L’échographie appliquée aux urgences pédiatriques

Dr Fournier Philippe

L’échographie

- Depuis 40 ans l’échographie est devenue accessible à tous
  - Amélioration des échographes avec une résolution qui donne des images proches des coupes anatomiques
  - Développement de machines transportables et même portables


1980


1990


2000

L’échographie appliquée aux urgences

- Depuis 30 ans l’échographie au lit du malade s’est développée.
- Les urgentistes adultes, depuis 20 ans se sont emparés de cette technique.

Ce que nous ont appris les urgentistes adultes

- L’échographie aux urgences par l’urgentiste
  - La FAST Echo
  - L’écho pleurale
  - Le repérage et la pose de VVC sous écho
  - L’échographie cardiaque
  - Le doppler transcrannien …

Ce que nous ont appris les urgentistes adultes

- Les urgences pédiatriques se développent depuis une 20 ans.
- Elles se basent sur l'expérience des urgences adultes

La place de l'échographie en pédiatrie

Point-of-care Ultrasonography by Pediatric Emergency Medicine Physicians

Jennifer R. Marin, MD, MSc, and Resa E. Lewiss, MD

In 2001 the American College of Emergency Physicians (ACEP) first published specialty-specific guidelines for point-of-care ultrasound (US) in emergency medicine (EM). At the same time, the Accreditation Council for Graduate Medical Education mandated that EM residents graduate with competency in point-of-care US. The guidelines and call for competency have since gained broad professional society acceptance.[1–6]

Several of the point-of-care US applications described in the ACEP guidelines and in the EM literature are not necessarily relevant to the practice of pediatric EM (PEM). In addition, there are applications that have not been well delineated in EM and are applicable to PEM practitioners. To date, the majority of PEM physicians have completed pediatrics residencies without point-of-care US training. In addition, point-of-care US only recently became a core competency for PEM fellowship training.[7] Consequently, PEM as a specialty has been slower to adopt and incorporate point-of-care US into clinical practice.

La place de l'échographie en pédiatrie

POINT-OF-CARE US IN PEDIATRIC EMERGENCY MEDICINE

More recently, PEM physicians have been using point-of-care US for patient care. According to a survey from 2011, 95% of emergency departments (EDs) with a PEM fellowship program use point-of-care US in some manner, and 88% of programs provide training in point-of-care US for their fellows.[13] This is a dramatic increase, because only 57% of programs reported the use of point-of-care US in 2006, and only 65% at that time incorporated training for their fellows.[14] Despite the growing use of point-of-care US by pediatric emergency physicians, there have been no published

Point-of-Care Ultrasonography by Pediatric Emergency Medicine Physicians

Jennifer R. Marin, MD, MSc, Resa E. Lewiss, MD, AMERICAN ACADEMY OF PEDIATRICS, Committee on Pediatric Emergency Medicine; SOCIETY FOR ACADEMIC EMERGENCY MEDICINE, Academy of Emergency Ultrasound; AMERICAN COLLEGE OF EMERGENCY PHYSICIANS, Pediatric Emergency Medicine Committee; WORLD INTERACTIVE NETWORK FOCUSED ON CRITICAL ULTRASOUND

Many departments with established programs have, at a minimum, a low-frequency and a high-frequency transducer. The high-frequency linear transducer can be used in pediatrics for the soft tissues, abdomen, lung, and spine and for procedural guidance. For the evaluation of deeper structures and evaluation of the chest and abdomen, a lower-frequency transducer will provide improved visualization. The phased-

La place de l'échographie en pédiatrie

Point-of-Care Ultrasonography by Pediatric Emergency Physicians

AMERICAN ACADEMY OF PEDIATRICS
Committee on Pediatric Emergency Medicine

SOCIETY FOR ACADEMIC EMERGENCY MEDICINE
Academy of Emergency Ultrasound

AMERICAN COLLEGE OF EMERGENCY PHYSICIANS
Pediatric Emergency Medicine Committee

WORLD INTERACTIVE NETWORK FOCUSED ON CRITICAL ULTRASOUND

Point-of-care US can expedite clinical decisionmaking, direct follow-up diagnostic imaging, aid in procedural guidance and improve patient satisfaction.[1-6] Point-of-care US is designed to answer specific yes/no questions in real time. The point-of-care US examination has important qualities as an imaging modality. There is no need to transport a patient outside of the emergency department (ED), examinations can be performed at all hours, examinations may be repeated, and there is no ionizing radiation exposure. Moreover, it may help direct further evaluation so as to avoid unnecessary and costly testing.

INDICATIONS FOR POINT-OF-CARE ULTRASONOGRAPHY

Pediatric emergency physicians can use point-of-care US as a diagnostic or procedural adjunct in the evaluation of patients in the ED. Diagnostic applications are those that assist in diagnosis and inform medical decisionmaking. Procedural applications may be "US-assisted" or "static," or "US-guided," also referred to as "dynamic." Static US is defined as using US prior to the procedure, identifying anatomic structures, and determining the ideal circumstances for the procedure to be performed. The procedure itself is performed without the use of US. In contrast, in dynamic US, the US and procedure are performed simultaneously.

Les domaines d'application aux urgences

- Abdominale
- Tissus mous
- Poumon
- Vasculaire
- Ostéoarticulaire

Abdominale

- Invagination
- Appendicite
- trauma

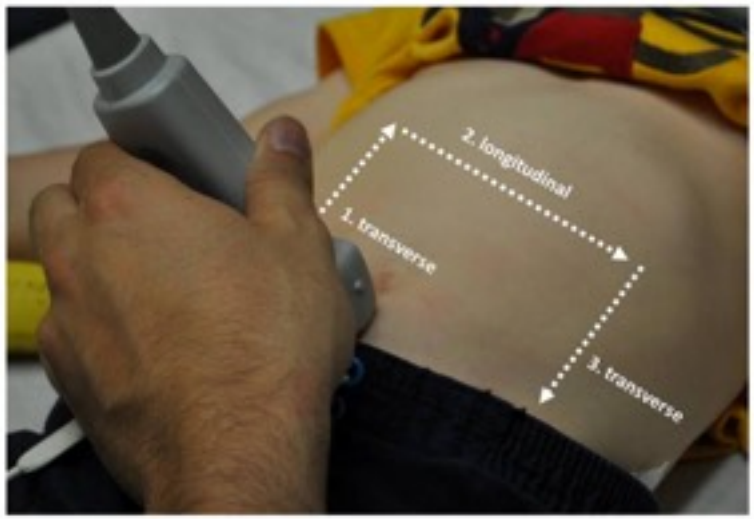
Diagnosis of Intussusception by Physician Novice Sonographers in the Emergency Department

Antonio Riera, MD, Allen L. Hsiao, MD, Melissa L. Langhan, MD, T. Rob Goodman, MBBChir, Lei Chen, MD, MHS

From the Department of Pediatrics, Section of Emergency Medicine (Riera, Hsiao, Langhan, Chen), and Department of Diagnostic Radiology (Goodman), Yale University School of Medicine, New Haven, CT.

Therefore, bedside ultrasonography had a sensitivity of 85% (95% CI 54% to 97%), specificity of 97% (95% CI 89% to 99%), positive predictive value of 85% (95% CI 54% to 97%), and negative predictive value of 97% (95% CI 89% to 99%) for the diagnosis of ileocolic intussusception. The likelihood ratio of a positive bedside ultrasonographic result was 29 (95% CI 7.3 to 117), whereas the likelihood ratio of a negative bedside ultrasonographic result was 0.16 (95% CI 0.04 to 0.57). Review of still images by study physician 1 did not reveal any discrepancies with the bedside physician's interpretation of the ultrasonographic findings.

Invagination



Transducer positioning and trajectory to include views of the right lower quadrant, right upper quadrant, left upper quadrant and left lower quadrant.

