emergency Departments (ED) suspected for TAD, over a 1-year period from 1st July 2018 to 30th June 2019. Through the presentations, patients with confirmed TAD were identified and demographics, management options as well as outcome were analysed.

Results: 16045 adults presented to Monash health EDs with chest pain as their chief complaint over the study period. 68 had been investigated for TAD mainly with CT aortogram. 11 patients had a confirmed TAD (incidence rate of approximately 6.5 in 10000 patients per year), with majority (9 patients) being diagnosed with Stanford Type A dissection. Two patients died in the ED (mortality rate 18%) and others who survived were discharged home and stayed well in 3 months follow up.

Conclusion: Thoracic aortic dissection, in particular Type A, remains a condition with a relatively high mortality rate. To reduce this, high index of suspicion and prompt investigation is essential. We demonstrated good accuracy and competency of Emergency physicians in diagnosing and screening for thoracic aortic dissection.

Keywords: Aortic dissection; death; dissection; emergency department; TAD; Thoracic aortic dissection

Introduction

Aortic dissection is a type of acute aortic syndrome and potential life-threatening condition characterised by a tear in the aortic intima. Blood then accumulates and separates the intima from the media, sometimes involving the tunica adventitia layer as well [1]. There are several risk factors for aortic dissection, including but not limited to congenital disorders like: Turner’s syndrome, bicuspid aortic valve and certain connective tissue disorders such as Marfan’s syndrome (fibrillin gene mutations) or Ehler Danlos syndrome type IV (collagen defects) [2]; Aortic wall stress secondary to: hypertension (72%), previous aortic or cardiovascular surgeries, aortic aneurysm; and lastly reduced wall resistance with increase age.

Patients are typically known to present with acute sharp, tearing and severe interscapular chest pain with or without other associated symptoms. TAD is also known as chest pain plus syndrome because of accompanying associated symptoms / signs mainly neurological, gastrointestinal, ST elevation Myocardial infarction, respiratory, syncope and altered conscious state etc. TAD eventually can lead to severe complications such as aortic rupture, cardiac tamponade, stroke, severe aortic regurgitation, acute myocardial infarction...
and end organ ischemia due to poor cardiac output and eventually death [3]. The risk of death among patients who arrived alive at a hospital emergency department with thoracic aortic dissection is about 21% within 24 hours [4, 5].

One of the well-known and widely used classification for TAD is the Stanford classification with Type A involving the ascending aorta (with or without dissection of aortic arch or descending aorta) and Type B which refers to all other dissections [1].

In a hemodynamically stable patient, the most common imaging modality is a CT aortogram (CTA) which is easily available in ED with high sensitivity and specificity. Contrarily in a haemodynamically unstable patient, transthoracic bed side echocardiography (TTE) with specific views (including suprasternal, 75% diagnostic for Type A) [6] as well as transoesophageal echocardiography (TOE) can be used to identify the aortic root dilatation, dissection flap as well as some complications like tamponade.

TAD can be managed either surgically (endovascular aortic repair or replacement procedures) or conservatively (blood pressure control and close observation) depending on the type and extent [7].

**Methods**

This was a retrospective cross-sectional study of adults presenting to any of three Monash Health EDs between 1st July 2018 to 30th June 2019 with suspected TAD. Monash Health, located in south-east Melbourne, is the largest health network in Victoria, Australia, with approximately 230,000 annual presentations across three hospitals: Monash Medical Centre (tertiary hospital with cardiothoracic surgical and intensive care units), Dandenong Hospital and Casey Hospital (district hospitals with general surgical and intensive care units). This study was approved by the Monash Health and Monash University Human Research and Ethics Committees (RES-19-0000-533Q).

**Selection**

Eligible cases were adults who presented for the first time with symptoms concerning for TAD and were investigated in ED. Cases were identified through the ED medical records (Symphony, EMIS Health, Leads, UK) between 1st July 2018 to 30th June 2019 by electronically filtering of patients over 18 years old on presentation who presented with chest pain, syncope, neurological symptoms including altered conscious state and investigated for TAD including CTA. To minimize missed cases, patients who had Cardiothoracic surgical team consult as well as patients who died in ED during the study period were identified and cause of death had been analysed. Data obtained included patients’ age and gender, Type of TAD (Stanford classification), as well as disposition, management options and outcome were also recorded. A follow up period of 3 months after discharge were considered.

**Results**

During the study period, there were a total of 233297 presentations (168905 adult presentations) across the three Monash Health EDs with 16045 of them presented with chest pain (10086 cardiac and 5959 non cardiac).

After applying the inclusion criteria and data analysis, 68 patients (40 male and 28 female), with the median age of 65 years old (IQR 55-75.5) with concerning features for TAD were identified. 11 patients [7 males and 4 females (M/F: 1.75), with a mean age of 62.9 years old and median age of 70 years old (IQR 62-73)] had a confirmed TAD after investigation in ED (Incidence rate of 6.5 in 100000 person years) (Table 1).

| TAD incidence = confirmed TAD / adult presentations: 11/168905= 0.006513% |

**Table 1:** Incident rate of Thoracic aortic dissection in this study

10 patients (91%) presented with chest pain as their initial chief complain (7 of them were triaged as cardiac and 3 of them as non-cardiac chest pain). One case (9%) presented with altered conscious state.

