



# The Impacts of Using Cardiac Ultrasonography in the Emergency Department (ED) for Clinical Decision-Making: Two Case Reports

Acil Serviste Kardiyak Ultrasonografi Kullanımının Klinik Karar Üzerine Etkisi: İki Olgu Sunumu

Aslıhan Yürüktümen<sup>1</sup>, Funda Karbek Akarca<sup>2</sup>, İlhan Uz<sup>2</sup>, Selahattin Kıyan<sup>2</sup>, Ekrem Musalar<sup>2</sup>

<sup>1</sup>Department of Emergency Medicine, Faculty of Medicine, Akdeniz University, Antalya, Turkey

<sup>2</sup>Department of Emergency Medicine, Faculty of Medicine, Ege University, Izmir, Turkey

## ABSTRACT

Bedside cardiac ultrasonography in emergency departments (ED) is used frequently, with the name of Focused Cardiac Ultrasound (FOCUS) for certain indications. A 72 year old man with congestive heart failure, coronary artery disease and atrial fibrillation presented to the ED with the chief complaint of dyspnoea. Pulmonary hypertension and a left ventricular ejection fraction of 35-40% was determined by echocardiography one month previously. The emergency physician applied bedside FOCUS to the patient who was diagnosed to have pulmonary oedema after examination and chest x-ray. The patient was hospitalised as global hypokinaesia and a new atrial thrombus was determined. A 55 year old patient presented to the ED with soft tissue sarcoma in his left arm and leg. He had left hemiparesis and pulses were not palpable in the right upper extremity. The head computerised tomography (CT) was normal. In the bedside ultrasonography, an aortic thrombus was determined. In the latter examination by computed tomographic pulmonary angiography and formal doppler evaluation, complete thrombus at the right subclavian artery and at the arteries of right upper extremity were detected with signs that were indicative of thrombus in the intracranial part of right internal carotid artery. The patient was hospitalised within the plan of peripheral vascular surgery. Dyspnoea is a well known indication for FOCUS. However, the use of bedside cardiac ultrasonography with patient-based decision can contribute to safe and fast service delivery in ED as in the second case. Thus, the wider use of FOCUS can be indicated in the future.

**Keywords:** Cardiac ultrasonography, emergency medicine, FOCUS

**Received:** 09.07.2012 **Accepted:** 10.08.2012

## ÖZET

Acil servislerde yatakbaşı kardiyak ultrasonografi, belirli endikasyonlarla Focused Cardiac Ultrasound (FOCUS) adı altında sıkça kullanılmaktadır. Nefes darlığı ile başvuran 72 yaşında hastanın konjestif kalp yetmezliği, koroner arter hastalığı, atriyal fibrilasyon öyküsü vardı. Bir ay önce yapılan EKO'sunda pulmoner HT, LVEF: %35-40 saptanmıştı. Fizik muayene ve akciğer filmi sonrası akut akciğer ödemi düşünülen hastaya acil hekim tarafından yatakbaşı FOCUS yapıldı. Global hipokinezi ve yeni sağ atriyal trombus saptanması üzerine hasta interne edildi. Yumuşak doku sarkomlu 55 yaşında diğer hasta sol kol ve bacakta güçsüzlük yakınması ile başvurdu. Sol hemiparesisi vardı ve sağ üst ekstremitede nabızları alınmıyordu. Beyin tomografisinde patoloji yoktu. Yatakbaşı yapılan kardiyak ultrasonografisinde aortta trombus olduğu görüldü. Sonrasında yapılan torakoabdominal anjio BT ve formal doppler incelemede; sağ subclavian arter ve sağ üst ekstremitate arter sisteminde tam tromboz, sağ İCA intrakraniyal bölümünde tromboz varlığını düşündürülen bulgular görüldü. Hasta periferik vasküler cerrahi planlanarak interne edildi. İyi bilinen FOCUS endikasyonu "nefes darlığı" yanı sıra ikinci olgudaki uygulamada olduğu gibi olgu bazlı yatakbaşı kardiyak ultrasonografi kullanımı acil serviste güvenli ve hızlı hasta bakımına katkı sağlayabilmektedir. Bu bağlamda FOCUS'un yakın gelecekte daha geniş endikasyonlarla kullanımını söz konusu olabilir.