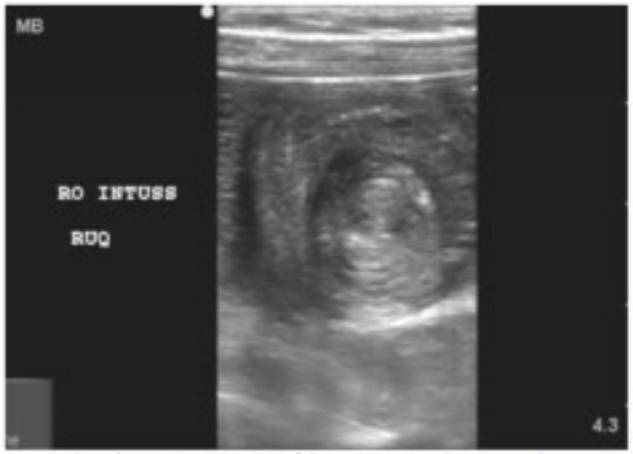


Figure 1. Classic appearance of intussusception on ultrasound "the doughnut sign".

Invagination

World J Emerg Med, Vol 5, No 4, 2014

Original Article

Emergency bedside ultrasound for the diagnosis of pediatric intussusception: a retrospective review

Samuel H. F. Lam[1,2], Adam Wise[1], Christopher Yenter[1]

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[2] *Department of Emergency Medicine, University of Illinois at Chicago, Chicago, Illinois, USA*

Corresponding Author: *Samuel Lam, Email HiufungSamuel.Lam@advocatehealth.com*

RESULTS: A total of 1 631 charts were reviewed, with 49 meeting inclusion criteria. Five of those were later excluded for incomplete documentation or lack of saved BUS images. The prevalence of intussusception was 23%. The mean age of the subjects was 31 months. BUS was 100% sensitive (95%*CI* 66%–100%) and 94% specific (95%*CI* 79%–99%) for detection of pediatric intussusception compared to radiology study results. Positive and negative likelihood ratios were 16.5 (95%*CI* 4.30%–63.21%) and 0 (95%*CI* 0–0) respectively.

CONCLUSIONS: BUS is an accurate means of diagnosing acute intussusception in pediatric patients. Further study might be indicated to confirm such benefits.

Appendicite

PEDIATRICS/ORIGINAL RESEARCH

Evaluation of Acute Appendicitis by Pediatric Emergency Physician Sonography

Adam B. Sivitz, MD*; Stephanie G. Cohen, MD; Cena Tejani, MD
*Corresponding Author. E-mail: asivitz@barnabashealth.org

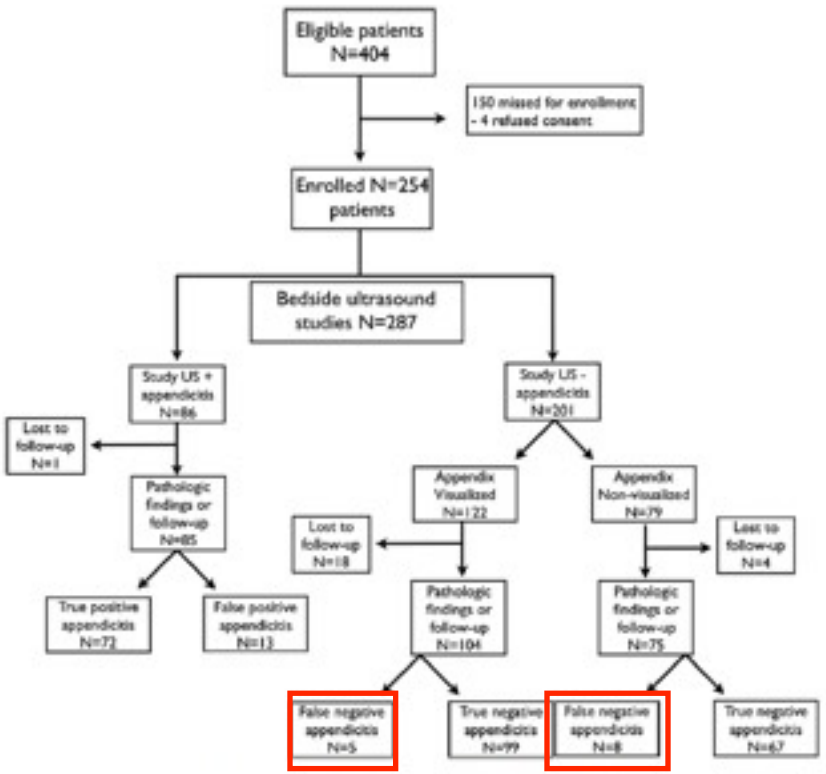


Figure 2. Study flow chart.

Appendicite

Table E1. Test characteristics by quartile of sonographer VAS confidence.

Test Characteristics	Sonographer's VAS Confidence 0–66 (N = 66)	VAS 67–84 (58)	VAS 85–94 (66)	VAS 94–100 (74)
Sensitivity (95% CI)	0.62 (0.34–0.88)	0.54 (0.24–0.85)	0.91 (0.78–1)	0.97 (0.88–1)
Specificity (95% CI)	0.94 (0.85–1)	0.91 (0.81–1)	0.95 (0.86–1)	0.89 (0.76–1)
PPV (95% CI)	0.73 (0.45–0.99)	0.6 (0.29–0.91)	0.91 (0.78–1)	0.9 (0.78–1)
NPV (95% CI)	0.91 (0.81–1)	0.9 (0.78–1)	0.95 (0.86–1)	0.97 (0.88–1)
LR+ (95% CI)	10.9 (3.3–35)	6.4 (2.2–19)	20 (5–76)	8.8 (3.5–22)
LR− (95% CI)	0.41 (0.2–0.81)	0.5 (0.26–0.96)	0.09 (0.02–0.34)	0.02 (0.004–0.2)

PPV, Positive predictive value; *NPV*, negative predictive value; *LR+*, positive likelihood ratio; *LR−*, negative likelihood ratio.

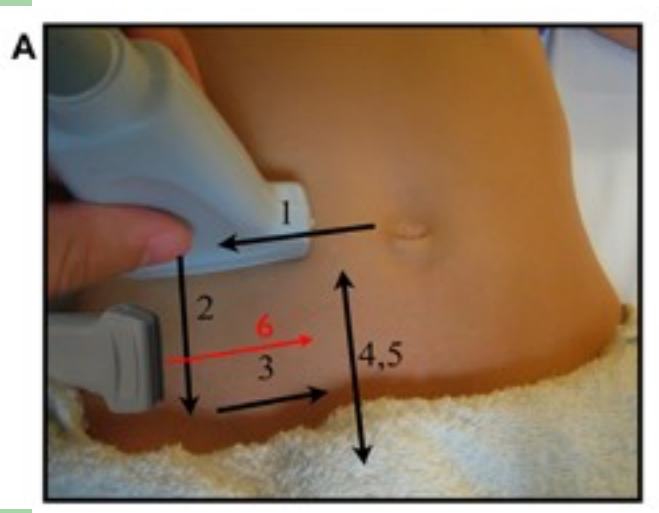
Table E2. Test characteristics by sonographer visualization and experience.

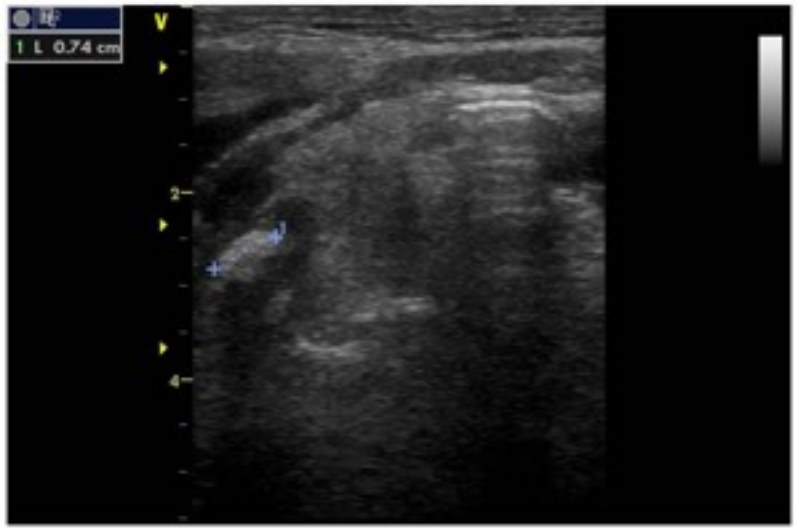
Test Characteristics	Studies Conducted by All (N = 264)	Studies With Appendix Visualized (N = 189)	Sonographers With >25 Scans (133)	Sonographers With <25 Scans (131)
Sensitivity (95% CI)	0.85 (0.74–0.95)	0.95 (0.86–1)	0.88 (0.76–1)	0.82 (0.69–0.95)
Specificity (95% CI)	0.93 (0.85–1)	0.88 (0.8–0.97)	0.98 (0.9–1)	0.87 (0.78–0.97)
LR+ (95% CI)	11.7 (6.9–20)	8.2 (4.9–13.8)	40 (10–160)	6.5 (3.7–11.5)
LR− (95% CI)	0.16 (0.1–0.27)	0.06 (0.02–0.15)	0.12 (0.05–0.28)	0.2 (0.11–0.39)

