急危重症医师“看得见的听诊器”

——床旁超声应用进展

张　茂

浙江大学医学院附属第二医院急诊医学科
浙江大学急救医学研究所

一、背　景

急危重患者需要一种快速有效的评估手段！

现场急救

急诊室

ICU

常用的评估手段各有优缺点！

超声检查在急危重患者评估中具有明显优势！

易于反复进行

无射线

无　创

简　单

快　速

准　确

适用范围广

危重病人超声检查的模式

1

3

1

2

临床医师应用超声快速评估急危重患者

- 快速、方便、直观——“看得见的听诊器”
- 评估内容全面——从头到脚
- 适用于迫切需要回答的临床问题
- 可作为**ICU**危重患者日常评估的手段
- 国外的实践证实超声的价值
- 超声设备的进步提供了可能

美国索诺声公司提供的专业手提超声系列

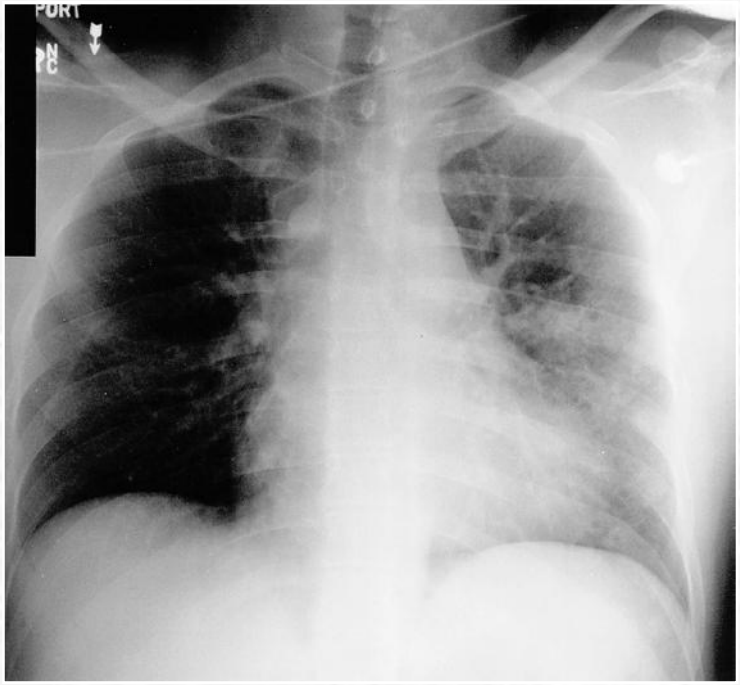
临床医师应用超声快速评估急危重患者

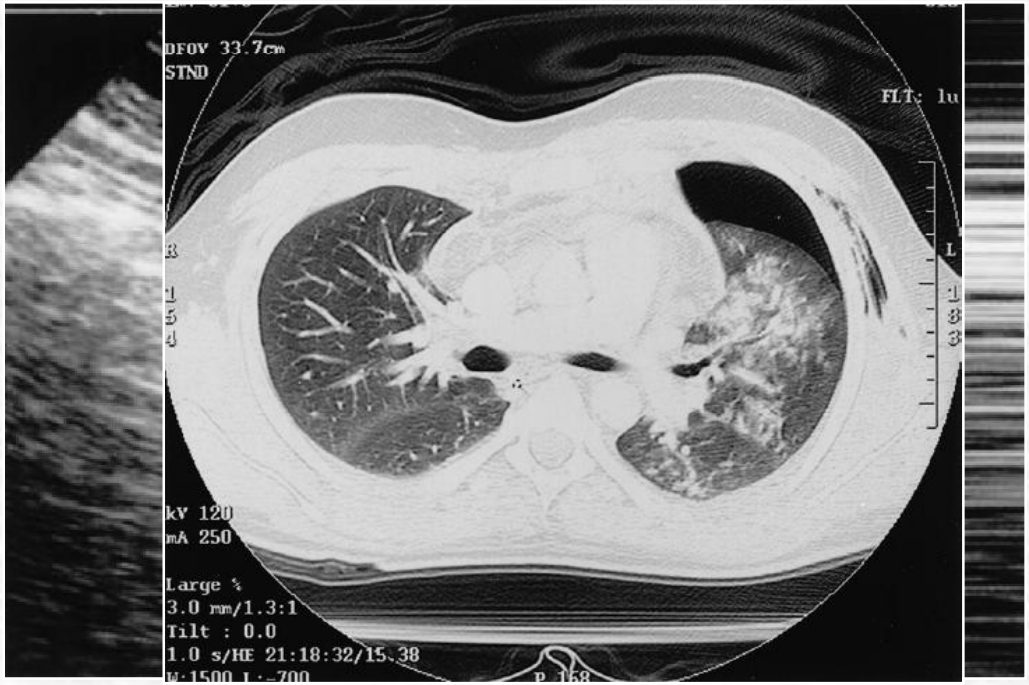
床旁超声在急危重患者中应用的范围

1. 呼吸系统相关问题的评估
2. 循环系统相关问题的评估
3. 创伤的**FAST**评估
4. 血管相关问题的检查
5. 腹部情况的评估
6. 引导各种介入操作
7. 其它

二、呼吸系统相关问题的评估

在1例创伤患者中超声检测到X片未能发现的气胸

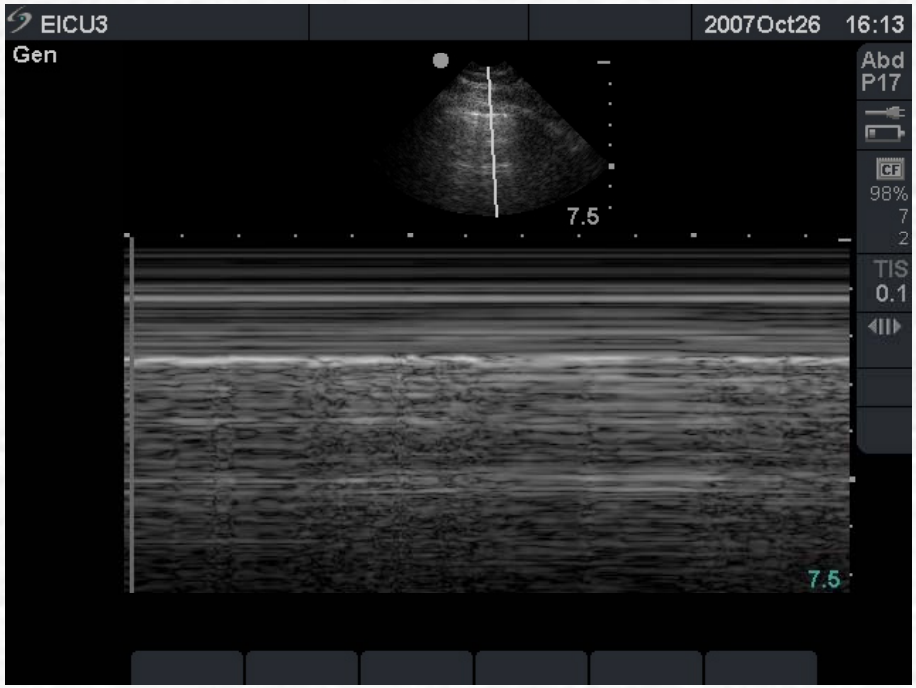




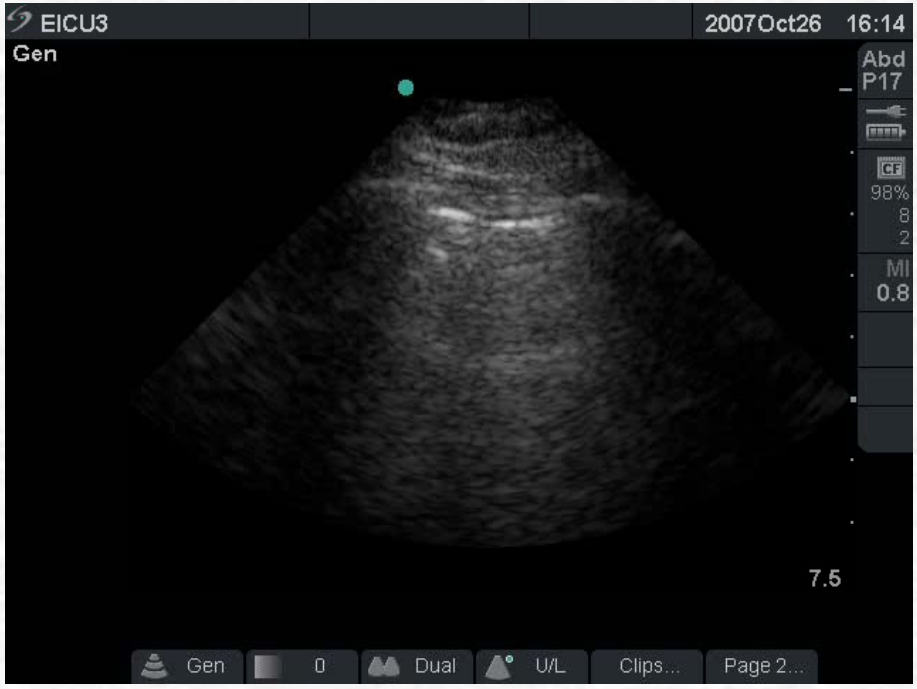
Kirkpatrick AW, et al. J Trauma , 2001, 50 (4): 750-752.

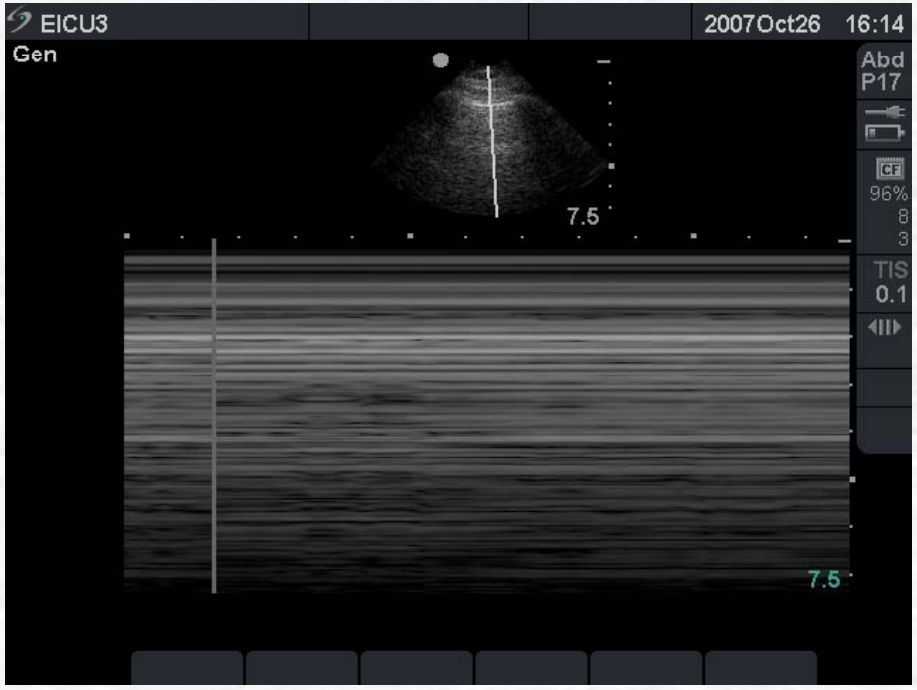
肺滑行消失


EICU3
2007Oct26 16:11
Gen
Abd
P17
CF
99%
6
1
MI
0.8
7.5
Gen
0
Dual
U/L
Clips...
Page 2...

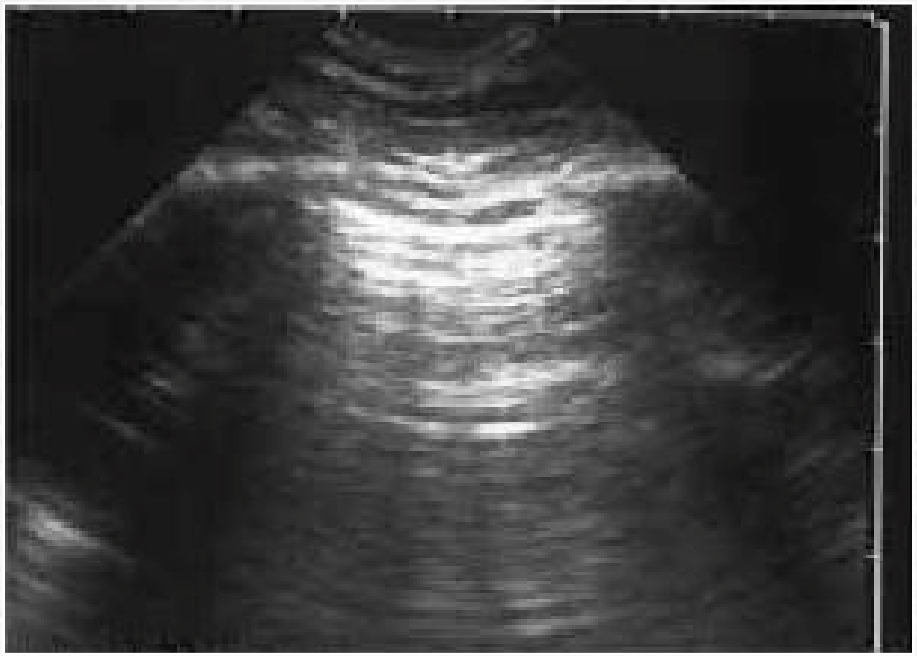

EICU3
2007Oct26 16:13
Gen
Abd
P17
CF
98%
7
2
TIS
0.1
7.5
7.5

肺滑行消失

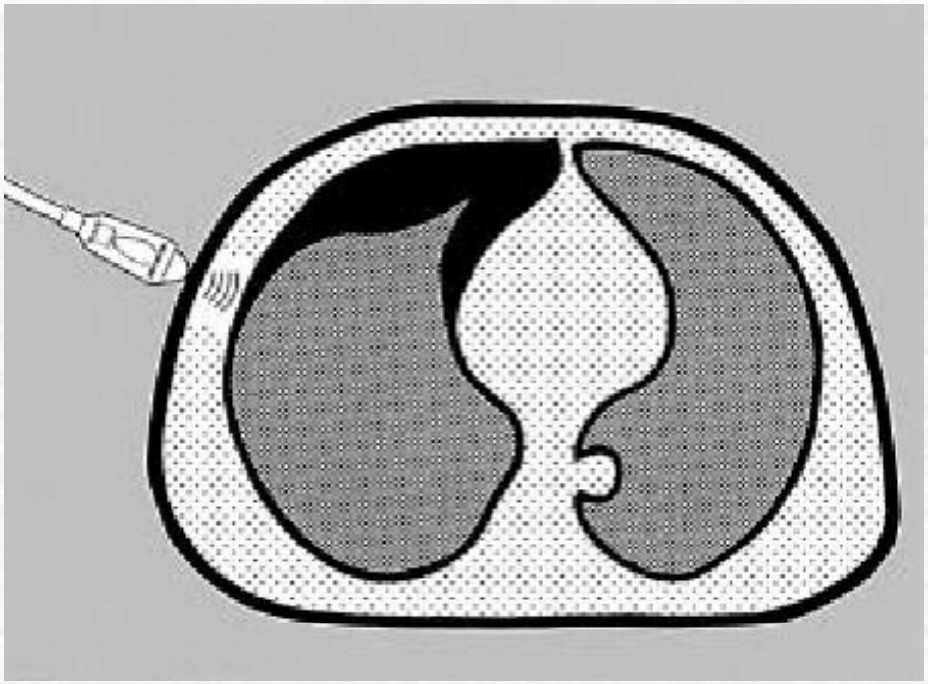

EICU3
2007Oct26 16:14
Gen
Abd
P17
98%
8
2
MI
0.8
7.5
Gen
0
Dual
U/L
Clips...
Page 2...


EICU3
2007Oct26 16:14
Gen
Abd
P17
7.5
96%
8
3
TIS
0.1
7.5

慧尾征消失



肺　点



Lichtenstein D, et al. Intensive Care Med, 2000, 26(10): 1434-1440

应用超声快速诊断多发伤患者的气胸

Research

Open Access

Rapid detection of pneumothorax by ultrasonography in patients with multiple trauma

Mao Zhang[1], Zhi-Hai Liu[1], Jian-Xin Yang[1], Jian-Xin Gan[1], Shao-Wen Xu[1], Xiang-Dong You[2] and Guan-Yu Jiang[1]

[1]Department of Emergency Medicine, Second Affiliated Hospital, Zhejiang University, School of Medicine and Research Institute of Emergency Medicine, Zhejiang University, Hangzhou, China
[2]Department of Ultrasound, Second Affiliated Hospital, Zhejiang University, School of Medicine, Hangzhou, China

Corresponding author: Shao-Wen Xu, zmhz@hotmail.com

Received: 28 Apr 2006 Revisions requested: 22 Jun 2006 Revisions received: 3 Jul 2006 Accepted: 1 Aug 2006 Published: 1 Aug 2006

Critical Care 2006, **10**:R112 (doi:10.1186/cc5004)
This article is online at: http://ccforum.com/content/10/4/R112

应用超声快速诊断多发伤患者的气胸

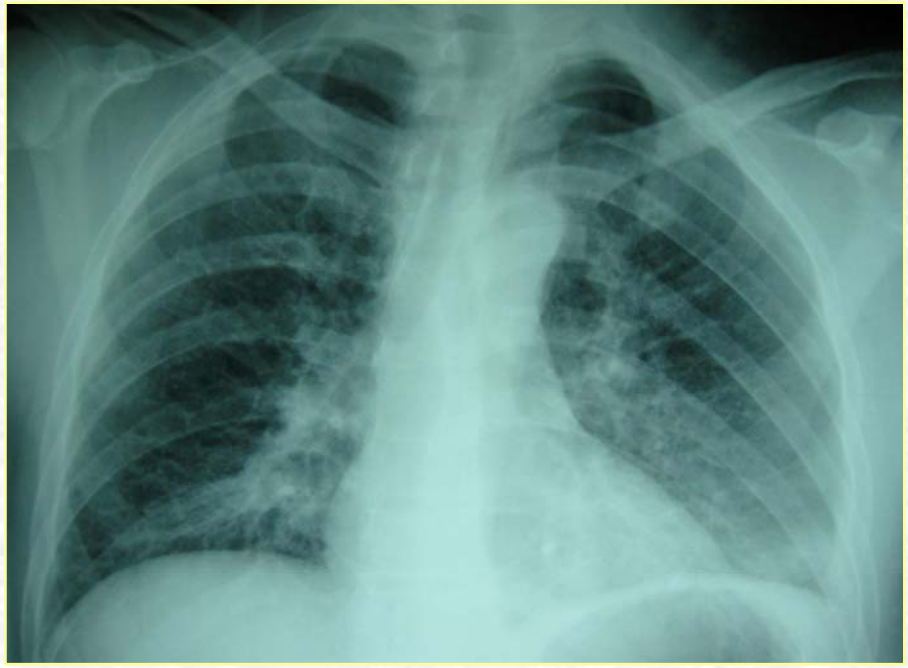
Table 1

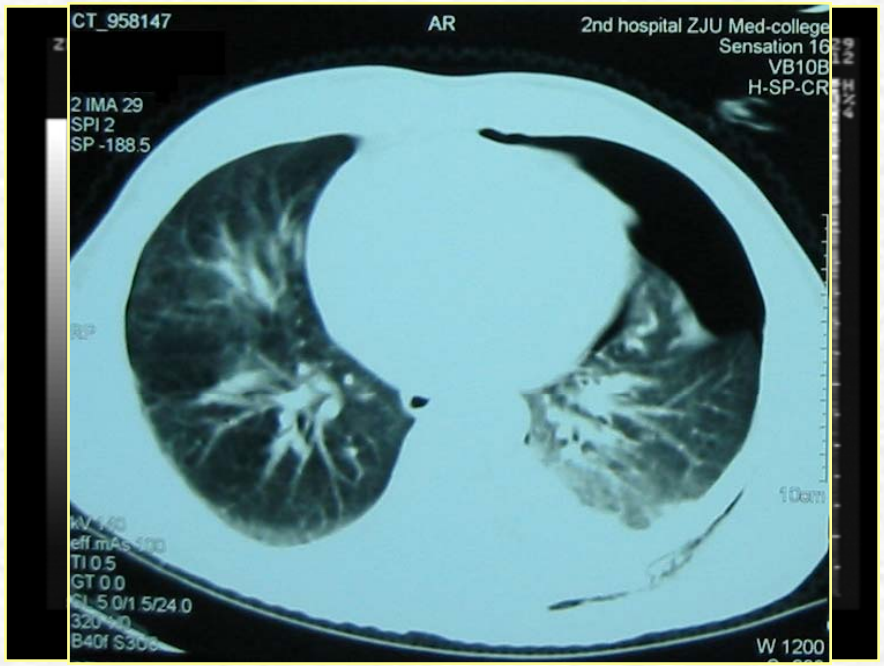
Efficacy for diagnosing pneumothorax in multiple trauma patients by clinician-performed ultrasonography and radiography

Parameters	Ultrasonography (%)		Radiography (%)		Comparison
	Value	95%CI	Value	95%CI	P
Sensitivity	86.2 (25/29)	73.7–98.8	27.6 (8/29)	11.3–43.9	<0.001
Specificity	97.2 (103/106)	94.0–100	100 (106/106)	100–100	0.246[a]
Positive predictive value	89.3 (25/28)	77.8–100	100 (8/8)	100–100	1.0[a]
Negative predictive value	96.3 (103/107)	92.7–99.9	83.5 (106/127)	77.0–89.9	0.002
False positive ratio	2.8 (3/106)	0–6.0	0 (0/106)	0–0	0.246[a]
False negative ratio	13.8 (4/29)	1.2–26.3	72.4 (21/29)	56.1–88.7	<0.001
Accuracy	94.8 (128/135)	91.1–98.6	84.4 (114/135)	78.3–90.6	0.005

[a]Fisher's exact test. CI, confidence interval.

