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"A backbone pain": 61-year-old Female with Acute Aortic Dissection Stanford Type B

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ABSTRACT

Introduction: *In Europe, Cardiovascular Diseases (CVDs) remains the most common cause of morbidity and mortality, with 49% of deaths in women and 40% of deaths in men. Women have a higher risk of CVDs mortality, worse prognosis, and outcomes, major cardiovascular events, are undertreated, and have a lower rate of diagnostic angiograms and interventional procedures, compared to men.*

Case Summary: *A 61-year-old white female, presented to the Emergency Department (ED) with chief complaints of sudden bone pain and a headache. She had been evaluated but discharged without further investigation from another ED, because of the symptoms she reported. She has a history of smoking for 30 years. Her family history included sudden death for both parents, with the symptomatology of an aneurysm. She never had a cardiovascular (CV) assessment before or any CV symptoms. Upon triage, the pain was located in the upper back and extended down the back. She characterized it as 'bone pain' (skeletal pain). Vital signs revealed high Blood Pressure (BP) [216/97] mmHg. Her initial laboratory investigation revealed D-dimers level 1.01μg/ml with an upper limit of normal <0.50μg/ml. Urgent Computerized Tomography Angiography of whole aorta with IV contrast was performed and a diagnosis of Aortic Dissection Stanford Type B was given. The patient was admitted to the ICU for close hemodynamic monitoring and medical therapy, BP control, and pain management. The patient was monitored for 19 days without any complications. There were no indications for surgical intervention between admission and discharge, based on the latest guidelines.*

Discussion: *The presented clinical case is an example of lack of adequate recognition and assessment by health professionals, but also of inadequate prevention and delay of presentation to medical care by the patient due to misconception. This must drive the community of cardiology to implement changes in prevention, diagnosis, intervention, and management for women, and provide education and training in early recognition and management of CVDs in the medical community, taking into consideration the sex and gender differences.*

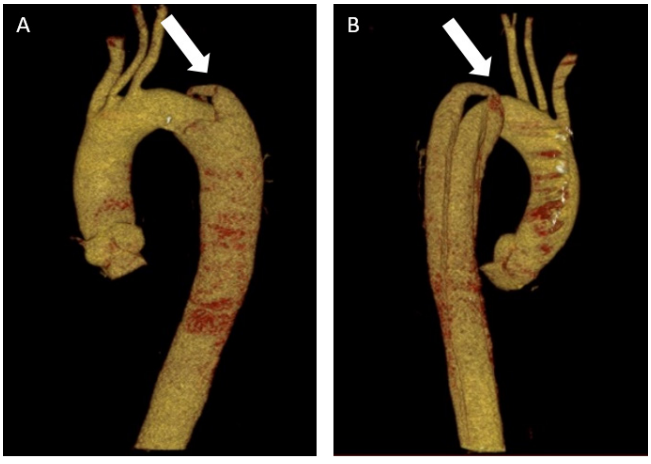
Keywords
Acute aortic dissection, Sex differences, Gender differences.

Introduction
Sex and gender differences have been shown to affect the prevention, presentation, diagnosis, intervention, management, and outcomes of cardiovascular diseases (CVDs) [1-3]. For several years, CVDs have been seen as a "male" disease, due to the high risk of morbidity, underestimating the risk of CVDs in women, which leads to less often guideline-recommended therapies. In

Europe, CVDs remain the most common cause of morbidity and mortality, with 49% of deaths in women and 40% of deaths in men [4]. According to the literature, women have a higher risk of CVDs mortality, worse prognosis, major cardiovascular (CV) events, they are undertreated, have a lower rate of diagnostic angiograms and interventional procedures, and worse clinical outcomes compared to men [1,2,4]. These may be the result of lower use of prevention therapies and lifestyle counseling, fewer strategies for secondary prevention, different presenting symptoms, longer delay in seeking emergency care, underutilization of evidence-based diagnostics and therapies, aggressive pharmacotherapy, and invasive treatments, but also, a result of lack of recognition, assessment, and intervention by healthcare professionals (HPs) [1,4-7].

Case Report

A Caucasian 61-year-old female, presented to the Emergency Department (ED) with chief complaints of sudden 'backbone pain' (descripted as skeletal pain) that started the same day after an intense stressful episode, and a headache for the last week. The patient mentioned also, she had been evaluated and discharged without further investigation or therapy from the ED of another hospital, due to the symptoms she reported. It was considered as musculoskeletal pain. Upon triage, the pain was located in the upper back and extended down lower the back. Her past medical history included constipation, pneumonia 5 years earlier, and a coronavirus (COVID-19) infection the previous year. She had a surgical history of seven dental implants two weeks before the event and bilateral breast augmentation 22 years ago. The patient referred she did not take any prescribed medication, except of natural food supplements for intestinal transit and multivitamins. The patient reported a history of smoking 10 cigarettes per day for 30 years, alcohol consumption socially, and no history of illicit drug use. She has a normal BMI, doing regular exercise daily. Not known any drug, food, or environmental allergies. She is employed as a secretary to an architecture office.

