

A surgeon in a blue scrubs and mask is pointing upwards with his right hand. He is wearing a blue surgical cap and glasses. The background shows other medical staff in a sterile operating room environment.

超音波在 兒科急症之應用

陳國智雙和醫院急診醫學科

陳國智 醫師



醫用超音波學會指導醫師
WINFOCUS director / instructor
急救加護醫學會重症超音波負責人

急診 / 重症 / 介入 / 急性疼痛

經歷

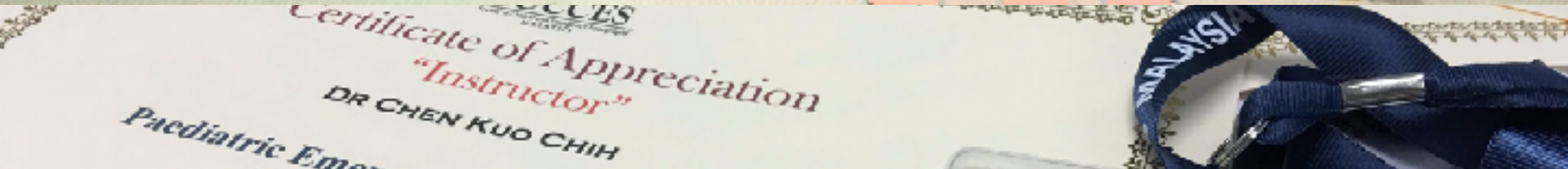
新光急診超音波訓練中心主任

西園醫院急診醫學科主任

急診醫學會超音波委員會主委

台灣疼痛醫學會大體模擬手術講師

juice119@gmail.com



PAEDIATRIC EMERGENCY AND CRITICAL CARE ULTRASOUND (PERCUSS)



17 & 18 July 2018

Allied Healthcare Centre of Excellence, Penang, Malaysia

WFPICC 2018 @ Singapore



2018 JUNE

14

THURSDAY

Faculty Instructors

Thomas Conlon, MD,
The Children's Hospital of Philadelphia, USA
Akira Nishisaki, MD, MSCE
The Children's Hospital of Philadelphia, USA

Venue

Chang Gung Memorial Hospital
No.5, Fuqin St., Guoshan Dist., Taoyuan City 333, Taiwan

Pediatric Bedside Ultrasound Course

Intermediate level: Taiwan Society of Pediatric Emergency Medicine and Children's Hospital of Philadelphia



Course Agenda

8:00	Registration
8:30	Pre-test, Faculty Introductions
9:00	Physics/Artifact of Ultrasound
9:30	Vascular Access and Guided Procedures
10:00	Cardiac Ultrasound
10:30	Thoracic Ultrasound
11:00	Break
11:15	HANDS ON Vascular access, Thoracic Ultrasound
12:00	Lunch
12:30	HANDS ON Cardiac Ultrasound
13:30	Volume Assessment
14:00	Shock Assessment
14:30	Break
14:45	RV and LV Function Assessment
15:30	HANDS ON Volume assessment
16:30	HANDS ON RV and LV function assessment
17:30	Break
17:45	Ultrasound Research and Quality Improvement Opportunity
18:30	Post-test, Questions and Concluding Remarks
19:00	



Taiwan Society of Pediatric Emergency Medicine



Moving Beyond the Stethoscope: Diagnostic Point-of-Care Ultrasound in Pediatric Practice

Thomas W. Conlon, MD,^a Akira Nishisaki, MD, MSCE,^e Yogesh Singh, MBBS, MD, DCH, FRCPC,^b Shazia Bhombal, MD,^c
Daniele De Luca, MD, PhD,^{d,f} David O. Kessler, MD, MSc,^l Erik R. Su, MD,^g Aaron E. Chen, MD,^h María V. Fraga, MD^g

SPECIAL ARTICLE

Pediatrics 2019;144: e20191402

Point-of-care ultrasound: Is it time to include it in the paediatric specialist training programme?☆

