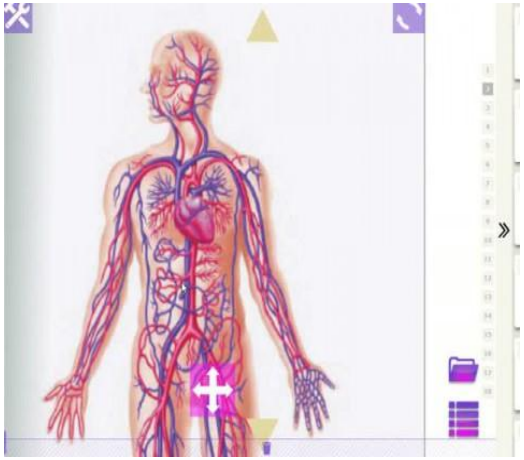
Şoklu Hastada Görüntüleme Yöntemleri

Uz. Dr. Akkan Avci

Şok=Hipoperfüzyon?

- Dolaşım sistemi kompleks bir vasküler ağdan oluşur.
- 60.000 mil uzunluğa sahip!!!
- 8.000 litre/gün dolaşan kan miktarı



- Sirkülatuvar sistemin bozulması

- Oksijen sunumunda azalma

- İlerleyici hücresel disfonksiyon

- Organ yetmezliği ve ölüm

Organ Fonksiyon Gereksinimi

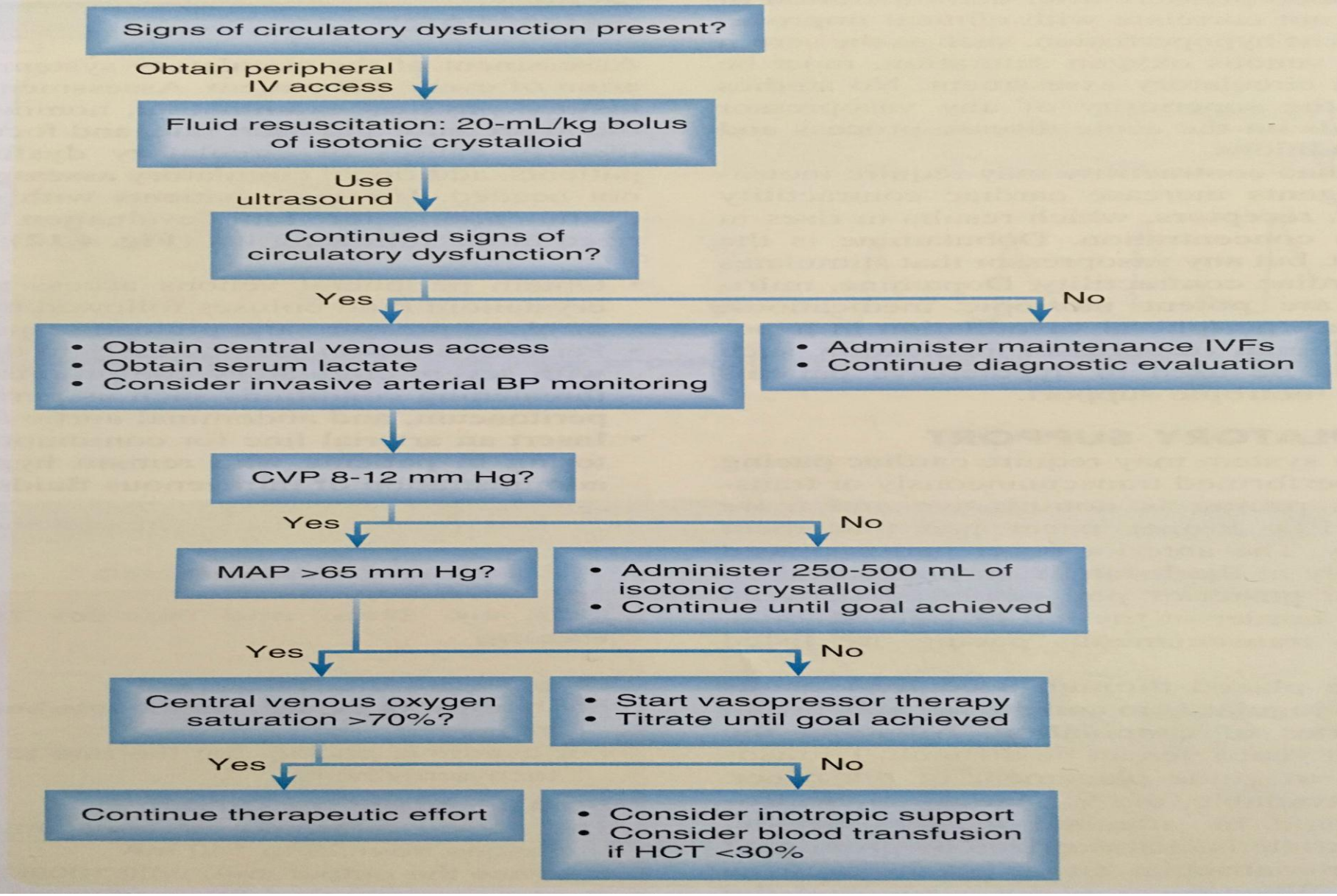
- Yeterli pefüzyon
  - Kardiyak output
    - Kalp hızı ve kontraktilite
    - Kardiyak dolum
    - Periferik direnç
- Yeterli oksijen sunumu
  - Hb konsantrasyonu
  - Oksijen saturasyonu

Hipovolemik	Kardiyojenik	Obstrüktif	Distrüptif
1. Kanamalar 2. Üçüncü alan kayıpları a.İleus b.Yanıklar c.Pankreatit	1. AMI 2. Kapak yetmezliği 3. Aritmiler	1. Massif PE 2. Tansiyon pnmx 3. Perikardiyal tamponad	1. Septik şok 2. Anaflaktik şok 3. Nörojenik şok

Hinshaw and Cox Classification of Circulatory Shock

- Hikaye
-
- Vital bulgular
- Fizik muayene

*Şok patofizyolojisini belirler mi???