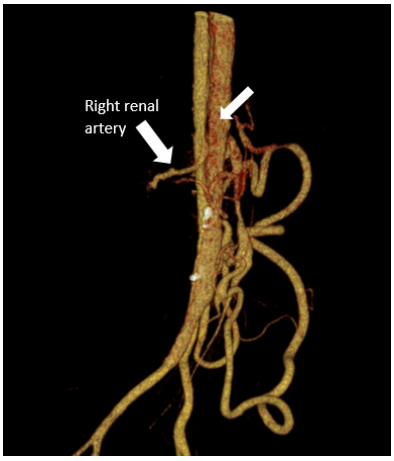


Picture 1: 3D reconstruction of Computed Tomography Angiography of aorta with intravenous contrast administration. Images show the dissection of the aorta with intimal flap extending from the distal aortic arch and distal to the left subclavian artery downwards along the whole descending thoracic aorta. A- Anterior view. B- Posterior view.

Her family history included sudden death for both parents; her mother by the age of 60 and her father at the age of 51. Both parents' symptomatology was suspicious for aneurysm. She never had a CV assessment before. Vital signs revealed high blood pressure (BP) [216/97] mmHg and [209/97] mmHg bilaterally on upper limbs. During the initial physical examination, the patient's lungs were clear to auscultation, equally bilaterally and the patient showed no signs of respiratory distress. Peripheral pulses on upper and lower limbs were bilaterally normal to palpation without any differences in pulse intensity, volume, and rhythm. No pulse deficit. No upper or lower extremity edema. The skin was pink, warm, and dry. Upon neurological examination, the patient was awake, alert, and oriented with a Glasgow Coma Scale of 15/15. The patient described sharp pain located in the upper back and extended down lower the back. The abdomen was soft and flat with normal bowel sounds.

The patient was initially treated by the ED multidisciplinary team, placed on a cardiac monitor (including BP), two large bore peripheral intravenous (IV) catheters were placed, and IV administration of labetalol and tramadol were given for BP and pain management. Her 12-lead electrocardiogram (ECG) on presentation showed sinus rhythm without any pathological findings. Initial laboratory investigation revealed a D-dimers level 1.01μg/ml with an upper limit of normal <0.50μg/ml. No other pathological findings other than the above were found. The initial differential diagnosis of upper back pain and headache is broad. However, due to the intense symptomatology, the significant family history of sudden deaths, the positive D-dimer adjusting to age, the absence of CV assessment in the past, and the smoking habit, the multidisciplinary team decided to proceed with urgent Computed Tomography Angiography (CTA) of aorta with intravenous contrast administration.

The CTA showed Aortic Dissection (AD) Stanford Type B, with intimal flap extending from the distal aortic arch and distal to the left subclavian artery downwards along the whole descending thoracic aorta, the abdominal aorta, and the proximal common iliac arteries (Picture 1-2). The aorta had a double lumen, a smaller



Picture 2: 3D reconstruction of Computed Tomography Angiography of aorta with intravenous contrast administration. Image show the dissection of aorta involving the right renal artery.

true lumen, and a large false lumen, which continued to the right common iliac artery. No pleural or pericardial effusion. Normal appearance of the upper abdominal organs, without ascites. The measurements obtained in 3D data showed the size of the proximal descending aorta 33x31mm, the dimension of the ascending aorta at the level of pulmonary artery bifurcation 33x33mm, the size at the level of proximal transverse aortic arch 31x29mm and the distal transverse aortic arch 28x36mm.

When the diagnosis was confirmed, the cardiothoracic surgeon assessed the patient immediately. Intravenous bolus injections of labetalol, verapamil, and enalapril were given for BP control, with a goal of Systolic BP <120 mmHg, according to the latest guidelines [8,9]. Also, morphine was given IV to manage the pain. Arterial line was placed for close monitoring of the BP and the patient was admitted to the Intensive Care Unit (ICU) for close hemodynamic monitoring and medical therapy. The patient was monitored for 19 days. During the hospitalization, the medications had positive outcomes in BP control and pain management. Between admission and discharge, there were no indications for surgical intervention based on the guidelines.

The patient was discharged home with the instructions of oral medication of nebivolol, eplerenone, valsartan, alprazolam, and pantoprazole, and a follow-up visit a week later. She was informed about her condition and medication, her medical options, and the lifestyle modification she should follow. She was encouraged to communicate with the hospital if any symptoms were obtained and ask the multidisciplinary team if further questions or queries existed.