Juan Mayordomo-Colunga ^{a,b,r,1}, Rafael González Cortés ^{c,d,e,r,1},
María Carmen Bravo ^f, Roser Martínez Mas ^{g,s}, José Luis Vázquez Martínez ^{h,r},
Luis Renter Valdovinos ^{i,j,k,r}, Thomas W. Conlon ^l, Akira Nishisaki ^l,
Fernando Cabañas ^{m,n}, José Ángel Bilbao Sustacha ^{o,t}, Ignacio Oulego Erroz ^{p,q,r,*,1}

PEDIATRICS®

Moving Beyond the Stethoscope: Diagnostic Point-of-Care Ultrasound in Pediatric Practice

Thomas W. Conlon, MD,^a Akira Nishisaki, MD, MSCE,^e Yogesh Singh, MBBS, MD, DCH, FRCPC,^b Shezia Bhombal, MD,^c
Daniele De Luca, MD, PhD,^{d,f} David O. Kessler, MD, MSc,^g Erik R. Su, MD,^c Aaron E. Chen, MD,^h Maria V. Fraga, MD^h

Pediatrics 2019;144: e20191402

Answer questions

Narrow differentials

Guide therapy

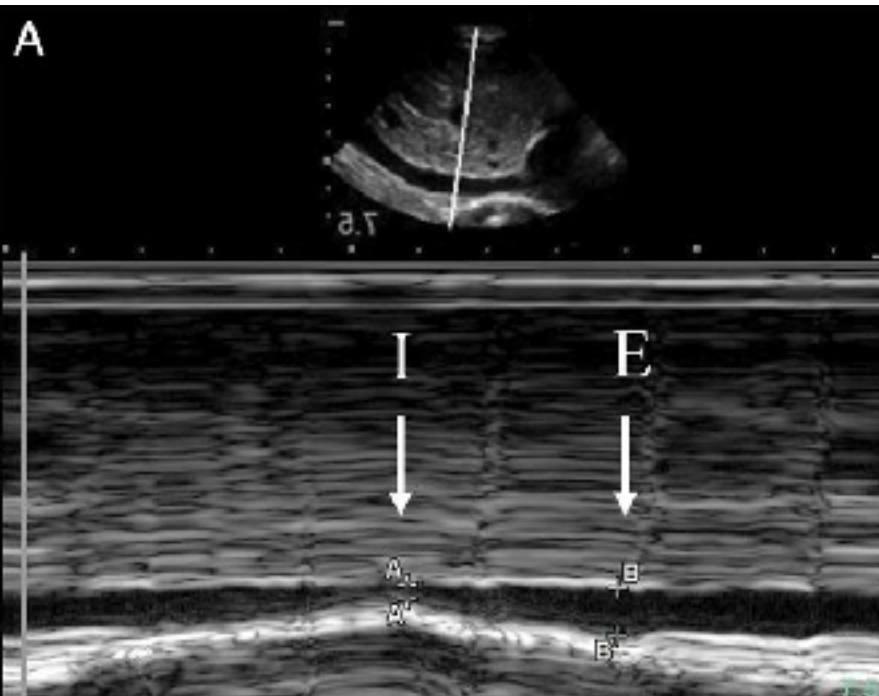
Direct consultation & disposition

Probe



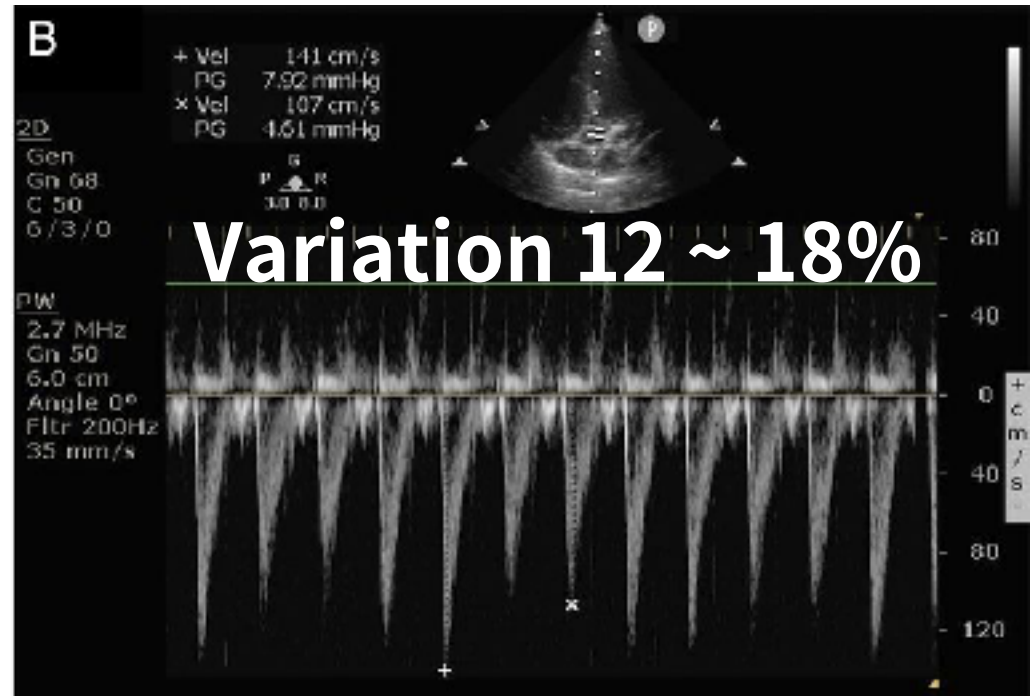
Hemodynamic: Fluid

Volume status



IVC variation

Fluid responsiveness



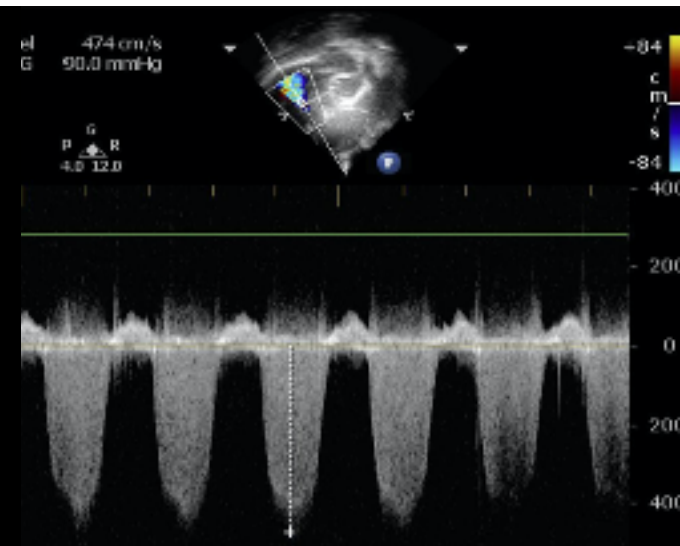
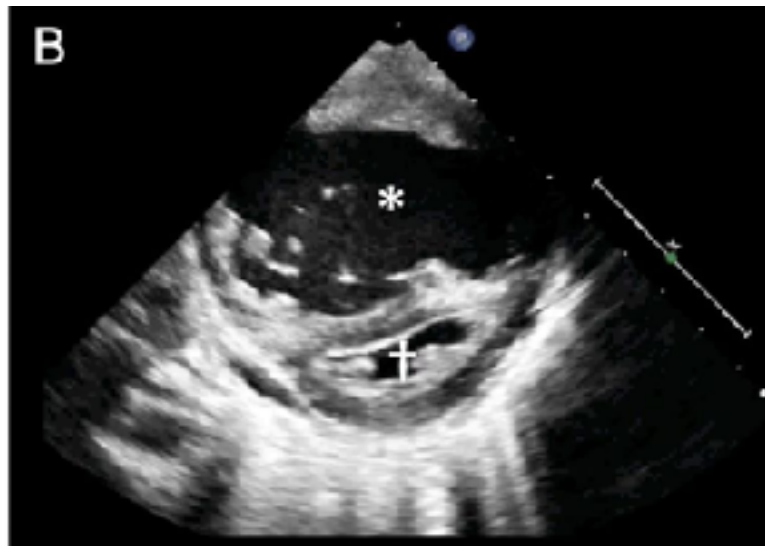
Aortic outflow velocity