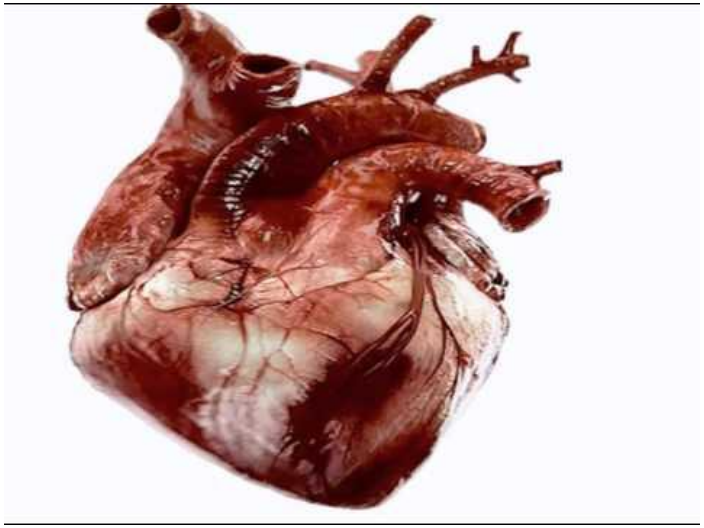


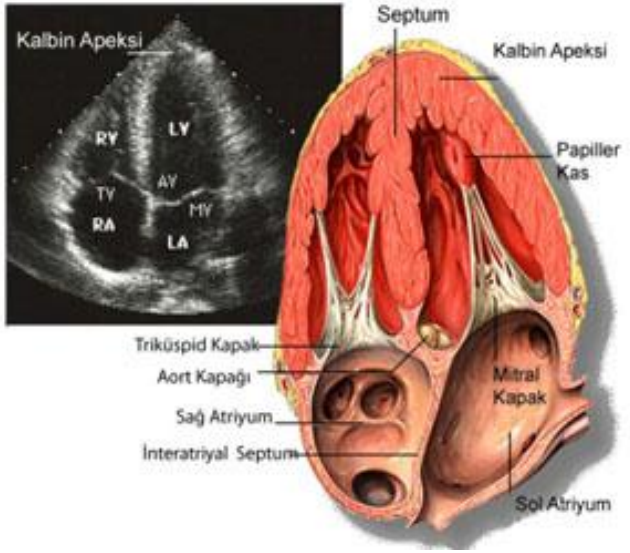
EMERGENCY MEDICINE CLINICAL ESSENTIALS 2th Edition-2013

Rapid Ultrasound in Shock (RUSH)