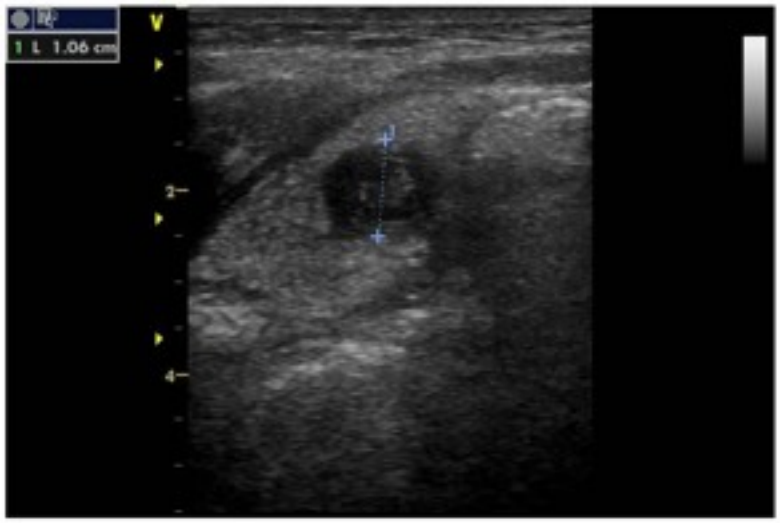
Results: Thirteen pediatric emergency medicine sonographers performed 264 ultrasonographic studies, including 85 (32%) in children with pathology-verified appendicitis. Bedside sonography had a sensitivity of 85% (95% confidence interval [CI] 75% to 95%), specificity of 93% (95% CI 85% to 100%), positive likelihood ratio of 11.7 (95% CI 6.9 to 20), and negative likelihood ratio of 0.17 (95% CI 0.1 to 0.28).

Conclusion: With focused ultrasonographic training, pediatric emergency physicians can diagnose acute appendicitis with substantial accuracy. [Ann Emerg Med. 2014;64:358-364.]

Appendicite







Traumatisme abdominal

The role of focused abdominal sonography for trauma (FAST) in pediatric trauma evaluation

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Received 16 February 2013; accepted 8 March 2013

Table 3 Diagnostic characteristics of FAST for free fluid as compared to CT ($n = 75$).

Region	Sensitivity	Specificity	PPV	NPV	Inconclusive FAST exam[a]
A. Comparing to free fluid on CT					
Overall	8/22 (36%)	40/48 (83%)	7/13 (54%)	45/58 (78%)	4
Right upper quadrant	4/11 (36%)	56/61 (92%)	5/6 (83%)	58/65 (89%)	4
Pericardial	NA (0 cases)	66/75 (88%)	0/1 (0%)	66/66 (100%)	8
Left upper quadrant	4/10 (40%)	58/62 (94%)	4/5 (80%)	61/67 (91%)	3
Pelvis	5/18 (28%)	44/51 (86%)	4/9 (44%)	50/62 (81%)	4
Ignoring minimal pelvic fluid on CT					
Overall	7/14 (50%)	51/60 (85%)	7/13 (54%)	51/58 (88%)	4
Pelvis	5/10 (50%)	56/63 (89%)	4/9 (44%)	57/62 (92%)	4
B. Comparing to free fluid or SOI on CT					
Overall	7/16 (44%)	49/58 (85%)	7/13 (54%)	49/58 (84%)	4

[a] Inconclusive FAST exams were not counted toward positive nor negative FAST exam findings.

Traumatisme abdominal

Ben-Ishay et al. World Journal of Emergency Surgery
DOI 10.1186/s13017-015-0021-x

WORLD JOURNAL OF EMERGENCY SURGERY

RESEARCH ARTICLE Open Access

Focused abdominal sonography for trauma in the clinical evaluation of children with blunt abdominal trauma

Offir Ben-Ishay*, Mai Daoud, Zvi Peled, Eran Brauner, Hany Bahouth and Yoram Kluger

Table 1 Sensitivity, specificity, PPV, NPV, and accuracy all of the groups

	Overall (n-543)		>2 years (n-454)		<2 years (n-89)	
	Free fluid	IAI[a]	Free fluid	IAI[a]	Free fluid	IAI[a]
Sensitivity	50 %	77 %	51 %	75 %	37 %	100 %
Specificity	88 %	70 %	90 %	69 %	78 %	72 %
PPV	84 %	22 %	88 %	22 %	50 %	20 %
NPV	58 %	97 %	56 %	96 %	67 %	100 %
Accuracy	66 %	66 %	64 %	70 %	62 %	74 %

PPV positive predictive value, *NPV* Negative Predictive value, *IAI* Intra-abdominal injury
[a]IAI: intra-abdominal injury

Traumatisme abdominal

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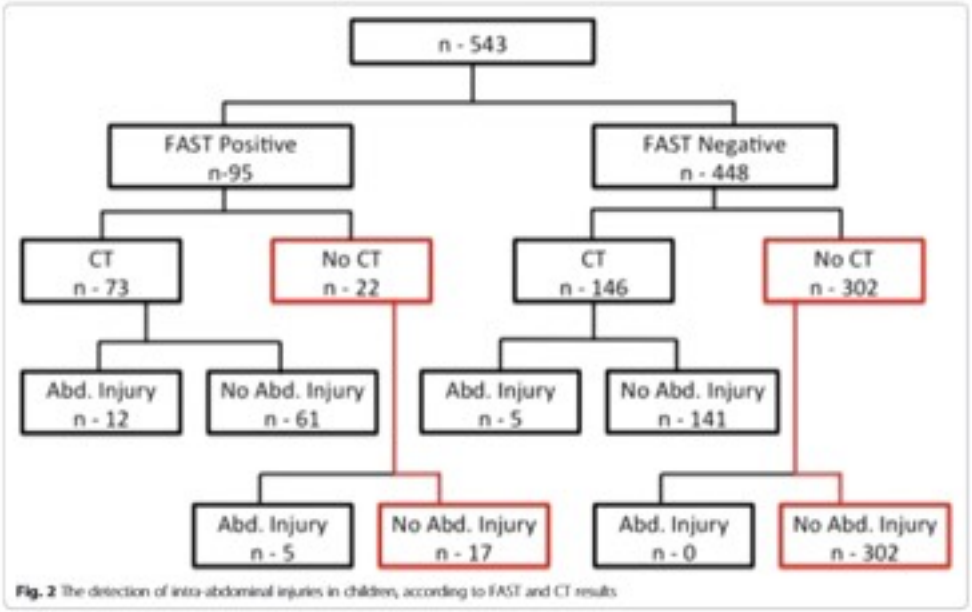


Fig. 2 The detection of intra-abdominal injuries in children, according to FAST and CT results