Pediatrics 2019;144: e20191402

Hemodynamic: Resus

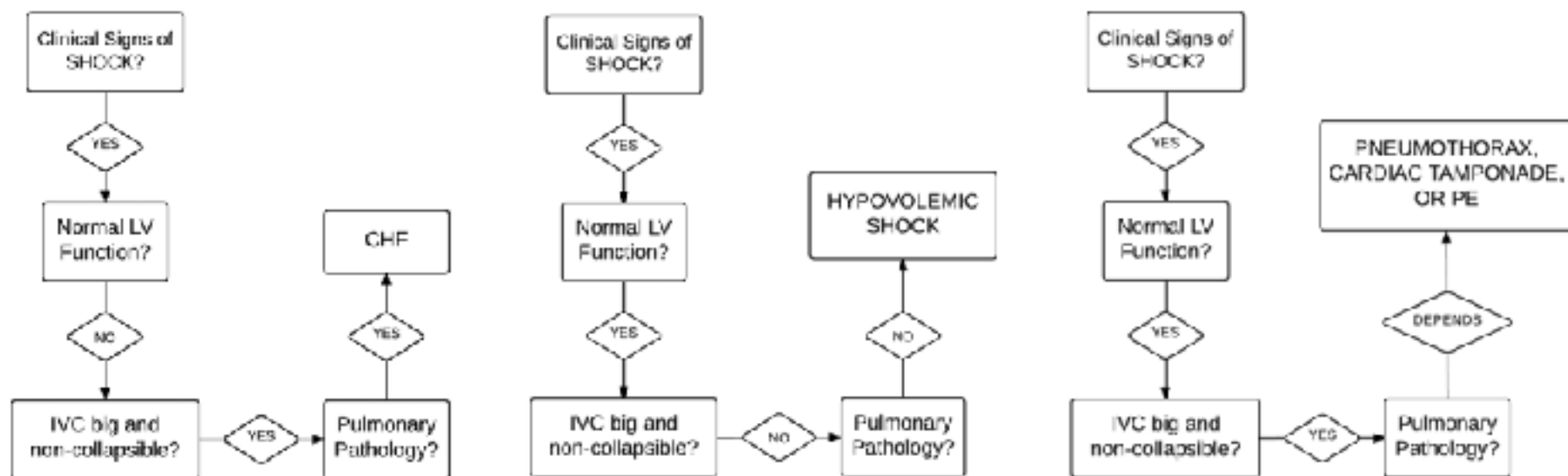
Cardiac function
Shock etiology

HQ-CPR



Point-of-Care Ultrasound for Pediatric Shock

Daniel B. Park, MD, Bradley C. Presley, MD,† Thomas Cook, MD,‡ and Geoffrey E. Hayden, MD†*





Rapid Ultrasound in SHock Evaluation

RUSH Protocol

PUMP: LV contractility, RV strain, tamponade

TANK: IVC variation, leaks, tank compromise

PIPE: Aortic dissection, aneurysms, DVT

HI-MAP Approach

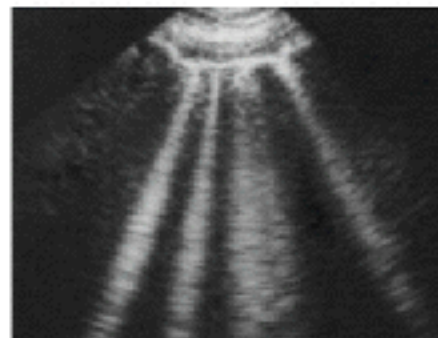
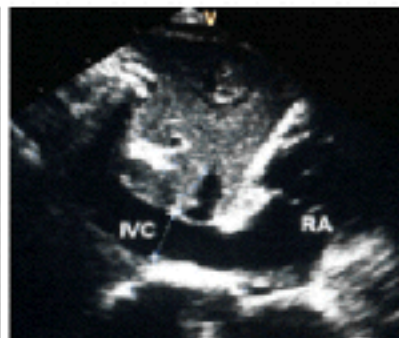
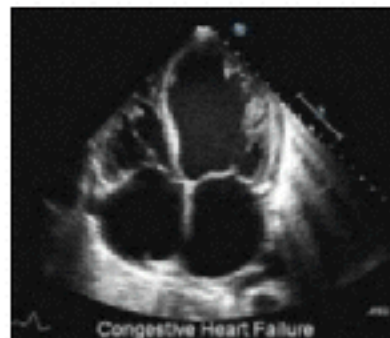
H: Heart

I: IVC

M: Morrison's pouch & E-FAST

A: Aorta and deep veins

P: Pneumothorax, PLE, PN, Pulm edema



Hemodynamic

Echo parameters ?