应用超声快速诊断多发伤患者的气胸





CHEST

CHEST Original Research

Diagnosis of Pneumothorax by Radiography and Ultrasonography

A Meta-analysis

Wu Ding, MM; Yuehong Shen, MM; Jianxin Yang, MM; Xiaojun He, MM; and Mao Zhang, MD

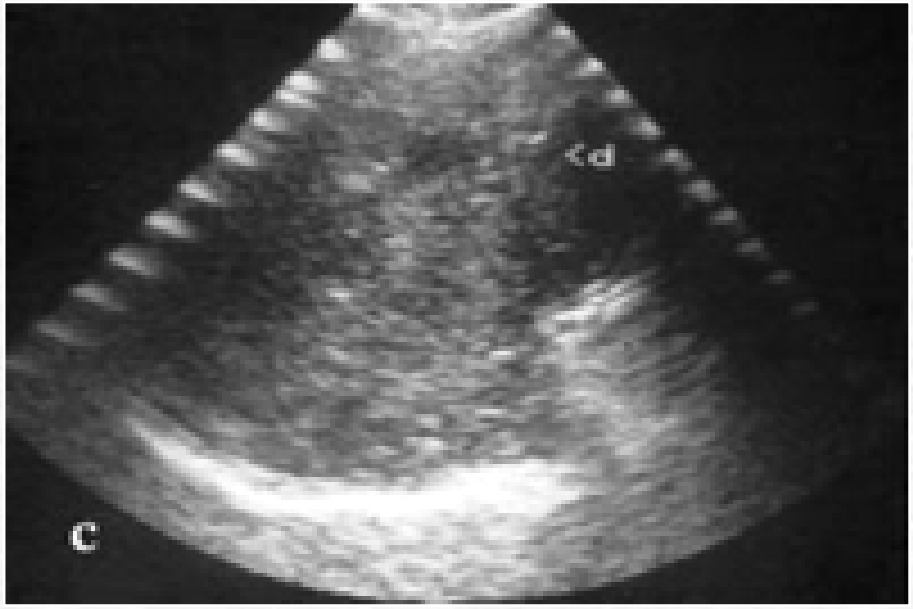
超声对胸腔积液的诊治价值

- 了解积液的性质
- 动态观察血胸/胸腔积液的变化
- 精确估算血胸/积液量，决定是否引流
- 引导胸腔穿刺
- 评估穿刺效果和并发症

胸腔积液的超声表现

无回声

均匀高回声



胸腔积液的超声表现

混合回声游离型

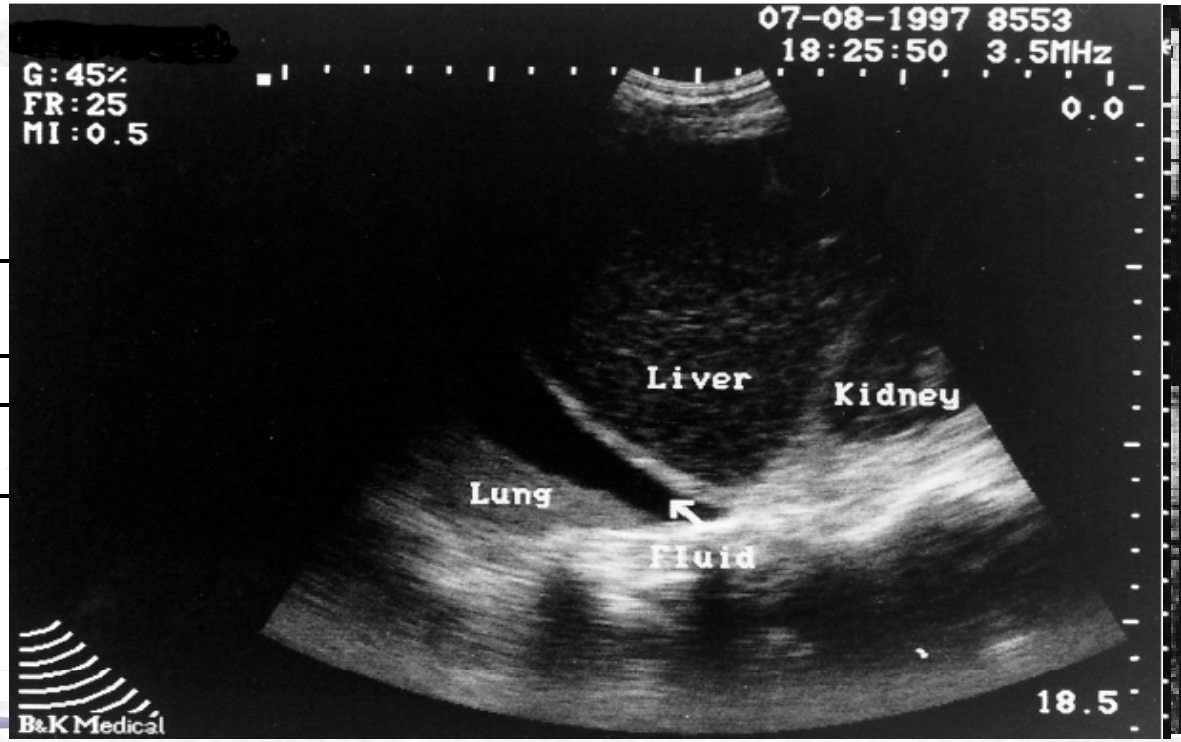
混合回声分隔型

ORIGINAL ARTICLE

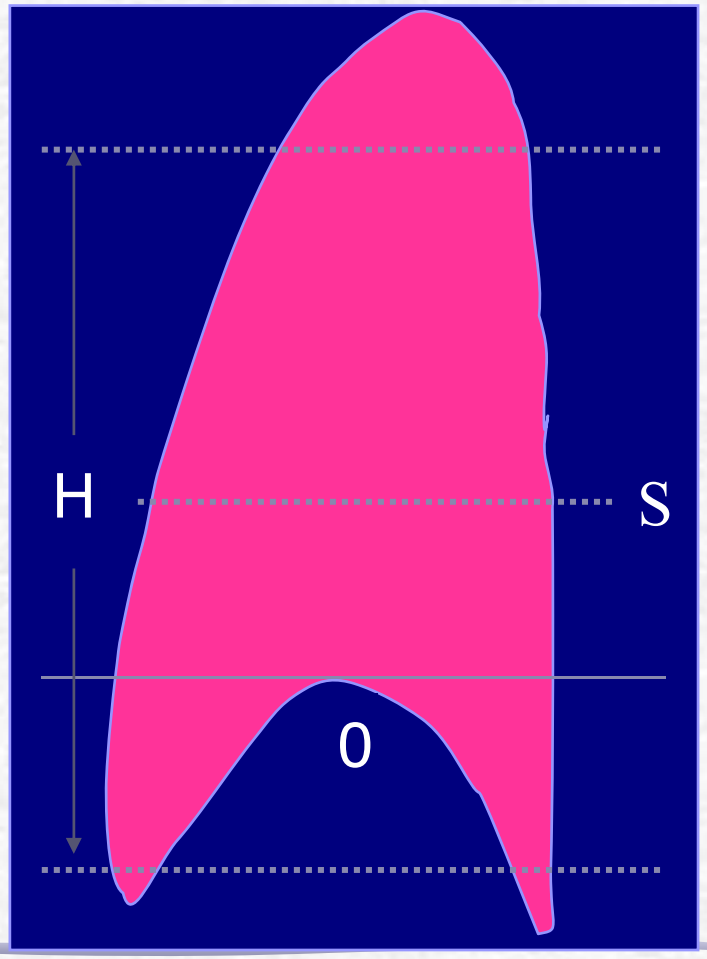
Emergency ultrasound in the acute assessment of haemothorax

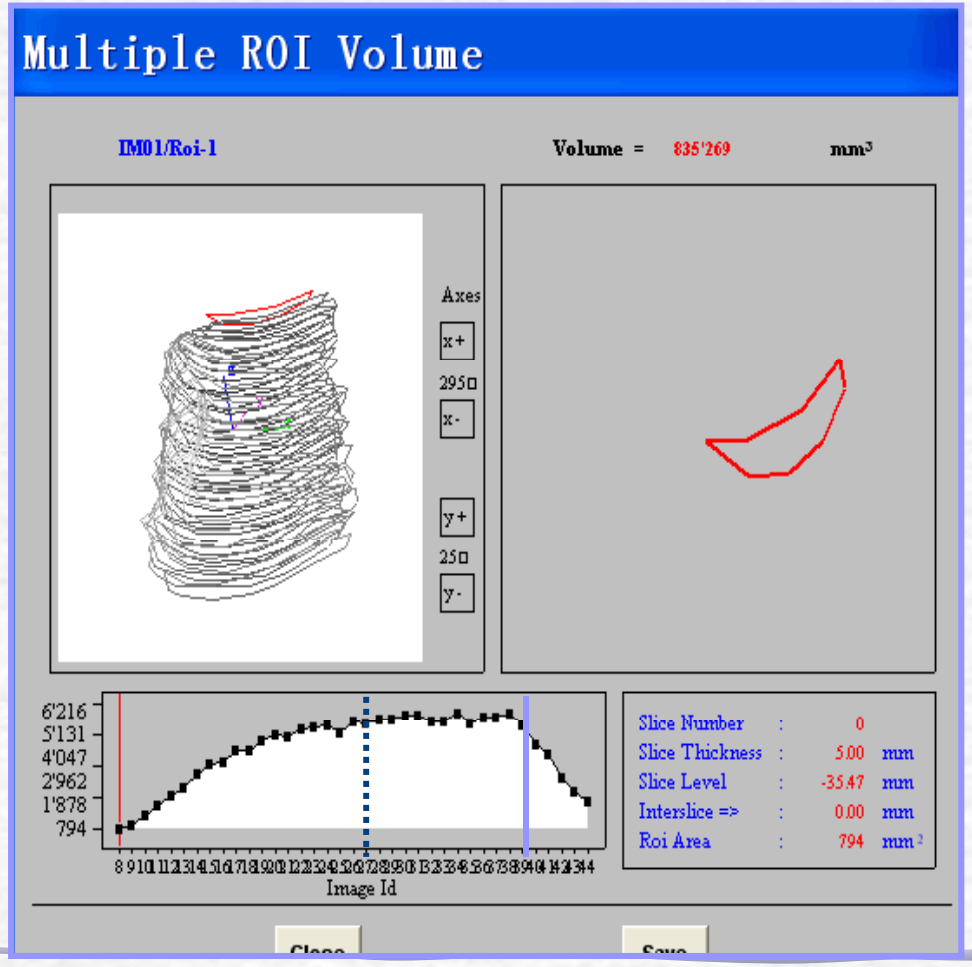
A Brooks, B Davies, M Smethhurst, J Connolly

Emerg Med J 2004;21:44–46

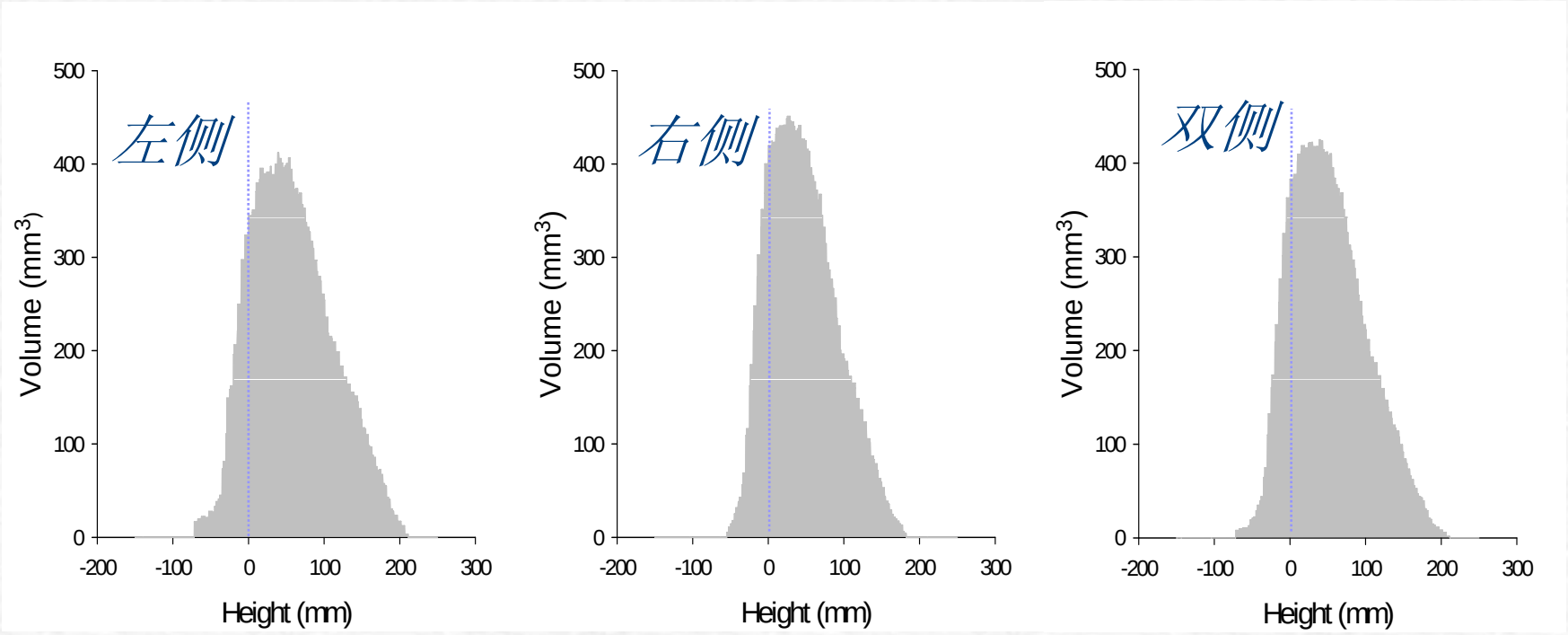


超声能对胸腔积液精确定量



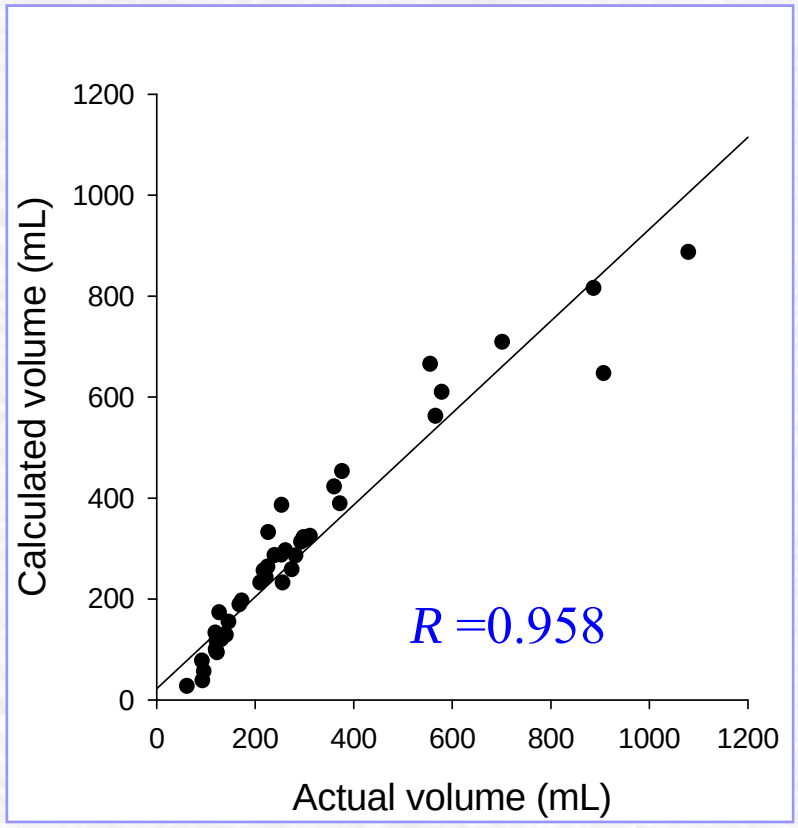


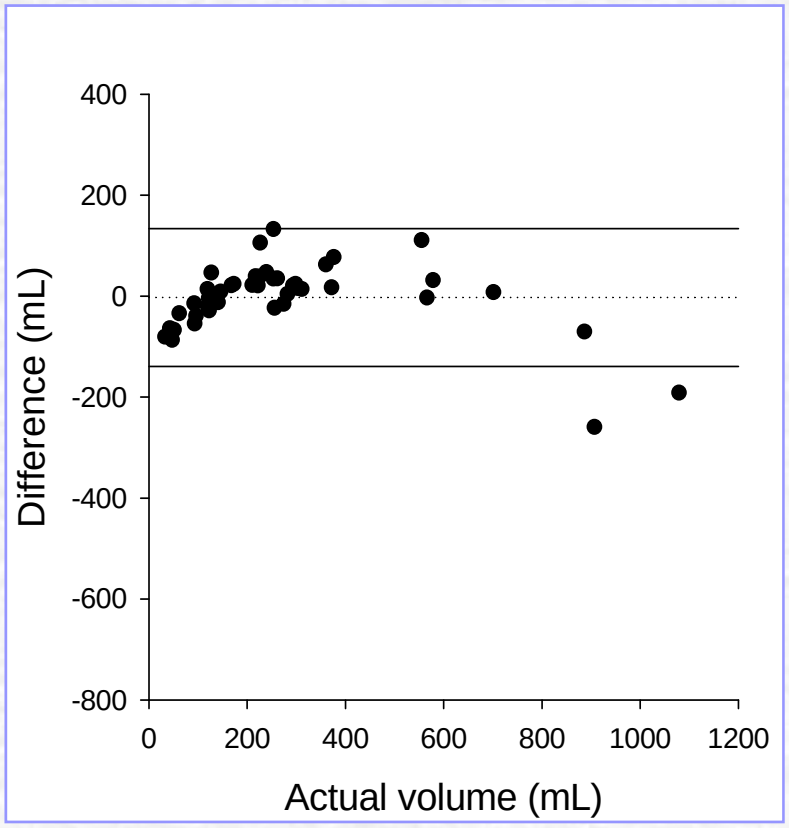
胸腔积液体积分布的形态特征



n=22　　n=23　　n=45

积液量与积液高度、中间积液层面积建立的回归方程





V=-262.1+13×S+18×H（R =0.958, P<0.001）

中国急救医学 2007年 10月第 27卷第 10期 Chin J Crit Care Med, Oct. 2007, Vol. 27, No. 10

论　　著

机械通气患者胸腔积液分布形态与精确定量的研究

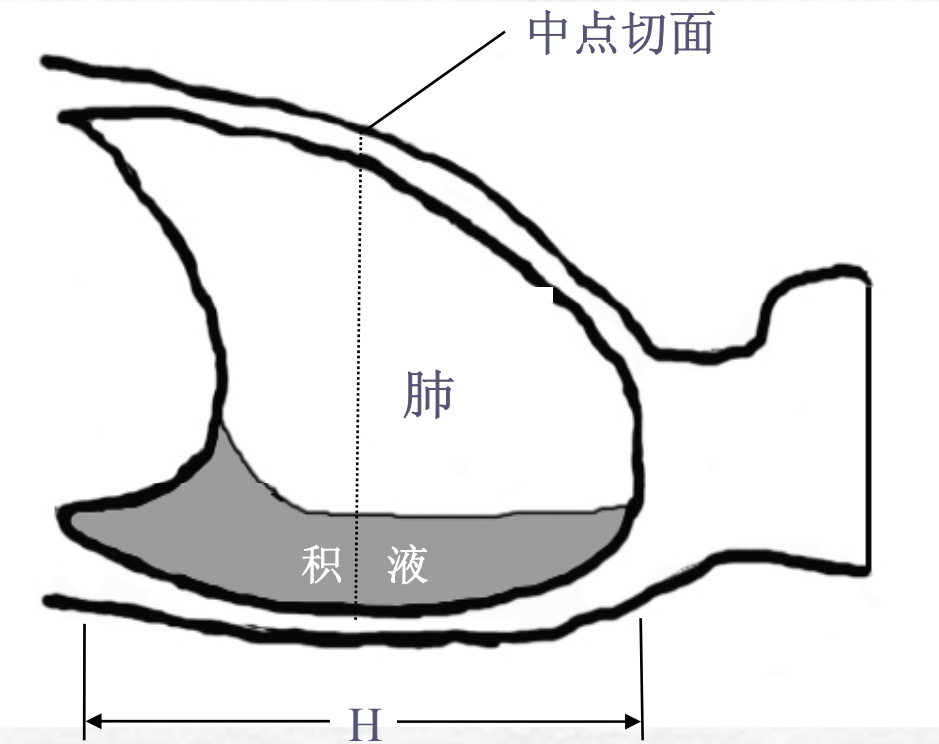
张　茂， 杨俭新， 刘志海， 干建新， 徐少文， 江观玉

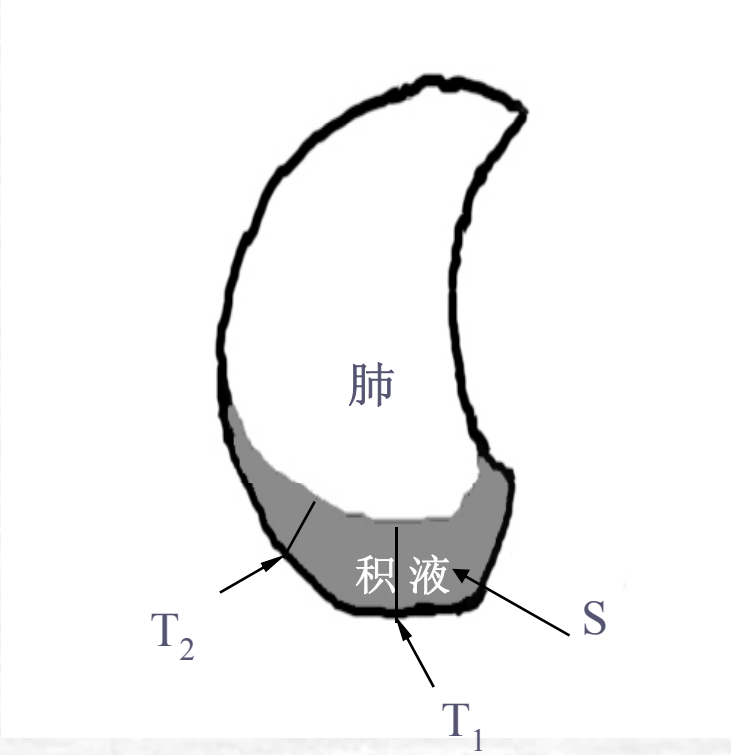
作者单位: 310009　杭州,浙江大学医学院附属第二医院急诊科 浙江大学急救医学研究所

作者简介:张　茂 (1974 -),男,博士研究生,副主任医师,从事急诊创伤与危重病的救治与研究工作。

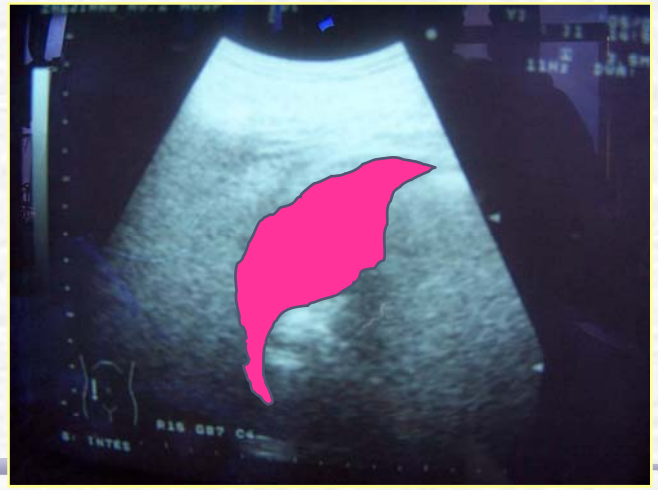
通讯作者:杨俭新, Tel: 0571 - 87783920, E - mail: zmhz@hotmail com。