- Pompa
- Depo
- Damarlar

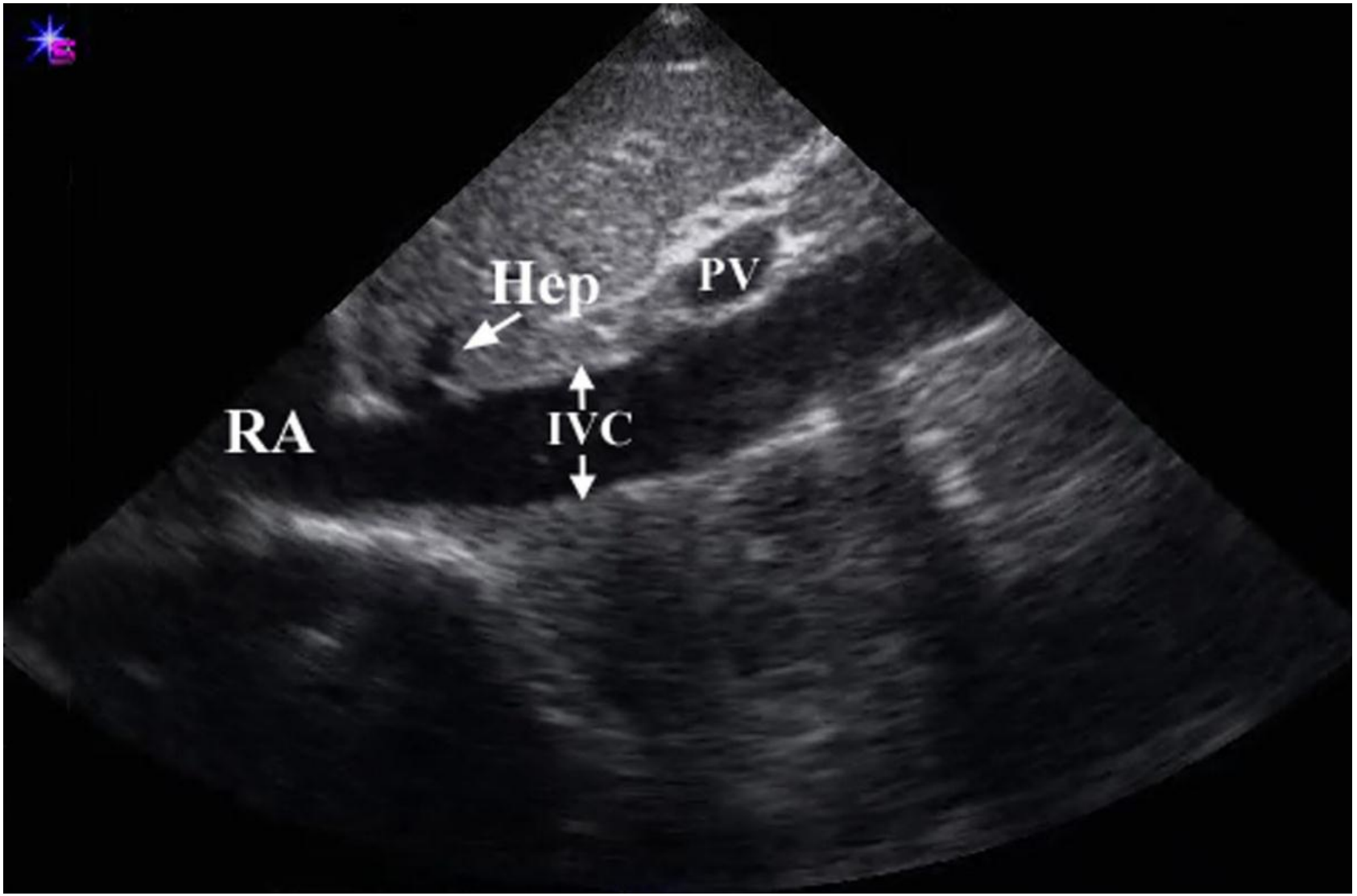
Pompa

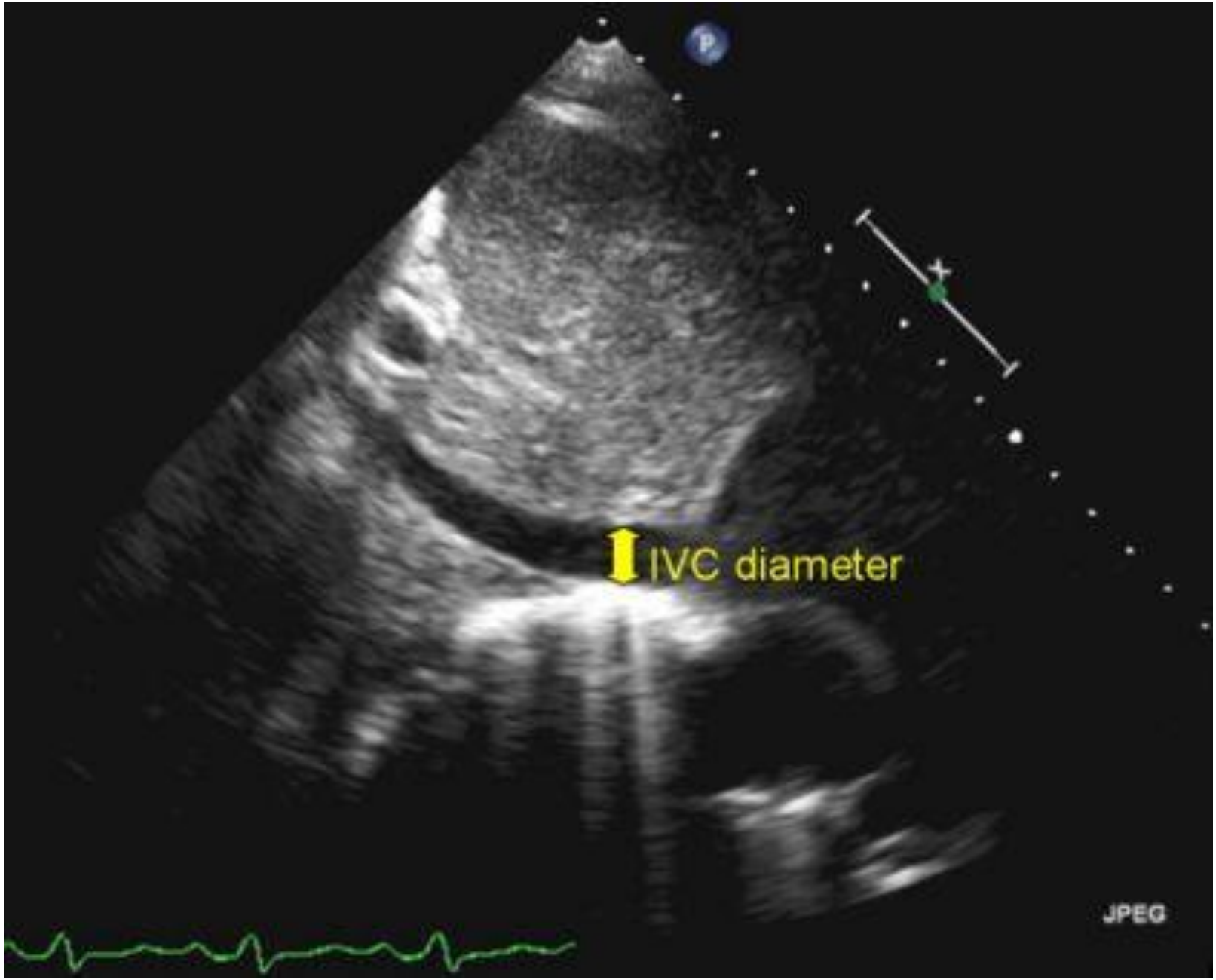



Kalbin Apeksi
RY
LY
AY
TY
MY
RA
LA
Septum
Kalbin Apeksi
Papiller Kas
Triküspid Kapak
Aort Kapağı
Sağ Atriyum
İnteratriyal Septum
Mitral Kapak
Sol Atriyum

