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Brief Report

Stay and play eFAST or scoop and run eFAST? That is the question!☆

Pierre-Marie Brun, MD ^{a,c,*}, Jacques Besereau, MD ^b, Hichem Chenaitia, MD ^b, Anne-Lise Pradel, MD ^a, Cecile Deniel, MD ^a, Gilles Garbaye, MD ^a, Régis Melaine, MD ^a, Olivier Bylicki, MD ^a, Christophe Lablanche, MD ^a

^a Prehospital Emergency Medical Services of Marine Fire Battalion, Marseille, France

^b Department of Emergency Medicine and Intensive Care, Timone University Hospital, Marseille, France

^c Department of Emergency Medicine and Intensive Care, HIA Digne-les-Bains, Digne, France

Reporter: Intern 鄭琬蓉

Supervisor: Dr. 朱健銘

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Preface

- ▶ The importance of the initial assessment in **trauma** patients /in a **prehospital setting**:
 - Therapeutic decisions
 - Patient outcomes

Preface

- ▶ The **nonspecific features** in pts with **altered mental status** and **delayed hemorrhage**

Extended focused assessment sonography for trauma (eFAST)

- An easy, fast, reproducible, and noninvasive tool to check for **intrapertitoneal, pericardial, or pleural fluid**
- To **improve prehospital exam performance** and to **reduce the incidence of injuries** identified late in the workup

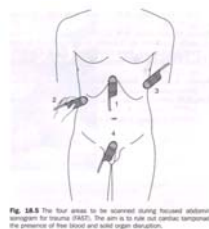
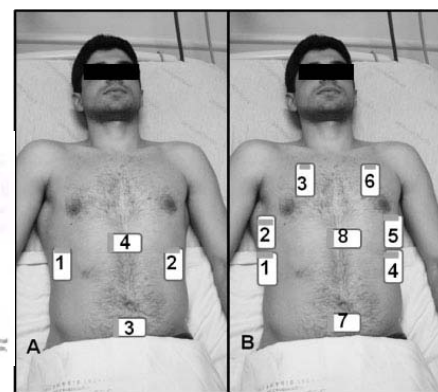


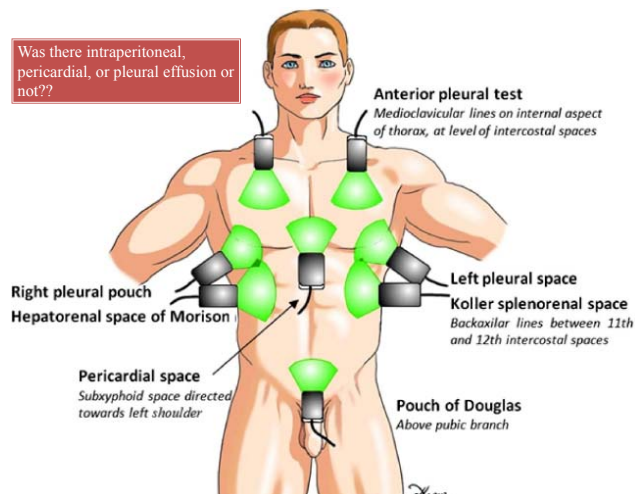
Fig. 18.9 The four areas to be scanned during focused abdominal sonography for trauma (FAST). The aim is to rule out peritoneal, pleural, or cardiac fluid.



FAST - Focused Assessment with Sonography for Trauma; EFAST - Extended Focused Assessment with Sonography for Trauma.

Figure 2- FAST (A) and EFAST (B) anatomical references.

Was there intraperitoneal, pericardial, or pleural effusion or not???



Preface

- ▶ Studies assessing eFAST efficiency: **rare** compared with those on FAST
- ▶ Walcher et al :
 - The **diagnostic efficiency** of **eFAST** in **prehospital settings** and those of an **in-hospital study** (Ma et al)
 - **Similar**
 - (sensitivity and specificity : 100% and 97.5% vs 90% and 99%)
- However, prehospital FAST studies, the exam performed **on-site** → **almost excluded**

Aim

- ▶ To compare the feasibility and the efficiency of an eFAST examination performed **on-site**, during the patient's **transfer**, or **repeatedly**.