胸腔积液超声精确定量示意图





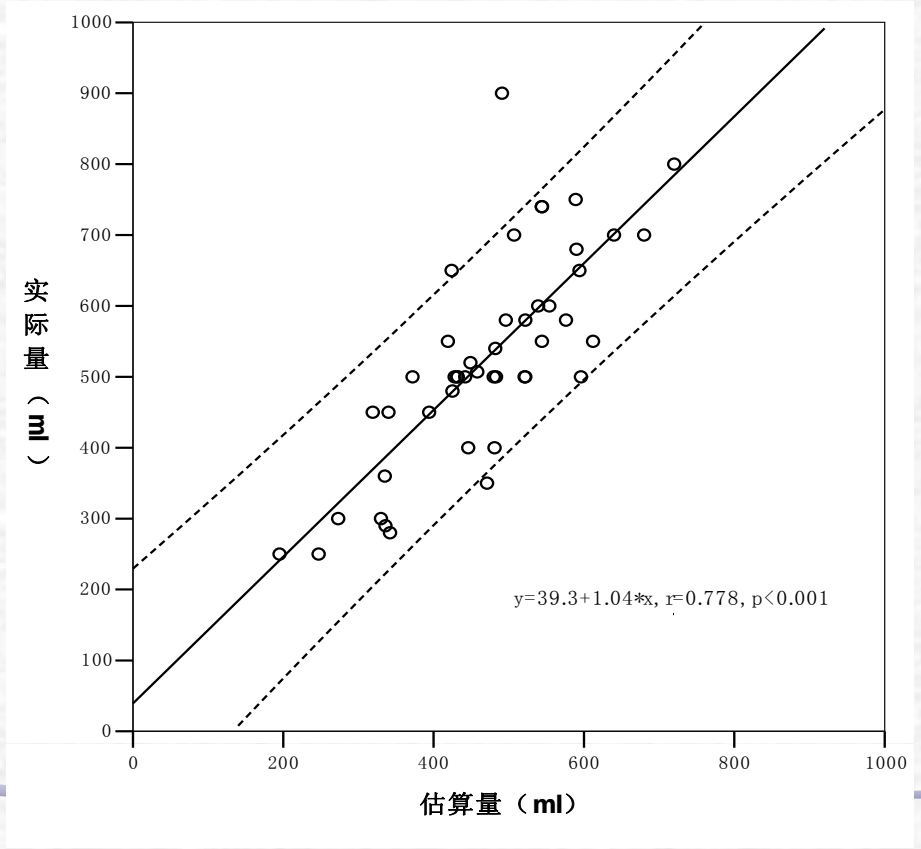
超声对胸腔积液的精确定量

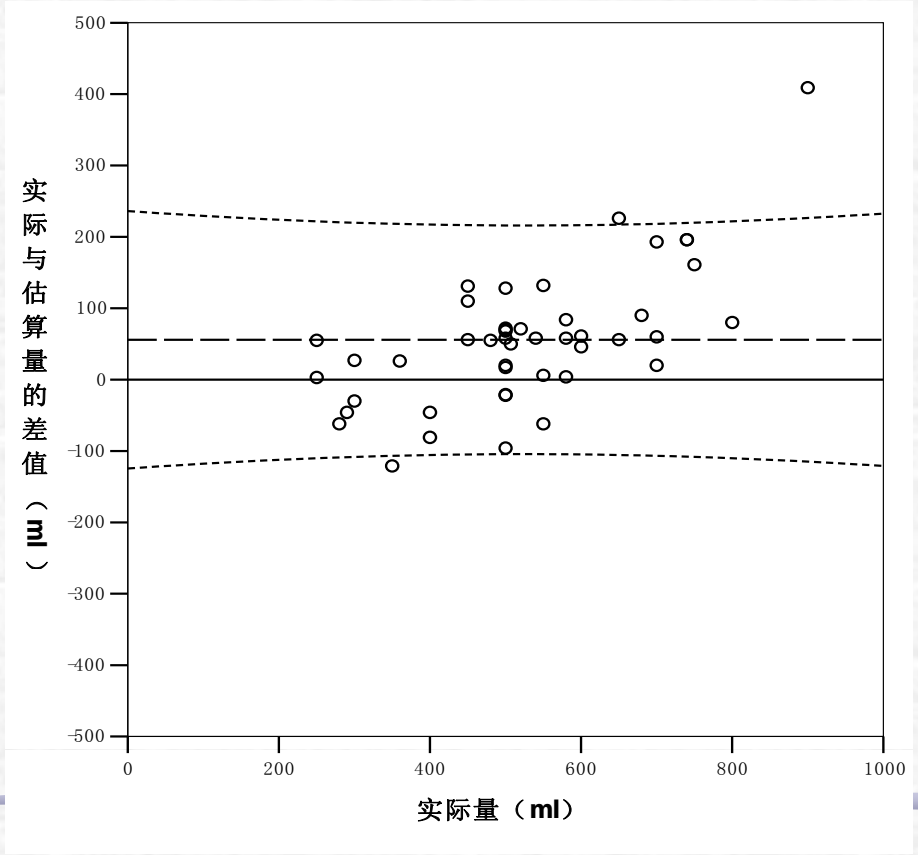


·临床研究·

危重患者胸腔积液超声测量新方法的建立与应用

张茂 杨俭新 徐善祥 巴立 刘志海 洪玉才 干建新 徐少文

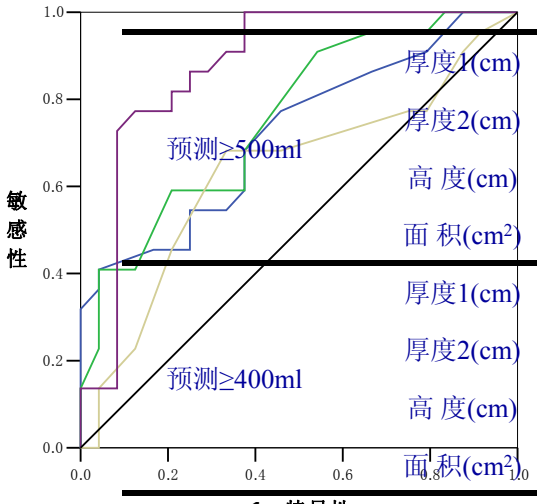


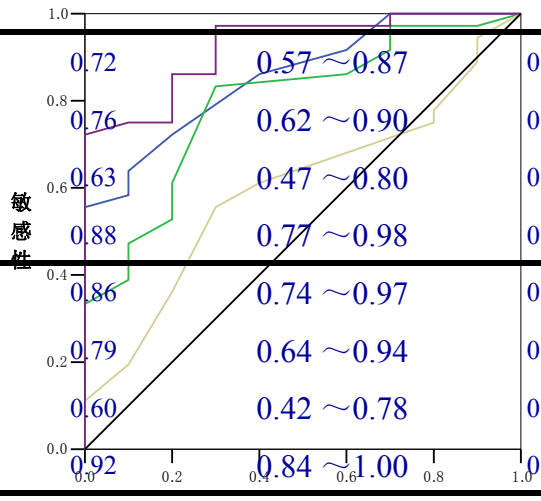


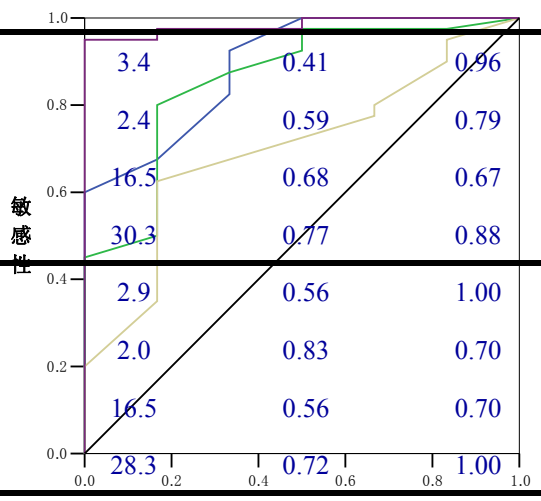
·临床研究·

危重患者胸腔积液超声测量新方法的建立与应用

张茂 杨俭新 徐善祥 巴立 刘志海 洪玉才 干建新 徐少文

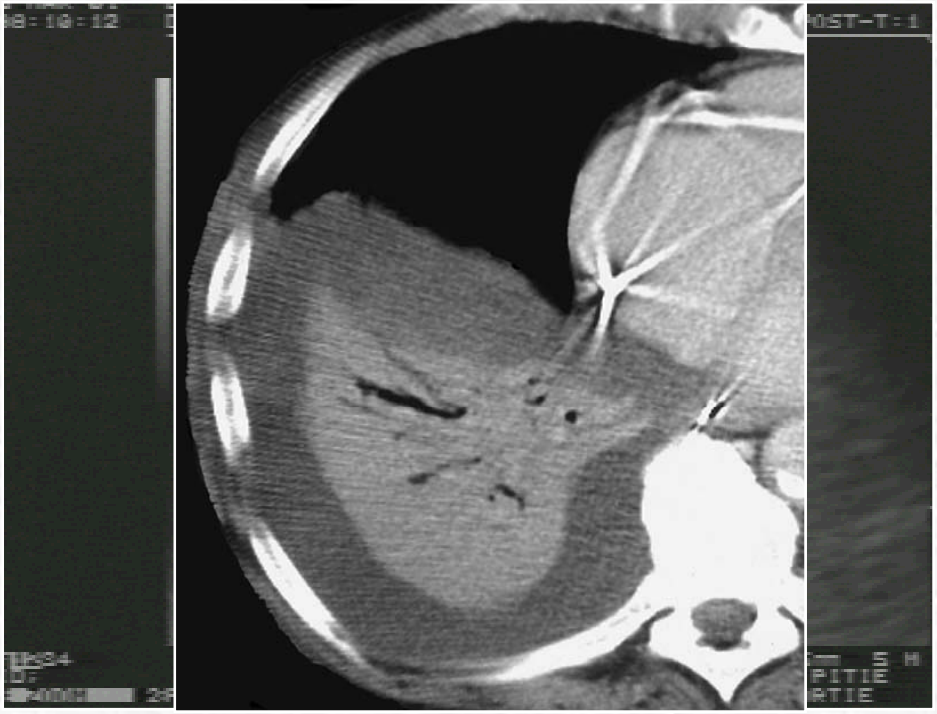






	指 标	曲线下面积	95%可信区间	P	阈 值	敏感性	特异性
500 ml	厚度1(cm)	0.72	0.57 ～0.87	0.010	3.4	0.41	0.96
	厚度2(cm)	0.76	0.62 ～0.90	0.003	2.4	0.59	0.79
	高 度(cm)	0.63	0.47 ～0.80	0.118	16.5	0.68	0.67
	面 积(cm^2)	0.88	0.77 ～0.98	0.000	30.3	0.77	0.88
400 ml	厚度1(cm)	0.86	0.74 ～0.97	0.001	2.9	0.56	1.00
	厚度2(cm)	0.79	0.64 ～0.94	0.005	2.0	0.83	0.70
	高 度(cm)	0.60	0.42 ～0.78	0.338	16.5	0.56	0.70
	面 积(cm^2)	0.92	0.84 ～1.00	0.000	28.3	0.72	1.00
300 ml	厚度1(cm)	0.89	0.76 ～1.02	0.002	2.7	0.60	1.00
	厚度2(cm)	0.86	0.70 ～1.02	0.005	2.0	0.80	0.83
	高 度(cm)	0.70	0.50 ～0.90	0.117	15.5	0.63	0.83
	面 积(cm^2)	0.98	0.95 ～1.02	0.000	23.1	0.95	1.00

超声能很好地区分肺实变和胸腔积液



Intensive Care Med (1999) 25: 955–958
© Springer-Verlag 1999

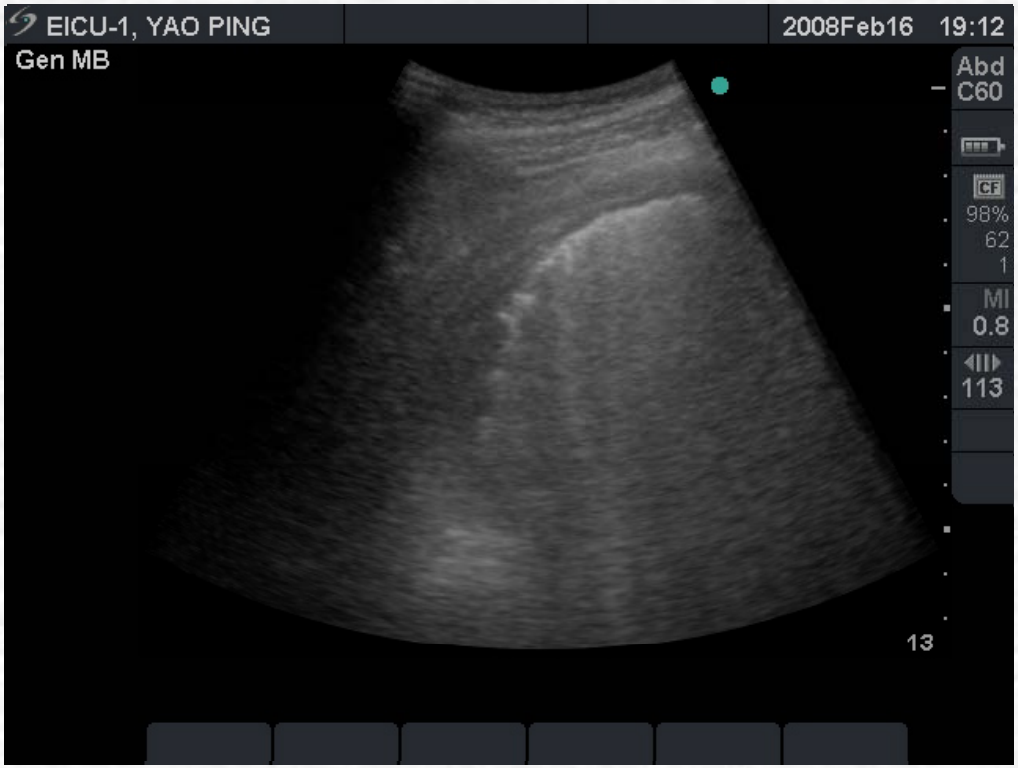
超声引导危重患者胸腔积液的穿刺引流

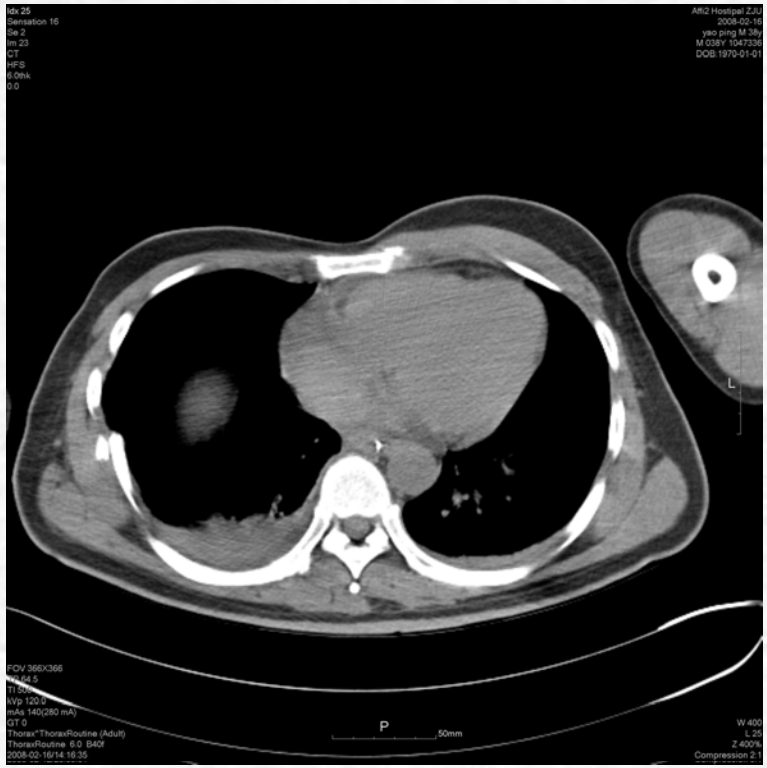
D. Lichtenstein
J.
A.
I.
G.

Feasibility and safety of ultrasound-aided

(CHEST 2004; 125:1059–1062)

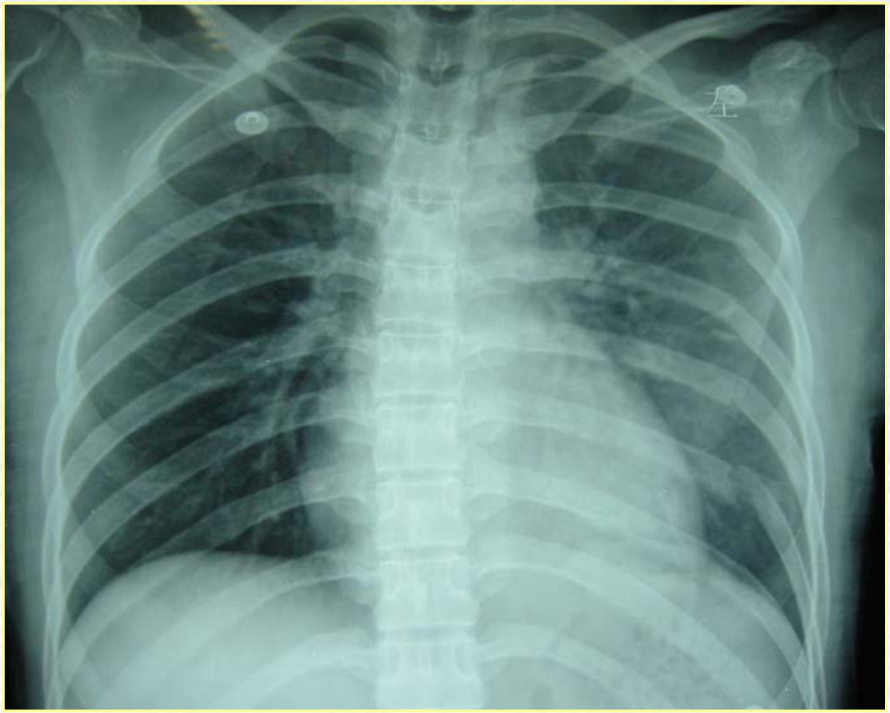
超声引导危重患者胸腔积液引流前后





3.诊断肺实变、肺不张

超声发现X片不能提示的肺不张

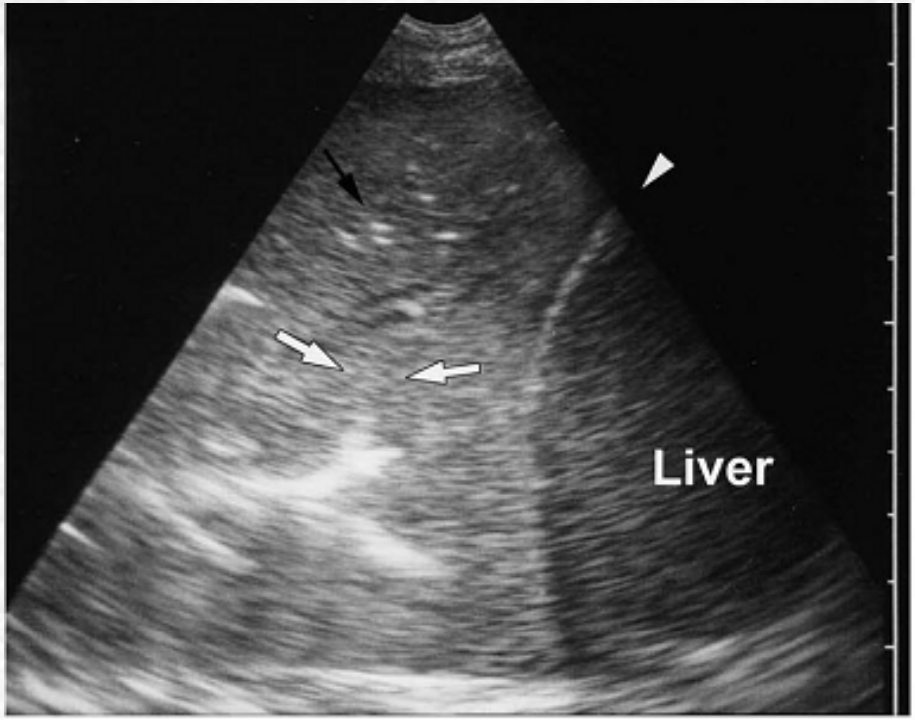


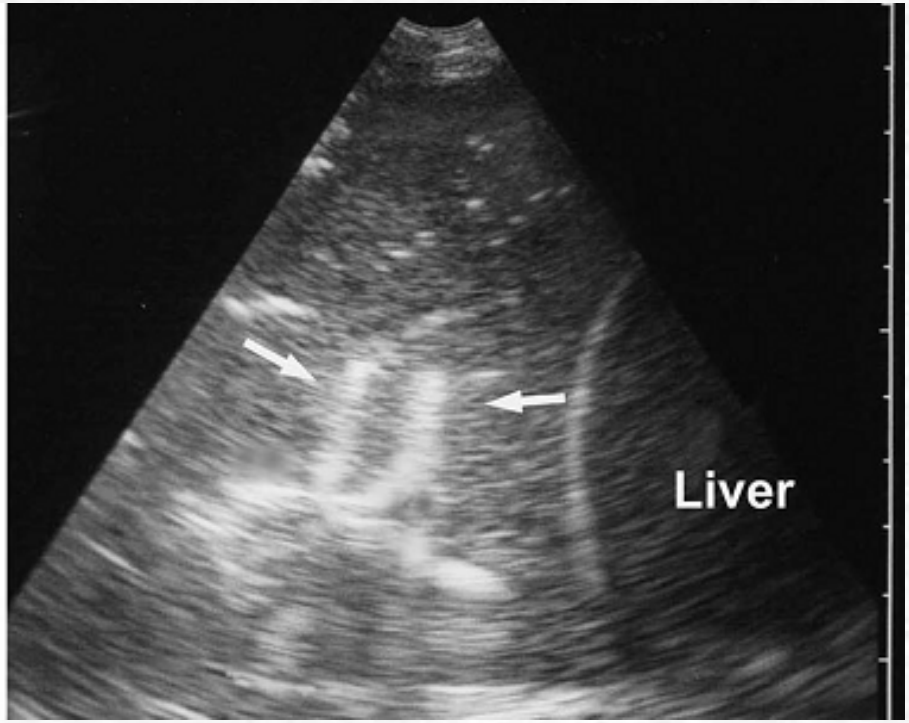
不同类型的肺实变


ZHEJIANG NO.2 HOSP
'05/01/05
09:42:21
3.5M S-H
18Hz
DVA: 100%
MI = 0.6
R12 G59 C4
1:Abdomen


ZHEJIANG NO.2 HOSP
'05/04/28
09:46:36
3.5M S-H
9Hz
DVA: 100%
MI = 0.8
R12 071 C4
8: INTES

The Dynamic Air Bronchogram





CHEST 2009; 135:1421–1425

Crit Ultrasound J (2009) 1:13–16
DOI 10.1007/s13089-009-0003-x

ORIGINAL ARTICLE

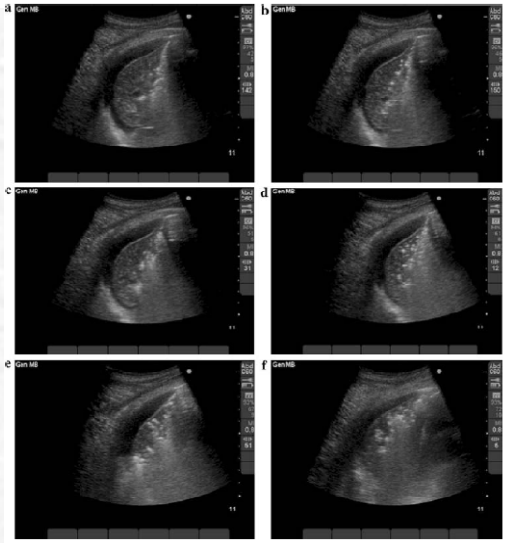
Detection of lung atelectasis/consolidation by ultrasound in multiple trauma patients with mechanical ventilation

Jian-xin Yang · Mao Zhang · Zhi-hai Liu · Li Ba · Jian-xin Gan · Shao-wen Xu

Table 1 Efficacy of ultrasound in the diagnosis of lung atelectasis/consolidation

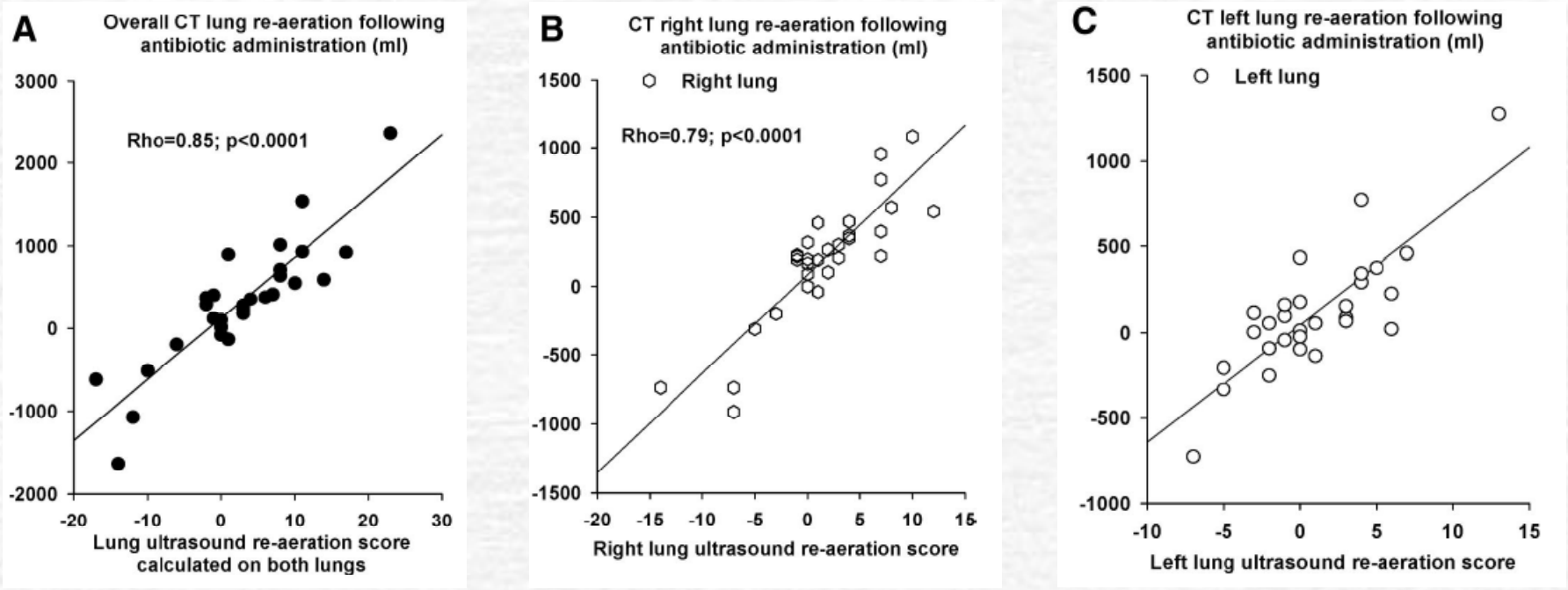
CT	Ultrasound		
	Positive	Negative	Total
Positive	126	28	154
Negative	0	170	170
Total	126	198	324

A concordance test showed a *Kappa* coefficient of 0.825 ($P = 0.031$)



Ultrasound assessment of antibiotic-induced pulmonary reaeration in ventilator-associated pneumonia*

Bélaïd Bouhemad, MD, PhD; Zhi-Hai Liu, MD; Charlotte Arbelot, MD; Mao Zhang, MD; Fabio Ferarri, MD, PhD; Morgan Le-Guen, MD; Martin Girard, MD; Qin Lu, MD, PhD; Jean-Jacques Rouby, MD, PhD



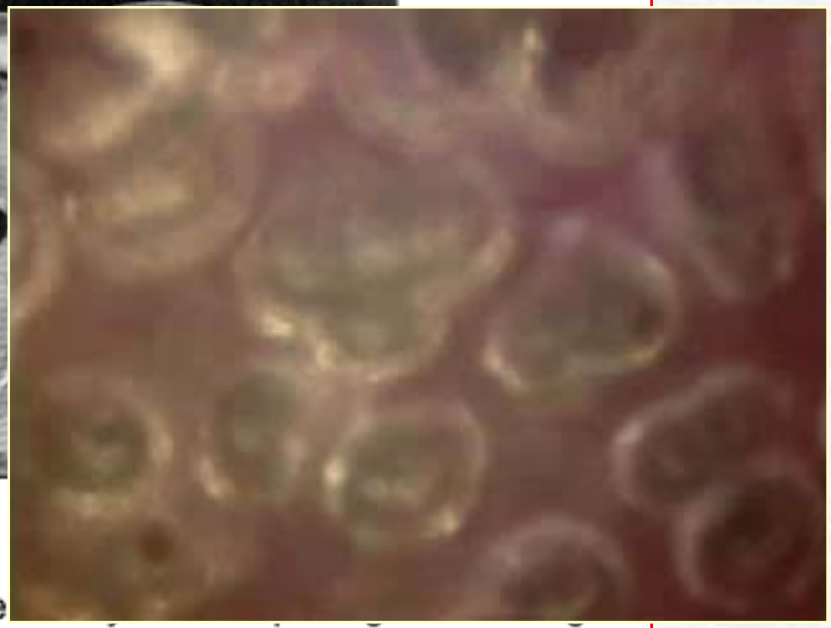
Crit Care Med, 2009, 39:

床旁超声监测指导呼吸机设置

PEEP增加前

Possible hyperinflation during invasive mechanical ventilation le

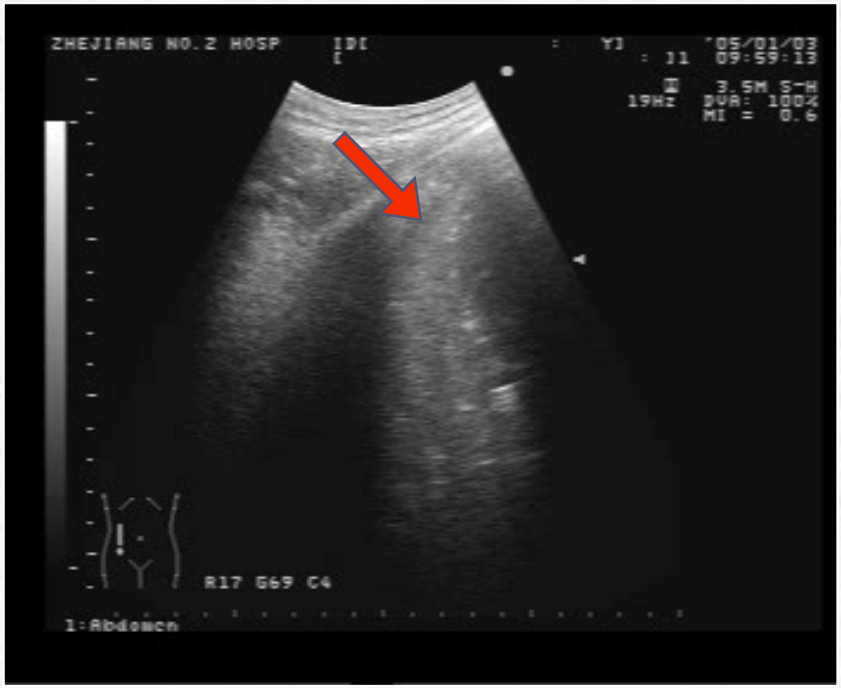
PEEP增加后



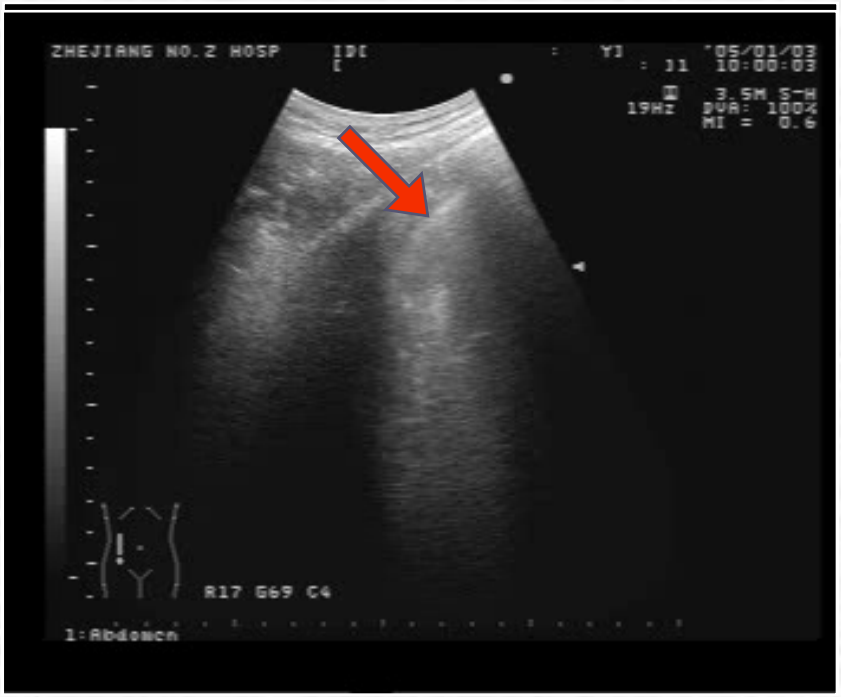
ossible

during invasive mechanical ventilation leading to VILI

床旁超声监测指导呼吸机设置

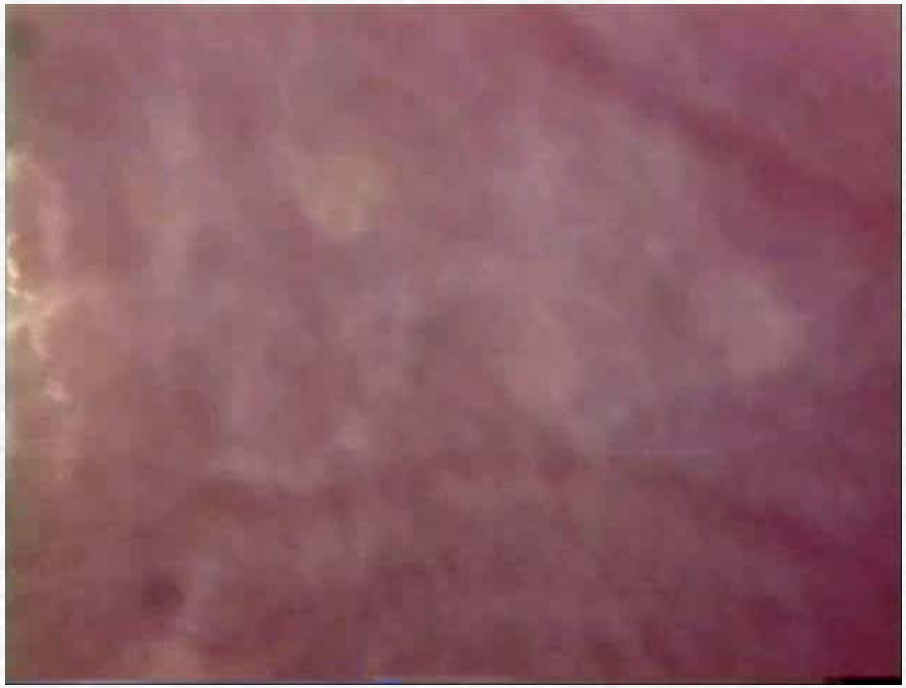


PEEP前

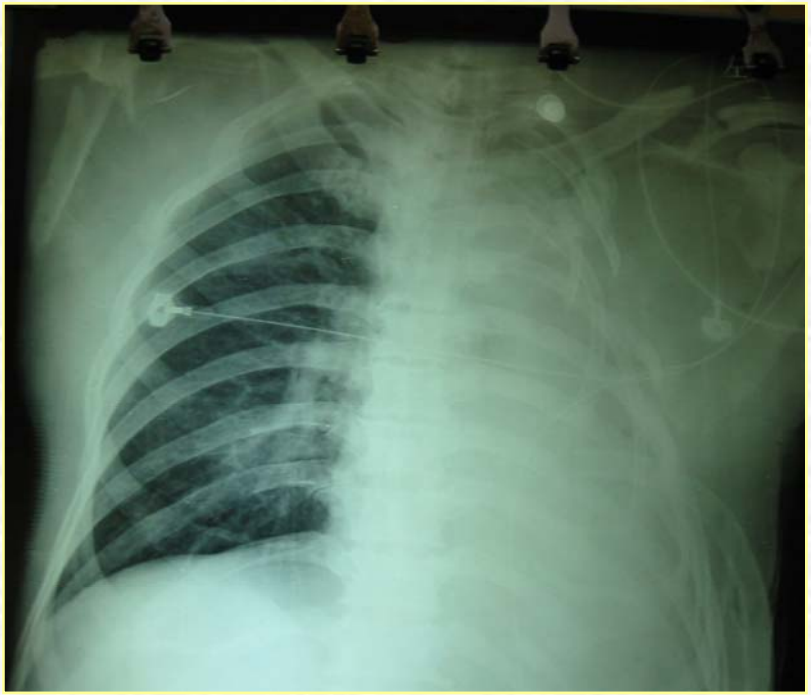


PEEP 40S

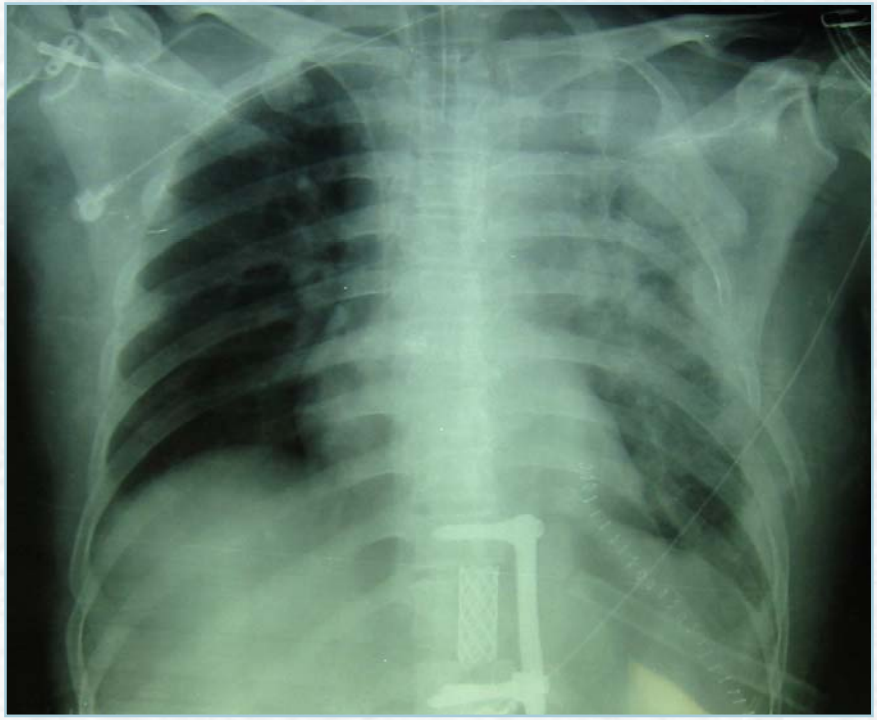
床旁超声监测指导肺复张

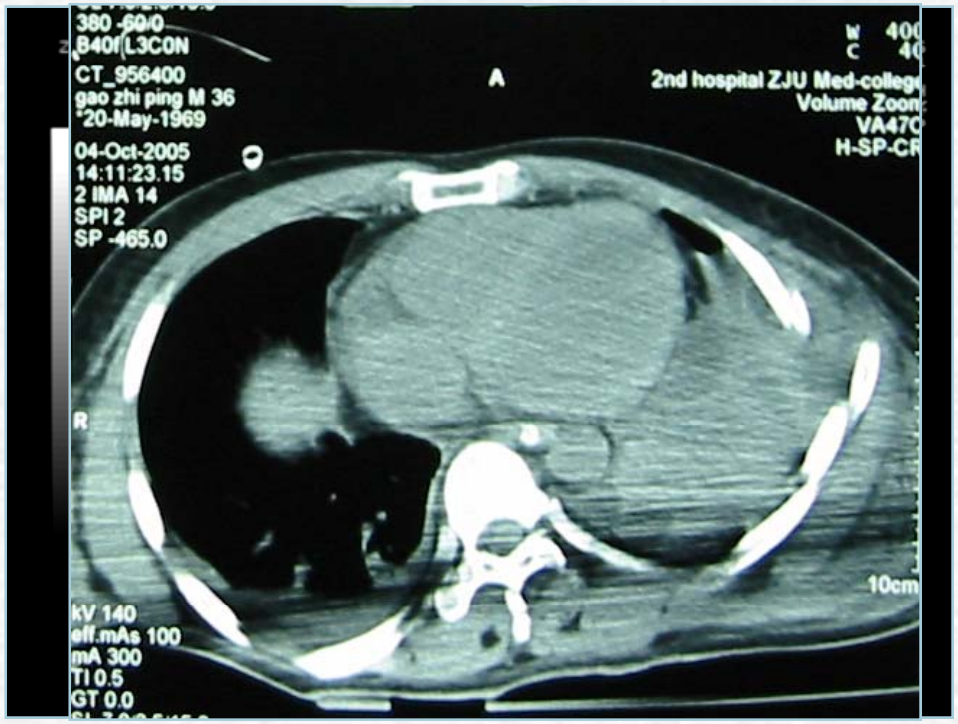


床旁超声监测指导肺复张

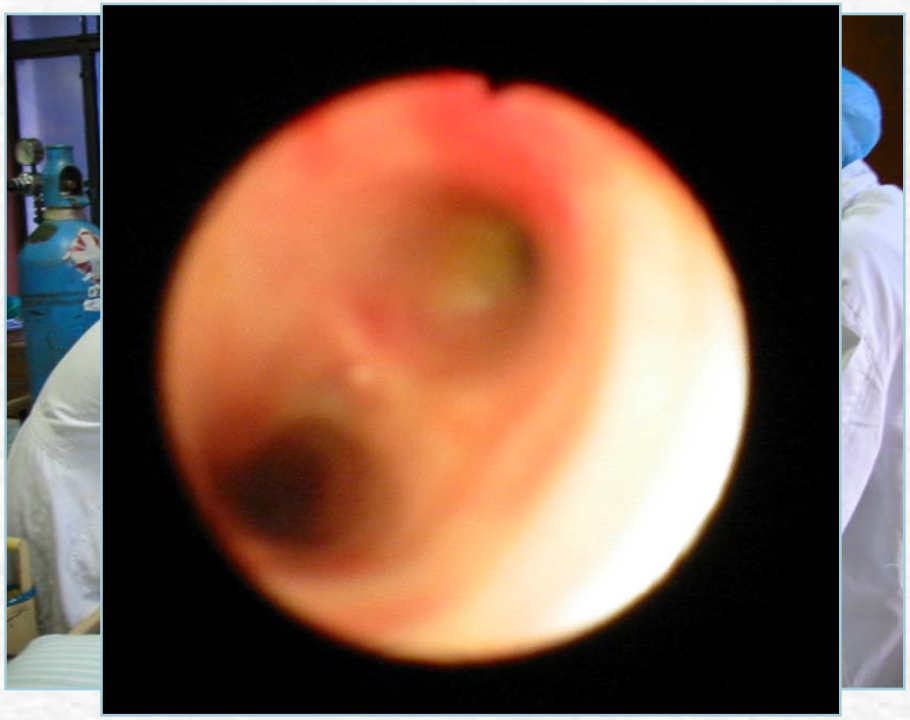


床旁超声结合纤维支气管镜治疗肺不张

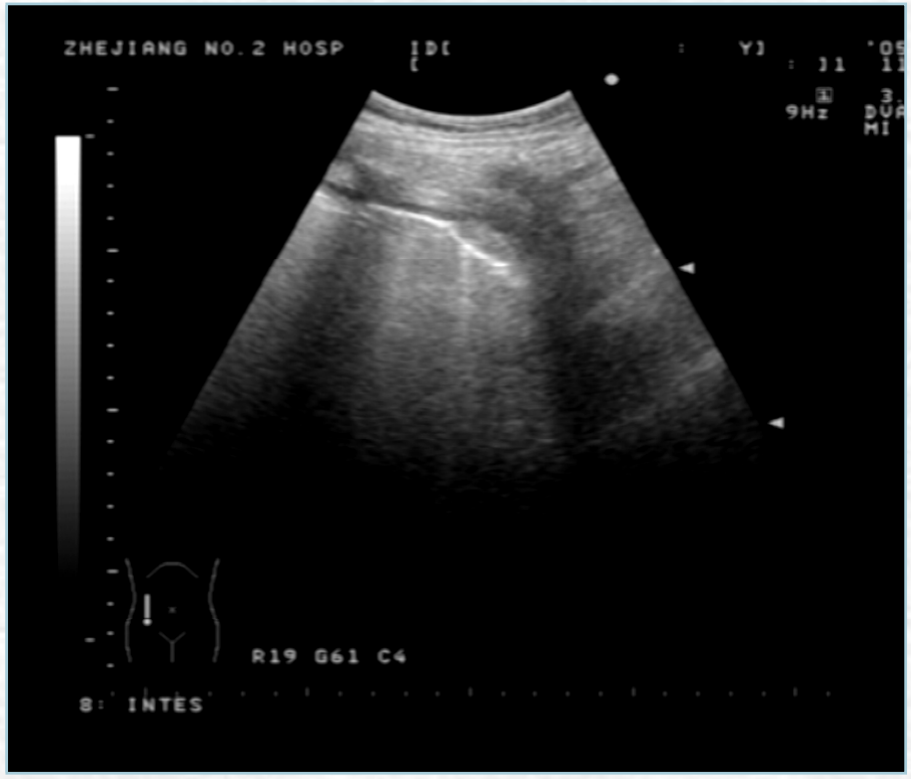




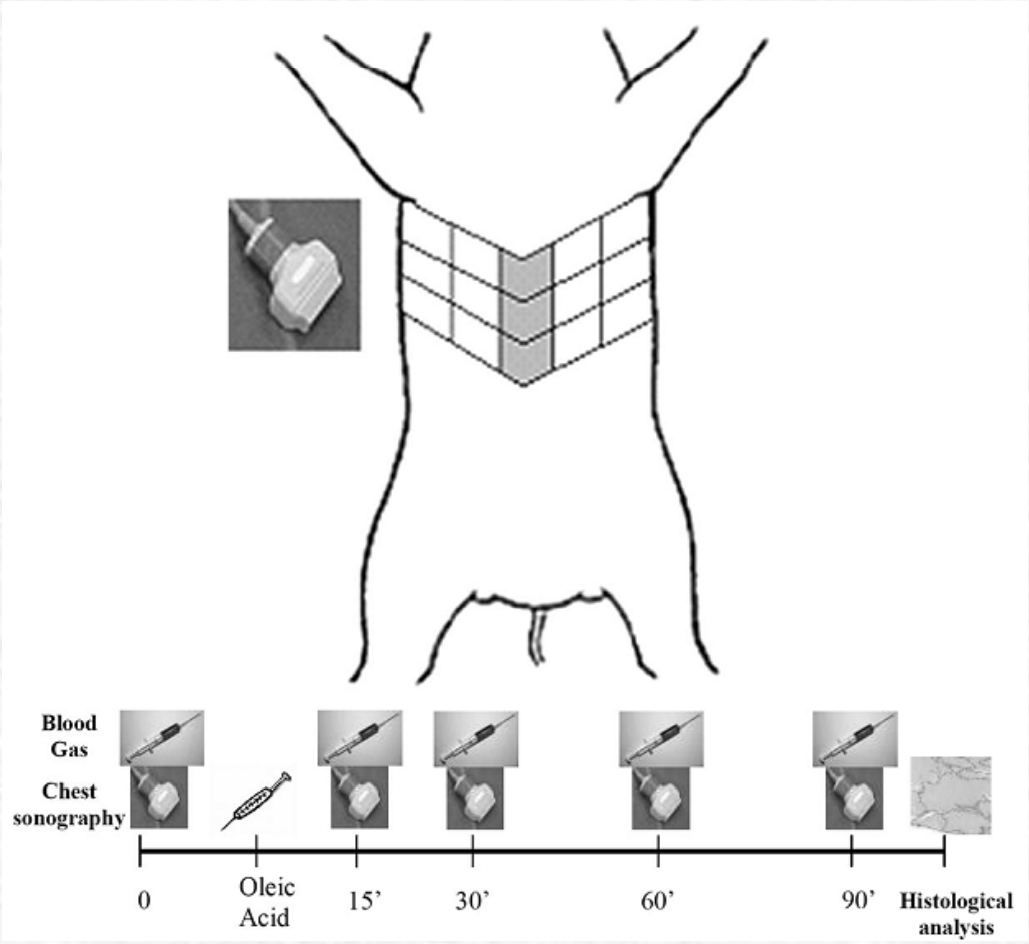
床旁超声结合纤维支气管镜治疗肺不张

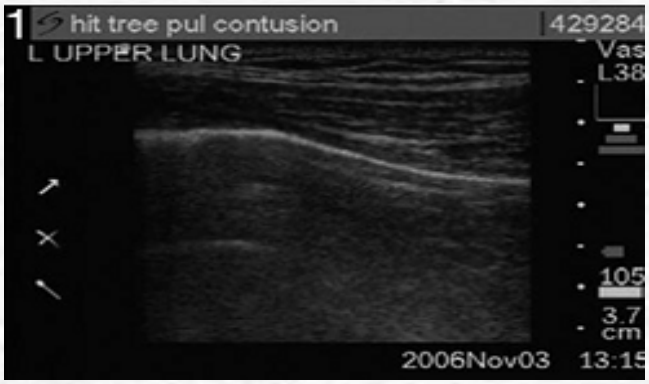


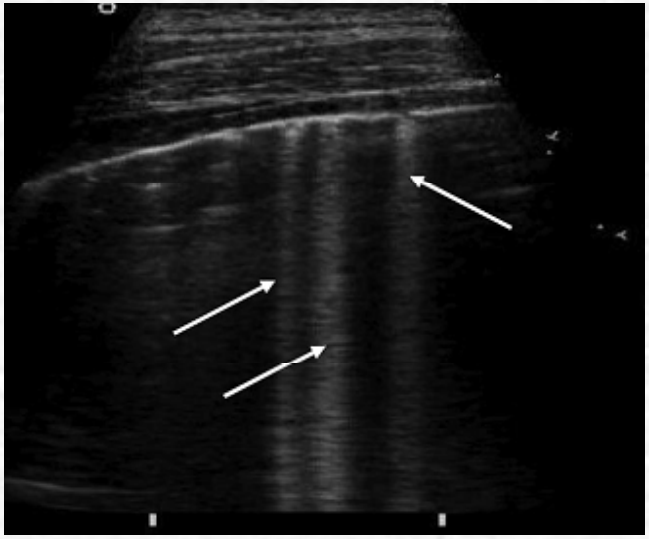
床旁超声结合纤维支气管镜治疗肺不张



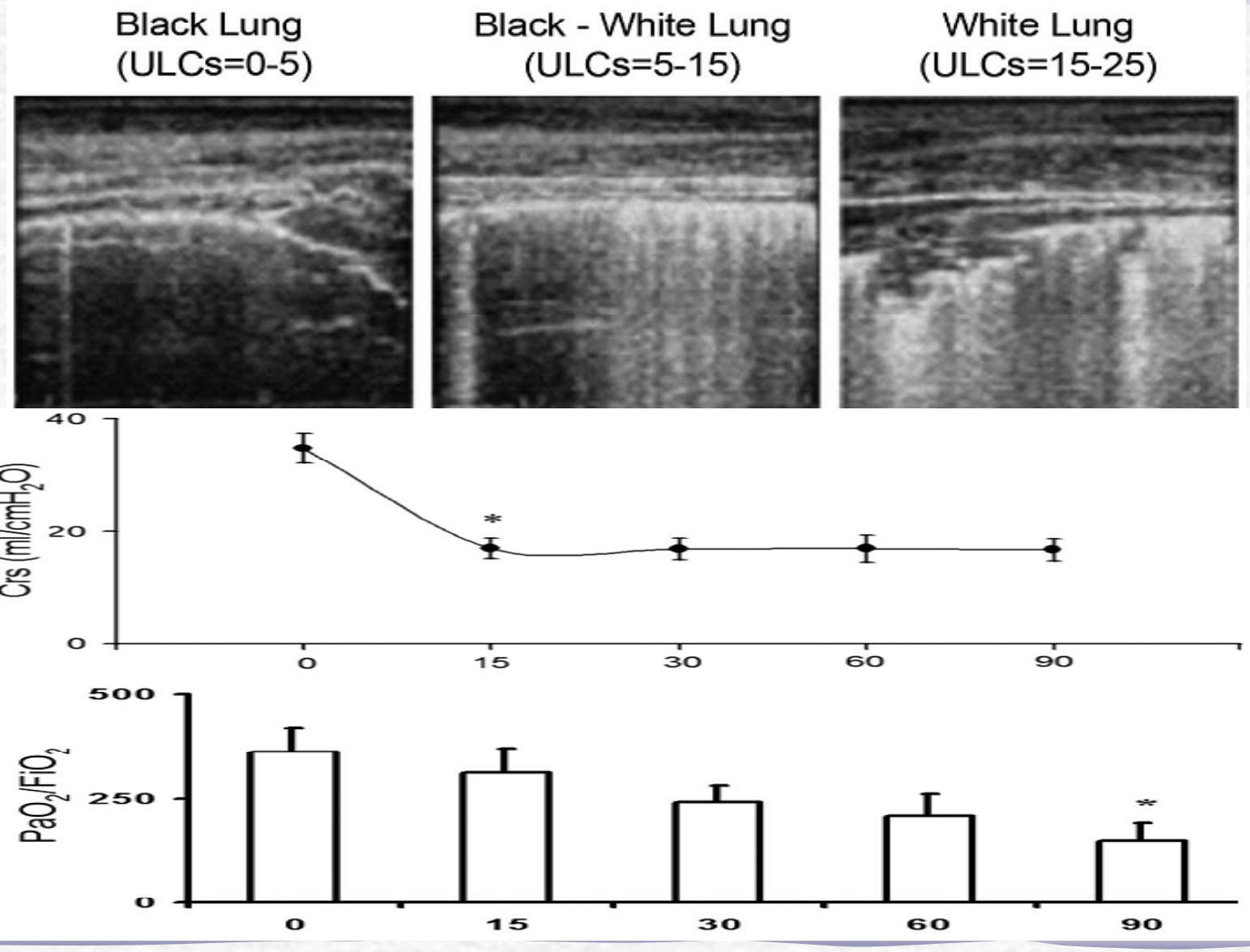
5.肺水肿程度的评估







CritCareMed,2007;35:2769–2774



CritCareMed,2007;35:2769–2774

6.低协助人工气道建立和定位

Crit Care Med 2007; 35:S173–S177

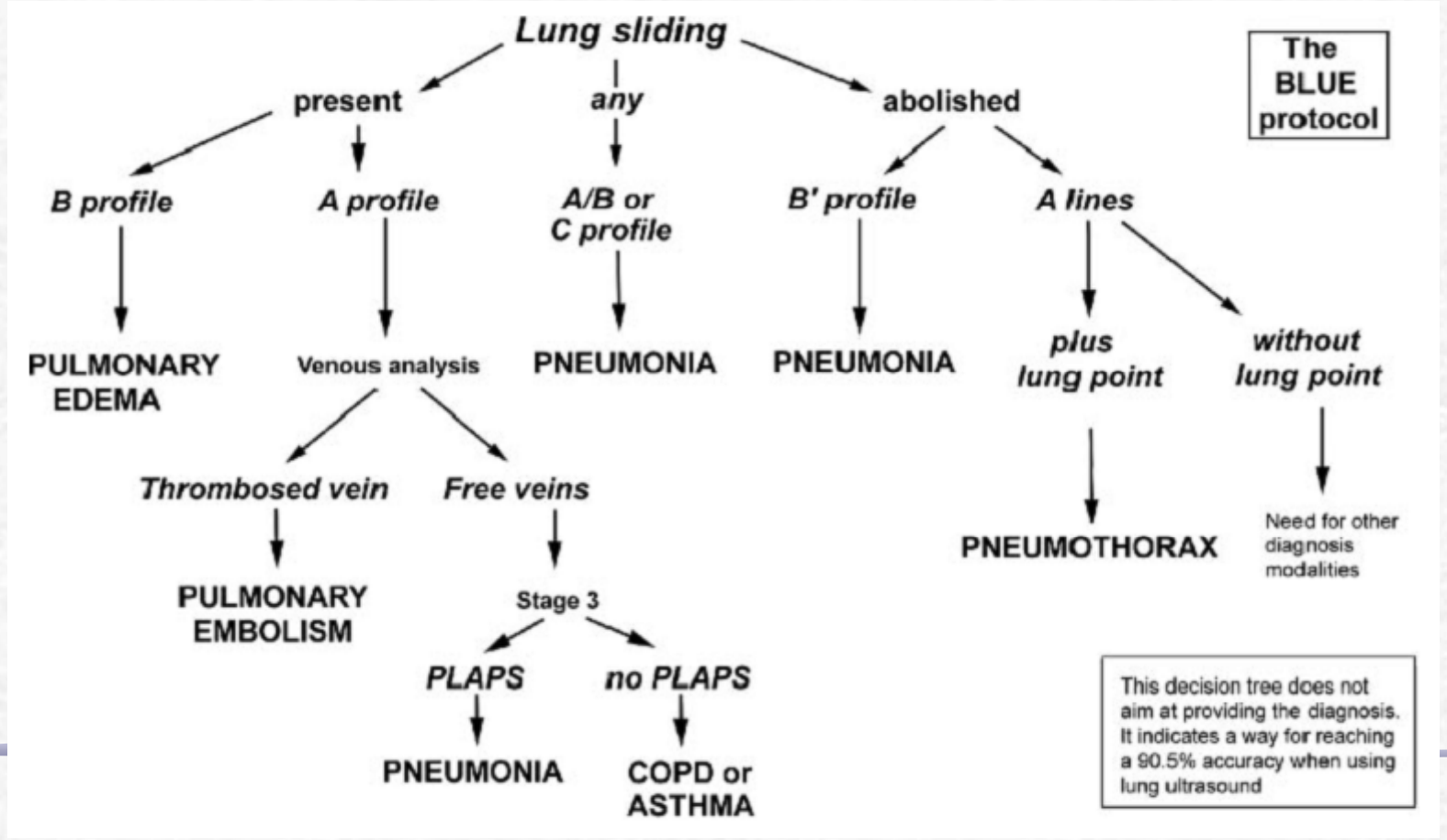
7.严重低氧血症的快速鉴别

1. 呼吸机工作异常
2. 气道不通畅
3. 大量气胸
4. 大量胸腔积液
5. 大块肺实变/不张
6. 肺水肿

Relevance of Lung Ultrasound in the Diagnosis of Acute Respiratory Failure *: The BLUE Protocol

Daniel A. Lichtenstein and Gilbert A. Mezière

Chest 2008;134;117-125; Prepublished online April 10, 2008;
DOI 10.1378/chest.07-2800



床旁超声在胸部病变评估中的应用

中国急救医学 2006 年 3 月第 26 卷第 3 期

床旁胸部超声在危重患者中应用的进展

张　茂[1]，　干建新[1]，　游向东[2]，　江观玉[1]

Review

Clinical review: Bedside lung ultrasound in critical care practice

Bélaïd Bouhemad[1], Mao Zhang[2], Qin Lu[1] and Jean-Jacques Rouby[1]

[1]Surgical Intensive Care Unit, Pierre Viars, Department of Anesthesiology and Critical Care, Assistance Publique Hôpitaux de Paris, University Pierre et Marie Curie, Paris 6, France