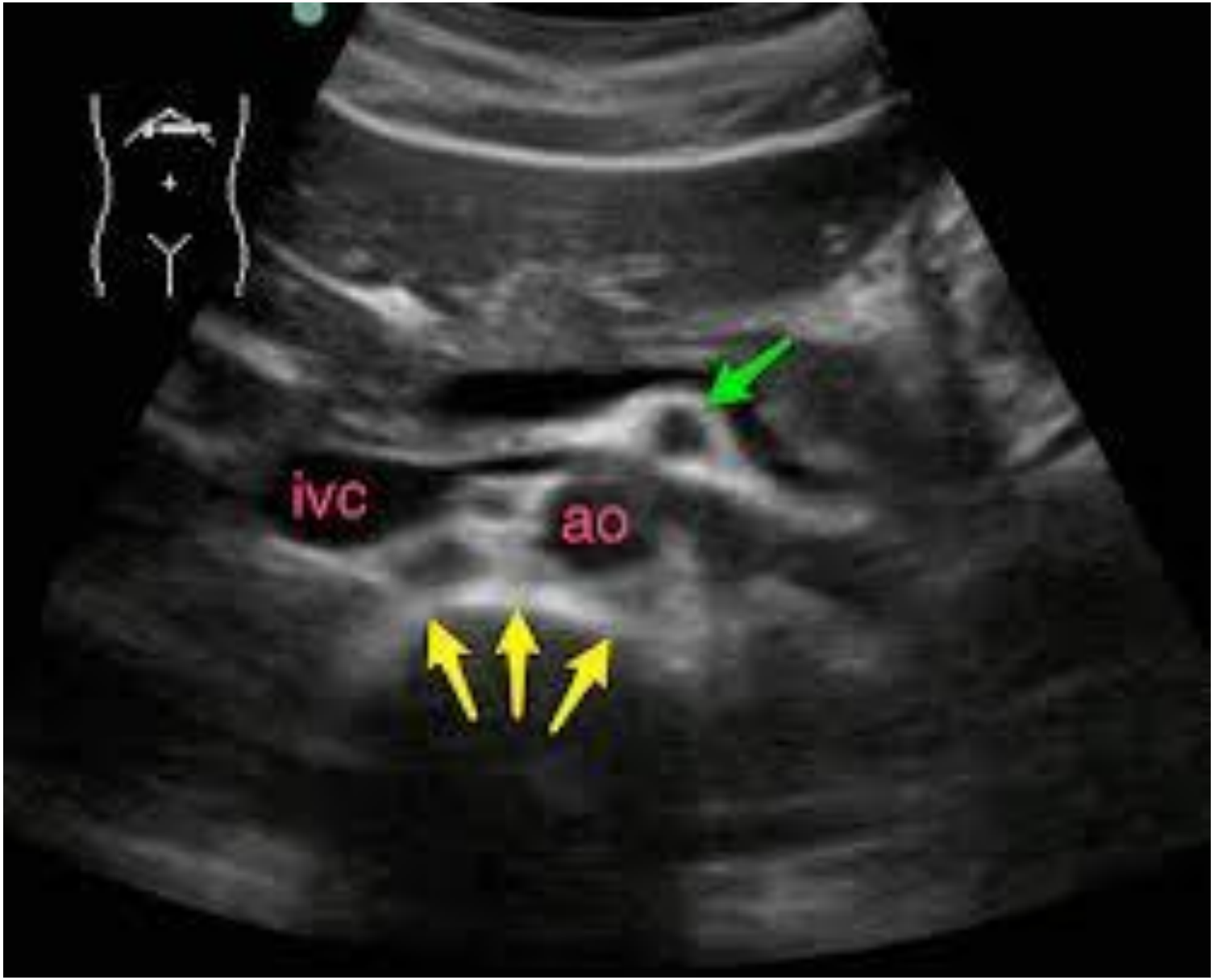

M
Per. Ef.