TABLE 106-2 Pediatric Vital Signs by Age (Awake and Resting)

Age	Heart Rate, Upper Limit (beats/min)	Respiratory Rate, Upper Limit (breaths/min)	Blood Pressure,* Lower Limit (mm Hg)	Weight,† (kg)
0–1 mo	180	60	60/40	3–4
2–12 mo	160	50	70/45	5–10
12–24 mo	140	40	75/50	10–12
2–6 y	120	30	80/55	13–25
6–12 y	110	20	90/60	25–40
>12 y	100	20	90/60	40–60

*May be estimated by:

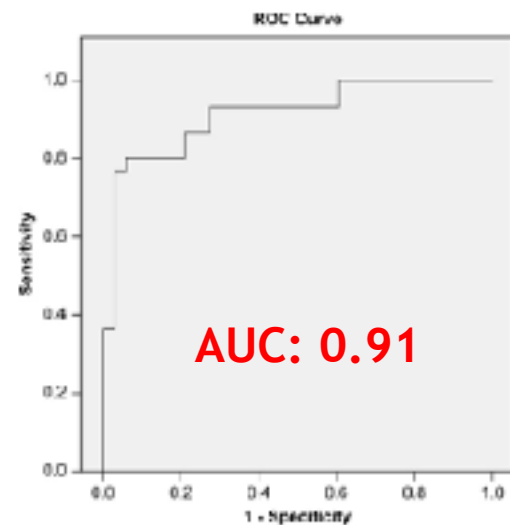
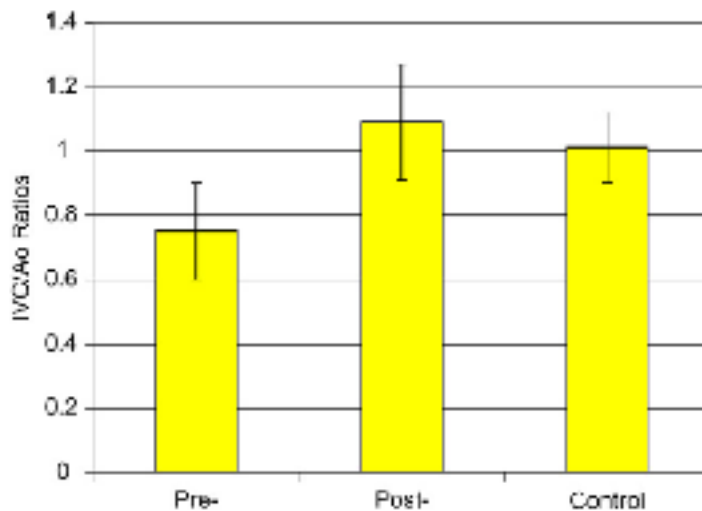
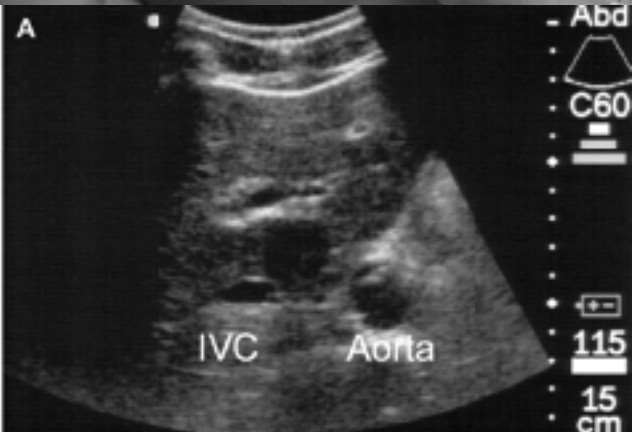
$$\text{Systolic blood pressure (5th percentile)} = 70 + [2 \times (\text{age in years})]$$