[2]Department of Emergency Medicine, Second Affiliated Hospital of Hangzhou, Zhejiang University, China

Corresponding author: Belaïd Bouhemad, belaid.bouhemad@psl.ap-hop-paris.fr

Published: 16 February 2007
This article is online at http://ccforum.com/content/11/1/205

Critical Care 2007, **11**:205 (doi:10.1186/cc5668)

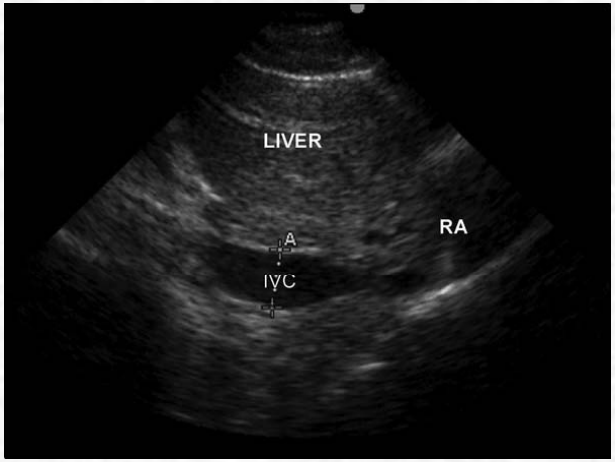
三、循环系统相关问题的评估

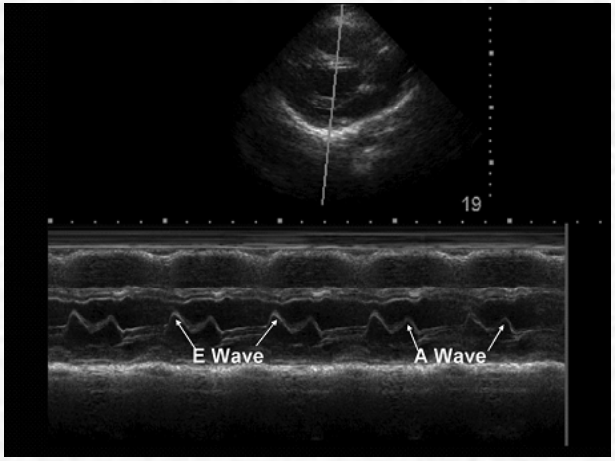
超声评估急危重患者循环系统的的功能

1. 血容量状态评估
2. 心脏泵功能的评估
3. 无创评估肺动脉高压
4. 心包积液的快速检测
5. 低血压原因的快速鉴别

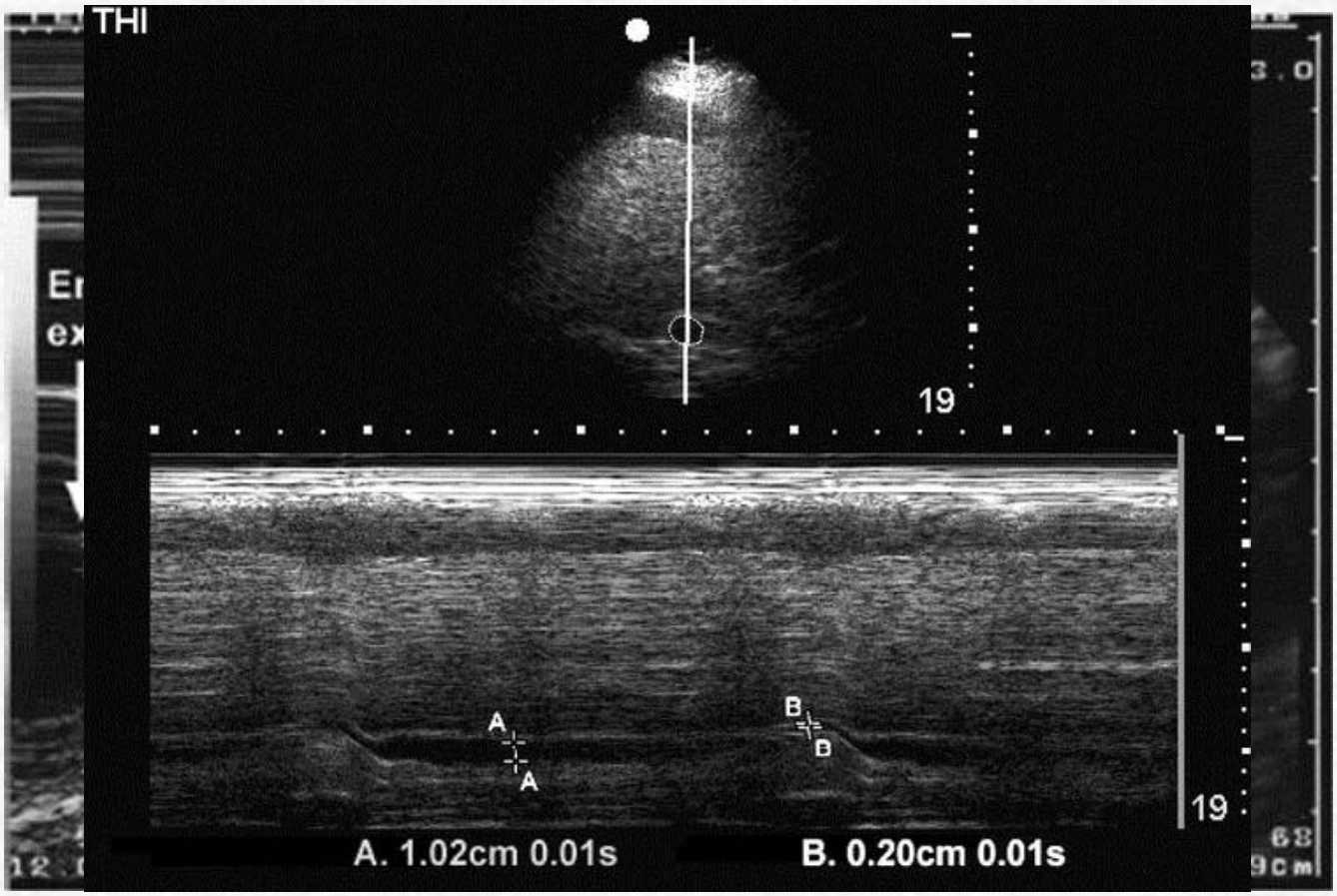
1. 血容量状态评估

1. 腔静脉大小与呼吸变异
2. 颈内静脉大小与呼吸变异
3. 二尖瓣E/A比例
4. 心室收缩/舒张末期容积
5. 主动脉血流呼吸变异



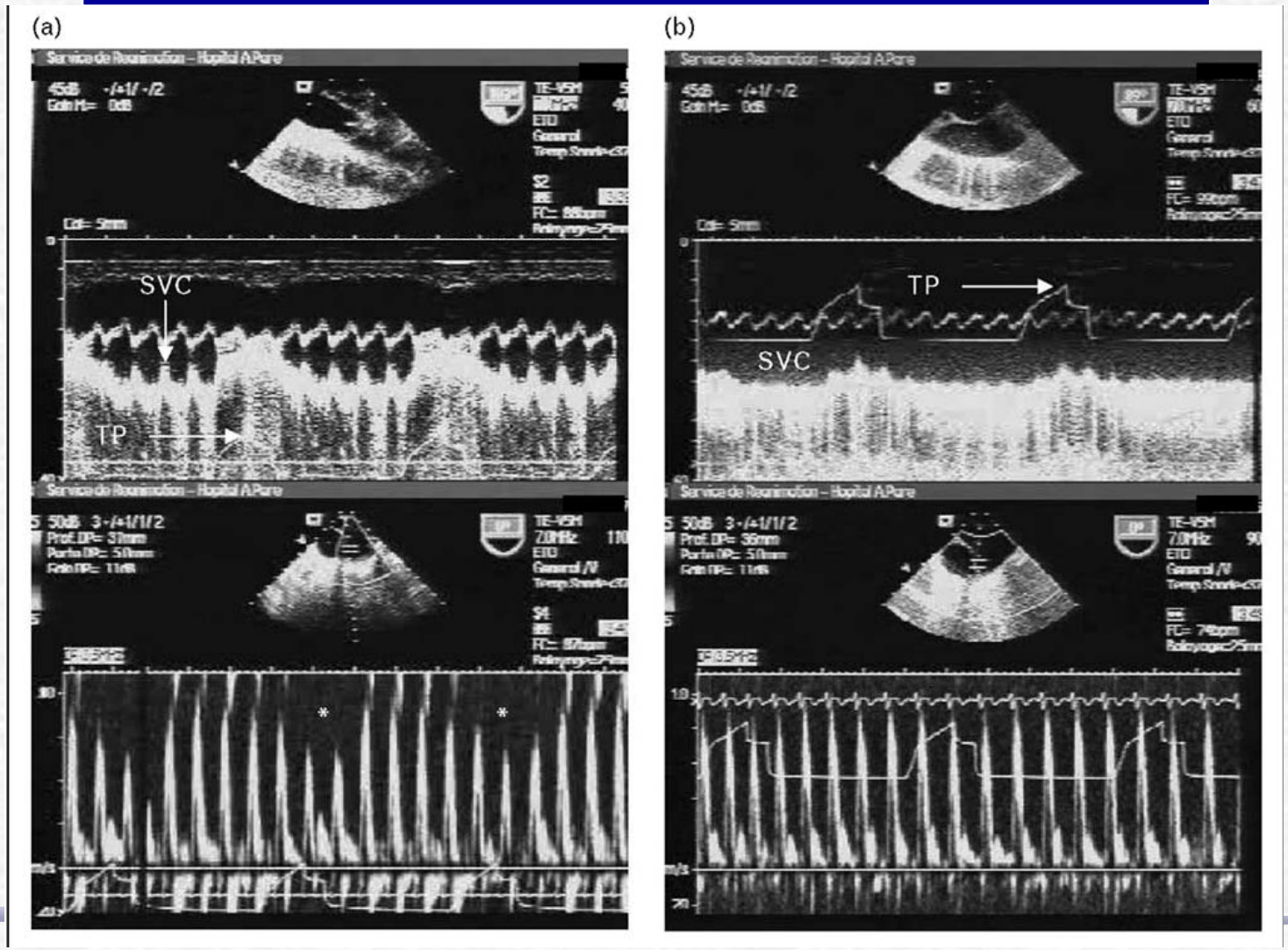


下腔静脉大小与呼吸变异反映血容量状态



J Trauma. 2007;63(3):495-500

上腔静脉大小与呼吸变异反映血容量状态



Current Opinion in Critical Care 2006, 12:249–254

以颈内静脉大小与呼吸变异系数评价血容量状况

表 2　严重创伤患者的中心静脉压与颈内静脉截面积大小及呼吸变异指数的关系

统计值	RVmax	RVmin	RVrvi	LVmax	LVmin	LVrvi
r 值	0.348	0.381	- 0.361	0.415	0.455	- 0.469
P 值	0.013	0.006	0.010	0.003	0.001	0.001

注 :RV :右侧颈内静脉 ;LV :左侧颈内静脉 ;max :最大截面积 ;min :最小截面积 ;rvi :呼吸变异指数

【关键词】 超声检查 ;颈静脉 ;多处创伤 ;血容量不足 ;中心静脉压

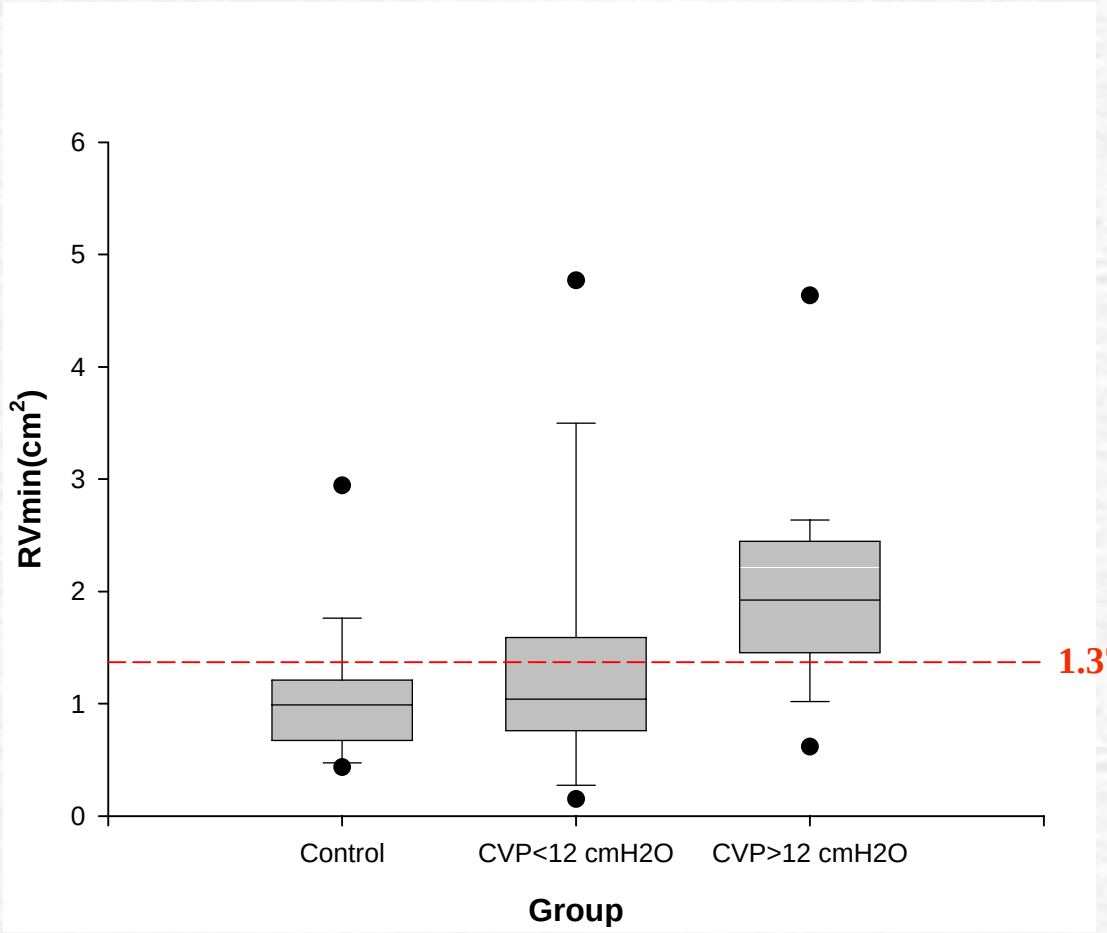
以颈内静脉大小与呼吸变异系数评价血容量状况

表 3　颈内静脉截面积大小及呼吸变异指数预测 CVP 的 ROC 分析的曲线下面积

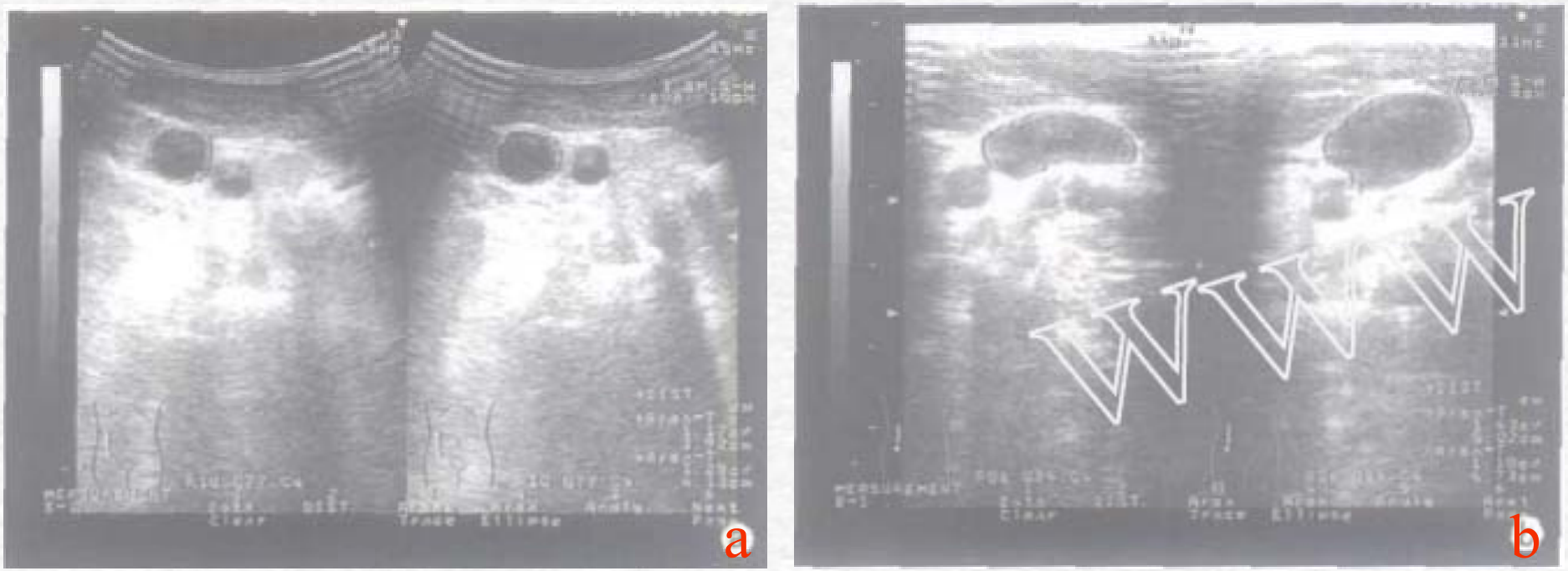
参数	测值（$\bar{x} \pm s$）	P 值	95 %可信区间
RVmax	0.724 ±0.077	0.007	0.573～0.876
RVmin	0.716 ±0.079	0.009	0.561～0.87
LVmax	0.611 ±0.082	0.177	0.450～0.773
LVmin	0.651 ±0.080	0.067	0.495～0.808
RVrvi	0.667 ±0.077	0.042	0.516～0.819
LVrvi	0.782 ±0.067	0.001	0.651～0.913

评估CVP>12 cmH_2O的阈值（敏感度、特异性）：RVmin为1.37 cm^2（84.6%，66.7%）；LVrvi为10.8%（66.7%，84.6%）