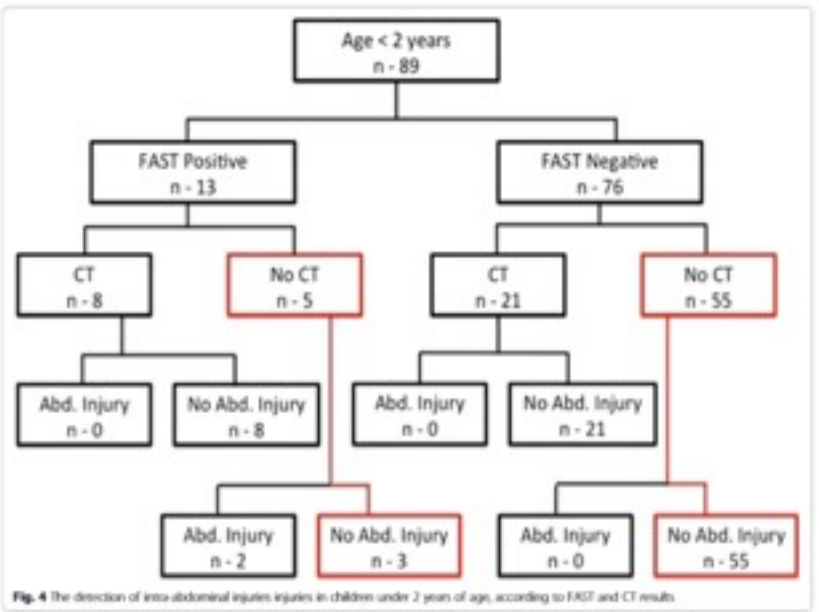
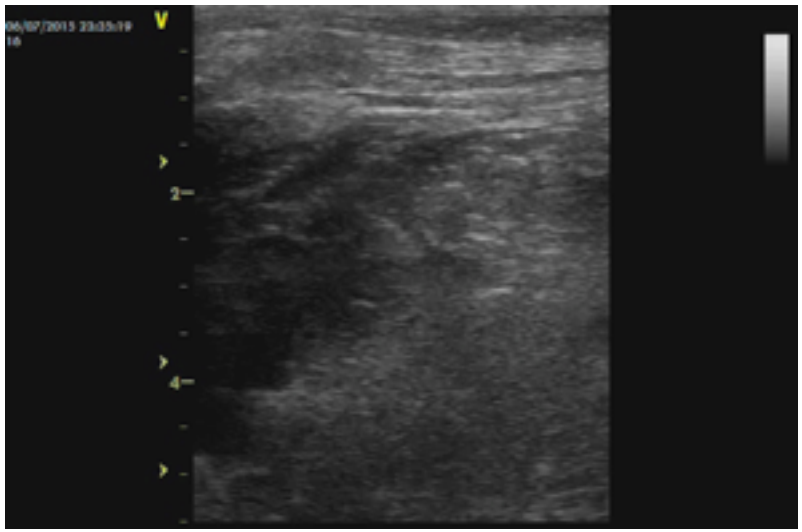
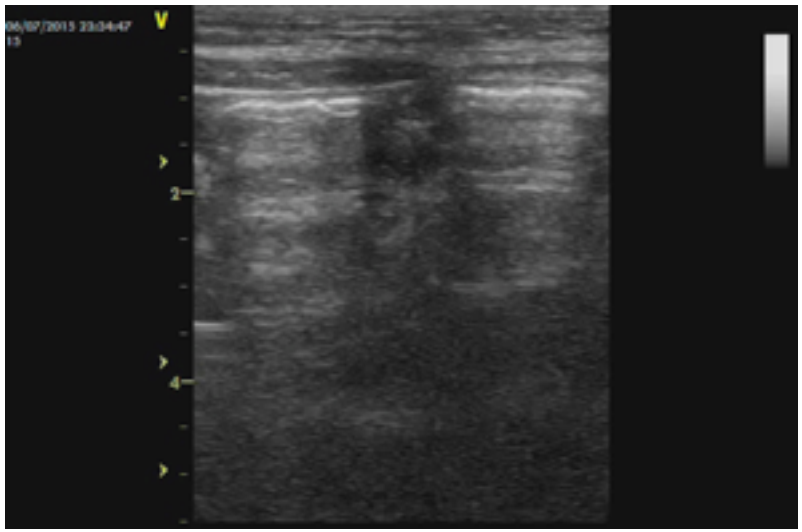


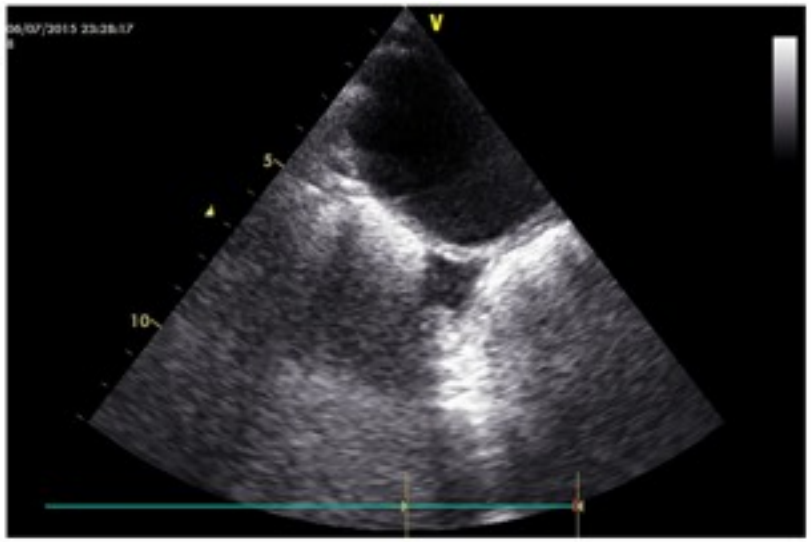
Fig. 4 The detection of intra-abdominal injuries injuries in children under 2 years of age, according to FAST and CT results

Traumatisme abdominal





Traumatisme abdominal



Tissus mous

- Recherche d'une collection
- Indication chirurgicale?

Tissus mous

Published in final edited form as:
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Emergency Ultrasound-assisted Examination of Skin and Soft Tissue Infections in the Pediatric Emergency Department

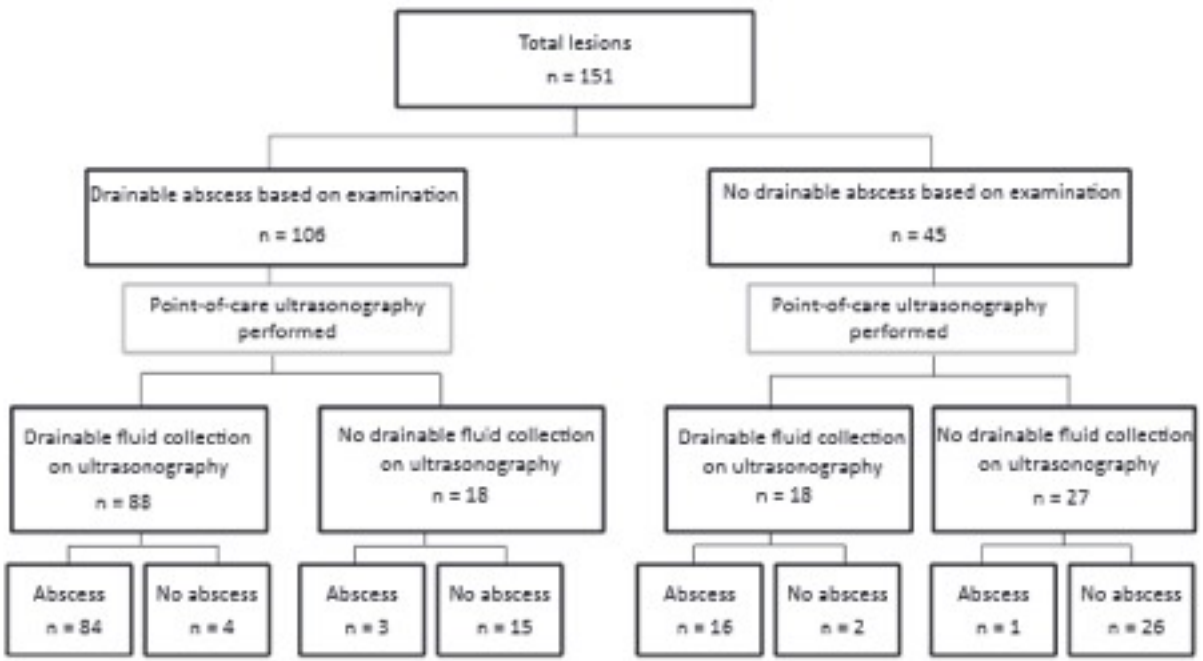
Jennifer R. Marin, MD, MSc, Anthony J. Dean, MD, Warren B. Bilker, PhD, Nova L. Panebianco, MD, MPH, Naomi J. Brown, MD, and Elizabeth R. Alpern, MD, MSCE

We demonstrated that in our pediatric study population, the addition of emergency ultrasound to the clinical examination for the diagnosis of skin and soft tissue infections does not improve on the test characteristics of the clinical examination alone for clinically evident lesions. Many lesions are not clinically evident, and in these cases emergency ultrasound may be useful as a diagnostic adjunct. Further trials are needed that incorporate emergency ultrasound into patient care, and evaluate whether the addition of emergency ultrasound improves clinical outcomes in pediatric patients with skin and soft tissue infections.