Depo



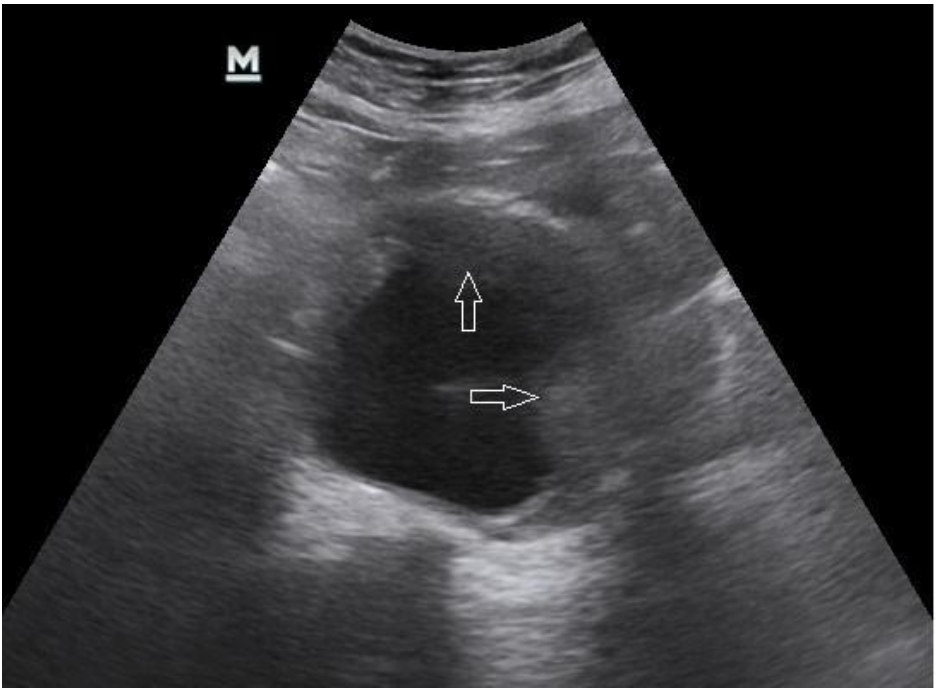

IVC diameter
JPEG

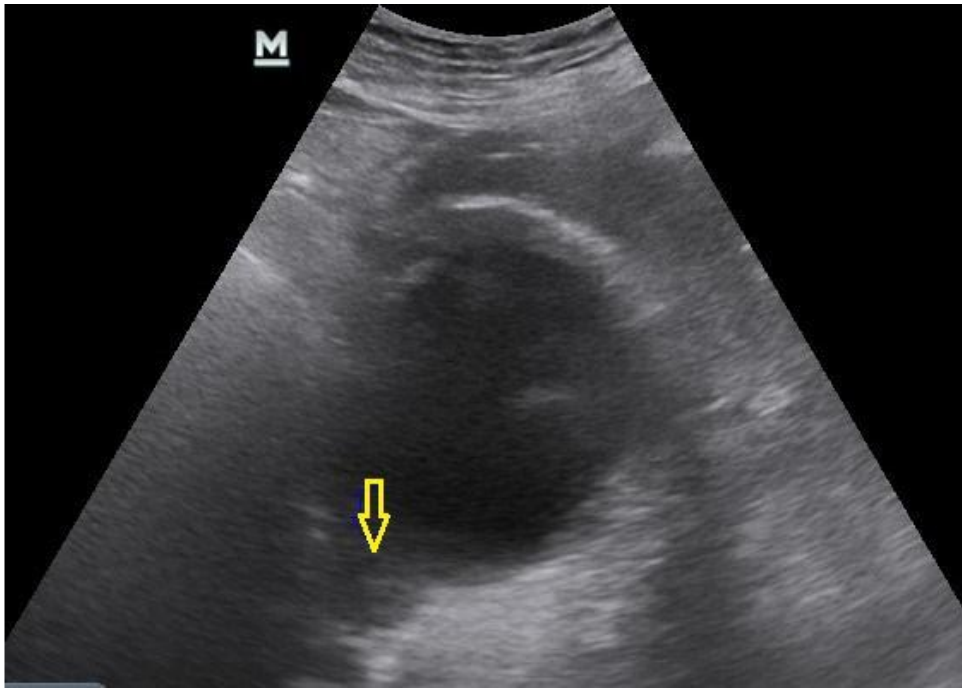
Büyük Damarlar


ivc
ao

61 yaşında erkek, TA:60/40, akut konfüzyon.


M
0
5
10
15

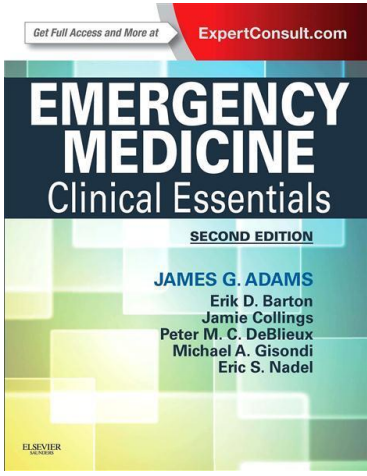




*RUSH	Hipovolemik Şok	Kardiyojenik Şok	Obstruktif Şok	Distrüptif Şok
Kalp	Hiperkontraktilite Azalmış ventriküler çap	Hipokontraktilite Dilate kalp	Hiperkontraktilite Perikardiyal effüzyon Kardiyak trombüs	Hiperkontraktilite (erken sepsis) Hipokontraktilite (geç sepsis)
IVC	Basık IVC, jügüler ven	Geniş IVC, jügüler ven Plevral sıvı Peritoneal sıvı	Geniş IVC, jügüler ven Pnömotoraks	Normal veya azalmış IVC çapı (erken sepsis) Plevral sıvı (sepsis kaynağı) Peritoneal sıvı (sepsis kaynağı)
Majör Damarlar	Abdominal anevrizma Aortik disseksiyon	Normal	Derin ven trombozu	Normal

*From Perera P, Mailhot T, Riley D, et al. The RUSH exam: Rapid Ultrasound in Shock in the evaluation of the critically ill. ***Emerg Med Clin North Am*** 2010;28:29-56.