正常对照和不同CVP组的右侧颈内静脉最小截面积的比较



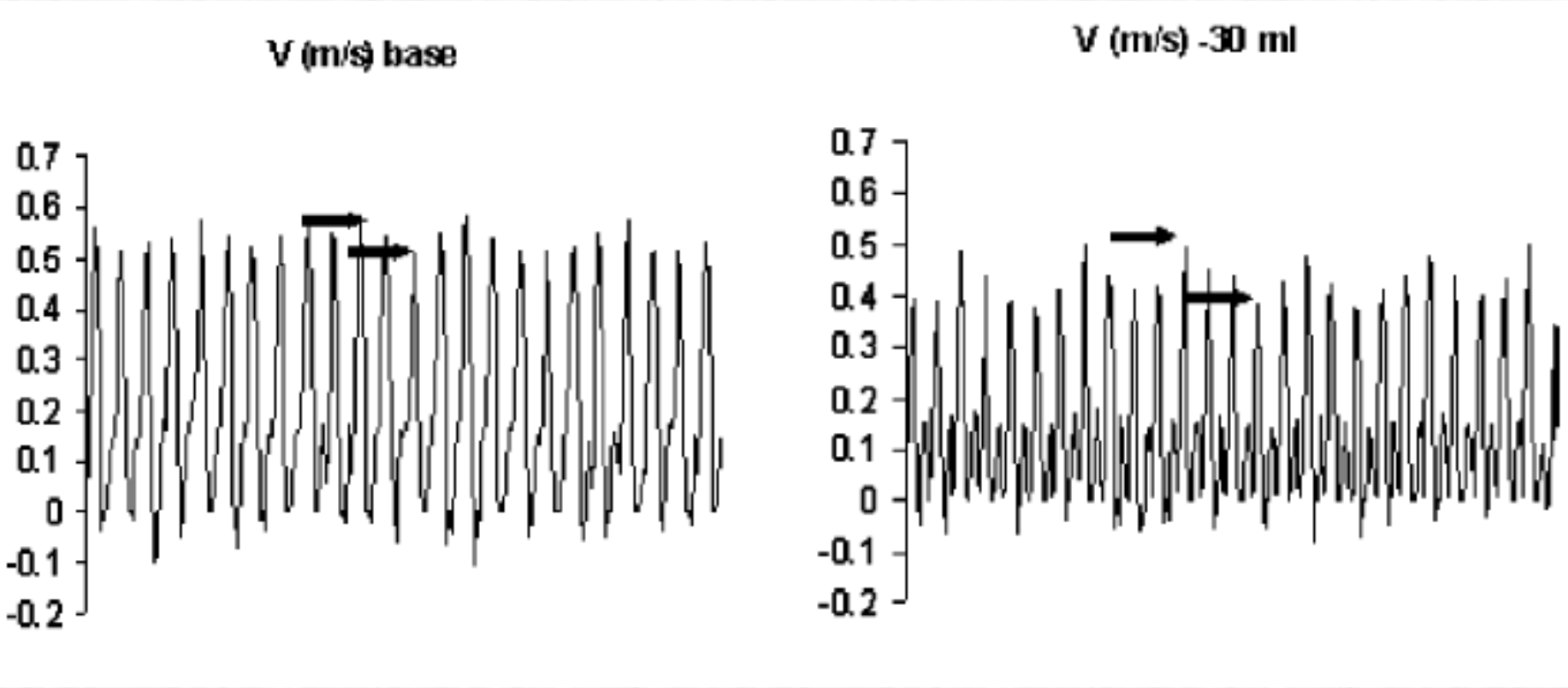
不同中心静脉压水平患者颈内静脉的呼吸变异指数



a. 右侧优势静脉，CVP=18cmH_2O，吸气末颈内静脉截面积为1.28cm^2，呼气末为1.17cm^2，呼吸变异指数9.4%

b. 左侧优势静脉，CVP=6cmH_2O，吸气末颈内静脉截面积为1.63 cm^2，呼气末为1.10 cm^2，呼吸变异指数48.2%

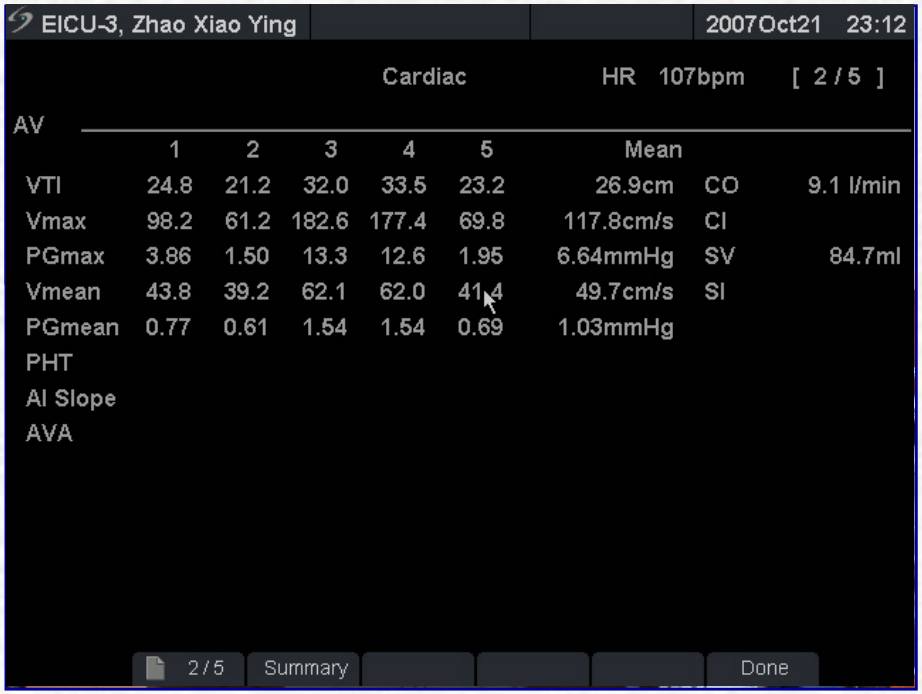
主动脉血流呼吸变异与血容量的关系



Intensive Care Med (2004) 30:1182–1187

2. 心脏泵功能的评估

危重患者心脏超声检查



急危重患者的食道心超检查

超声评估肺动脉压力

PAPs

PAPs=4×TR peak velocity^2+right atrial pressure (in the absence of PS)

PAPm

PAPm=79−0.45(RVOT AT)

PAPm=4×peak pulmonary regurgitation velocity^2

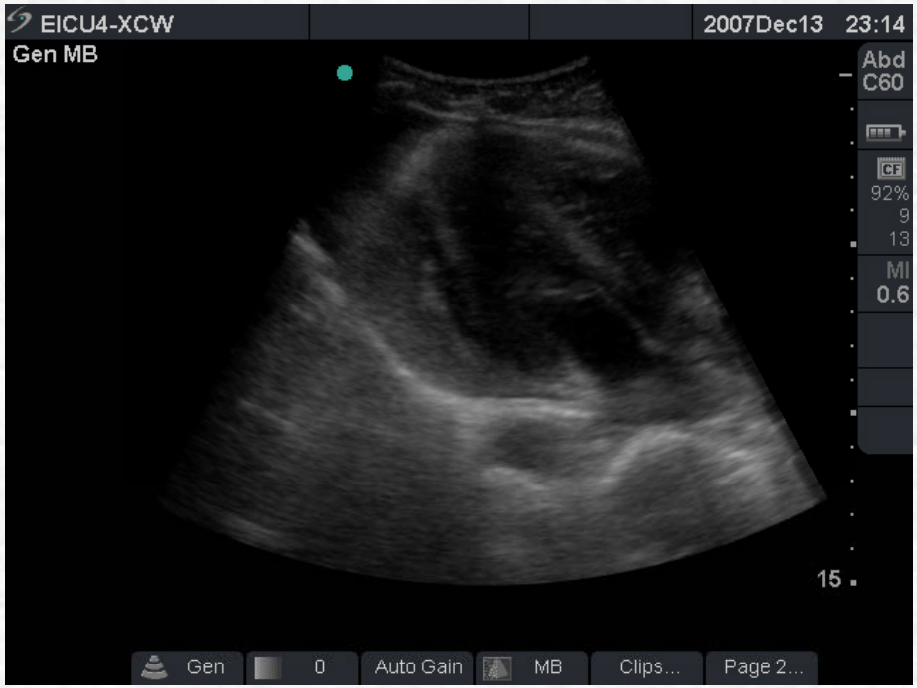
PAPd

PAPd=4×(pulmonary regurgitant end-diastolic velocity)^2+right atrial pressure

PAPs=Pulmonary artery systolic pressure; PAPm=mean pulmonary artery pressure; PAPd=pulmonary artery end-diastolic pressure; RVOT=RV outflow tract acceleration time.

CHEST 2005; 127:1836–1843

4. 快速诊断心包积液



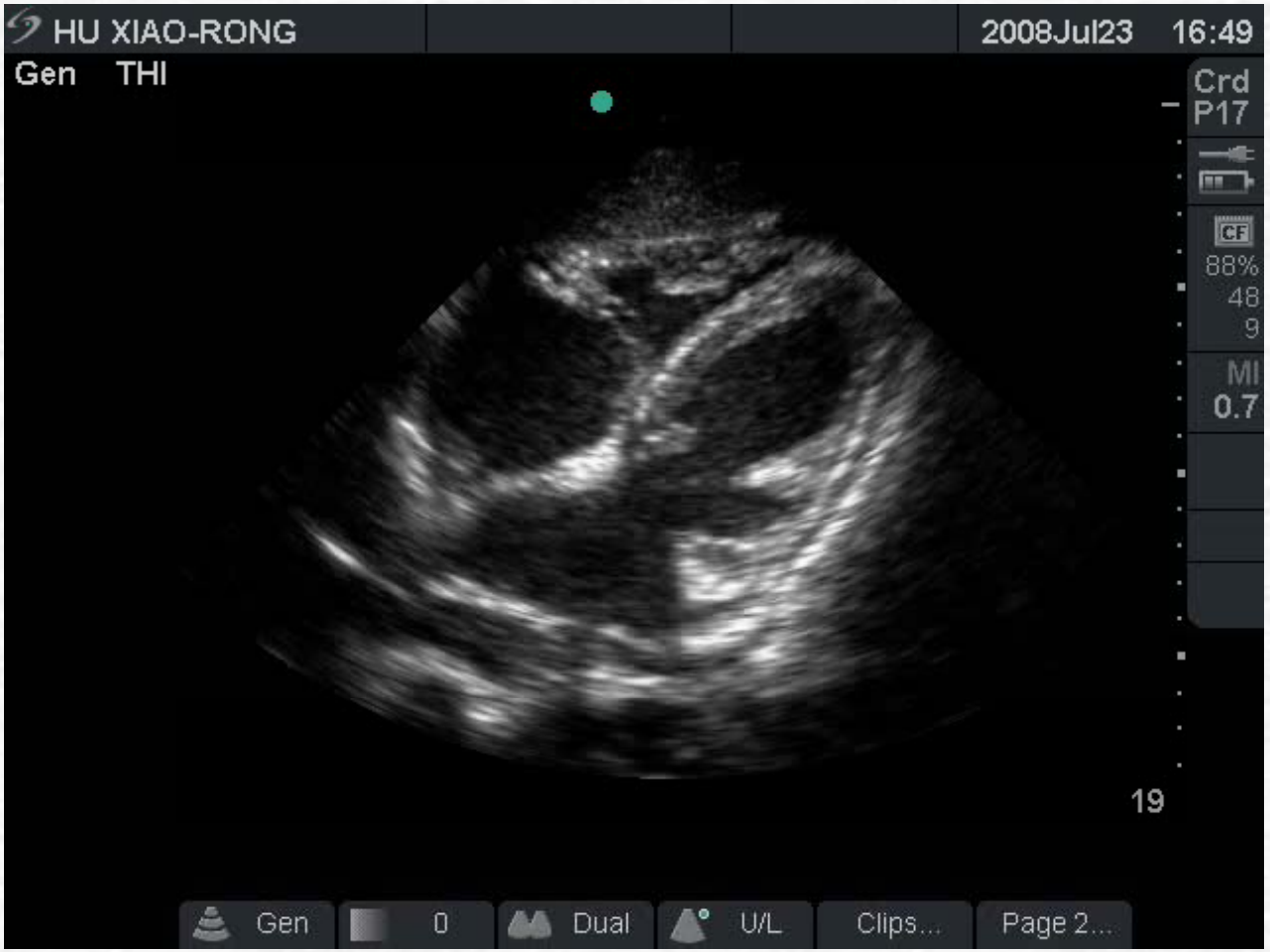
中华创伤杂志 2007 年 4 月第 23 卷第 4 期 Chin J Trauma, April 2007, Vol. 23, No. 4

· 心脏损伤 ·

急诊外科医师应用超声诊断严重多发伤合并心包积液的价值

易建华 张茂 伍峻松 杨俭新 陈金明 江观玉 徐少文

5. 快速鉴别低血压的原因



血容量不足


EICU-16, WANGBO
2008Jul21 11:39
Gen THI
Crd
P17
CF
94%
47
4
MI
0.6
16
Gen
0
Dual
U/L
Clips...
Page 2...

泵功能不良

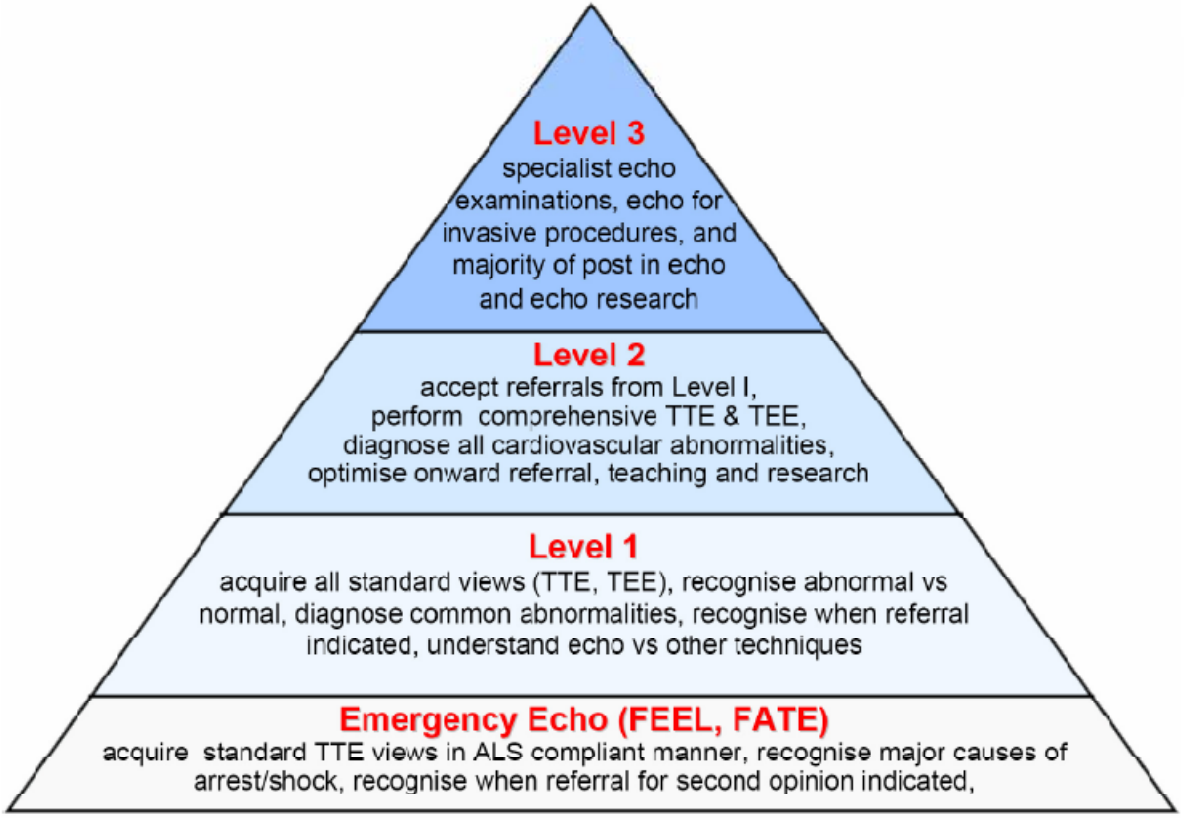
Cardiovascular Ultrasound

BioMed Central

Review

Open Access

Echocardiography practice, training and accreditation in the intensive care: document for the World Interactive Network Focused on Critical Ultrasound (WINFOCUS)



危重患者心超基本应用的方案

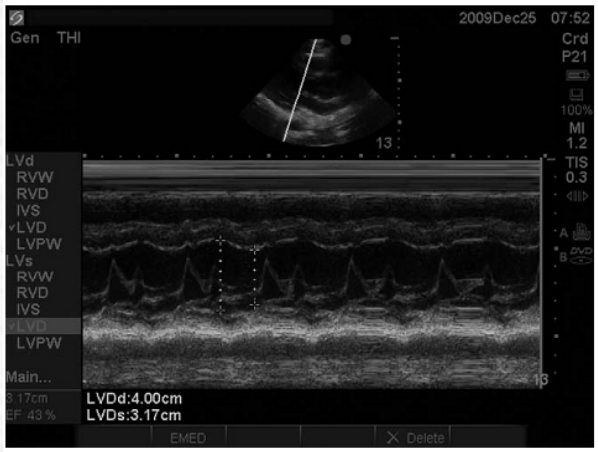
- ***CAUSE:***
  Cardiac arrest ultra-sound exam
- ***FEEL:***
  Focused Echocardiographic Evaluation in Life support
- ***FATE:***
  Focused Assessment with Transthoracic Echocardiography
- ***BEAT:***
  Bedside Echocardiographic Assessment in Trauma/ Critical Care

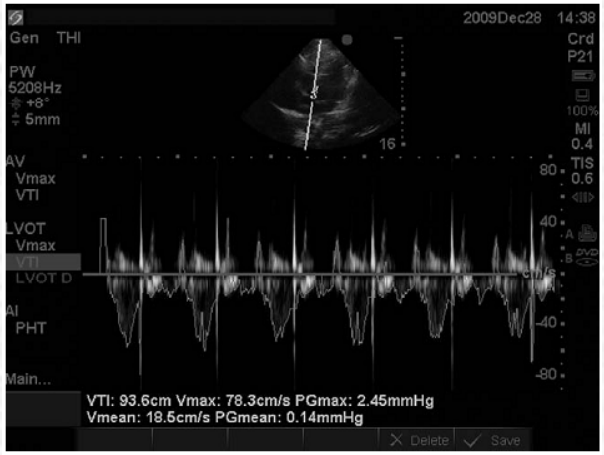
Bedside Echocardiographic Assessment in Trauma and Critical Care

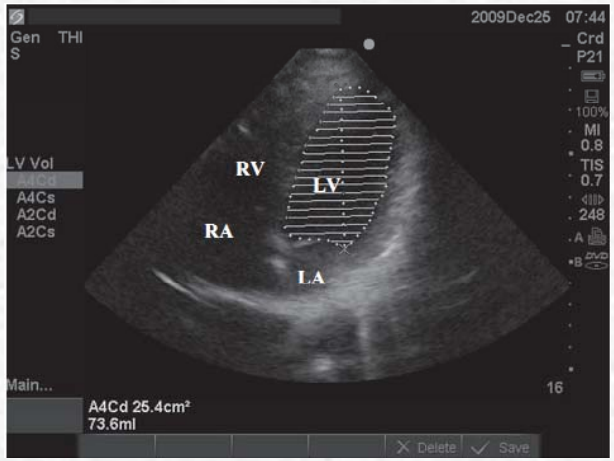
BEAT exam

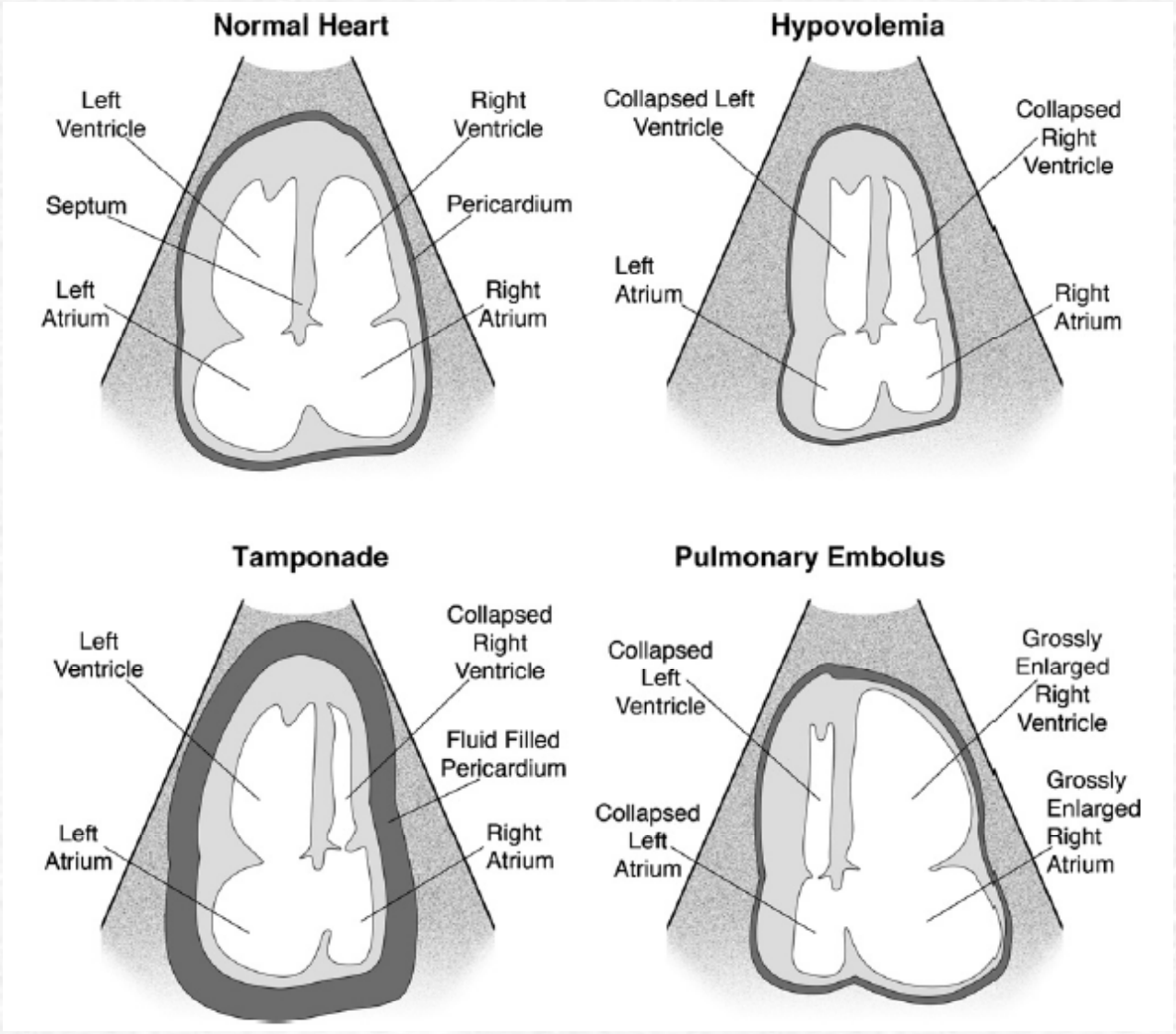
Table 1. Steps in the BEAT Exam

	Goal	View	Task
Beat	Cardiac function	Parasternal long	Stroke volume
Effusion	Pericardial effusion	Parasternal long	Subjective assessment
Area	R and L ventricle	Parasternal short apical 4 chamber	Subjective assessment
Tank	Volume status	M mode subcostal	IVC measurement









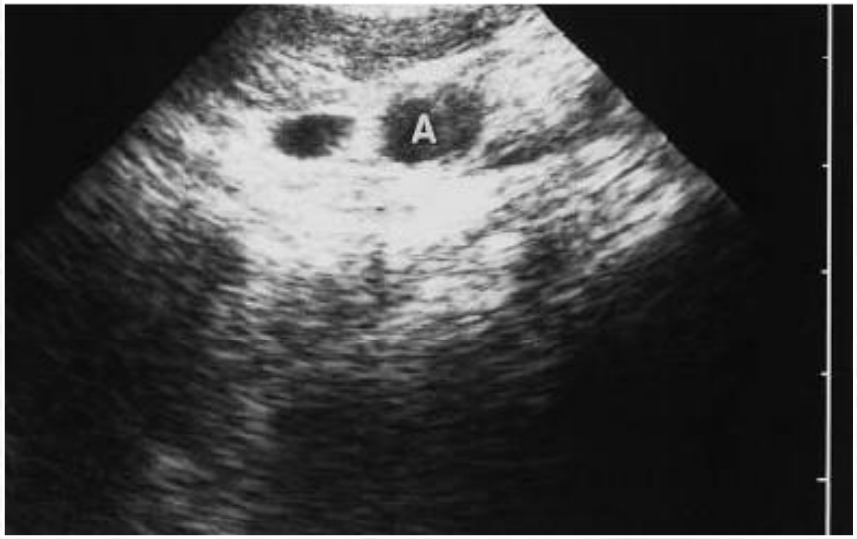
Resuscitation (2008) 76, 198—206

四、血管相关问题的应用

超声在急危重患者血管相关问题中的应用

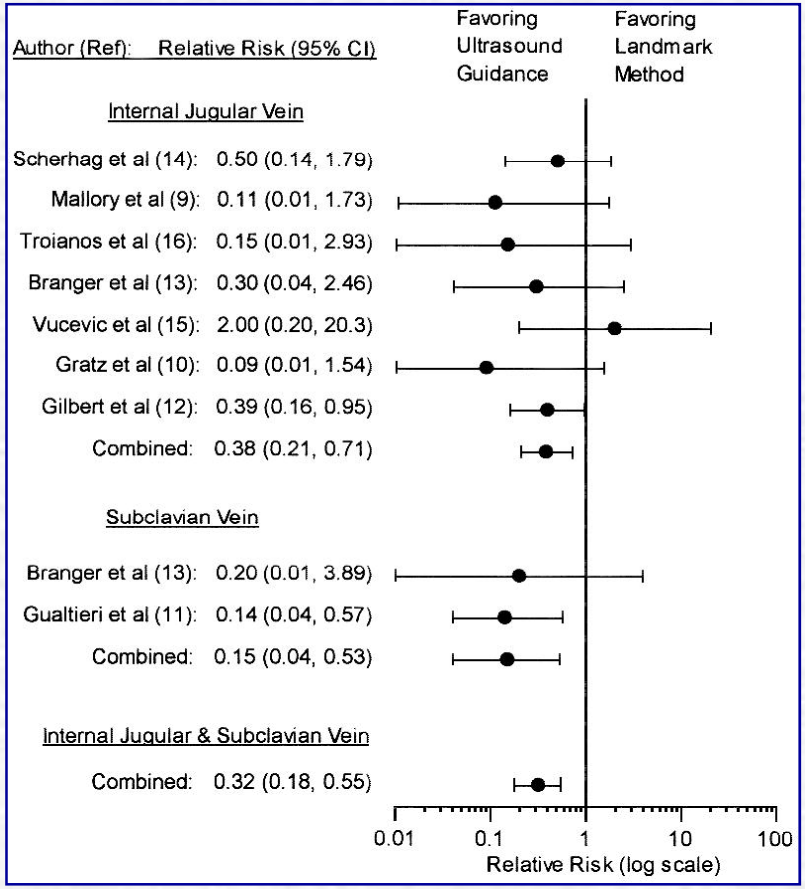
1. 引导中心静脉穿刺置管
2. 引导动脉穿刺置管
3. 引导外周静脉穿刺置管
4. 检测深静脉血栓
5. 其它应用

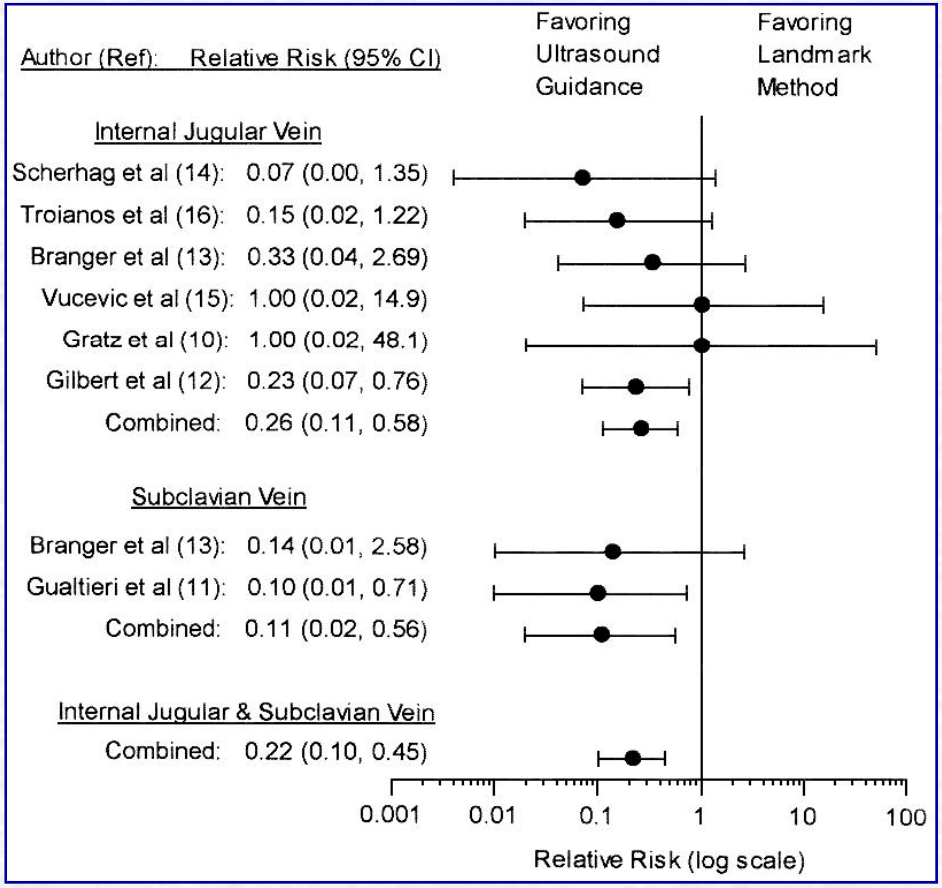
超声发现颈内静脉的解剖变异



Lichtenstein D, et al. Intensive Care Med, 2001, 27(1): 301-305.