Tissus mous

Point-of-Care Ultrasonography for the Diagnosis of Pediatric Soft Tissue Infection

Cynthia M. Adams, MD[1,2], Mark I. Neuman, MD, MPH[1,2], and Jason A. Levy, MD, RDMS[1,2]



Tissus mous

Table II. Test characteristics of physical examination and point-of-care ultrasonography stratified by pretest likelihood of a drainable abscess

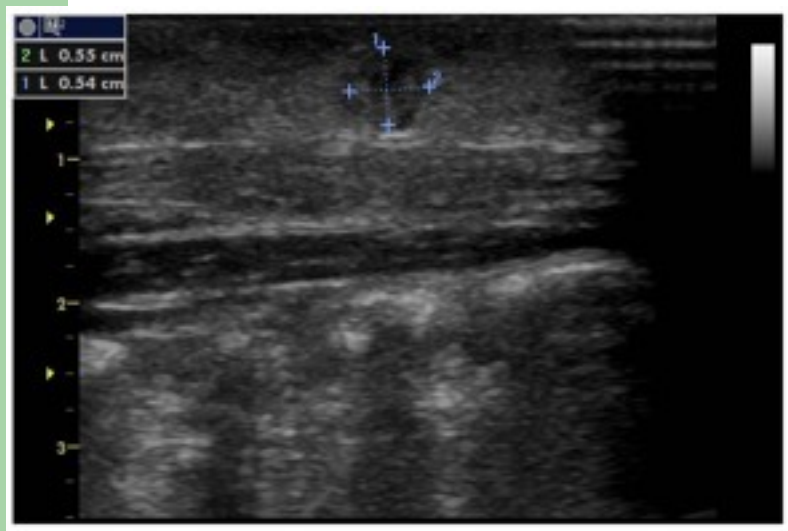
	Sensitivity, % (95% CI)	Specificity, % (95% CI)	PPV (95% CI)	NPV (95% CI)	LR+ (95% CI)	LR− (95% CI)
All lesions (n = 151)						
Physical examination	84 (75-90)	60 (44-73)	82 (73-89)	62 (47-76)	2.1 (1.5-3.0)	0.3 (0.2-0.5)
Point-of-care ultrasonography	96 (90-99)	87 (74-95)	94 (88-98)	91 (79-97)	7.5 (3.6-15.9)	0.04 (0.02-0.1)
High certainty lesions (n = 62)						
Physical examination	84 (69-94)	88 (68-97)	91 (77-98)	78 (58-91)	6.7 (2.3-19.6)	0.2 (0.1-0.4)
Point-of-care ultrasonography	97 (86-100)	96 (79-99)	97 (86-99)	96 (79-99)	23.4 (3.4-159.3)	0.03 (0-0.2)
Equivocal lesions (n = 89)						
Physical examination	83 (72-91)	30 (13-53)	77 (66-87)	39 (17-64)	1.2 (0.9-1.6)	0.6 (0.2-1.2)
Point-of-care ultrasonography	95 (87-99)	78 (56-92)	93 (84-98)	86 (64-97)	4.4 (2.0-9.6)	0.06 (0.02-0.2)

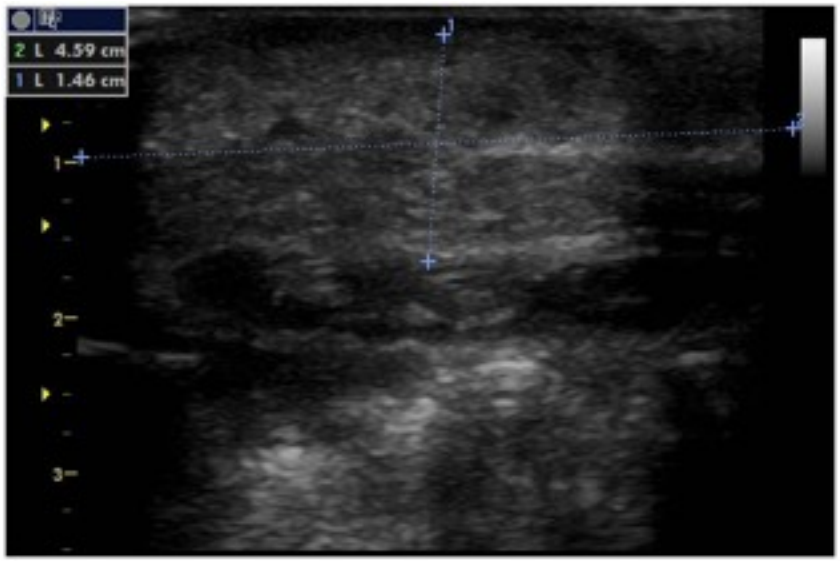
LR−, negative likelihood ratio; *LR+*, positive likelihood ratio;

RESULTS: Of 151 SSTIs evaluated among 148 patients, the sensitivity and specificity of point-of-care ultrasonography for the presence of abscess were 96% (95% CI 90%-99%) and 87% (74%-95%), respectively. The sensitivity and specificity of physical examination for the presence of abscess were 84% (75%-90%) and 60% (44%-73%), respectively. For every 4 ultrasound examinations performed, there was 1 correct change in management.

CONCLUSIONS: Point-of-care ultrasonography demonstrates excellent test characteristics for the identification of skin abscess and has superior test characteristics compared with physical examination alone.

Tissus mous





Poumons

- Pneumopathie
- Épanchement
  - Quantification
  - Repérage
- Contrôle de la place de la sonde d'intubation

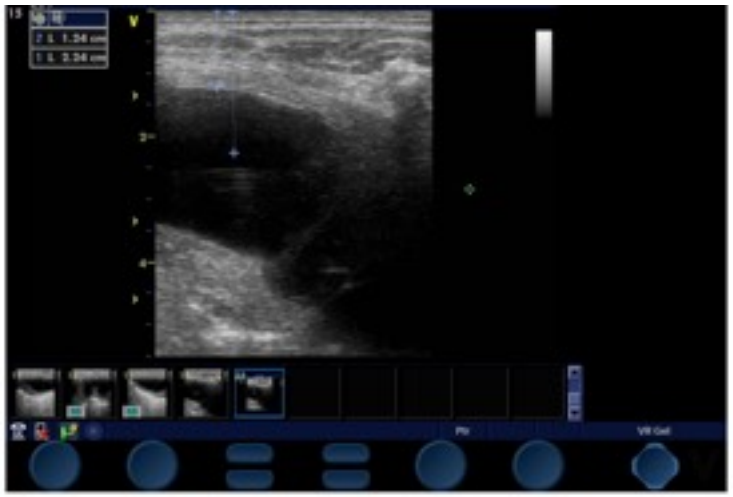
Poumons

Performance of lung ultrasonography in children with community-acquired pneumonia

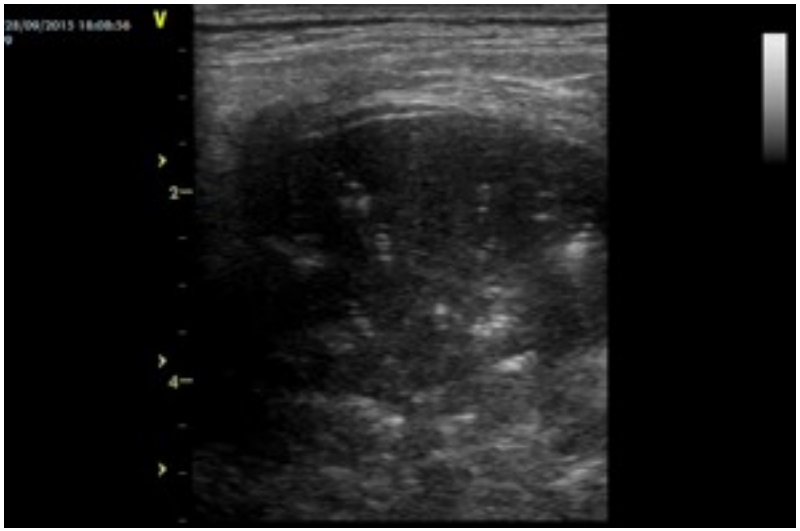
Susanna Esposito[1*], Simone Sferrazza Papa[1], Irene Borzani[2], Raffaella Pinzani[1], Caterina Giannitto[2], Dario Consonni[3] and Nicola Principi[1]