IVC Çapı	İnspiryum Esnasında IVC Çapı	RA Basıncı (mm-Hg)
<1.5 cm	Total kollaps	0-5
1.5-2.5	> % 50 azalma	5-10
1.5-2.5	< % 50 azalma	10-15
>2.5 cm	< % 50 azalma	15-20
IVC ve hepatik ven dilatasyonu	Değişiklik yok	> 20



Travma-FAST/E-FAST

- İlk çalışma 1995 yılında Ma ve Mateer!
- 975 hasta
- Duyarlılık % 90
- Özgünlük % 99
- Etkinlik % 99

Travma-FAST/E-FAST

- Takip eden çalışmalarda, Duyarlılık % **79-100**, Özgünlük % **95.6-100**

Healey M, Simons RK, Winchell RJ, et al: A prospective evaluation of abdominal ultrasound in trauma: is it useful? J Trauma. 40:875-885 1996

Boulanger BR, McLellan BA, Brenneman FD, et al.: Emergent abdominal sonography as a screening test in a new diagnostic algorithm for blunt trauma. J Trauma. 40:867-874 1996

Rozycki GS, Ballard RB, Feliciano DV, et al.: Surgeon performed ultrasound for the assessment of truncal injuries: lessons learned from 1540 patients. Ann Surg. 228:557-567 1998

Lee BC, Ormsby EL, McGahan JP, et al.: The utility of sonography for the triage of blunt abdominal trauma to exploratory laparotomy. AJR Am J Roentgenol. 188:415-421 2007

Travma-FAST/E-FAST

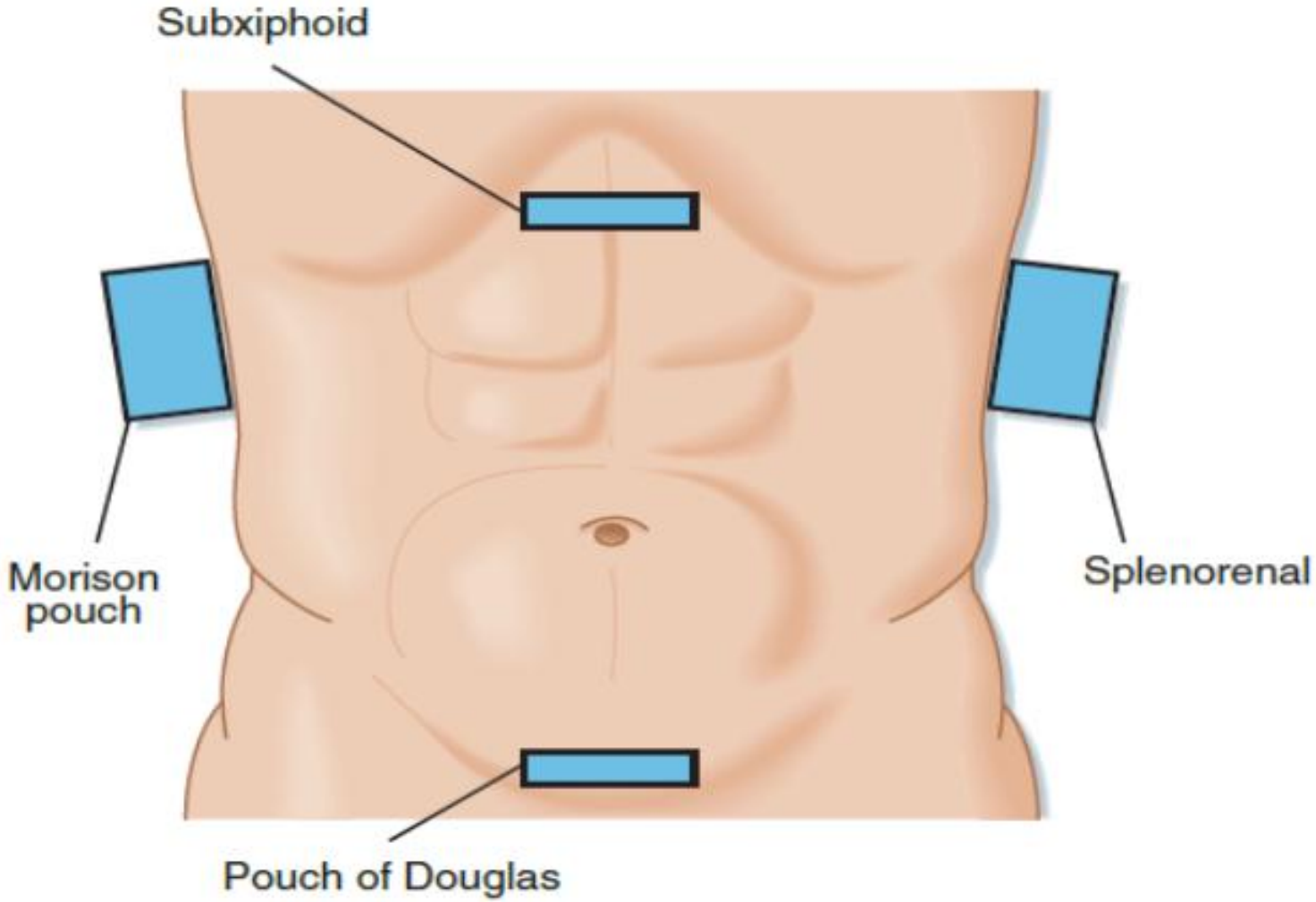
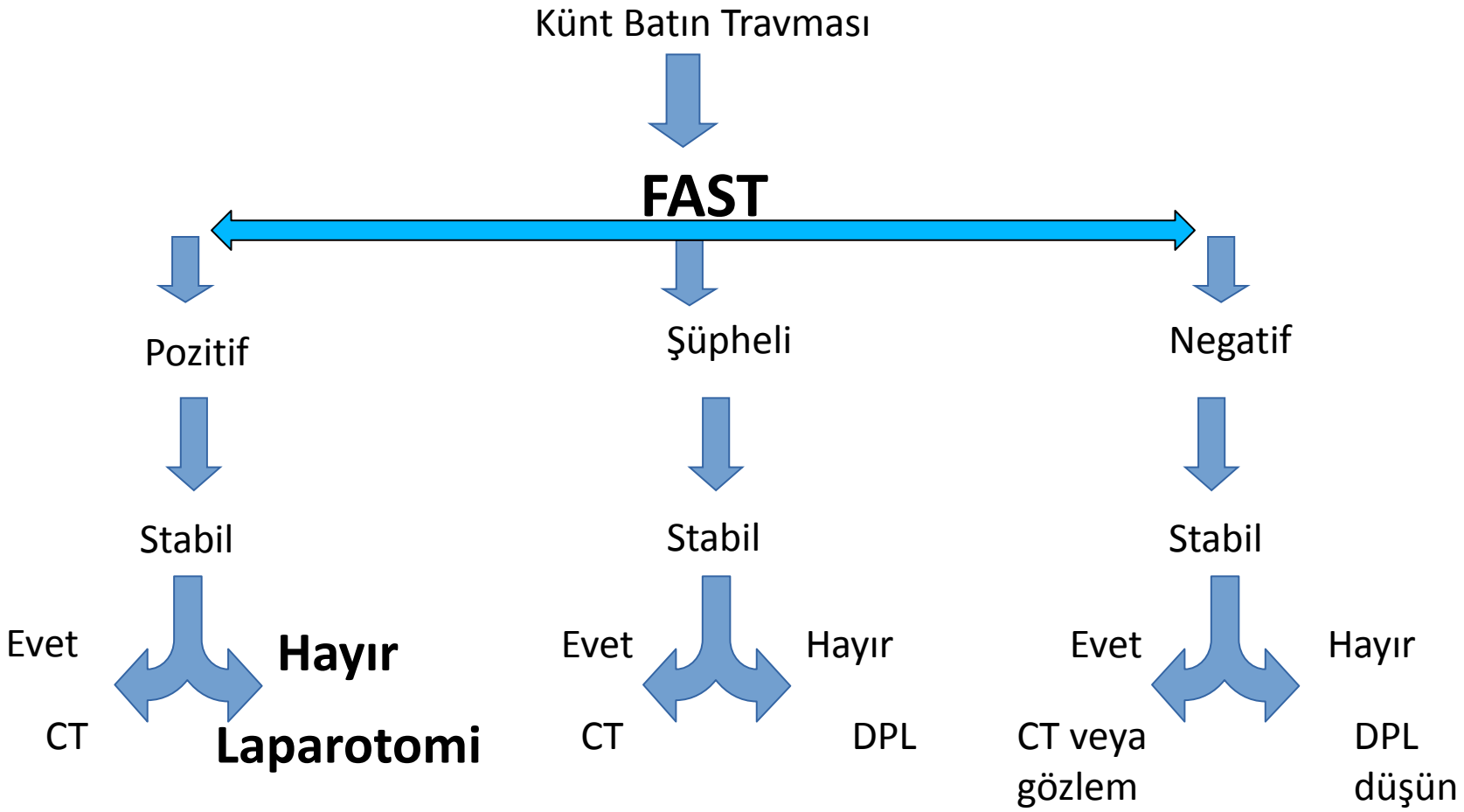


