

An advanced life support ambulance arrived within 8 minutes, he was already awake, a bit confused (Glasgow coma scale of 14), he did not remember what had happened and he complained of dizziness and dorsal–lumbar pain.

Bystanders reported that the patient had been well until the syncope. He had hurt his head and back on the floor by falling down, his heart pulse had always been palpable and hadn't had any tonic–clonic movements.

Blood pressure was 80/40, heart rate 105 bpm, oximetry 98%, and the electrocardiography registered a sinus tachycardia without any segment alterations.

Physical examination revealed a small hematoma of the occipital region, a painful cervical column, a spontaneous and intermittent dorsal and lumbar pain, the absence of neurological deficits. The examinations of the heart, lung, and abdomen were completely normal, whereas a slight asymmetry of the radial pulses was found, with the left one weaker than the right one.

A fluid challenge was administered with 500 ml of crystalloid with improvement of blood pressure up to 110/70 and a concomitant reduction of the heart rate (80 bpm). A rapid pre-hospital POCUS was performed according to the RUSH protocol.

The subcostal scan of the heart (the pump) revealed a normal cardiac contractility; a small pericardial effusion was described (Figure 1A), whereas no signs of pleural and peritoneal effusions were found (the tank); finally, the evaluation of the “pipes” showed an abdominal aorta with a normal diameter but with an endovascular floating image (Figure 1B; Video 1).

The examination of the thoracic aorta with a sector probe highlighted a dilation of the ascending aorta (Figure 1C) and a floating flap inside the aortic arch (Figure 1D; Video 2).

The whole pre-hospital US examination lasted less than 5 minutes. The clinical presentation, the asymmetric radial pulses, and the ultra-sonographic finding were consistent with the diagnosis of aortic dissection.

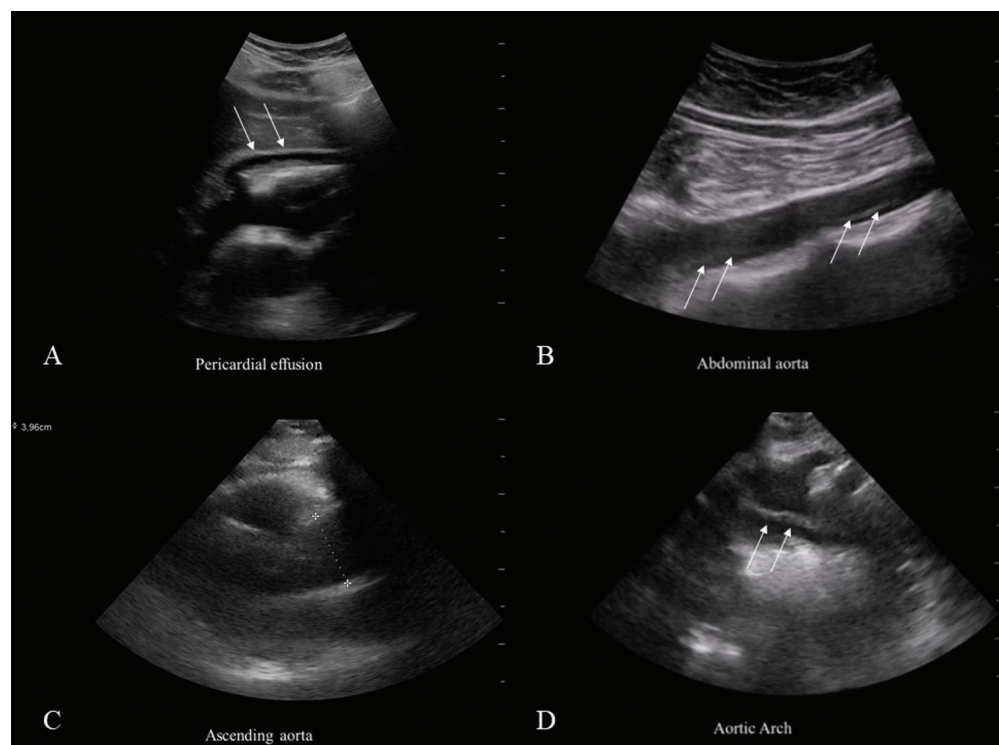
The patient was transported urgently to the emergency department of the nearest district hospital without a heart and thoracic surgery. During the transport, the local radiology was alerted in order to go through a computed tomography (CT) scan as soon as possible.

In the Emergency Department, the dorsal and lumbar pain worsened with some episodes of severe hypotension that were responsive to the fluid therapy. The patient underwent CT scan rapidly that confirmed the diagnosis of the aortic dissection which started from the aortic bulb and reached the left femoral artery, involving the celiac tripod, the superior mesenteric artery, and the left renal artery (type A according to Stanford classification) (Figure 2).

The patient was transported by a helicopter of the Emergency Medical Service to the intensive care unit of the nearest hub hospital rapidly where both a heart and a thoracic surgery were available. He underwent emergency surgical correction two times and the outcome was successful.

He was discharged from the hospital after a period of rehabilitation in good condition but with a persistent amnesia of the event.

Figure 1. (A) Subcostal scan shows a small pericardial effusion. (B) Abdominal aorta with an endovascular floating image. (C) Parasternal scan using a sector probe: ascendant aorta dilation of 3.96 cm. (D) Suprasternal scan using a sector probe: aortic arch with a floating flap.