9 of the 11 patients (81.8%) showed Stanford Type A TAD in CTA. 5 patients were transferred to theatre for surgical management from ED (with aorta or aortic root replacement with or without graft), and subsequently to Intensive Care Unit (ICU). All of them were closely monitored and managed in ICU and eventually transferred to the cardiothoracic surgical ward prior to discharge home. The mean length of stay in ICU were of 110.4 hours (from 48 hours to 192 hours).

2 patients were transferred to another tertiary hospital because of the complexity of the case and potential need for ECMO and unfortunately, the remaining 2 patients died in the Emergency department.

2 patients with Type B TAD were managed conservatively in ICU with close monitoring and tight blood pressure control, with antihypertensives mainly labetalol or GTN infusion in combination with metoprolol or amlodipine. The length of stay in ICU for both patients was 72 hours. (Table 2)
Discussion

These type of tumours are very rare they comprise only 5% of neoplasms and are seen in 0.4-2.6 for every 100,000 cases around the world, the mucoepidermoid tumour affects parotid and minor salivary glans in adults and is mostly seen in women and Young adults, most of the cases arise in the parotid gland with this case accounting for only 2-4% of the cases because it was seen in the submandibular gland, this patient is currently under treatment he was performed two surgeries for removal of ganglions located in neck and in the submandibular gland, highest prevalence for this type of tumour is around the fifth decade of life and they can be asymptomatic like in this case with the patient having few to no symptoms. It has a puripotent cell origin and as we mention can be classified into three stages [3].

Table 2. Summary of cases with confirmed TAD

Mortality rate of 18% in our study was demonstrated at 24 hours after onset of symptoms.

All patients who survived the first 24 hours remained alive at 3 months follow up in this study. (Figure 1)
Discussion

Above data in our study suggest good accuracy and competency of Emergency physicians in diagnosing and screening for thoracic aortic dissection. Some studies had shown about 1 out of 6 acute aortic dissection cases are missed in ED [8]. Fortunately none of the TAD cases were missed within ED. The study demonstrated that expectedly, Type A aortic dissection being more common and is associated with a higher mortality rate. This is in accordance with the general literature surrounding this topic.

The incidence rate of TAD in this study (6.5 per 10000 patient years) is slightly higher to other similar studies (2.5 to 4 cases per 10000 persons per year) [4, 5]. This difference can be due to several reasons, including small sample size and the fact that some hospitals under the Monash Health network are tertiary centers and receive referrals from other EDs. We also utilised multiple data sources and broad screening, thus minimizing the likelihood of any missed TAD cases.

The male to female ratio in our study correlates with the observed ratio in other studies [4]. Male sex is commonly cited as a risk factor for TAD.

The mean age of patients with confirmed TAD in our study was slightly lower than other sources [5]. The mean age in our study is 62.9 years old whereas that in other studies are approximately 66.9 years old [4].

After analysing the risk factors in patients with TAD, expectedly hypertension and age were two important ones. Only young patient in this study with TAD was a known case of Marfan’s syndrome.

All confirmed TAD cases were managed in a controlled environment with close monitoring (ICU / HDU). Type A aortic dissections were mostly managed surgically with an aortic replacement whereas type B aortic dissections were managed conservatively with blood pressure control and close observation.

The mortality rate in this study (18%) at 24 hours is lower than average (approx. 21%) [4, 5]. This might be due to early diagnosis in ED and high level of suspicion for this cohort. This allows adequate management to be given within a shorter period of time. Risk stratification and early investigation is therefore extremely in crucial in mortality reduction and improve outcomes for patients.

Limitation

We are aware if some of the limitations in this study including the small sample size.
To reduce missed cases beside screening all patients presented to the ED, we have analysed information through multiple sources of data (patients who had CT Angiogram, referred to cardiothoracic surgical team, patients who died in ED).

Due to the retrospective study design and the large number of patients being reviewed, we only had the resources to track representations and because of this, combined with limited ethics approval, we were not able to contact patients who had no further presentations to our network after being discharged after the index visit. It is unlikely that there were patients missed by this approach, however repeat presentations are generally to the same health network in our region as our network covers a very large geographical area. In addition, hospitals generally notify each other of unexpected deaths following recent discharges. This makes attrition bias unlikely but not impossible.

As this was a single network study two cases who were transferred to another tertiary hospital because of the complexity couldn’t be analysed accurately in terms of ICU or hospital length of stay however they remined alive after discharge in 3 months follow up period.

Conclusion

Thoracic aortic dissection, in particular Type A remains a condition with a relatively high mortality rate despite adequate management in a prompt manner, hence high level of suspicion is required in risk stratification of patients with signs and symptoms concerning for TAD.

Type A Aortic Dissection has a mortality rate of approximately 1% per hour with delayed management [9]. Thus, missed diagnosis has a high chance of increasing risk of death. Prompt diagnosis starting from presentation to the emergency department is vital to reduce mortality and to initiate treatment as soon as possible.

A reduction in mortality rate and rate of representation to hospital due to the same issue can be used as markers in future research to investigate the overall outcome for patients with this condition.

A heightened sense of awareness with prompt diagnosis and management is the key to improving survival and outcomes for patients with thoracic aortic dissection.

References


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