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CASE REPORT

A Case of Fatal Stanford Type A Aortic Dissection Caused by a Traffic Accident with Low Energy Impact

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Abstract: A seemingly healthy 84-year-old female pedestrian was mildly bumped by a car, and she hit her left shoulder, flank, and lower legs when she fell down on a street. She was conscious and stable when transferred to an emergency room. She had no sign of any major injuries except minor lacerations on her legs. Repeated evaluations including chest X-ray, ECG, and focused assessment with sonography for trauma did not reveal any abnormal findings. While waiting for discharge, she started having mild chest discomfort. Unexpectedly, the third echocardiogram showed mild pericardial effusion, and a CT with contrast showed aortic dissection in the ascending aorta and infra-left subclavian aortic dissection. She was immediately transferred by a helicopter to a tertiary trauma center for emergent repair surgery. Considering the site of dissections, progression of existing intrinsic intimal tear triggered by energy impact was suspected. However, traumatic causes could not be excluded. Extra caution and diligence should be exercised when examining elderly patients in blunt trauma.

Keywords: aortic dissection, traffic accident, blunt trauma, elderly patients

Introduction

Acute Stanford type A aortic dissection is a catastrophic condition, and it causes almost immediate death if ruptured into the pericardial space or extravasation.[1] Intrinsic aortic dissection is usually seen in patients with hypertension or pre-existing aortic diseases.[2] On the other hand, blunt thoracic aortic injury is one of the leading causes in all traumatic deaths.[3] Usually, an aortic tear occurs below the left subclavian artery by anatomical reason, and Stanford type A aortic dissection may be a rare occurrence unless injuries are caused by high-energy impact.[4] Advanced Trauma Life Support (ATLS) emphasizes importance of repeated and deliberate inspection for cardiovascular and respiratory systems during primary and secondary surveys, which reduced the number of early trauma deaths.[5] However, prejudice arisen from the information provided by witnesses or emergency medical services (EMS) can be a potential pitfall leading to underestimation of trauma patients diagnoses. This case report demonstrated a case of fatal aortic dissections that were initially unapparent despite of very careful examinations.

Case Presentation

A seemingly healthy 84-year-old woman was mildly bumped by a car while she was walking on a pedestrian crosswalk. She never presented with chest or back pain, and her regular checkup did not show any remarkable findings. She lost her balance and hit

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her left shoulder, flank, and lower legs upon falling. Upon contact with emergency medical service (EMS), no major injuries were observed except mild lacerations on her bilateral legs. She was transferred to a local hospital even though she was very reluctant to be examined since she thought her condition was not serious. On arrival to the ER, she was totally conscious with a Glasgow coma scale of 15, and her vital signs were stable: blood pressure, 156/92 mmHg; heart rate, 69 bpm; and body temperature, 36.5°C. Her physical examinations on airway, respirations, circulation, and neurological findings were normal. An initial focused assessment with sonography for trauma (FAST) examination was negative. The secondary survey did not show any abnormal findings except mild tenderness on her left armpit and mild lacerations on her left elbow and both legs. No other evidences of chest trauma such as bruises, hematoma, and deformity were seen. Her chest X-ray showed subtle cardiomegaly and mediastinal widening which was interpreted as postural effect, and her pelvic X-ray did not show any fractures (Figure 1). An echocardiography revealed mild to moderate aortic regurgitation suggesting mild aortic insufficiency associated with aortic valve calcification, but no pericardial effusion was observed (data not available). An electrocardiogram (ECG) showed no abnormal findings. The patient was diagnosed with only appendicular superficial lacerations. Irrigation and suture for her lacerations were performed. While waiting to be picked-up by her family, she started complaining of very mild chest discomfort. To ensure nothing was wrong, another echocardiogram was performed. Unexpectedly, it revealed slight pericardial effusion and an intimal flap which were not seen previously. An urgent computed tomography (CT) with contrast media demonstrated aortic dissections in the ascending aorta and the descending aorta down to the origin of the celiac trunk with patent innominate, left common carotid, and left subclavian arteries. The dissection in the ascending aorta had a false lumen communicated with the true lumen (Figure 2A–D). In the descending aorta, the proximal part of the false lumen was stained with contrast media, and the distal part showed thrombus formation (Figure 2D and E). The blood tests that returned after the CT revealed high D-dimer (19.79 μg/mL) and high FDP (40.0 μg/mL). She was diagnosed with a Stanford type A aortic dissection, and she was transferred to a tertiary trauma center by a helicopter due to lack of resources to rescue her in the local hospital where a cardiovascular surgeon did not exist and percutaneous cardiopulmonary support was not available. Unfortunately, it took at least two hours from the time the helicopter was requested to take-off, and the patient could not be rescued before emergency repair surgery due to rapid progress of cardiac tamponade at the tertiary trauma center.