超声引导能提高中心静脉穿刺成功率，降低并发症





Randolph AG, et al. Crit Care Med, 1996, 24:2053-2058.

对超声引导中心静脉穿刺置管的认识

即使保守地推测，超声引导静脉穿刺能减少国家卫生资源的消耗。

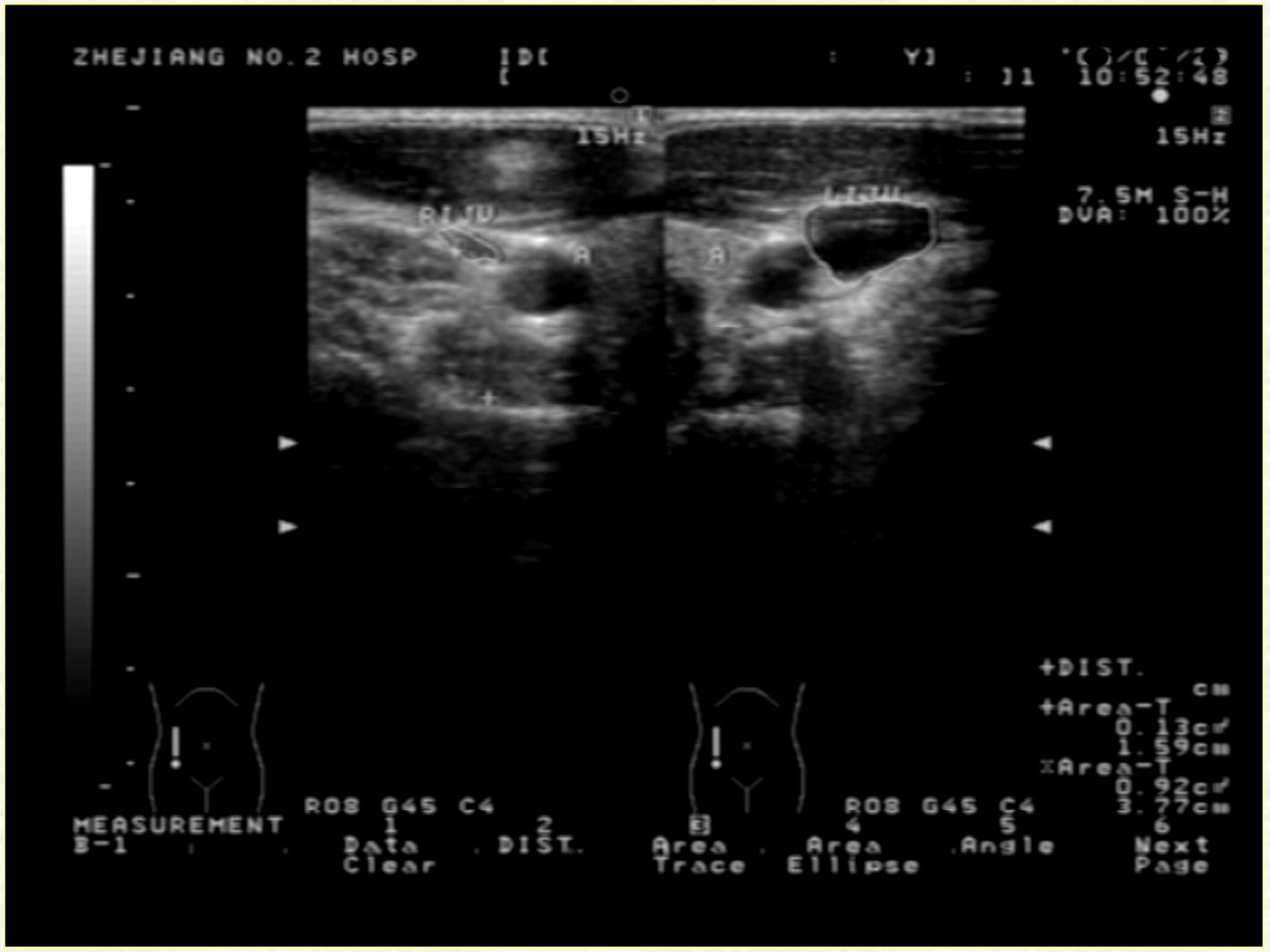
Calvert N, et al. Anaesthesia. 2004, 59(11):1116-1120.

超声引导的静脉穿刺越来越引起大家的重视，为减少相关的并发症，对操作有关的因素如***who, when***和 ***where***及其它因素必须加以考虑。

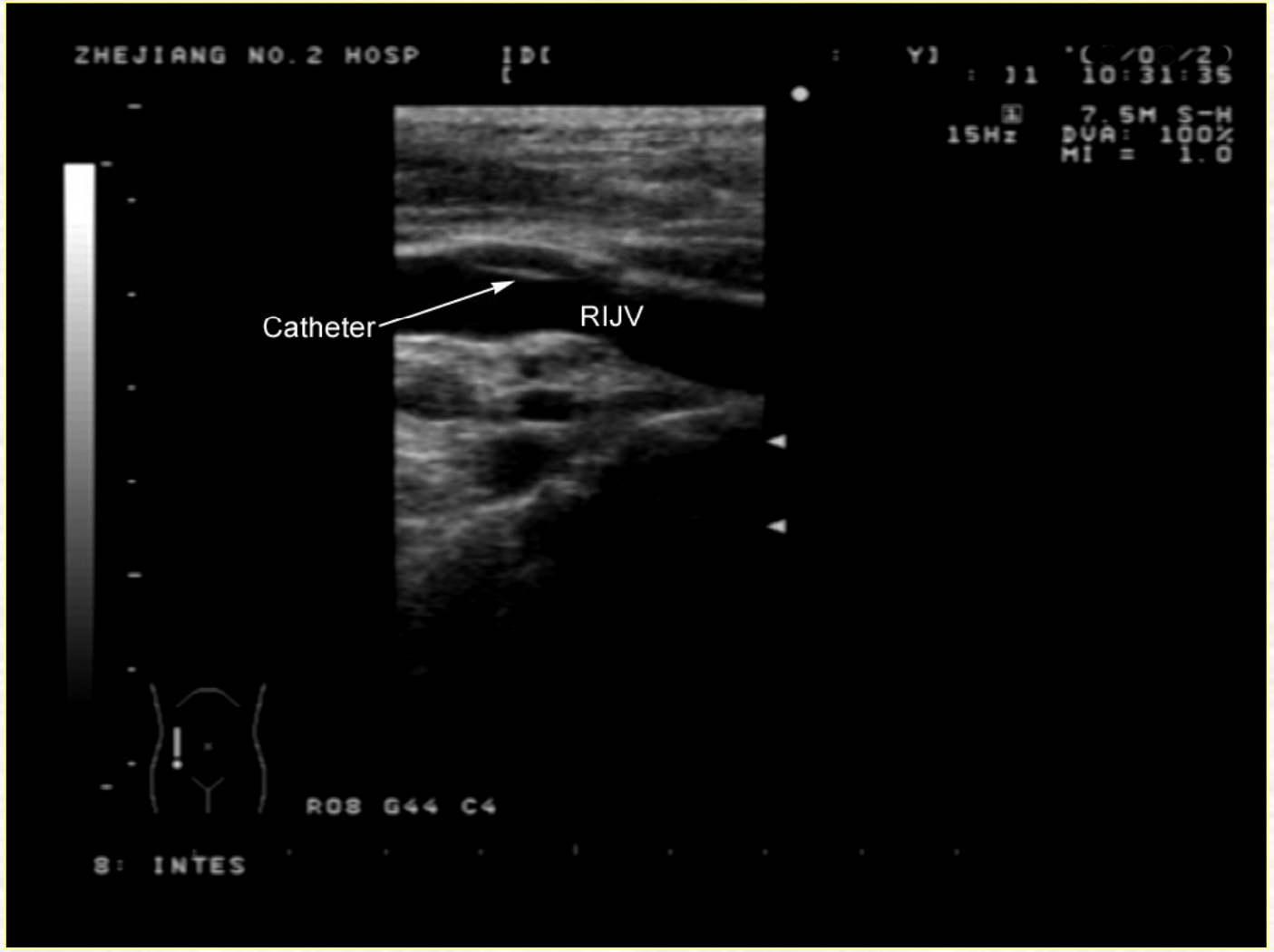
Hall AP, et al. Anaesthesia, 2005, 60(1):1-4.

超声引导最适合于困难的深静脉穿刺置管

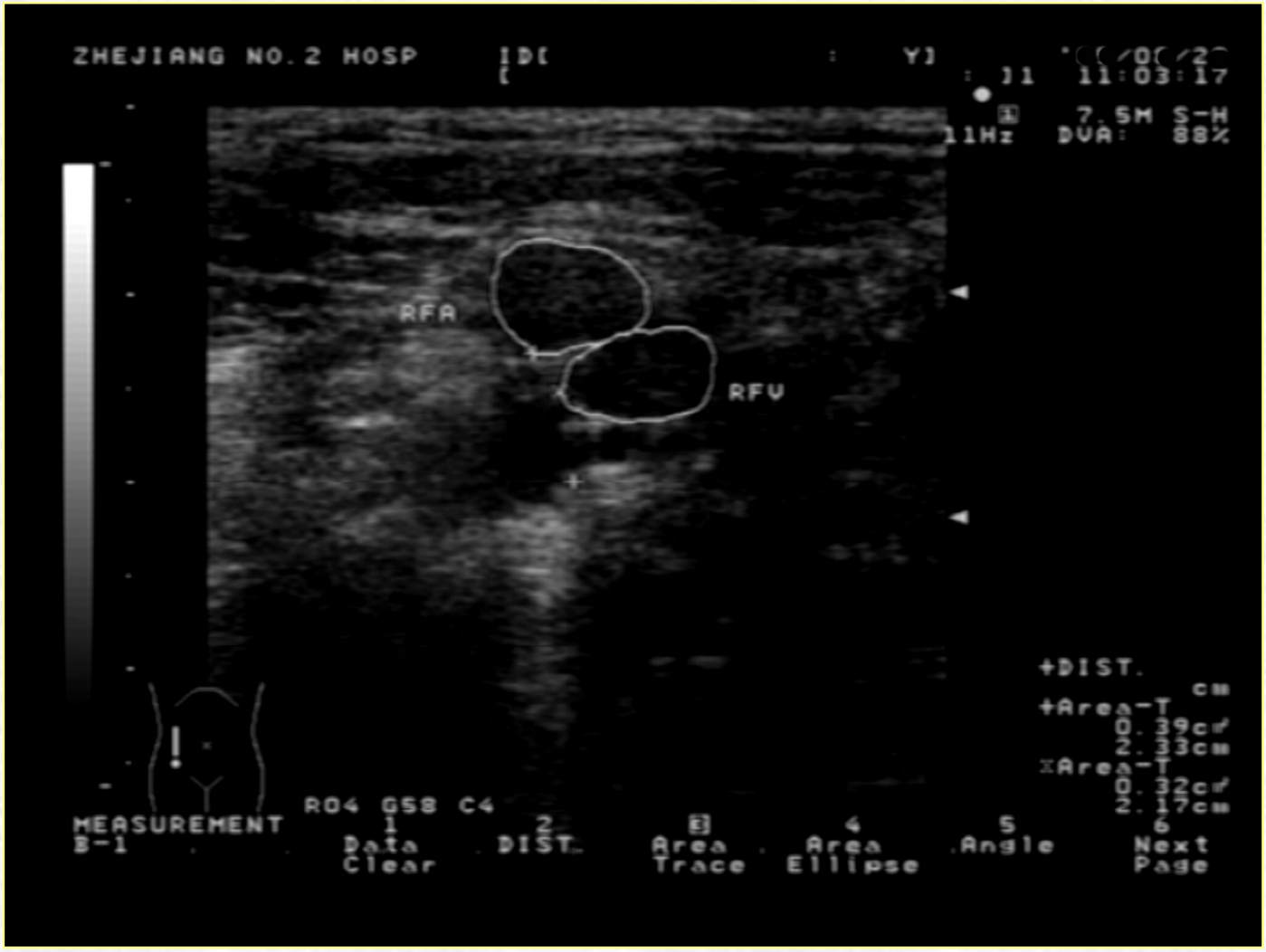
超声引导最适合于困难的深静脉穿刺置管



右颈内静脉(RIJV), 左颈内静脉(LIJV)截面积分别为0.13和0.92 cm^2



置管后超声确定导管（Catheter）位于右颈内静脉（RIJV）内



右侧股静脉(RFV，0.39cm²)位于股动脉(RFA，0.32cm²)之下，且大部分重叠

中华创伤杂志 2006 年 9 月第 22 卷第 9 期 Chin J Trauma, September 2006, Vol. 22, No. 9

· 临床研究 ·

严重多发伤患者颈内静脉的粗细及其影响因素

张茂 杨俭新 刘志海 干建新 徐少文 江观玉

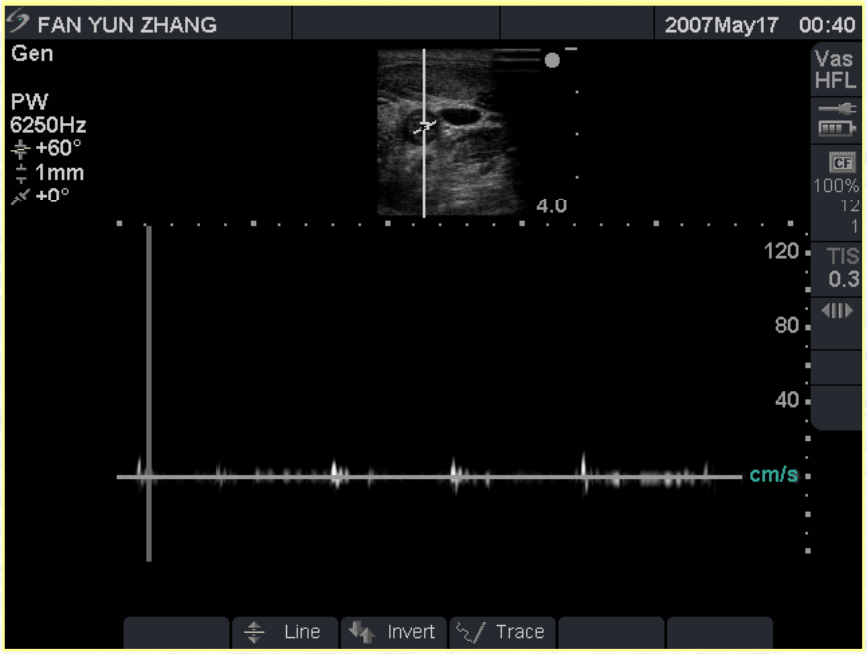
中华麻醉学杂志 2006 年 11 月第 26 卷第 11 期 Chin J Anesthesiol, November 2006, Vol 26, No. 11

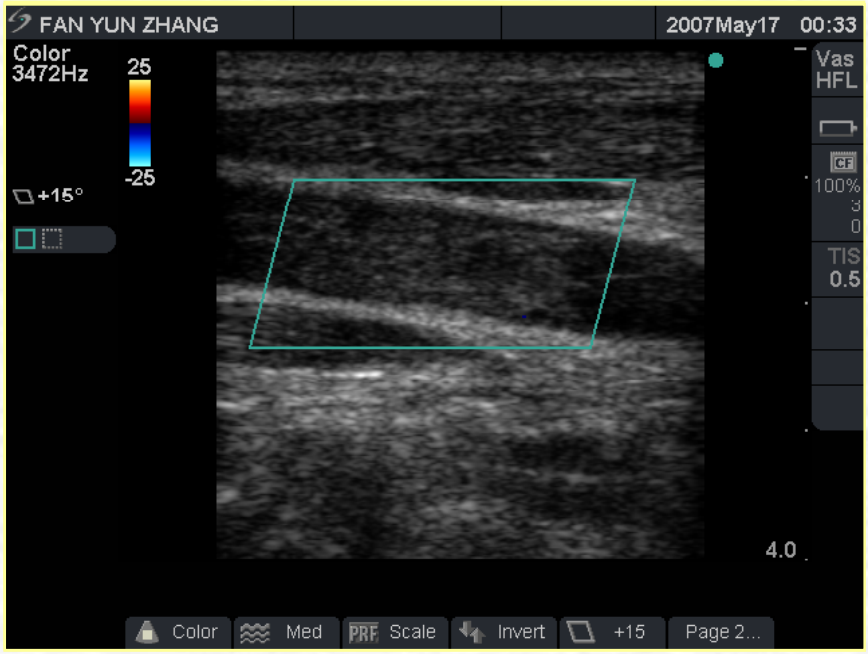
·重症医学·

超声定位在急诊 ICU 患者困难深静脉置管中的应用

黄养能 张茂 杨俭新 吴红波 刘志海 干建新 江观玉

诊断多发伤合并颈总动脉损伤、血栓形成

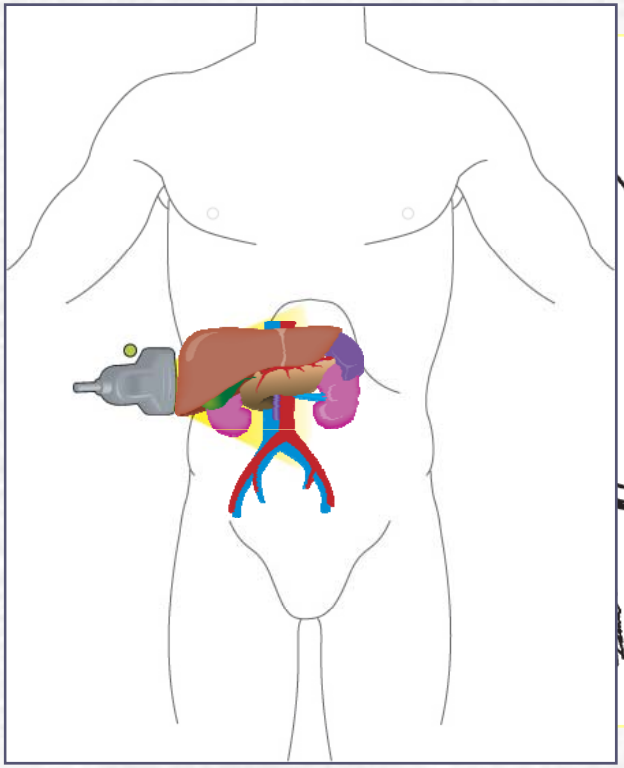


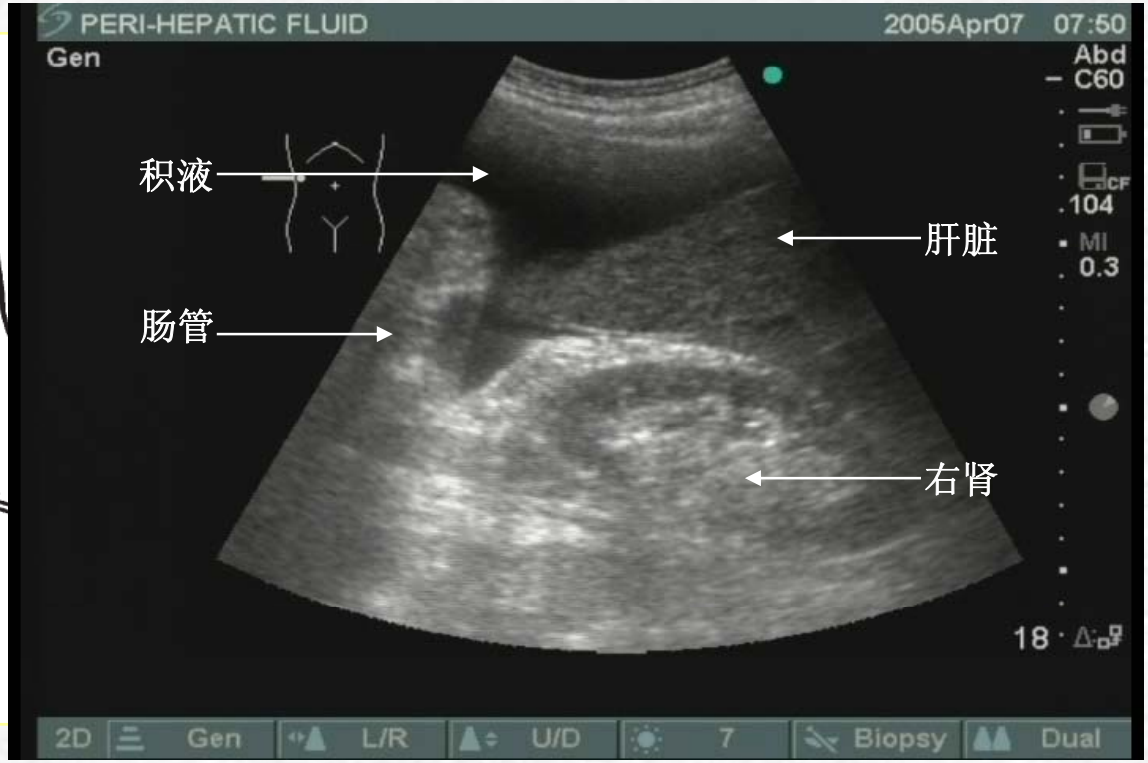


五、创伤相关问题的应用

创伤早期的 FAST评估

focused assessment with sonography for trauma





FAST评估具有较好的诊断价值

Study	No. of subjects	Sensitivity (%)	Specificity (%)	NPV (%)
Our study	242	86	99	98
Nural (2005) [25]	454	86.5	95.4	98.7
Holmes (2004) [26]	447	79	95	93
Miller (2003) [27]	359	42	98	93
Mattew (2001) [15]	2,576	86	98	98
Mckenney (2001) [20]	996	88	99	98
Coley (2000) [28]	107	55	83	50
Boulanger (1999) [21]	400	81	97	96
Shackford (1999) [10]	234	69	98	98
Chiu (1997) [14]	772	71	100	78

Chi LT.Int J Emerg Med,2008,1:183–187

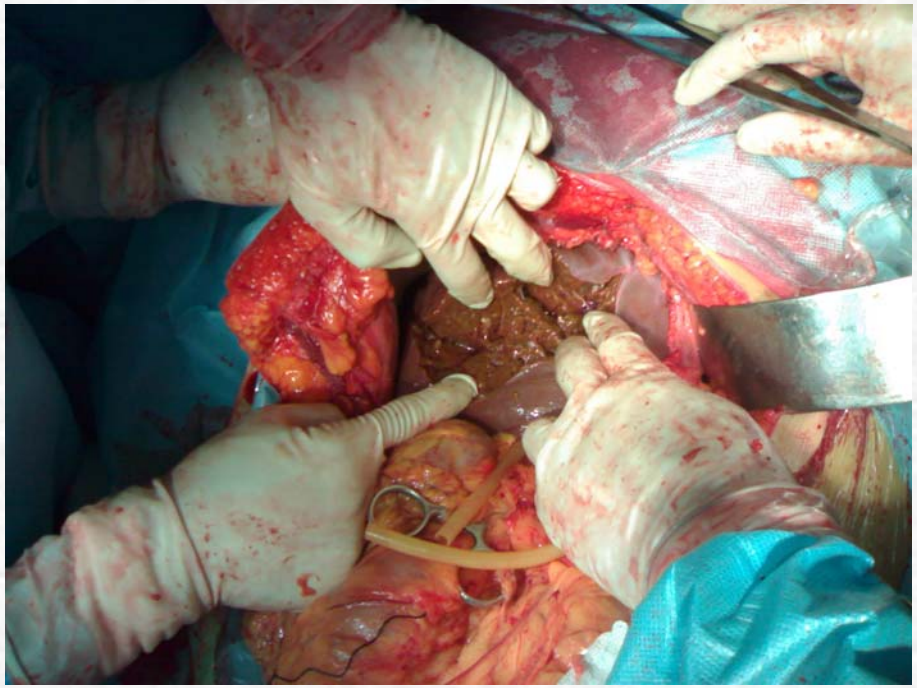
FAST评估缩短术前和住院时间，减少CT检查、并发症和费用

OR Patients Only	PLUS (N=29)†	Control (N=34)
Age, y	23 [20, 21, 22]	22 [18, 22, 24]
Sex, female, %	26	29
Revised trauma score (0–7.8)	6.8 [6.7, 7.5, 7.8]	6.7 [6.6, 7.5, 7.8]
Injury Severity Score (0–75)	22 [17, 22, 29]	21 [15, 18, 26]
Glasgow Coma Scale score (0–15)	12 [10, 14, 15]	12 [10, 13, 15]
Torso trauma (%)	86±9	84±9
Time from ED arrival to OR transfer, min	57 [41, 60, 70]	166 [90, 157, 178]

Subgroups	PLUS	Control	Multiplicative Changes or Odds Ratios With 95% CIs Associated With PLUS
All patients	(N=111)	(N=106)	
CT done (%)	53 [44, 62]	85 [76, 92]	Odds ratio=0.16 [0.07, 0.31]
Total charges, $	16,100 [5,700, 10,600, 19,000]	31,500 [6,700, 16,400, 43,600]	Multiplicative change=0.65 [0.52, 0.81]
Admitted patients only	(N=92)	(N=83)	
Hosp-LOS, days	6.2 [1.0, 4.0, 8.0]	10.2 [2.0, 5.0, 12.0]	Multiplicative change=0.73 [0.54, 0.99]
OR patients only	(N=29)	(N=34)	
CT done (%)	25 [10,47]	78 [56, 93]	Odds ratio=0.07 [0.01, 0.29]
Hosp-LOS, days	10.7 [4.0, 8.0, 22]	15.1 [5.0, 12.0, 23.6]	Multiplicative change=0.40 [0.16, 1.00]
Composite complications, %*	21 [11, 27]	38 [28, 46]	Odds ratio=0.17 [0.02, 0.86]
Total charges, $	28,400 [15,100, 22,600, 37,100]	47,600 [29,500, 43,800, 55,700]	Multiplicative change=0.90 [0.54, 1.48]

Lawrence AM. Ann Emerg Med,2006,48:227-235.