Fig. 79.3 Focused abdominal sonography for trauma: four views.



*1600 John F. Kennedy Blvd. Ste 1800 Philadelphia, PA 19103-2899
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Travma-FAST/E-FAST

- Genişletilmiş FAST
  - İntravasküler sıvı durumu için IVC değerlendirmesi
  - Pnömotoraks
  - Plevral sıvı
  - Batın içi solid organ değerlendirmesi

Travma-FAST/E-FAST

- Compared with CT, the sensitivities of e-FAST for intraabdominal injury and hemothorax were 54.5% and 71 %, respectively. The patients with hemothorax and intraabdominal injuries were not identified with e-FAST, didn't need for invasive intervention. Pneumothorax diagnosis was established in 27 patients with e-FAST (sensitivity 81.8%) from among 33 (30.8%) pneumothorax patients.
- e-FAST can be used with high sensitivity for determination of pneumothorax requiring invasive procedure. It has low sensitivity in the diagnosis of intraabdominal injury and hemothorax; however, e-FAST can predict the need for invasive procedures.

Impact of the practice of "Extended Focused Assessment with Sonography for Trauma" (e-FAST) on clinical decision in the emergency department. UZ İ, YÜRÜKTÜMEN A, BOYDAK B, BAYRAKTAROĞLU S, ÖZÇETE S, ÇEVRİM Ö, ERSEL Ö, KIYAN S. Turkish Journal of Trauma & Emergency Surgery 2013;19 (4):327-332

PURPOSE: Combined clinical examination and supine chest radiography have shown low accuracy in the assessment of pneumothorax in unstable patients with major chest trauma during the primary survey in the emergency room. The aim of our study was to evaluate the diagnostic accuracy of extended-focused assessment with sonography in trauma (e-FAST), in the diagnosis of pneumothorax, compared with the results of multidetector computed tomography (MDCT) and of invasive interventions (thoracostomy tube placement).

MATERIALS AND METHODS: This was a retrospective case series involving **368** consecutive unstable adult patients (273 men and 95 women; average age, 25 years; range, 16-68 years) admitted to our hospital's emergency department between January 2011 and December 2012 for major trauma (Injury Severity Score ≥ 15). We evaluated the accuracy of thoracic ultrasound in the detection of pneumothorax compared with the results of MDCT and invasive interventions (thoracostomy tube placement).