Figure 1 A chest X-ray on arrival. No obvious rib fractures were seen.

Discussion

Among trauma patients, one of the causes of late deaths, which are defined as deaths later than 48 hours after admission, is blunt chest trauma.[6] Cardiovascular damages by traffic accidents can be missed in spite of careful physical examination and regular imaging studies such as a chest X-ray and an echography, unless the damages are obvious due to suspicious symptoms like severe chest and/or back pains, syncope, and shock state.[6,7] Except direct hit on the anterior chest, the tear mostly occurs just below the left subclavian artery in the drivers and passengers who wear seatbelts due to the anatomical reason.[8] Although the site of aortic tear may vary depending upon position of the bodies and direction of the energy force, the entry site is usually single.[9]

Our case is a rare occasion since the Stanford type A dissection was developed by a low energy impact in a pedestrian. Specifically, ascending aorta is usually not involved without direct hit on the chest or rapid deceleration.[4,10] In addition, she never presented with any chest and back pain previously, and she had never been diagnosed with an aortic dissections. Therefore, we cannot confirm whether this was a newly developed dissection or a worsening intrinsic subclinical dissection. One speculation is that the existing intimal tear near the

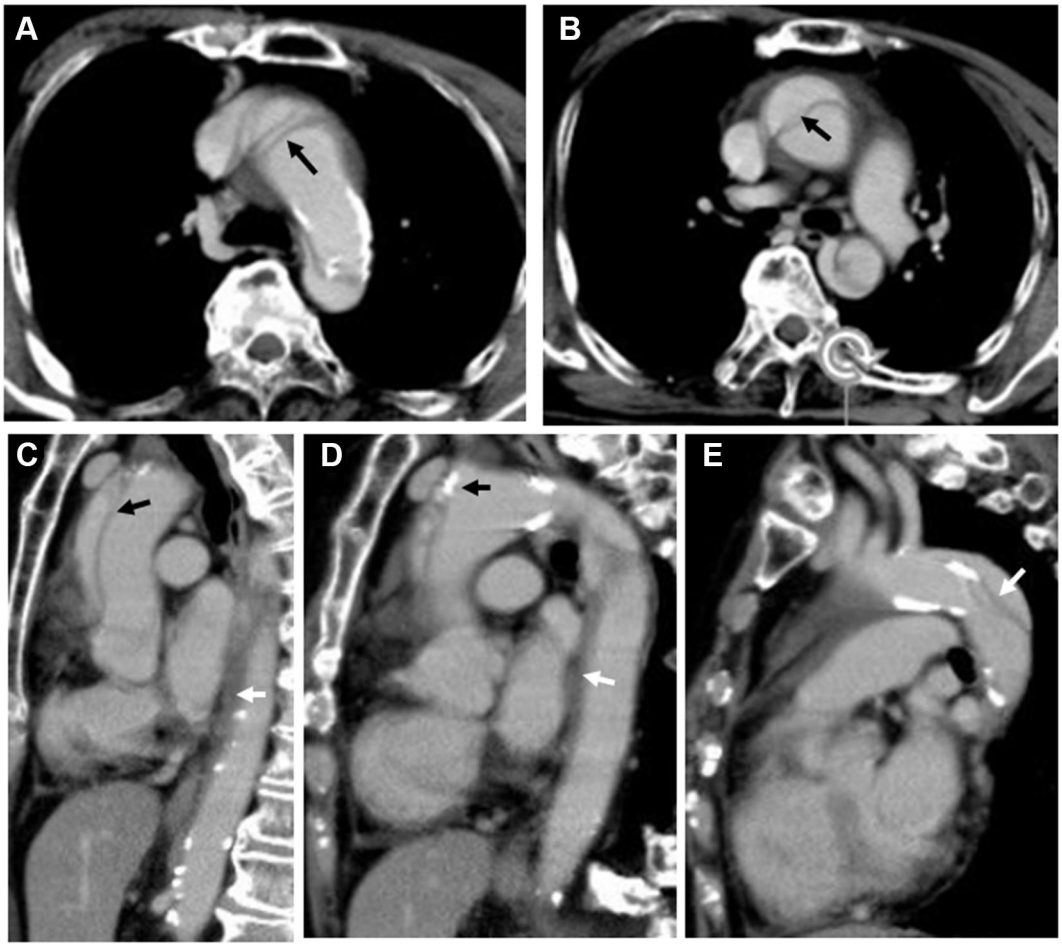

Figure 2 CT scan images. (**A**) An axial plane CT showing dissections in the ascending (black arrow) and the descending aorta. The aortic arch is strongly calcified. (**B**) The false lumens were filled with contrast media (black arrow). (**C**) A sagittal plane of the truncal CT showing dissection in the ascending aorta with a false lumen filled with contrast media (black arrow) and dissection in the descending aorta. The false lumen in the descending aorta was patent to the true lumen in the proximal part and filled with thrombus in the distal part (white arrow). (**D**) The flaps in the ascending aorta seem to be connected to the calcified aortic arch (black arrow). (**E**) The distal end of calcified aortic arch is attached to the flap in the descending aorta (white arrow).