**Anahtar Kelimeler:** Kardiyak ultrasonografi, acil tıp, FOCUS

**Geliş Tarihi:** 09.07.2012 **Kabul Tarihi:** 10.08.2012

## Address for Correspondence/Yazışma Adresi:

Dr. Aslıhan Yürüktümen, Department of Emergency Medicine, Faculty of Medicine, Akdeniz University, 07059 Antalya, Turkey  
Phone: +90 533 227 49 88 E-mail: ayuruktumen@akdeniz.edu.tr

©Copyright 2013 by Emergency Physicians Association of Turkey - Available online at www.jaemcr.com

©Telif Hakkı 2013 Acil Tıp Uzmanları Derneği - Makale metnine www.jaemcr.com web sayfasından ulaşılabilir.



## Introduction

In emergency departments (ED), bedside ultrasonography has been used for a long time, especially in trauma patients for diagnostic or therapeutic purposes. For certain indications, cardiac ultrasonography, with the name of Focused Cardiac Ultrasound (FOCUS), a method with a clearly defined role in ED, is frequently used by cardiologists and emergency physicians and increases safety and speed in service delivery (1).

## Case Reports

### Case 1

A 72 year old man with congestive heart failure, coronary artery disease, atrial fibrillation and benign prostate hypertrophy (BPH) presented to the ED with the chief complaint of dyspnoea. In his last hospitalisation due to BPH and post-renal acute renal failure, echocardiography (ECG) was applied. In this ECG, mitral valve failure (3°), tricuspid valve failure (3°), moderate pulmonary hypertension (HT), a left ventricular ejection fraction of 35-40% and a right ventricular ejection fraction of 30-35% was determined. After discharge from previous hospitalisation, the patient had stopped taking medications used to treat his chronic illness and was taking only antibiotics. In the initial examination, he had a blood pressure of 150/100 mmHg, a respiration rate of 18 breaths per minute, and a pulse rate of 76 beats per minute (with dysrhythmia). His oxygen saturation was 85% on room air. Decreased breath sounds at the lower part of the lungs and bilateral pre-tibial oedema were inspected. D-dimer was >788 µg/L and the rest of the laboratory results were within the normal limits. The electrocardiography showed atrial fibrillation. In the chest x-ray, cardiomegaly, pulmonary congestion and left pleural effusion were inspected. After the therapy for pulmonary oedema was initiated, his symptoms recovered. The bedside cardiac ultrasonography applied by the emergency physician indicated global hypokinesia in the apical four chamber view and a right atrial thrombus which did not exist in the previous examina-

tion one month ago (Figure 1). Computed tomographic pulmonary angiography (CTPA) was planned; a filling defect associated with the right atrium thrombus, a right pleural effusion and a mosaic pattern in lung parenchyma was detected. The patient, who had no sign of pulmonary embolism, was hospitalised for advanced assessment and therapy.

### Case 2

A 55 year old patient with soft tissue sarcoma who had his last chemotherapy session three days previously presented at the ED with a four to five hour weakness in his left arm and leg. The patient, who had a tendency to sleep, had left hemiparesis (strength was 2/5) and a Babinski sign was present on the left side. A pulse was not palpable in the right upper extremity. His blood pressure was 100/60 mmHg and he had a pulse rate of 88 beats/min, respiration rate of 14 breaths/min and 97% oxygen saturation at room air; no significant pathology was detected in the laboratory examination. ECG showed sinus rhythm. In the head CT, no sign of ischaemia, mass or bleeding was detected. In the bedside cardiac ultrasonography, an optimal image was not displayed for the standard FOCUS views. However, in the subxiphoid window, a thrombus was inspected in the aorta (Figure 2). In the CTPA, the right subclavian artery was totally thrombosed. The arcus aorta was not clearly evaluated because of the artifact. Doppler imaging was planned: in the arterial system of the right upper extremity, a complete thrombosis at subacute-acute stage and signs of thrombosis in the intracranial section of right internal carotid artery were detected. In the consultations done by cardiologist, cardiovascular surgeons and neurologist, it was decided that the patient should be transferred to intensive care for medical treatment and peripheral vascular surgery.

## Discussion

Cardiac trauma, cardiac arrest, dyspnoea, chest pain and unexplained hypotension are the main clinical indications of FOCUS



Figure 1. A right atrial thrombus extending to the ventricle in apical four chamber imaging



Figure 2. Aortic thrombus in subxiphoid view

proposed in ED by the American Society of Echocardiography and American College of Emergency Physicians (1). The assessment of the presence of pericardial effusion, global systolic function, right ventricle enlargement and intravascular volume as well as its use in transvenous pace placement control and in guidance for pericardiosynthesis are declared as the aims of FOCUS (1-3). Many studies have revealed that the application of bedside ultrasonography in ED, considering these main aims, have been a determinant in physician opinions as well as the results of patients (4-7).