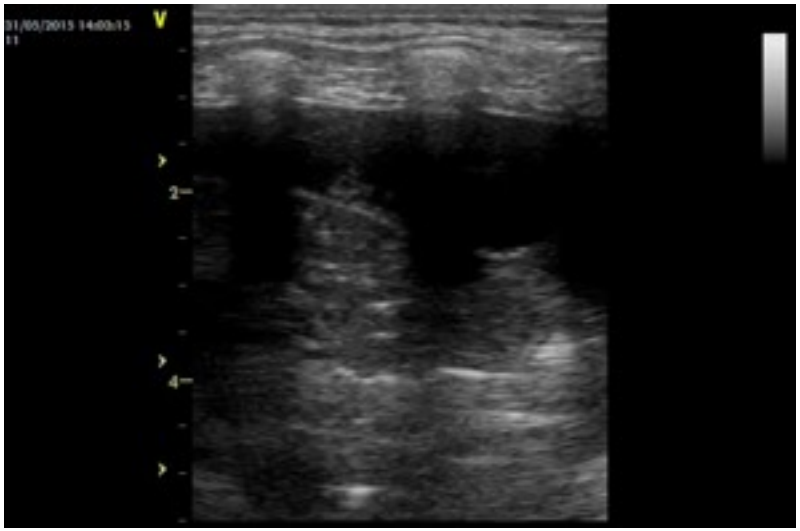
A total of 48 patients had radiographically confirmed CAP. The sensitivity, specificity, and positive and negative predictive values of US in comparison with CR were respectively 97.9%, 94.5%, 94.0% and 98.1%. US identified a significantly higher number of cases of pleural effusion, but the concordance of the two methods in identifying the type of CAP was poor.

Poumons



Poumons





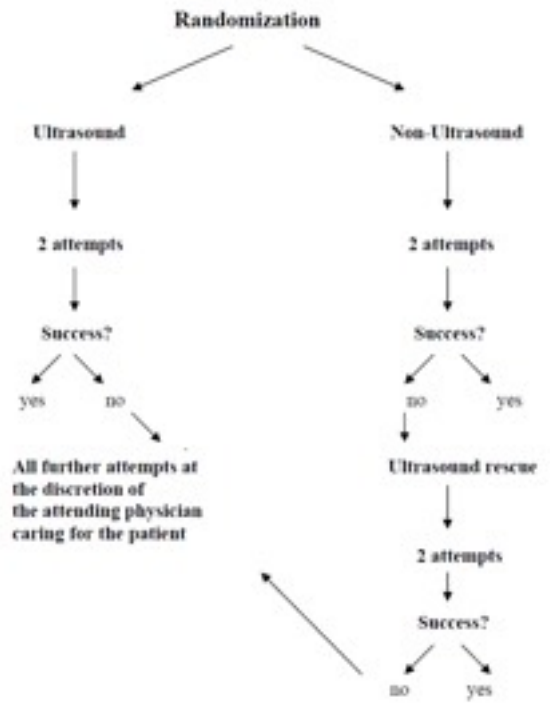
Vasculaire

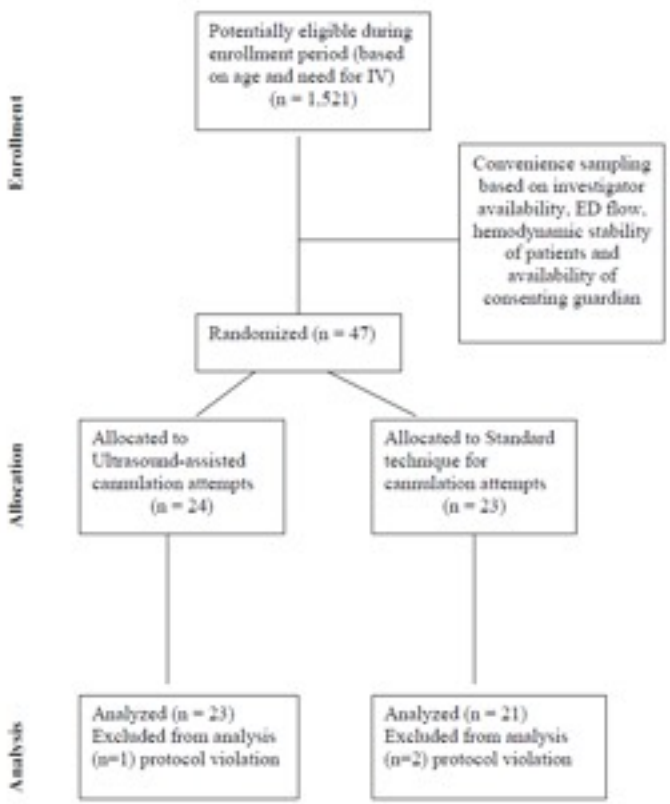
- Pose VVC/VVP
  - Statique => Repérage VVC/VVP
  - Dynamique => VVC sous écho guidage
- Evaluation hémodynamique et déshydratation

Pose VVP

Ultrasound-Assisted Peripheral Venous Access in Young Children: A Randomized Controlled Trial and Pilot Feasibility Study

Aaron E. Bair, MD, MSc
John S. Rose, MD
Cheryl W. Vance, MD
Emily Andrada-Brown, MD
Nathan Kuppermann, MD, MPH
University of California, Davis





Pose VVP

Ultrasound Technique

Figure 2. The static "no touch" technique. Note the thick ridge of acoustic gel between the transducer and the patient's skin. The thick layer of gel improves vessel visualization and ensures that the target vein will not be inadvertently compressed.

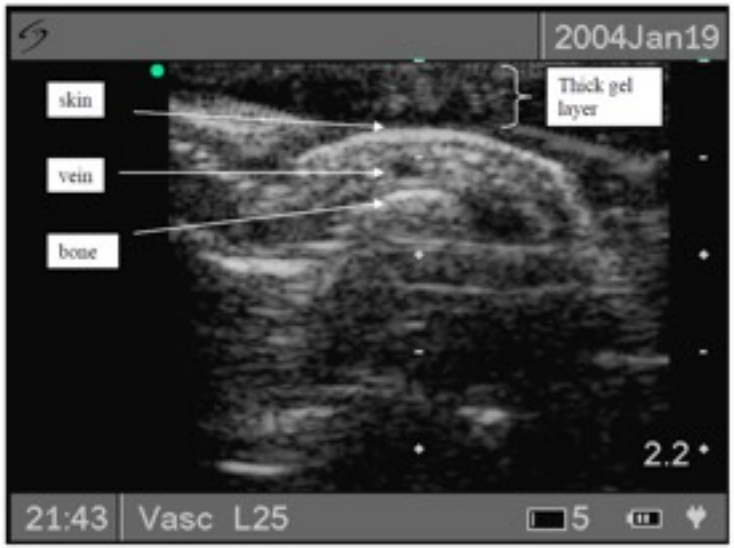


Figure 3. Ultrasound image of target vessel

Pose VVP

Ultrasound-Assisted Peripheral Venous Access in Young Children: A Randomized Controlled Trial and Pilot Feasibility Study

CONCLUSION

In summary, in this pilot and feasibility randomized controlled trial, we report our initial experience with one technique for ultrasound-assisted peripheral venous access in children after a failed IV attempt. While we were able to adequately visualize peripheral veins in all children in the study population, we were not able to show a difference in our primary outcome measures of cannulation or venipuncture success rates. However, we were able to demonstrate adequate vein visualization in all patients.

Pose VVP

Pediatr Emerg Care. 2009 Mar;25(3):154-9. doi: 10.1097/PEC.0b013e31819a8946.

