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Clinical Application of Echocardiography in Stanford Type A Aortic Dissection with Proximal Intima Intussusception

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Abstract

Stanford Type A aortic dissection (TAAD) with proximal intima intussusception is a rare disease that usually associated with severe aortic regurgitation and high mortality. Here we report a typical case of TAAD to discuss the crucial role of echocardiography, including transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE), in the clinical diagnosis and treatment of this case.

Keywords: Ascending aorta dissection, intima intussusception, echocardiography.

Case presentation

A 68-year-old man was sent to the emergency department of our hospital, as suffered from sudden dyspnea after exercise, accompanied by palpitation, chest tightness, shortness of breath, and coughing yellow purulent sputum. His previous history including: refractory heart failure, hypertension for more than 10 years and the highest blood pressure could reach 180/120mmHg, and chronic obstructive pulmonary disease. Emergency lab results showed: Hypersensitive Troponin I (HSTnI) 370.4 pg/ml (normal range: 0-26.2 pg/ml). After receiving symptomatic and supportive treatment such as non-invasive ventilator assisted ventilation, diuresis, asthma relief and vasodilation in the emergency department, the patient was transferred to cardiac care unit (CCU) as "acute exacerbation of chronic cardiac insufficiency".

Relevant positive laboratory and auxiliary examination in the CCU as followed. Blood biochemical examination: HSTnI 2408.6 pg/ml. The electrocardiogram (ECG) showed: anterior interwall abnormal Q wave with ST segment elevation (Fig. 1).

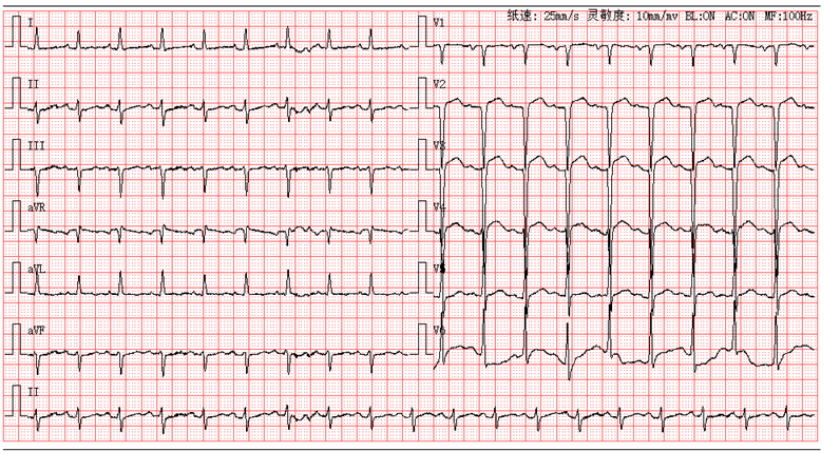

Figure 1: In CCU, the electrocardiogram showed: anterior interwall abnormal Q wave with ST segment elevation.

Bedside chest X-ray: bilateral lung infection with a few hydrothorax, and aortic heart with cardiac insufficiency (Fig. 2). Bedside TTE: aortic valve prolapses with severe regurgitation, the ascending aorta dilatation (4.6 cm), left ventricular contractile dysfunction (LVEF 40%) induced by regional wall motion abnormality (the movement of the middle and lower lateral walls was weakened), and a small amount of pericardial effusion. The aortic valve disease has met surgical criteria, but he refused. Then given medical treatment and discharged after his condition was stable.

Figure 2: Bedside chest X-ray in CCU: bilateral lung infection with a few hydrothorax, and aortic heart with cardiac insufficiency.

Half a month later, the patient reported a substantial decline in physical strength and thus went to the cardiovascular surgery department (CSD) for treatment. TTE reexamination: TAAD with intimal flap prolapse through the aortic valve into the left ventricular outflow tract (LVOT), and with severe aortic regurgitation, left ventricular wall motion was normal (Fig. 3).