Evidence Based Practice

Acute aortic dissection (AAD) is a rare but a lethal, life-threatening emergency condition, where prompt diagnosis and appropriate therapeutic interventions are vital for the patient's survival. According to the European Society of Cardiology (ESC) guidelines, «AD is defined as a disruption of the medial layer provoked by intramural bleeding, resulting in separation of the aortic wall layers and subsequent formation of a true lumen and a false lumen with or without communication» [8]. The incidence of AD is estimated at 5 to 30 cases per million people per year, in between the ages of 50 to 70 years old, with male sex more commonly affected [9].

The classification is based on the location of the intimal tear and the time from the onset of symptoms to the presentation at the ED (acute < 14 days, subacute 15-90 days, chronic >90 days) [8]. The Stanford classification divides AD into two types: type A extending in ascending aorta; type B extending in descending aorta distal to the left subclavian artery. Type A AD is presented in 67% of the patients. In acute phase is highly lethal in untreated symptomatic patients, with associated mortality of 1-2% per hour after onset of the symptoms and is generally managed surgically [8,9]. Type B AD is presented in 33% of the patients, and the initial management of the uncomplicated acute phase is medical therapy (BP-heart rate control, pain management). However, the treatment choice for acute complicated Type B AD is thoracic endovascular aortic repair (TEVAR) or open surgery [8,9].

The main clinical presentation of patients with AAD is abrupt onset chest, back, and abdominal pain, which may migrate from its point to other sites – just like the woman in the current clinical case [10,11]. Predisposing and common risk factors for AD are arterial hypertension (observed in 65-75% of incidence), family history of aortic diseases, pre-existing aortic diseases or aortic valve disease, connective tissue disorders, gene mutations, history of cardiac surgery, direct blunt chest trauma, cigarette smoking, and use of intravenous drugs [8,10]. The 12-lead ECG may show ST-segment elevation in myocardial infarction or ischemia in 10-15% of patients with AD. In the current clinical case the 12-lead ECG was shown to be normal most possible due to the absence of myocardial ischemia/infarction [8].

In patients with chest pain and suspicion of AD, the level of D-dimers is immediately very high, in comparison with other disorders where the D-dimers are increased gradually. The initial laboratory results in the clinical case revealed D-dimer level twice as much as the normal range. With the combination of the other risk factors, D-dimer level was the trigger point for urgent investigation [8,10]. However, the golden standard diagnostic imaging in AD is the contrast CT scan, which in the presented clinical case gave the final diagnosis of AD Stanford type B [8,10]. The uncomplicated type B AD and the absence of malperfusion or signs of disease progression, drive the multidisciplinary team to treat the patient medically. The initial management targets were the Systolic BP <120 mmHg, heart rate between 60 to 80 bpm and pain management. The patient was admitted to the ICU for close hemodynamic monitoring and recognition of complications.

Discussion

The presented clinical case was a 61-year-old female, without any significant medical history, with daily exercise and a healthy diet, but with a positive family history of sudden death of both parents with the symptomatology of aneurysm, a smoking habit for 30 years and a non-cardiology evaluation in the past, which was discharged without further investigation or treatment from the ED of another hospital. Most probably, the reason was the non-urgent symptom of «back-bone pain» referred. That raises several issues about the prevention, presentation, diagnosis, and management of CVD in women. The patient's initial approach changed immediately at the point of triage assessment, because of the location of the pain, the family history, the smoking habit, and the lack of CV evaluation in the past. Also, the vital signs revealed high BP, which added to the clinical case the emergency call for urgent management of symptoms and further investigation. The diagnosis of AAD Type B, a life-threatening emergency condition, verified the initial assessment and highlights the importance of early prevention, presentation to medical care, recognition of clinical features, and management of CVDs in women.

This patient's clinical case is an example of lack of adequate recognition and assessment by HPs, but also of inadequate

prevention and delay of presentation to medical care by the patient. The incidence of Type B AAD is approximately three times higher in men than in women, although, the prognosis in women is poorer, as a result of atypical presentation and delayed in diagnosis [5,8]. According to the literature, women with type B AAD tend to be older with more comorbidities and higher mortality, in comparison with men. Also, women are presented delayed to the ED with non-specific clinical features, the diagnosis is often delayed, the management frequently do not follow the clinical guidelines, and the odds of acute cardiac events are higher than in men [11-13].

Conclusion

The cardiology community needs to take advantage of the knowledge of sex and gender differences, to implement changes in prevention, diagnosis, intervention, management, and outcomes among men and women. These will include the release of guidelines with an emphasis on the sex and gender differences in CVDs, targeted campaigns for women to increase awareness, and enrolling more women in CV clinical trials for interventions, early identification, drug trials, and modification of risk factors, and to improve management and outcomes. In addition, education and training are required about sex and gender differences and also about the early recognition and management of CVDs by the multidisciplinary team [2,7,14,15]. It is necessary to pay attention to patients' history to achieve a quick and definitive diagnosis.

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