FAST评估有助于迅速筛选剖腹手术的伤员

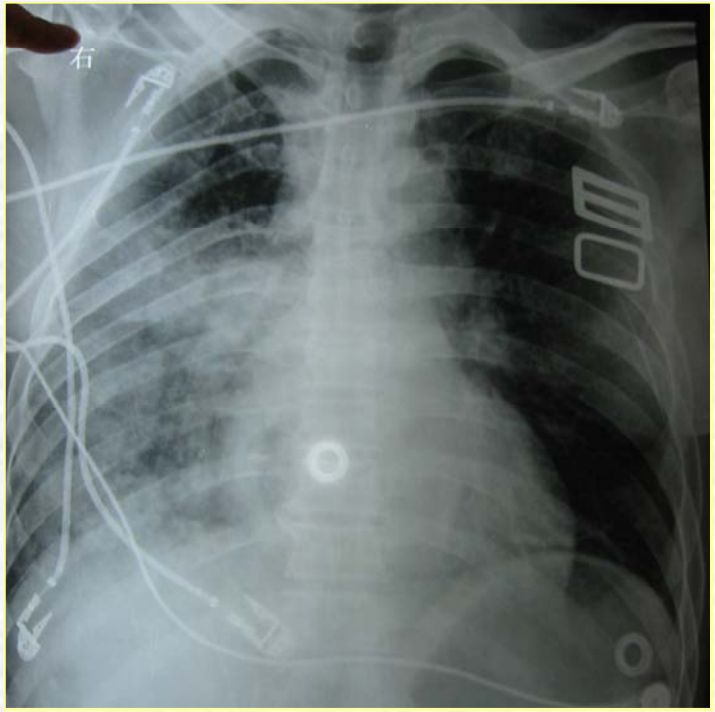


Lee BC. AJR, 2007, 188:415–421

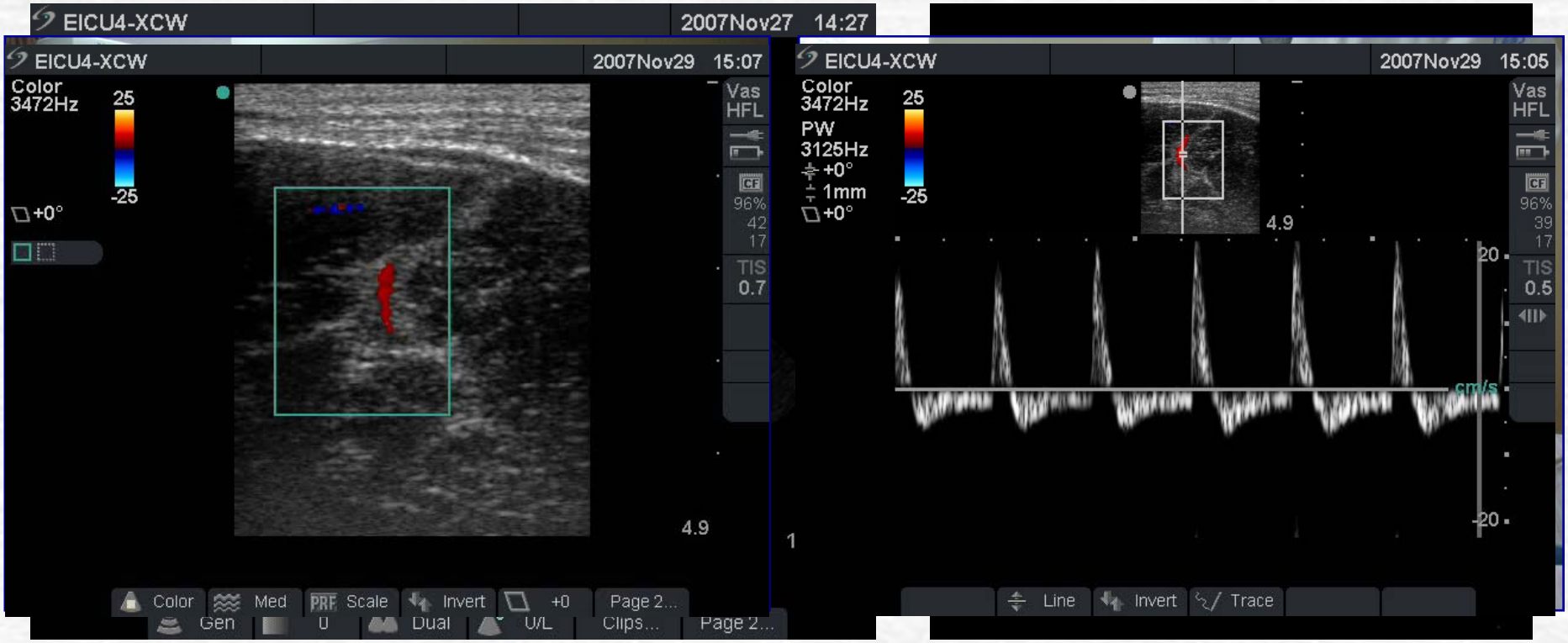
超声诊断肋骨骨折

时 间	作 者	对 象	超 声	X 片
1997年	Bitschnau等	103例胸部外伤	56例101处	27例49处
1999 年	Griffith等	50例怀疑肋骨骨折	39例83处	6例8处
2003年	Kara等	37例胸部钝性伤	15例	0

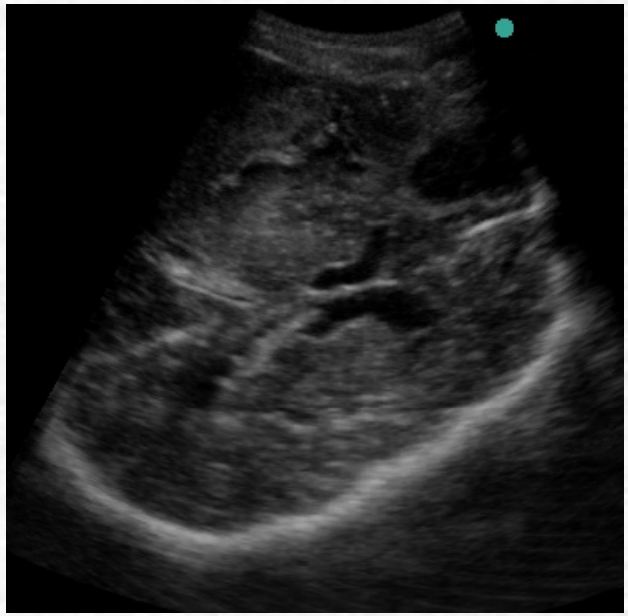
超声诊断胸骨骨折1例

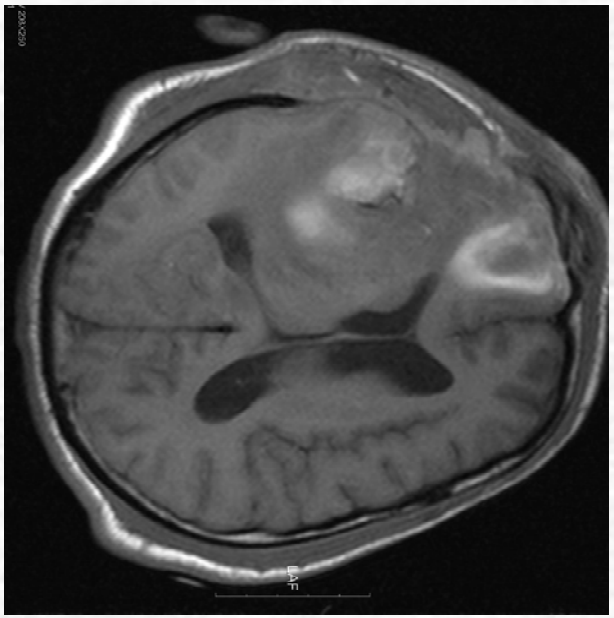


严重颅脑损伤的监测

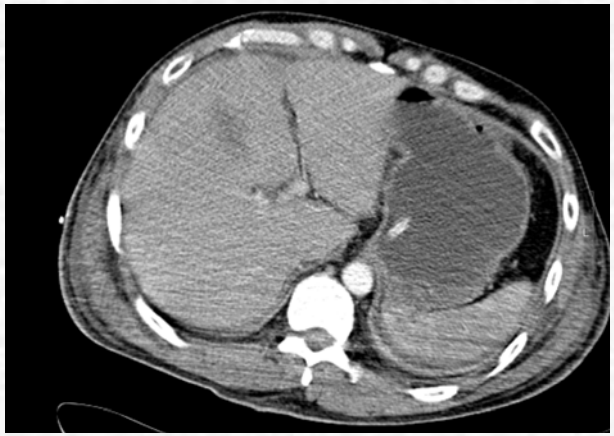

EICU4-XCW
2007Nov27 14:27
EICU4-XCW
2007Nov29 15:07
Color
3472Hz
25
-25
+0°
Vas
HFL
96%
42
17
TIS
0.7
4.9
Color
Med
Scale
Invert
+0
Page 2...
Gen
0
Dual
U/L
Clips...
Page 2...
EICU4-XCW
2007Nov29 15:05
Color
3472Hz
PW
3125Hz
+0°
1mm
+0°
25
-25
4.9
20
-20
cm/s
Vas
HFL
96%
39
17
TIS
0.5
1
Line
Invert
Trace

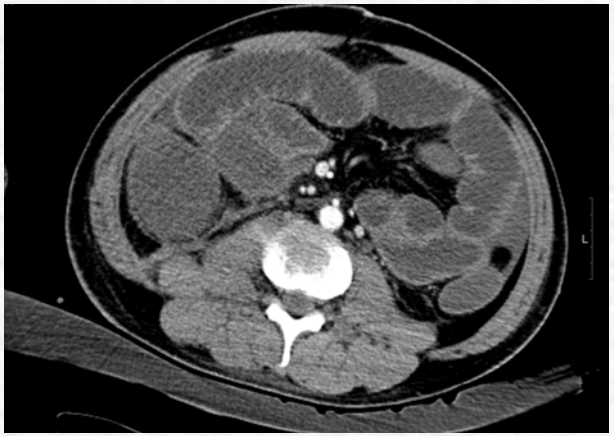
严重颅脑损伤开颅术后的监测

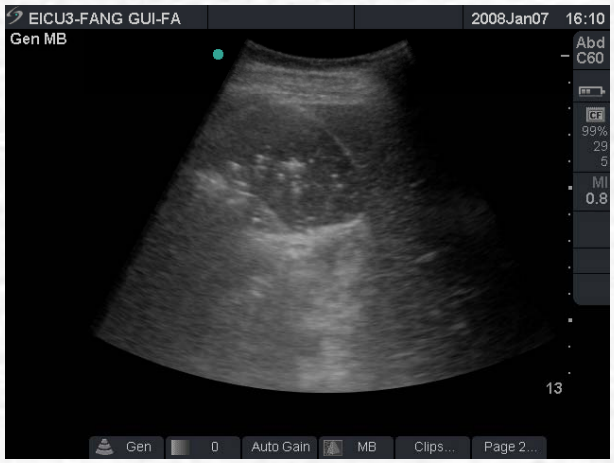


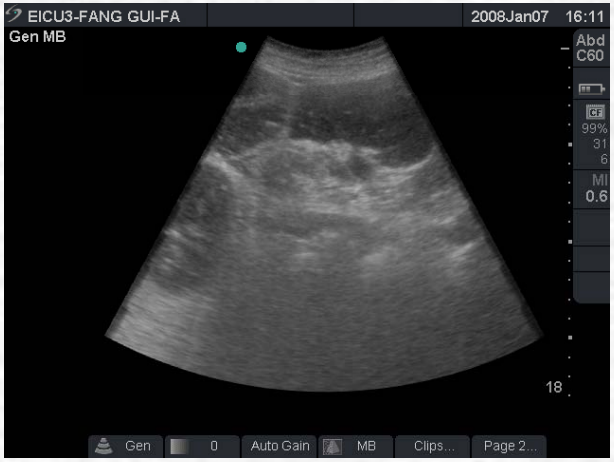


胃肠功能状况的监测






EICU3-FANG GUI-FA
2008Jan07 16:10
Gen MB
Abd
C60
99%
29
5
MI
0.8
13
Gen
0
Auto Gain
MB
Clips...
Page 2...


EICU3-FANG GUI-FA
2008Jan07 16:11
Gen MB
Abd
C60
99%
31
6
MI
0.6
18
Gen
0
Auto Gain
MB
Clips...
Page 2...

胃肠功能状况的监测


HYC
851996
2010Feb18 17:13
Gen MB
Abd
C60
CF
96%
26
9
MI
0.8
13
Gen
0
Auto Gain
MB
Clips...
Page 2...

Diaphragm dysfunction assessed by ultrasonography: Influence on weaning from mechanical ventilation

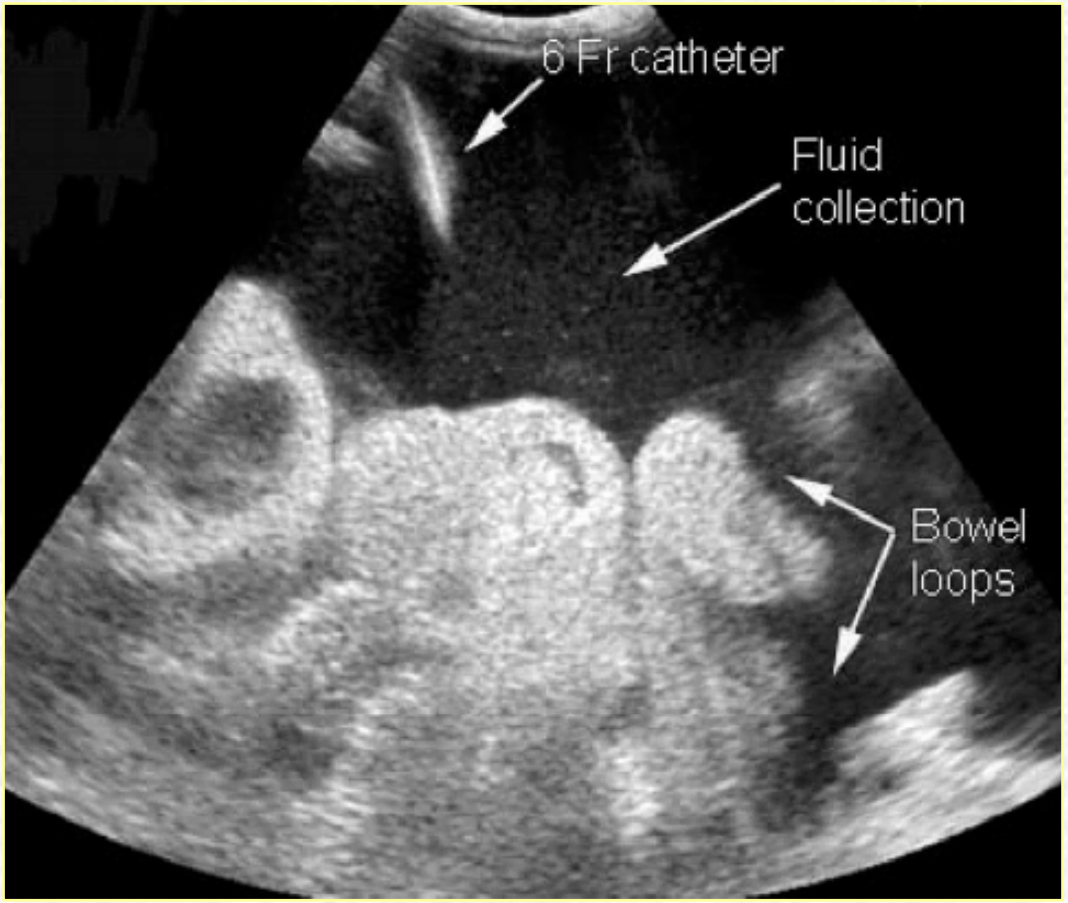
Won Young Kim, MD; Hee Jung Suh, RT; Sang-Bum Hong, MD, PhD; Younsuck Koh, MD, PhD, FCCM; Chae-Man Lim, MD, PhD, FCCM

Table 3. Sensitivity, specificity, and negative and positive predictive values of ultrasonography-diagnosed diaphragmatic excursion and rapid shallow breathing index for predicting primary weaning failure

Variable	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value	Area Under the Curve
Diaphragmatic excursion (right 10, left 10)	83	41	37	86	0.61
Diaphragmatic excursion (right 14, left 12)	60	76	82	51	0.68
Rapid shallow breathing index ≥80/L	26	90	82	40	0.58

Crit Care Med 2011; 39:000–000

引导腹腔积液的引流



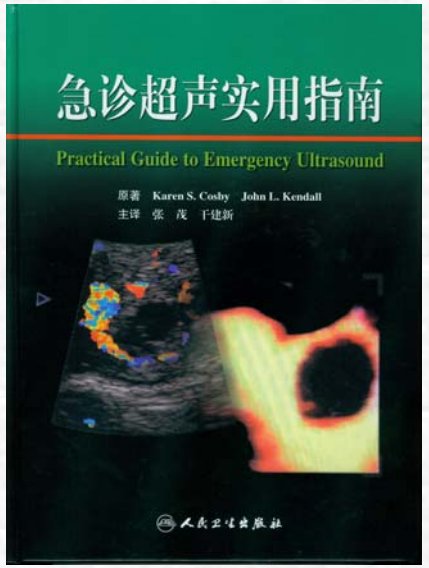
观察膀胱充盈情况和引导穿刺引流

床旁超声在急危重人的处理

中的应用还有很多……

浙江大学医学院附属第二医院急诊医学科的经验

1. 2004年开始将其作为急危重患者日常评估的手段
2. 发表论文24篇（SCI 5篇，中华系列11篇，国际1篇）
3. 翻译出版“急诊超声实用指南”一书
4. 获国际合作和省级科研项目各1项
5. 举办专题培训班3次（国家级继教项目）
6. 建立了多方的国际合作关系



Venue : Room 301 – 302
Programme Title : Mastering Emergency Ultrasound

Topic	Speaker
Now that I've mastered FAST.. what's next?	Dr CHAN Kim Chai
Emergency ultrasound in assessment of possible ectopic pregnancy.	Dr James RIPPEY
Rapid assessment of critical illness by clinician-performed ultrasound	Dr Mao ZHANG

10th June 2010, Day 2 : Emergency Imaging

Emergency Imaging	
The Assessment of Non-Traumatic Shock with Bedside Ultrasound	Timothy Harris
A Visual Stethoscope: Lung Ultrasound in patients with Critical illness	Mao Zhang
CT in Abdominal Pain: Critical Answers to Difficult Questions	Kenenth Sheah

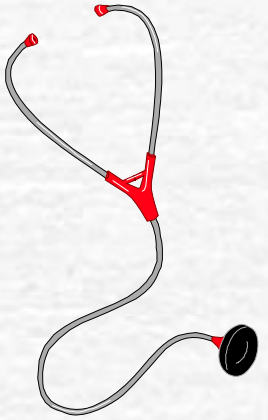
1. Rapid detection of pneumothorax by ultrasonography in patients with multiple trauma. ***Crit Care***, 2006, 10(4): R112.
2. Diagnosis of pneumothorax by radiography and ultrasonography-a Meta-analysis. ***Chest***, 2011, 137(5):
3. Bedside lung ultrasound in critical care practice. ***Crit Care***, 2007, 11(1): R205.
4. Ultrasound assessment of antibiotic-induced pulmonary reaeration in ventilator-associated pneumonia. ***Crit Care Med***, 2010, 38(1):84-92.
5. Multiplane ultrasound approach to quantify pleural effusion at the bedside. ***Intensive Care Med***, 2010, 36(4):656-64.
6. Detection of lung atelectasis/consolidation by ultrasound in multiple trauma patients with mechanical ventilation. ***Crit Ultrasound J***, 2009, 1(1):13-16.
7. 急诊超声快速诊断多发伤患者的气胸. *中华创伤杂志*, 2006, 22 (7): 549-551.
8. 机械通气患者合并气胸的超声诊断. *中华结核和呼吸杂志*, 2006, 29(8): 570-571.

9. 严重多发伤患者颈内静脉的粗细及影响因素. *中华创伤杂志*, 2006, 22 (9): 679-682.
10. 超声引导对ICU危重患者困难深静脉置管的价值. *中华麻醉学杂志*, 2006, 26(11): 1047-1048.
11. 严重创伤患者颈内静脉大小及呼吸变异与中心静脉压的关系. *中华超声影像学杂志*, 2007, 16(2): 123-127.
12. 急诊外科医生应用超声诊断严重多发伤合并心包积液的价值. *中华创伤杂志*, 2007, 23(4): 277-278.
13. 超声对机械通气多发伤患者肺不张/实变诊断价值的初步研究. *中华创伤杂志*, 2010, 26 (3)：252-256
14. 重视超声在严重创伤救治中的应用. *中华急诊医学杂志*, 2010, 19(5): 459-461.
15. 急诊床旁应用超声FAST方案快速评估多发伤的初步研究. *中华急诊医学杂志*, 2010, 19(10): 1066-1069.
16. 危重患者胸腔积液超声新定量方法的建立与应用. *中华超声影像学杂志*, 2011, 20(2): 129-133.
17. 超声诊断气胸的研究进展. *中华急诊医学杂志*, 2010, 19(7) :778-780.

浙江大学医学院附属第二医院急诊医学科的经验

床旁超声在急危重患者中应用的展望

床旁超声将成为急危重症医师



——看得见的听诊器！

问 题 和 挑 战

1. 如何获得超声应用的知识与技能？
2. 如何获得超声设备？
3. 如何处理与超声专科的关系？
4. 如何获得资格认证？
5. 检查的收费问题？
6. 规范培训问题？

……


谢 谢!