Materials and methods

- ▶ From February 2010 to June 2012 on the 3 mobile resuscitation ambulances of the Marseille Battalion of Mariner Firefighters.
- ▶ 30 prehospital emergency physicians (2/3 eFAST qualifications >4 yrs ;performed ≥ 5 /Month)
→divided randomly into 3 groups:
 - Group 1 **on-site**
 - Group 2 **during patient transfer**
 - Group 3 **in both settings**

French Vittel criteria- Inclusion of patients in our study

Table 1
French Vittel criteria: severity criteria for triage of traumatized patients

French Vittel criteria	
Physiologic variables	Glasgow score <13 Systolic blood pressure <90 mm Hg O ₂ saturation <90%
Kinetic elements	Ejection from a vehicle Other passenger died in the same accident Fall >6 m =a fall of more than 3 floors Victim thrown away or run over Global assessment (vehicle deformation, estimated speed, no helmet, no seat belt)
Anatomical injuries	Blast Penetrating trauma of the head, neck, chest, abdomen, pelvis, arm, thigh Flail chest Severe burns, inhaled smoke Smashed pelvis Suspected spinal cord injury Amputation at the wrist, ankle, or above Acute limb ischemia
Prehospital resuscitation	Assisted ventilation Fluid resuscitation >1000 mL colloid Catecholamines Inflated antishock trousers

A single criterion
→defined as severe trauma

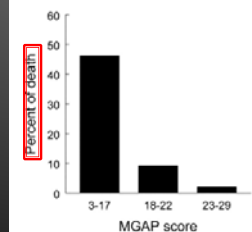
Exclusion & MGAP

Exclusion:

- Pts with an isolated distal limb trauma(below the elbow or the knee)
- Those who died before reaching hospital

Table 2
Mechanism, Glasgow Coma Scale, age and arterial pressure

MGAP score: multivariate analysis of prehospital predictors of in-hospital death		
	Odds ratio (95% CI)	Points of MGAP score
Glasgow Coma Scale	0.71 (0.68-0.74)	GCS value
Systolic arterial blood pressure (mm Hg)		
>120	1	+5
60-120	2.7 (2.0-3.6)	+3
<60	5.4 (4.1-7.3)	0
Blunt trauma (vs penetrating)	0.24 (0.13-0.45)	+4
Age <60 y	0.21 (0.13-0.35)	+5



Results

Table 3
Population characteristics

Population characteristics	Group 1: on-site eFAST, n = 44	Group 2: transfer eFAST, n = 33	Group 3: on-site and transfer eFAST, n = 21
Age (y) (mean/median/SD)	34/28/17	39/35/29	37/35/11
Trauma mechanism			
Traffic incident	34	27	15
Fall >6 m	4	2	4
Aggression	6	0	3
Trauma type			
Blunt	41	27	21
Penetrating	3	3	1
MGAP score [5]			
Low risk	30	23	15
Medium risk	10	5	4
High risk	4	2	3

Results

Table 4
Feasibility, efficiency, and duration of the eFAST examinations performed on-site, during the transfer, or both.

	On-site eFAST, n = 44	Transfer eFAST, n = 33	On-site and transfer eFAST, n = 21
Feasibility	44/44 (100%)	31/33 (93.9%)	20/21 (95.2%)
eFAST efficiency	29/44 (65.9%)	18/33 (54.5%)	12/21 (57.1%)
eFAST +	20/29 (68.9%)	11/18 (61.1%)	6/12 (50%)
IE in %	95	96.7	100
eFAST duration min (mean/median/SD)	3.5/4/2.5	3.9/4/3	3.7/3/1.5
Global intervention duration min (mean/median/SD)	56/53/25-180	50/49/28-70	57/52/35-79
Duration mean ratio of eFAST/transfer	1/16	1/3	1/8
	-	1/3.6	1/3.5

Diagnostic performance

No significant difference

2 cases in group 3, the second examination carried out during transfer
→ new results with the appearance of **intraperitoneal effusion** and **pleural effusion**