RESULTS: Among the 736 lung fields included in the study, 87 pneumothoraces were detected with thoracic CT scans (23.6%). e-FAST detected 67/87 and missed 20 pneumothoraces (17 mild, 3 moderate). **The diagnostic performance of ultrasound was: sensitivity 77% (74% in 2011 and 80% in 2012), specificity 99.8%, positive predictive value 98.5%, negative predictive value 97%, accuracy 97.2% (67 true positive; 668 true negative; 1 false positive; 20 false negative); 17 missed mild pneumothoraces were not immediately life-threatening (thickness less than 5 mm).**

CONCLUSIONS:

Thoracic ultrasound **(e-FAST) is a rapid and accurate first-line, bedside diagnostic modality for the diagnosis of pneumothorax in unstable patients with major chest trauma during the primary survey in the emergency room.**

- First-line sonographic diagnosis of pneumothorax in major trauma: accuracy of e-FAST and comparison with multidetector computed tomography. Ianniello S, Di Giacomo V, Sessa B, Miele V. Radiol Med. 2014 Sep;119(9):674-80.

BACKGROUND: In Africa, snakebite envenomations are frequently complicated by life-threatening hemorrhagic syndromes. The authors of the present study conducted a prospective analysis at the University Hospital of Parakou (north of Benin) for seven months (January 1 to July 31, 2014) to assess the contribution of ultrasonography to the diagnosis of internal bleedings and management of envenomation.

METHODS: An ultrasound examination was performed in all patients with clinical envenomation regardless of its severity. The study involved 32 patients admitted to the ICU of the University Hospital of Parakou.

RESULTS: The average age was 27 ± 13.9 years. The main signs of severity were: prolongation of clotting time (88 %), severe anemia (41 %), clinical hemorrhage (47 %), and shock (19 %). The ultrasound imaging showed internal hemorrhage in 18 patients (56 %). **There were hematomas (22 %), hemoperitoneum (13 %) or a combination of both (22 %).** The occurrence of internal bleeding and hemoperitoneum were mainly related to the delay of hospital presentation ($p = 0.007$) and the existence of external bleeding ($p = 0.04$). Thirty patients (94 %) received antivenom. Case fatality rate was 3.1 %.

CONCLUSION: **Ultrasonography may help in diagnosing internal bleeding, even in patients that did not show external hemorrhages, and evaluating its importance.** As a consequence, the management of snakebite victims may be significantly improved.

Tchaou BA, Savi De Tove KM, Sissinto-Savi De Tove Y and et al. Contribution of ultrasonography to the diagnosis of internal bleeding in snakebite envenomation. ***J Venom Anim Toxin Incl Trop Dis.* (2016) 22:13.

Crit Care 2016 May 14;20(1):145. doi: 10.1186/s13054-016-1327-0.

Speckle tracking echocardiography in patients with septic shock: a case control study (SPECKSS).

Ng PY, Sin WC, Ng AK, Chan WM

- **BACKGROUND:**
- Sepsis-induced myocardial dysfunction is a well-recognized condition and confers worse outcomes in septic patients. Echocardiographic assessment by conventional parameters such as left ventricular ejection fraction (LVEF) is often affected by ongoing changes in preload and afterload conditions. Novel echocardiographic technologies such as speckle tracking echocardiography (STE) have evolved for direct assessment of the myocardial function. We investigate the measurement of myocardial strain by speckle tracking echocardiography for the diagnosis of sepsis-induced myocardial dysfunction.
- **METHODS:**
- This is a case-control study at a university-affiliated medical intensive care unit. Consecutive adult medical patients admitted with a diagnosis of septic shock were included. Patients with other causes of myocardial dysfunction were excluded. They were compared to age-matched, gender-matched, and cardiovascular risk-factor-matched controls, who were admitted to hospital for sepsis but did not develop septicshock. Transthoracic echocardiography was performed on all patients within 24 hours of diagnosis, and a reassessment echocardiogram was performed in the study group of patients upon recovery.

- **RESULTS:**
- Patients with septic shock (n = 33) (study group) and 29 matched patients with sepsis but no septic shock (control group) were recruited. The mean sequential organ failure assessment (SOFA) score for the study and control groups were 10.2 and 1.6, respectively (P < 0.001). In patients with septic shock, the mean arterial pressure was lower (76 mmHg vs 82 mmHg, P = 0.032), and the heart rate was higher (99 bpm vs 86 bpm, P = 0.008). The cardiac output (5.9 L/min vs 5.5 L/min, P = 0.401) and systemic vascular resistance (1090 dynes•sec/cm(5) vs 1194 dynes•sec/cm(5), P = 0.303) were similar. The study group had a greater degree of myocardial dysfunction measured by global longitudinal strain (GLS) (-14.5 % vs -18.3 %, P <0.001), and the myocardial strain differed upon diagnosis and recovery (-14.5 % vs -16.0 %, P = 0.010). Conventional echocardiographic measurements such as LVEF (59 % in the study group vs 61 % in the control group, P = 0.169) did not differ between the two groups.
- **CONCLUSION:**
- Speckle tracking echocardiography can detect significant left ventricular impairment in patients with septic shock, which was not otherwise detectable by conventional echocardiography. The reversible nature of myocardial dysfunction in sepsis was also demonstrable. This echocardiographic technique is useful in the diagnosis and monitoring of sepsis-induced myocardial dysfunction.

Teşekkürler