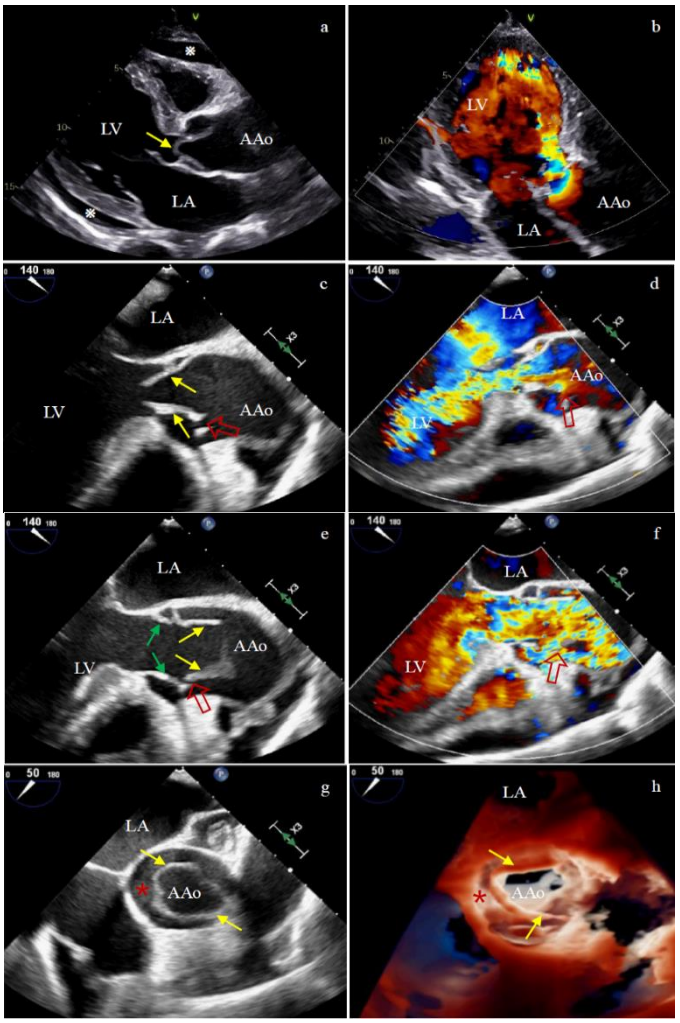

Figure 3: The echocardiography showed views of the Stanford Type A3 aortic dissection with proximal intima intussusception in long axis (a-b: preoperative TTE and c-d: intraoperative TEE during diastole and with color Doppler respectively, e-f: intraoperative TEE during systole) and short axis (g-h: intraoperative TEE during systole). Yellow arrow: intimal intussusception. Green arrow: aortic valve leaflet. Red arrow: site of intimal tear. ※: hydropericardium. *: false lumen. LA: left atrium; LV: left ventricle; AAo: ascending aorta.

Aortic angiography of computed tomography (CTA): Ascending aorta dissection (Stanford Type A_3, the dissection was confined to the proximal segment of ascending aorta and involved the sinotubular junction), and the intimal flap prolapsed into the LVOT (Fig. 4).

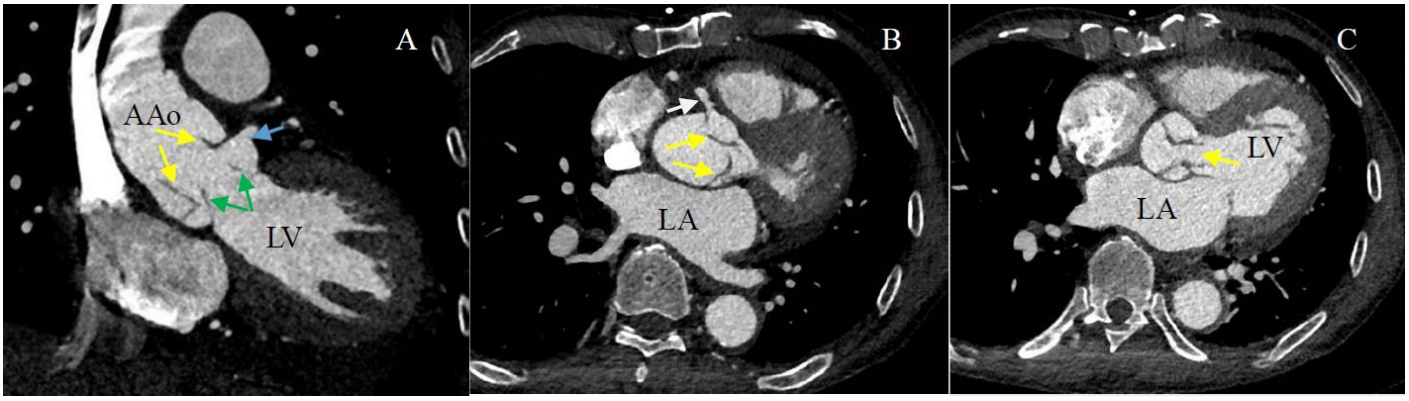

Figure 4: The aortic CTA showed views of the Stanford Type A_3 aortic dissection with proximal intima intussusception (A: coronal during systole, B-C: axial during diastole). Yellow arrow: intimal intussusception. Green arrow: aortic valve leaflet. Blue and White arrow: left and right coronary artery ostia respectively. AAo: ascending aorta; LV: left ventricle; LA: left atrium.

Whereupon the patient was scheduled for urgent surgical treatment. Intraoperative TEE (Fig. 3) confirmed the extent of arterial dissection and the intimal flap prolapsing into LVOT during diastole which causing severe aortic regurgitation. Meanwhile TEE identified the location of the rupture of the aortic dissection and showed a degenerative aortic valve thickening, consistent with the intraoperative result (Fig. 5 A-B, it revealed intimal ruptured at the sinotubular junction with circumferential dissected, aortic valve thickening with severe insufficiency).

Figure 5 A-B: Intraoperative view. C-D: Histopathologic diagnosis (C: the hyaline and mucoid degeneration in aortic valve and D: fibrous hyperplasia of the intimal aorta with mucoid degeneration). Blue arrow: intimal intussusception. Green arrow: aortic valve leaflet. Yellow arrow: aortic adventitia. White arrow: site of intimal tear.