Randomized controlled trial of ultrasound-guided peripheral intravenous catheter placement versus traditional techniques in difficult-access pediatric patients.

Doniger SJ[1], Ishimine P, Fox JC, Kanegaye JT.

RESULTS: Fifty patients were enrolled, with 25 patients randomized to each group. The overall success rates for the ultrasound-guided group were 80% and for the traditional-attempts group, 64%, with a difference in proportions of 16% (95% confidence interval, -9% to 38%, P = 0.208). The ultrasound-guided group required less overall time (6.3 vs 14.4 minutes, difference of -8.1 minutes [95% confidence interval, -12.5 to -3.6], P = 0.001), fewer attempts (median, 1 vs 3; P = 0.004), and fewer needle redirections (median, 2 vs 10; P G 0.0001) than traditional approaches.

CONCLUSIONS: In a sample of pediatric ED patients with difficult access, ultrasound-guided intravenous cannulation required less overall time, fewer attempts, and fewer needle redirections than traditional approaches.

Pose VVC

Ultrasound Assistance for Central Venous Catheter Placement in a Pediatric Emergency Department Improves Placement Success Rates

Rachel A. Gallagher, MD, RDMS, Jason Levy, MD, RDMS, Rebecca L. Vieira, MD, RDMS, Michael C. Monuteaux, ScD, and Anne M. Stack, MD

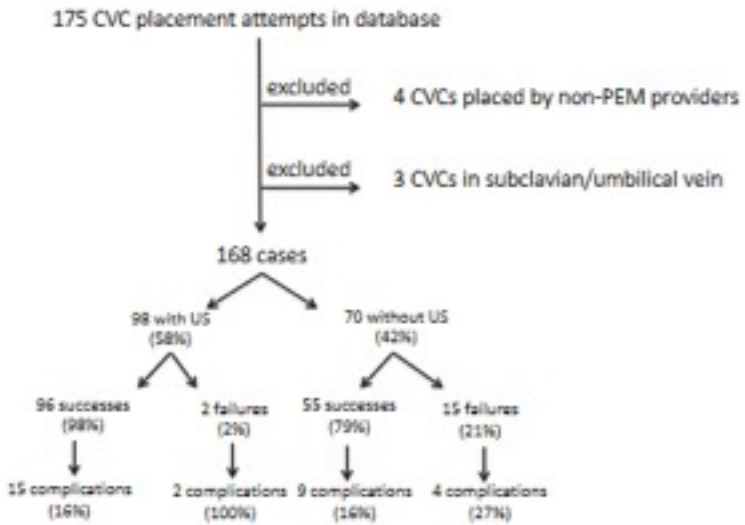


Figure 1. Case selection for CVC placements. CVC – central venous catheter; PEM – pediatric emergency medicine; US – ultrasound.

Pose VVC

Ultrasound Assistance for Central Venous Catheter Placement in a Pediatric Emergency Department Improves Placement Success Rates

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Table 4
Multivariate Analyses of Factors Associated With Successful CVC Placement Versus Unsuccessful Placement

Multivariate Models	OR (95% CI)
Model 1	
Physician experience	0.8 (0.6–1.1)
US use	11.0 (2.4–50.8)
Model 2	
Patient weight	1.0 (0.9–1.0)
US use	11.4 (2.4–53.0)
Model 3	
Medical resuscitation	1.8 (0.2–15.7)
US use	13.6 (3.0–62.2)
Model 4*	
Placement site	0.7 (0–8.8)
US use	7.9 (1.7–74.7)

US = ultrasound.
*Estimated with exact logistic regression.

CONCLUSIONS

The use of ultrasound assistance for central venous catheter placement is associated with an increase in success rate of the procedure in a pediatric ED. Ultrasound assistance is now the standard of care for central venous catheter placement in our department. This work supports the Association for Healthcare Research and Quality call for ultrasound assistance for central venous catheter placement in the ED.

Ostéo articulaire

- Echo osseuse
  - Fracture
  - Infection

Fractures

CLINICAL INVESTIGATION

Bedside Ultrasound Diagnosis of Clavicle Fractures in the Pediatric Emergency Department

Keith P. Cross, MD, MS, Fred H. Warkentine, MD, MS, In K. Kim, MD, MBA, Edward Gracely, PhD, and Ronald I. Paul, MD

Table 1
Results for the Primary Outcome of Blinded US Interpretation Versus Radiographs

	Radiograph	
US	Fracture	No Fracture
Fracture	41	2
No fracture	2	55

US = ultrasound.

Table 3
Distribution of Wong-Baker FACES Pain Scores Following Each Type of Imaging From 86 Patients Age 5 or Older

Pain Score (No. of Respondents)	US	Radiograph
0 (no hurt)	41	40
1 (hurts little bit)	20	10
2 (hurts little more)	14	13
3 (hurts even more)	7	7
4 (hurts whole lot)	3	6
5 (hurts worst)	1	10
Total	86	86

US = ultrasound.

Fractures

CLINICAL INVESTIGATION

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Table 1 shows the primary outcome of the blinded reviewer's interpretation of US images for patients who did and did not have a clavicle fracture on radiograph. Based on these results, the sensitivity of US to radiographically detected fracture was 95% (95% CI = 83% to 99%), and the specificity was 96% (95% CI = 87% to 99%). The likelihood ratio of a positive US result was 27 (95% CI = 7 to 106) and of a negative US result was 0.05 (95% CI = 0.01 to 0.19). The positive PPV was 95% (95% CI = 83% to 99%) and the NPV was 96% (95% CI = 87% to 99%).

CONCLUSIONS

This study showed that bedside ultrasound in the pediatric ED can accurately diagnose clavicle fractures when compared to plain radiographs. Given its diagnostic accuracy, minimal pain during examination, and lack of ionizing radiation, physicians should consider US for bedside diagnosis of pediatric clavicle fractures.

Fractures

Accuracy of Point-of-Care Ultrasonography for Diagnosis of Elbow Fractures in Children

Joni E. Rabiner, MD; Hnin Khine, MD; Jeffrey R. Avner, MD; Lana M. Friedman, MD; James W. Tsung, MD, MPH

Figure 1. Elbow ultrasonography: longitudinal probe placement (*A*) and transverse probe placement (*B*).

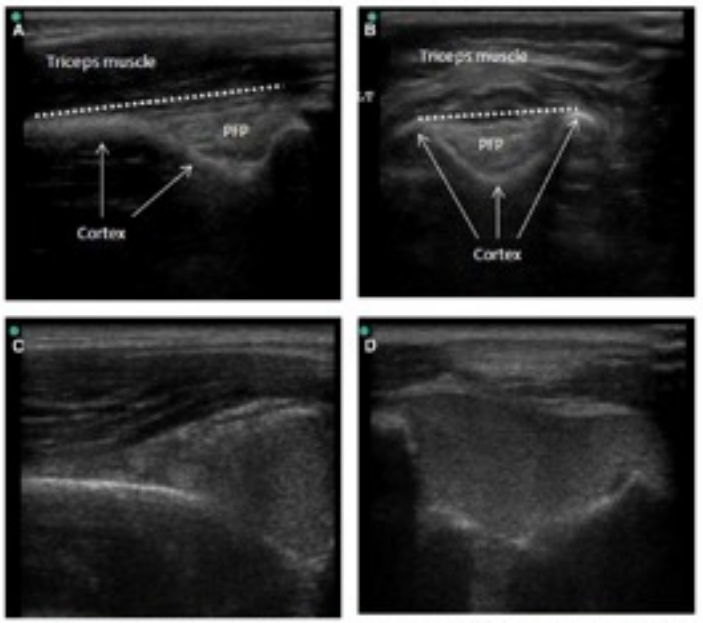

Figure 2. Normal posterior fat pad (PFP) in longitudinal view with the PFP below the distal humeral line (*A*) and transverse view with the PFP below the line connecting both lips of the olecranon fossa (*B*). Elevated PFP in longitudinal view (*C*) and transverse view (*D*).