Discussion

The value of ultrasonography in prehospital settings and during the transfer:

- ▶ In 1980s Massen and Mercat--

•early diagnosis •on-site resuscitation •orientation to a suitable center •more precise information for management •safety	•bulky devices •the vehicle movements •dorsal decubitus of the patient •the small space around the patient •the short time dedicated to the examination
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- ▶ In the late 1990s, the first studies assessing the role of ultrasonography (esp. **in air medical evacuation**)

Discussion

- ▶ In 1998, French intensive care physicians—
 - The contributive use of a **portable ultrasonography** device in a **helicopter**.
- ▶ Since 2002, The German Air Rescue Organization as well as several ground-based ambulance services--
 - including ultrasound into their field management algorithms
 - focusing on **the FAST exam and cardiac sono** for nontrauma patients in **prehospital**.
- ▶ In 2005, The Italian EMS system--
 - integrating ultrasound in **prehospital care**
 - 3 major clinical indications were evaluated: **cardiac arrest, chest trauma, and acute dyspnea**

Discussion

- ▶ In other countries-*The « scoop and run » strategy (Fast transfer and shorter length of on-site management)* : Slowed down the use of ultrasonography in out-of-hospital traumatized patients management algorithm.
- ▶ The **different** contribution of **on-flight ultrasonography** exams from one study to another:

Table 5
Feasibility and efficiency of ultrasonography examinations during air medical evacuations

	Examination type	No. of patients	Feasibility	Sen	Sp	VPP	DE
Price et al [11]	Fast	21	100%	NR	NR	NR	NR
Pelle et al [12,13]	Fast	84	NR	81%	NR	100%	96-95%
Mazur et al [14]	Fast	38	94%	NR	NR	NR	83%
Hegard et al [15]	Morison's Pouch-Pericard	100	90%	60%	91%	NR	NR
			94%	100%	100%	NR	NR
Melanson et al [16]	Fast	71	48%	NR	NR	NR	NR

Abbreviation: NR, not reported.

The main technical difficulties:

- ▶ Positional difficulty/ the dorsal decubitus position
- ▶ The limited space around obese patients
- ▶ Flight turbulence
- ▶ Patient agitation
- ▶ Strong lightning
- ▶ The lack of time to complete the exam due to short time flights or to unstable patients requiring on-flight therapeutics

Discussion

- ▶ **No** description of routine use of ultrasonography in **emergency ambulances**.
- ▶ In our study, the feasibility and efficiency of eFAST **on-site or during the transfer** : **Similar**
 - The **maximal** diagnostic efficiency → 2 exams done
- ▶ Take into consideration :
 - **Operator-dependent** exam
 - **The time interval** between the 2 exams

Discussion

At the trauma center

- ▶ Hemodynamically **unstable** pts: **ultrasound**
- ▶ Hemodynamically **stable** pts: **scan** <30 mins of admission and following **echography**

The echographic threshold

- ▶ intraperitoneal fluid 250ml
- ▶ pleural fluid 100ml
- **No effusion below this threshold**

Discussion

- ▶ The duration of the exam : not too time consuming (1/3 of the transfer time)
→ **Bias**: the short transfer times due to many hospitals in Marseille
- ▶ Less experience physicians → no negative consequence in terms of diagnostic efficiency with the eFAST either on-site or during the transfer

Limitations

- ▶ A prospective observational single-center nonrandomized study with a small number of patients
- ▶ The only prognostic prehospital score: **MGAP** → **Low** (very few with penetrating trauma)
- ▶ To assess the efficiency:
eFAST vs the first exam in hospital
 - The stable pts (72%) → a whole-body CT scan,
 - The unstable pts → an eFAST performed by a radiologist and then a surgical procedure <assuming suitable>