Therefore, the surgeon decided to perform the Bentall surgery, including aortic valve replacement with ascending aorta graft implantation. The operation went well and the patient discharged on 2 weeks after surgery. The HSTnI was 10.2 pg/ml (within the normal range, the abnormal Q wave in ECG (Fig. 6) was disappeared and chest X-ray: a few hydrothorax in left side (Fig. 7). The histopathologic diagnosis (Fig 5. C-D): the hyaline and mucoid degeneration in aortic valve and fibrous hyperplasia of the intimal aorta with mucoid degeneration. Informed consent has been obtained from the patient for publication.

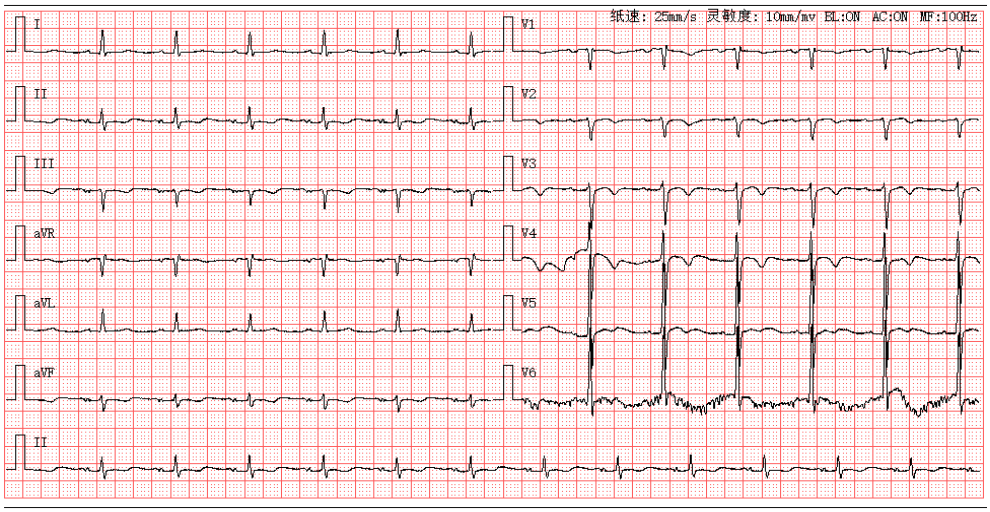

Figure 6: The electrocardiogram (postoperative): the abnormal Q wave disappeared.

Figure 7: The chest X-ray (postoperative): a few hydrothorax in left side.

Discussion

As well known, TAAD is a life-threatening disease and remains challenging to diagnose when the physical symptoms are not typical [1]. This is the case with this subject, who initially presented with post-activity dyspnea without chest pain, combined with laboratory, ECG results and a history of heart failure, so he was diagnosed as acute exacerbation of chronic cardiac insufficiency. Worse yet, sonographer misdiagnose proximal intima intussusception as aortic valve prolapse during diastole, and we lost the image data as its bedside TTE.

In the aortic dissection, with intimal intussusception is a rare manifestation by incidence of < 2 % [2]. It's classified into three types: anterograde, retrograde and bidirectional type according to the orientation of intimal invagination, and the intimal flap could cause severe complications [3]. This case belonged to a retrograde type, the proximal intima flap prolapse retrograde into the LVOT causing severe AR and obstructed the ostia of the coronary arteries in the meanwhile, which caused acute coronary syndrome (Tn I, ECG and regional wall motion abnormality). These symptoms occurred before the patient's surgery and disappeared afterward. When reviewing the diagnosis of this case, at the bedside TTE, the sonographer mistook the proximal intima intussusception for the prolapsed aortic valve, then missed diagnosis Type A aortic dissection.

Although echocardiography is the preferred method of examination for heart disease, we should appreciate that the value of TTE is not only affected by the patient (such as checking position, obesity, pulmonary emphysema, etc.) and machine conditions, but also by the sonographer's ability and skills of diagnosis. According to earlier research, the sensitivity and specificity of TTE in the diagnosis of ascending aortic dissection were 78-90% and 87-96% [4]. In the Sobczyk and Nycz's research, the sensitivity of it can be reached to 99.4% in the optimum conditions [5].

In this case and previous studies [6-8], intraoperative TEE could not only detect the extent of dissection, site of intimal tear and the mechanisms of AR in TAAD (in this case, AR in retrograde intussusception was caused by the intimal intussusception on the aortic valve leaflets in diastole rather than prolapse of the leaflets itself), but also provide more detailed information on aortic valve morphology and functional status, which could assist the surgeon to make the decision for aortic valve repair or replacement.

Conclusion

From this typical case, it's clear that the echocardiography (including TTE and TEE) plays an important role in diagnosis of TAAD with proximal intima intussusception. The case report will help clinicians make the right decision when patients with similar symptoms visit clinics, to avoid unnecessary and invasive examinations and treatment.

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Conflict of interests: The authors declare no conflict of interests.

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