As described in the first patient, dyspnoea is a well known indication of FOCUS for the assessment of global systolic function and detection of pulmonary embolism or pericardial effusion (1). In this patient with congestive heart failure and chronic atrial fibrillation, who had quit his drugs in the last month, an atrial thrombus, which did not exist in the previous examination but had appeared in this ECG, affected the diagnosis and therapy. FOCUS, which in this patient was primarily planned to evaluate the global systolic function, determined right ventricle dilatation, right ventricle hypokinesia and tricuspid insufficiency (some of the major signs of pulmonary embolism), all of which had already existed in the recent formal ECG (3, 6). In this patient, in whom chronic pulmonary hypertension history is documented, the pulmonary oedema symptoms recovered during the monitoring and therapy (furosemid, nitroglycerin) at the ED. As another ECG sign of pulmonary embolism, a right atrial thrombus was detected by FOCUS and a multi-slice CTPA was then performed. In the CTPA, there was no sign of pulmonary embolism; however, the high-risk patient was hospitalised for the arrangement of his therapy.

In the second patient, who had a lateralising neurological deficit and in whom pulses were not palpable unilaterally, although not a routine indication, the diagnostic cardiac ultrasonography imaging contributed to diagnosis and therapy. In routine practice, when an aortic pathology is suspected, transeosophageal ECG is suggested for better specificity and sensitivity (8). However, in the bedside ultrasonography which was pre-evaluated rapidly in this case, an examination of the subxiphoid region was carried out, which is again not a routine practice, and an aortic thrombosis was imaged. The results of the evaluation in our patient, who did not bear the clinical evaluation indications of classical FOCUS, merits attention.

## Conclusion

The improving skills regarding FOCUS for the emergency physician underlie a serious role in the management of an important critical patient group. Further comprehensive studies may enable a wider range of indications for the use of FOCUS.

## Conflict of interest

No conflict of interest was declared by the authors.

## References

1. Labovitz AJ, Noble VE, Bierig M, Goldstein SA, Jones R, Kort S, et al. Focused Cardiac Ultrasound in the Emergent Setting: A Consensus Statement of the American Society of Echocardiography and American College of Emergency Physicians. *J Am Soc Echocardiogr* 2010; 23: 1225-30. [\[Crossref\]](#)
2. American College of Emergency Physicians. Emergency ultrasound guidelines 2008. Available at: <http://www.acep.org>. Accessed November 1, 2009.
3. Ciccone TJ, Grossman SA. Cardiac ultrasound. *Emerg Med Clin N Am* 2004; 22: 621-40. [\[Crossref\]](#)
4. Levitt MA, Jan BA. The effect of real time 2-D-echocardiography on medical decision-making in the emergency department. *J Emerg Med* 2002; 22: 229-33. [\[Crossref\]](#)
5. Kimura BJ, Bocchicchio M, Willis CL, Demaria AN. Screening cardiac ultrasonographic examination in patients with suspected cardiac disease in the emergency department. *Am Heart J* 2001; 142: 324-30. [\[Crossref\]](#)
6. Wang HK, Tsai MS, Chang JH, Wang TD, Chen WJ, Huang CH. Cardiac ultrasound helps for differentiating the causes of acute dyspnea with available B-type natriuretic peptide tests. *Am J Emerg Med* 2010; 28: 987-93. [\[Crossref\]](#)
7. Zengin S, Yildirim C, Al B, Genc S, Kilic H, Doğan M. The Effectiveness of Ultrasound in Patients with Non-Traumatic Cardiopulmonary Arrest. *JAEM* 2012; 11: 68-72. [\[Crossref\]](#)
8. ACCF/AHA/ACEP/ASNC/SCAI/SCCT/SCMR 2007 appropriateness criteria for transthoracic and transesophageal echocardiography: a report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria Working Group, American Society of Echocardiography, American College of Emergency Physicians, American Society of Nuclear Cardiology, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, and the Society for Cardiovascular Magnetic Resonance endorsed by the American College of Chest Physicians and the Society of Critical Care Medicine. *J Am Coll Cardiol* 2007; 50: 187-204.