Conclusion

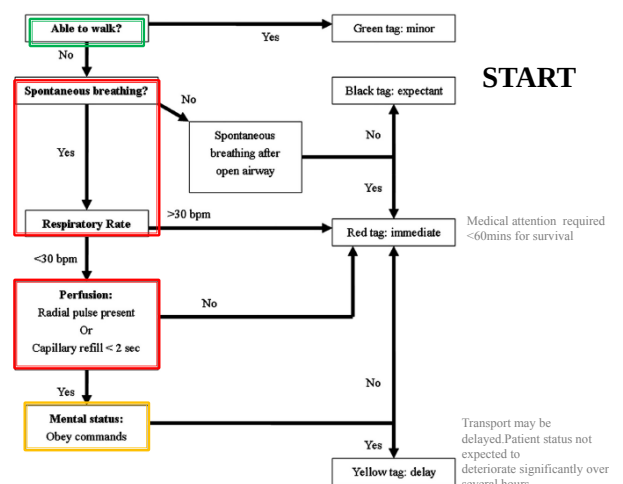
- ▶ Either on-site or during transfer, the eFAST examination can provide reliable and important information in the initial evaluation of trauma patients.
 - Its feasibility and efficiency are similar to that carried out in ICU, especially when it is repeated.
- ▶ 相較於以往的觀念(減少到院前現場處理及運送的時間),這篇研究顯示運用eFAST於事故現場及運送中做初步評估可以做更準確的診斷及後續處理

Streamlined focused assessment with sonography for mass casualty prehospital triage of blunt torso trauma patients

» Hai Hu, MD
Yarong He, MD
Shu Zhang, MD
Yu Cui, MD
Emergency Department, West China Hospital, Sichuan University
Chengdu 610041, PR China
The Chinese National Emergency Rescue Team member

Accurate triage

- ▶ Without prompt medical attention /proper emergency surgery → ↑mortality
- ▶ The Simple Triage and Rapid Treatment (START)
 - 1. Respiratory rate
 - 2. Perfusion (radial pulse and capillary refill time)
 - 3. Mental status (response to commands)
 - Categories: red (immediate), yellow (urgent), green (minor), and black
 - 3 minutes/patient
 - Accuracy : 81.6% to 84.2% for blunt torso trauma pts

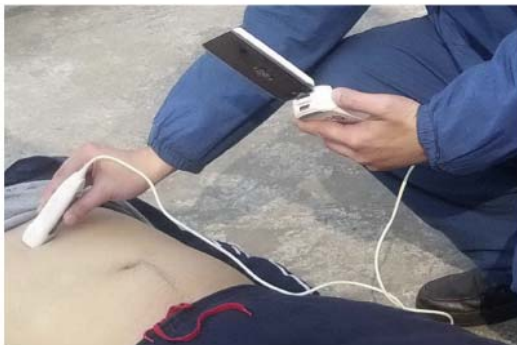


Other triages

- ▶ *The injury severity score (ISS)*
Complexity, unfeasible and unrealistic to be used on-site
- ▶ *The Focused Assessment with Sonography for Trauma (FAST)*
Theoretically 2-3 minutes , real-world practice takes longer (>5 minutes)

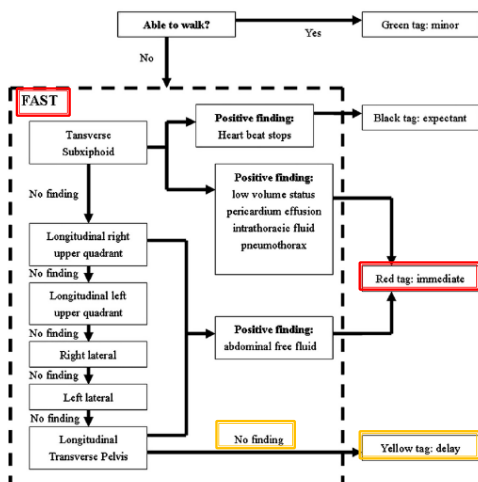
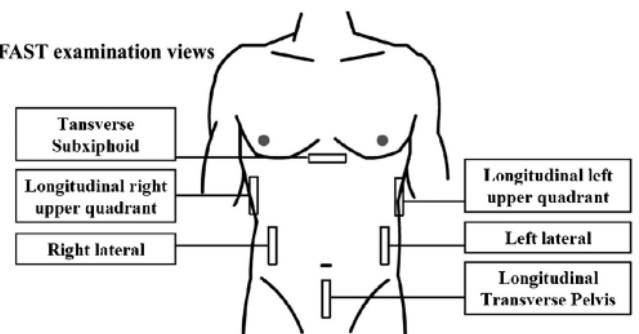
Streamlined FAST scan (SFAST)