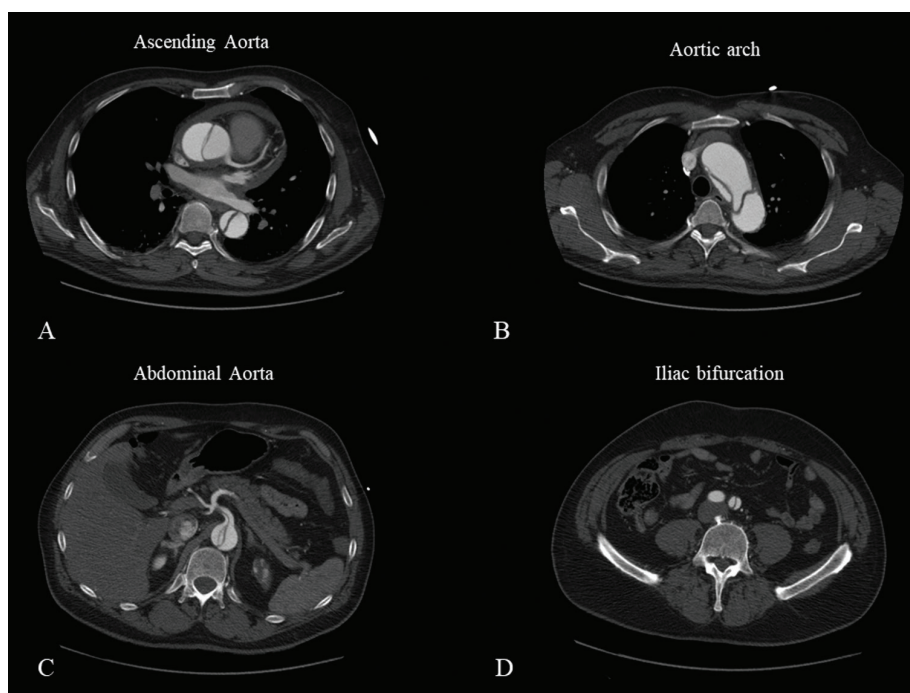


Figure 2. CT scan: Dissection of the thoracic (A – B) and abdominal aorta (C) from the aortic bulb to the left iliac artery (D).

Discussion

There is a lively debate regarding the use of US in the pre-hospital setting. It has been considered a priority for the upcoming years, but the indications are not still clear.

Some articles and reviews have tried to clarify this point, and according to them, we can suggest three major indications: trauma (FAST or EFAST) [9,10], CPR (FEEL protocol) [11], and respiratory insufficiency (LUS) [2,12].

In a recent review, we have also suggested the use of US for the management of aortic aneurysm, since the mortality is extremely high, and it can be reduced only with an early diagnosis and treatment [2,14].

Our case report described a patient with an aortic dissection and we think it is interesting because it clearly described how US can change the diagnostic and therapeutic decision of the emergency physician in the pre-hospital setting. The aortic evaluation was made within a wider approach based on the RUSH protocol and this is another important hint from our case report.

Pre-hospital US must be focused, rapid, and problem based, and the use of specific protocols prevents delays. For example, the FAST is focused on the identification of free fluid in the pericardium, pleura, and peritoneum [9,10]; the FEEL is used in patients with cardiac arrest for no more than 10 seconds during the pulse check to search for reversible causes of cardiac arrest [11]; the RUSH goes rapidly through all the possible causes of shock [13].

Pre-hospital US is time dependent and it should last less than 5 minutes [2,9]. We must always remember that each minute lost dramatically reduces the survival rate in critically ill patients: the probability of death is estimated to increase by 1% for every 3 minutes of delay [9,15].

This is certainly true, but when a rapid pre-hospital approach helps to reach the correct diagnosis or, on the other hand, to exclude life threatening conditions, precious information is obtained to make rapid in-hospital management.

This was the case of our patient: he underwent a CT scan rapidly to confirm dissection of the aorta and he was transported to his final destination within 2 hours. The patient could have been transported directly to the hub hospital, outlining as US can improve also the field triage.

However, the environmental conditions (remote village), the position of the nearest hospital (8 minutes) and the hemodynamic instability suggested to stop at the local emergency department and, after the CT scan, to ask for a helicopter that guaranteed a faster e safer transport.

In our case report, a convex probe was used and we think this is the correct approach since it can give a wider panorama and suits with almost all the scans that are required in the pre-hospital setting. The integration with other probes should be done only if necessary and for specific doubts.

We are aware that the identification of an aortic dissection is often difficult and sometimes impossible also with high performance devices. On the contrary, the visualization of the aorta, in particular the abdominal tract, is rapid and easy, both for physicians and for paramedics [2].

For example, a complete scan of abdominal aorta usually lasts few minutes, sometimes less than 1 minute. So that it should be done in all patients with abdominal pain and hemodynamic instability.

We definitely think that the evaluation of the aorta could be the fourth indication of pre-hospital US.

Acknowledgement

None

List of abbreviations

CPR	Cardiopulmonary Resuscitation
FAST	Focused Assessment of Sonography for Trauma
FEEL	Focused Echocardiography in Life support
LUS	Lung Ultrasound
POCUS	Point of Care Ultrasound
RUSH	Rapid Ultrasound for Shock and Hypotension
US	Ultrasound

Consent for publication

A written informed consent was signed by the patient before the submission of the article.

Ethical approval

Ethical approval is not required at our institution for the publication of this case report.

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Summary of the case

Patient (gender, age)	1	Male, 50 years old
Final Diagnosis	2	Aortic dissection: type A according to Stanford classification
Symptoms	3	Syncope, hypotension, dorsal-lumbar pain, asymmetry of the radial pulses
Medications (generic)	4	Fluid therapy, Emergency surgical correction of the aortic dissection
Clinical Procedure	5	Physical assessment, Pre-hospital US according to RUSH protocol, CT scan of the Aorta
Specialty	6	Emergency medicine, heart and thoracic surgery