calcified aortic arch (Figure 2D and E) might have progressed to Stanford type A dissection by the impact, even minimal, resulting in a pre-shock state due to progressive cardiac tamponade. The aortic regurgitation detected by the initial quick echocardiogram could have been the only sign of tear.[11] Although acute aortic regurgitation can be a manifestation of Stanford type A aortic dissection, it was not suspected in our patient because aortic root was intact and flap was not observed by a transthoracic echocardiogram, aortic murmur was not audible, and the patient did not complain any chest and back pain. In addition, aortic regurgitation by chest blunt trauma is extremely rare,[11] and more than 93% of blunt traumatic aortic rupture cases die at the accident scene.[12]

In cases of blunt impact, physicians always need to keep vigilant about aortic injuries and need to proceed with the ATLS protocol. Repeating FAST is one of the important examinations. Also, both high FDP and D-dimer are reported to be biomarkers for patients with aortic dissection.[13] However, in our case, the results were returned after the aortic dissections were diagnosed by imaging studies. From this standpoint, it could be said that progressive aortic dissection is difficult to diagnose in an appropriate time frame. It was prudent that the possibility of major vascular injury was kept in mind and examinations were repeated.

Learning Objects

In some trauma cases, insidious or progressing vascular injuries are initially missed or underestimated. Physicians should always be reminded of the possibility of major vascular injuries regardless of the mechanism or the size of the accident and be cautious of the subtle changes in vital signs or complaints from the patient.

Ethical Statement

This study was performed in accordance with the principles stated in the Declaration of Helsinki. The ethical committee in Toride Medical Center approved this study to be published. A written informed consent was obtained from the patient and legal guardians for the publication of details, which can include photograph(s) and/or videos and/or case history and/or details within the text ("Material") to be presented at any conference and published in any printed/online journals upon transfer to the hospital.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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