- ▶ On April 20, 2013, 11826 people injured in the Richter 7.0 **Lushan earthquake**
- ▶ Aim: The utilization of **SFAST in the 24 hrs** after a natural disaster, with hopes of improving future triage processes
- ▶ Population:
 - Inclusion: **45** nonambulatory blunt torso trauma cases
 - Exclusion: Traumatic brain injury, ambulatory cases, **green tag pts**
- ▶ Methods: Each triaged by **both START and SFAST**
- ▶ Goal of SFAST: Differentiate between **red and yellow tags** of the START triage scenario



Handheld portable ultrasound equipment (GE Healthcare). This machine had 2 components: a 5-MHz phase array probe and a 3.5-inch clamshell screen, akin to a flip cellular phone.

FAST examination views



Results

- ▶ **45** patients
 - 10 thoracoabdominal injuries
 - 29 abdominal traumas
 - 9 chest trauma
- ▶ The male-to-female ratio 2:1 (30 :15)
- ▶ The mean pt age :43.5 ± 19.9 y/o
- ▶ **All 45 pts ultimately survived**
- ▶ **No pts assigned an expectant black tag**

Table 1
Triage tag assignment by START vs SFAST

		ISS		Required emergent surgery	
		Red by ISS	Yellow by ISS	Red by ISS	Yellow by ISS
START	Red by START	17	4	14	7
	Yellow by START	5	19	13	11
	Total	22	23	27	18
SFAST	Red by SFAST	20	2	16	6
	Yellow by SFAST	2	21	11	12
	Total	22	23	27	18

No patients in this study were assigned or met ISS criteria for black tag.

Median triage :
START :2.3 minutes (range 0.5-4.0)
SFAST :2.9 minutes (range 1.4-4.7) (P = .01)

SFAST:
Positive finding: 22 (48.9%)

Table 2
Statistical comparison of START and SFAST against benchmark standard ISS scale

	Accuracy rate (%)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
START	80.0	77.3	82.6	81.0	79.2
SFAST	91.1	90.9	91.3	90.9	91.3

The κ coefficient:
between START and ISS : 0.599 (P=.00)
between SFAST and ISS : 0.822 (P=.00)

Table 3
Statistical comparison of START and SFAST in determining whether patient needed emergent surgery

	Accuracy rate (%)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
START	55.6	51.9	61.1	66.7	45.8
SFAST	62.2	59.3	66.7	72.7	52.2

K coefficient of agreement : K值落在-1與1之間
當完全一致時，則K=1，當完全不一致時，則K=0

Discussion

FAST--the current international triage standard

- ▶ **Accuracy** in blunt torso trauma patients : 85%- 98%
- ▶ The Haiti earthquake: Portable ultrasound used to perform FAST in the field
- ▶ The Wenchuan earthquake: ultrasound for assessing abdominal injuries (sensitivity 91.9%, specificity 96.9%)
- ▶ Real-time performance of FAST :5-8 mins ⇔ **limits** its advantage over START

Limitations

- ▶ Ultrasound :highly **operator-dependent**
- ▶ **Low sensitivity** for identifying **traumatic brain injury** and **retroperitoneal injuries**
- ▶ The examiners making the **SFAST**, had access to vital information used for **the standard triage**, which might also **affect the judgment**

Conclusion

- ▶ SFAST (**2.9 mins**) greatly reduced standalone FAST elapsed triage time.
- ▶ Median triage SFAST time exceeded START(2.3mins), **the sensitivity and specificity** of SFAST markedly exceeded START.
- ▶ We recommend **the use of SFAST to decrease patient triage to treatment time** in any unfortunate future disasters.

**Thank you for your
listening~~~**