Fractures

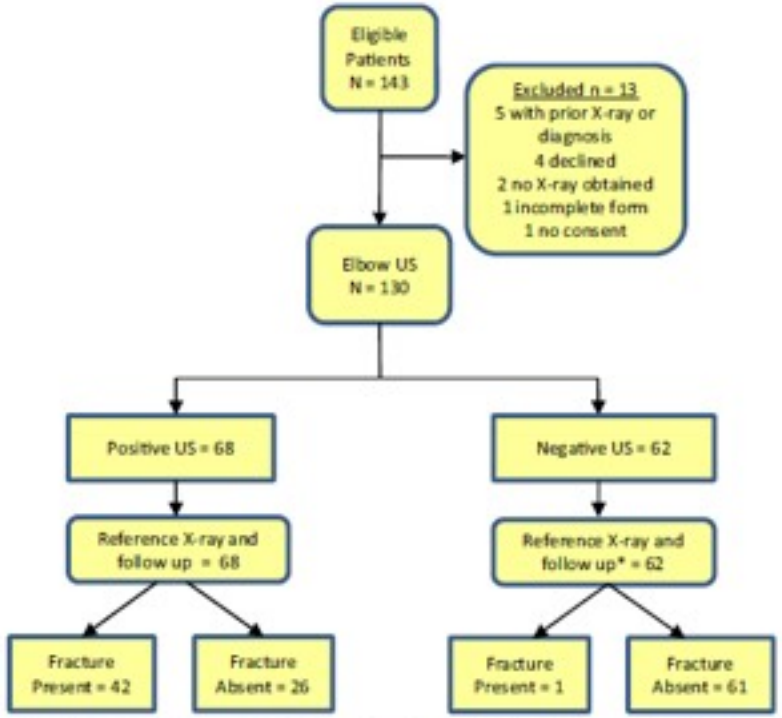

Figure 4. Study flow chart. *Four patients with no follow-up had negative elbow ultrasonographs and negative radiographs at the index ED visit and are analyzed in the Fracture Absent group.

Table 2. Test performance characteristics for point-of-care ultrasonographic diagnosis of elbow fractures (N = 130).

Ultrasonographic Findings	Sensitivity (%)	Specificity (%)	95% CI PPV	95% CI NPV	95% CI LR+	95% CI LR−	95% CI κ
Elevated PFP or LH	98 (88–100)	70 (60–79)	0.62 (0.50–0.72)	0.98 (0.91–1.0)	3.3 (2.4–4.5)	0.03 (0.01–0.23)	0.77 (0.66–0.88)
Elevated PFP	93 (81–98)	76 (66–84)	0.66 (0.53–0.76)	0.96 (0.88–0.99)	3.9 (2.6–5.6)	0.09 (0.03–0.28)	0.78 (0.68–0.89)
LH	91 (78–96)	79 (70–87)	0.68 (0.56–0.79)	0.95 (0.87–0.98)	4.4 (2.9–6.7)	0.12 (0.05–0.30)	0.72 (0.60–0.84)
Elevated PFP and LH	86 (73–93)	85 (76–91)	0.74 (0.60–0.84)	0.93 (0.85–0.97)	5.8 (3.4–9.6)	0.16 (0.08–0.35)	0.73 (0.62–0.85)

PPV, Positive predictive value; *NPV*, negative predictive value; *LR+*, likelihood ratio for a positive test; *LR−*, likelihood ratio for a negative test; *LH*, lipohemarthrosis.

Conclusion: Point-of-care ultrasonography is highly sensitive for elbow fractures, and a negative ultrasonographic result may reduce the need for radiographs in children with elbow injuries. Elbow ultrasonography may be useful in settings in which radiography is not readily accessible or is time consuming to obtain. [Ann Emerg Med. 2013;61:9-17.]

Fractures

Pediatrics
June 2013, VOLUME 131 / ISSUE 6

Accuracy of Point-of-Care Ultrasound for Diagnosis of Skull Fractures in Children

Joni E. Rabiner, Lana M. Friedman, Hnin Khine, Jeffrey R. Avner, James W. Tsung

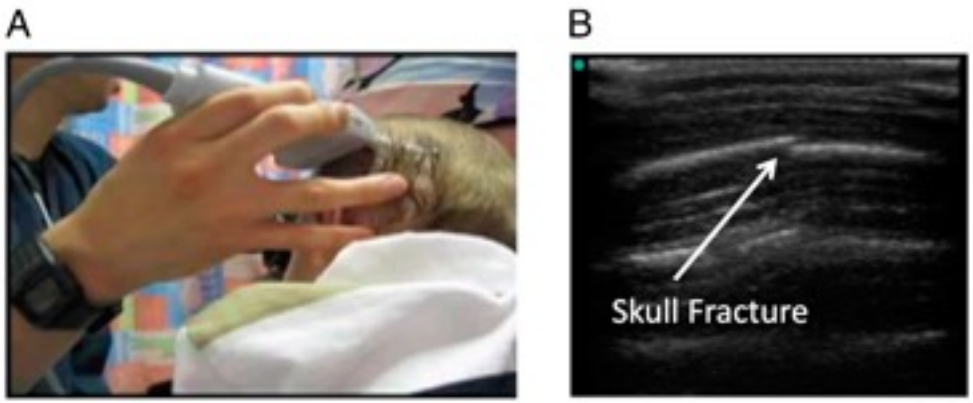

FIGURE 1
A, Linear transducer probe placement for skull ultrasound. B, Corresponding ultrasound image with skull fracture.

Fractures

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TABLE 3 Test Performance Characteristics for Point-of-Care Ultrasound Diagnosis of Skull Fractures

	N	Fractures, *n* (%)	Sensitivity, %	Specificity, %	PPV	NPV	LR+	LR−	κ
Overall	69	8 (12)	88 (53–98)	97 (89–99)	0.78 (0.45–0.94)	0.98 (0.91–1.0)	26.7 (6.7–106.9)	0.13 (0.02–0.81)	0.86 (0.67–1.0)
Novice sonologists	57	8 (14)	88 (53–98)	96 (86–99)	0.78 (0.45–0.94)	0.98 (0.89–1.0)	21.4 (5.4–85.4)	0.13 (0.02–0.82)	0.85 (0.66–1.0)

Data are test performance characteristics (95% CI). LR+, likelihood ratio of a positive test; LR−, likelihood ratio of a negative test; NPV, negative predictive value; PPV, positive predictive value.

TABLE 4 Pooled-Data Analysis of Point-of-Care Ultrasound for Skull Fracture Diagnosis

Study (Reference)	*N*	Fractures, *n* (%)	Sensitivity, %	Specificity, %	LR+	LR−
Weinberg et al (15)	21	2 (10)	100 (20–100)	100 (79–100)	Infinity (2.1–infinity)	0 (0–2.15)
Riera and Chen (19)	40	5 (13)	60 (17–93)	94 (79–99)	10.5 (2.3–48.2)	0.42 (0.15–1.25)
Parri et al (18)	55	35 (64)	100 (88–100)	95 (75–100)	13.8 (3.0–64.6)	0.02 (0–0.24)
Rabiner et al	69	8 (12)	88 (53–98)	97 (89–99)	26.7 (6.7–106.9)	0.13 (0.02–0.81)
Total pooled data	185	50 (27)	94 (84–98)	96 (92–98)	25.4 (10.7–60.2)	0.06 (0.02–0.19)

Data are test performance characteristics (95% CI). LR+, likelihood ratio of a positive test; LR−, likelihood ratio of a negative test.

Fractures

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Conclusions

Clinicians with focused, point-of-care ultrasound training were able to diagnose skull fractures in children with head trauma with high specificity and high negative predictive value. In addition, almost perfect agreement was observed between novice and experienced sonologists. Pooled analysis of published studies for skull fracture reveals high specificities with variable sensitivities. Future research is needed to determine if ultrasound can reduce the use of CT scans in children with head injuries.

Conclusion

- L’échographie appliquée aux urgences pédiatrique est en plein essor
- Elle permet de diminuer l’exposition aux Rx
- Elle est disponible H24, rapidement

Conclusion

- Sont utilisation aux urgences pédiatriques
  - FAST écho
  - Pleuro pulmonaire
  - Osseuse
  - Tissus mou
  - La VVC à peu de place aux urgences mais demain ….

Conclusion

- Les limites
  - Besoin de formation, de référents
  - La confiance des spécialistes (chir viscéraux, ortho ..)
  - De nouvelles études
  - Des recommandations françaises