† May be estimated by:

$$12 \text{ mo: weight (kg)} = 4 + (\text{age in months}/2)$$

$$1\text{--}12 \text{ y: weight (kg)} = 10 + [2 \times (\text{age in years})]$$

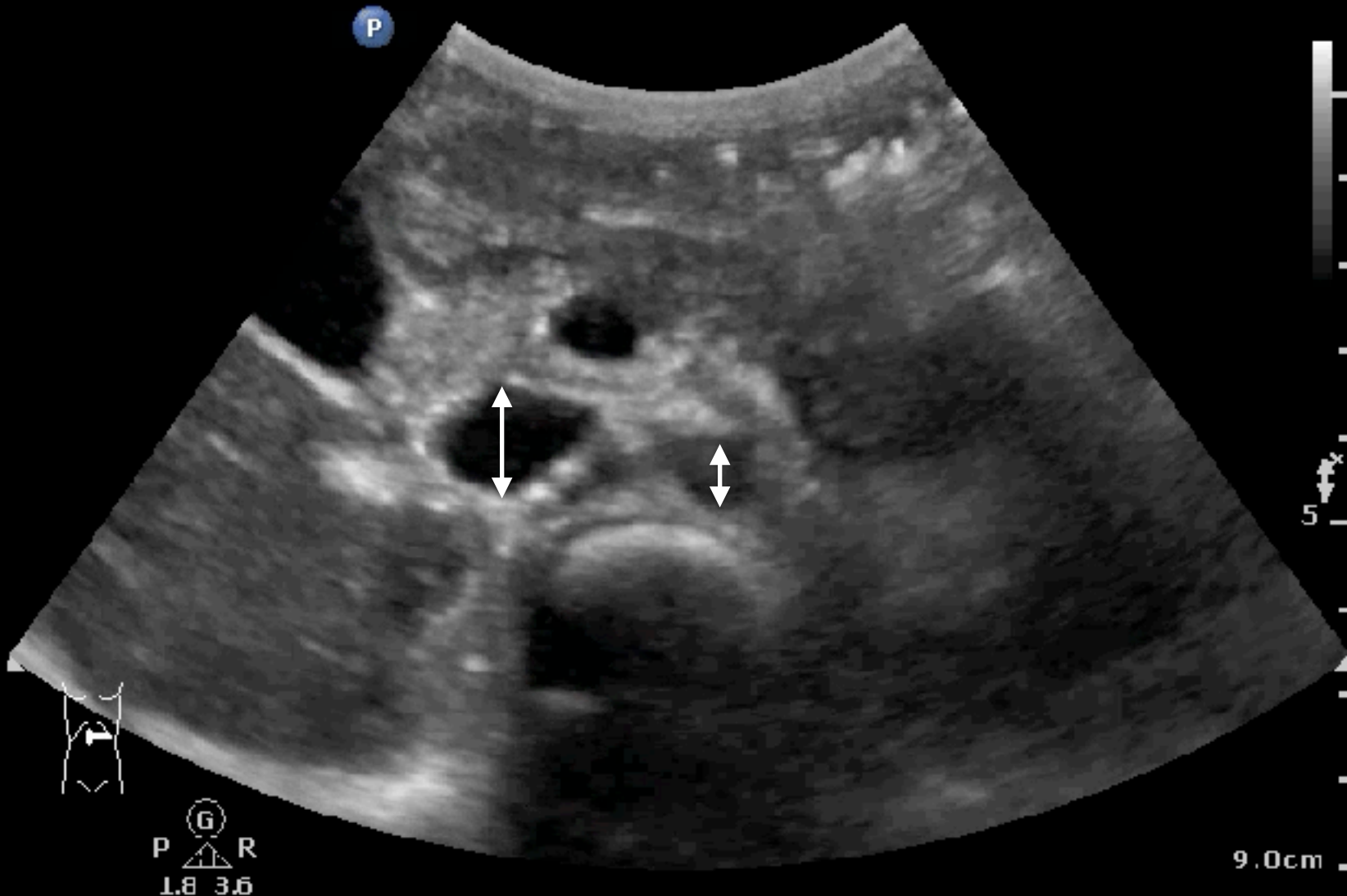
IVC/Ao ratio as an objective tool in assessment for dehydrated children



IVC/Ao ratio : 0.8 ~ 1.2

Abd Gen
C5-1
47 Hz
9.0cm

2D
HGen
Gn 81
C 56
3/3/3



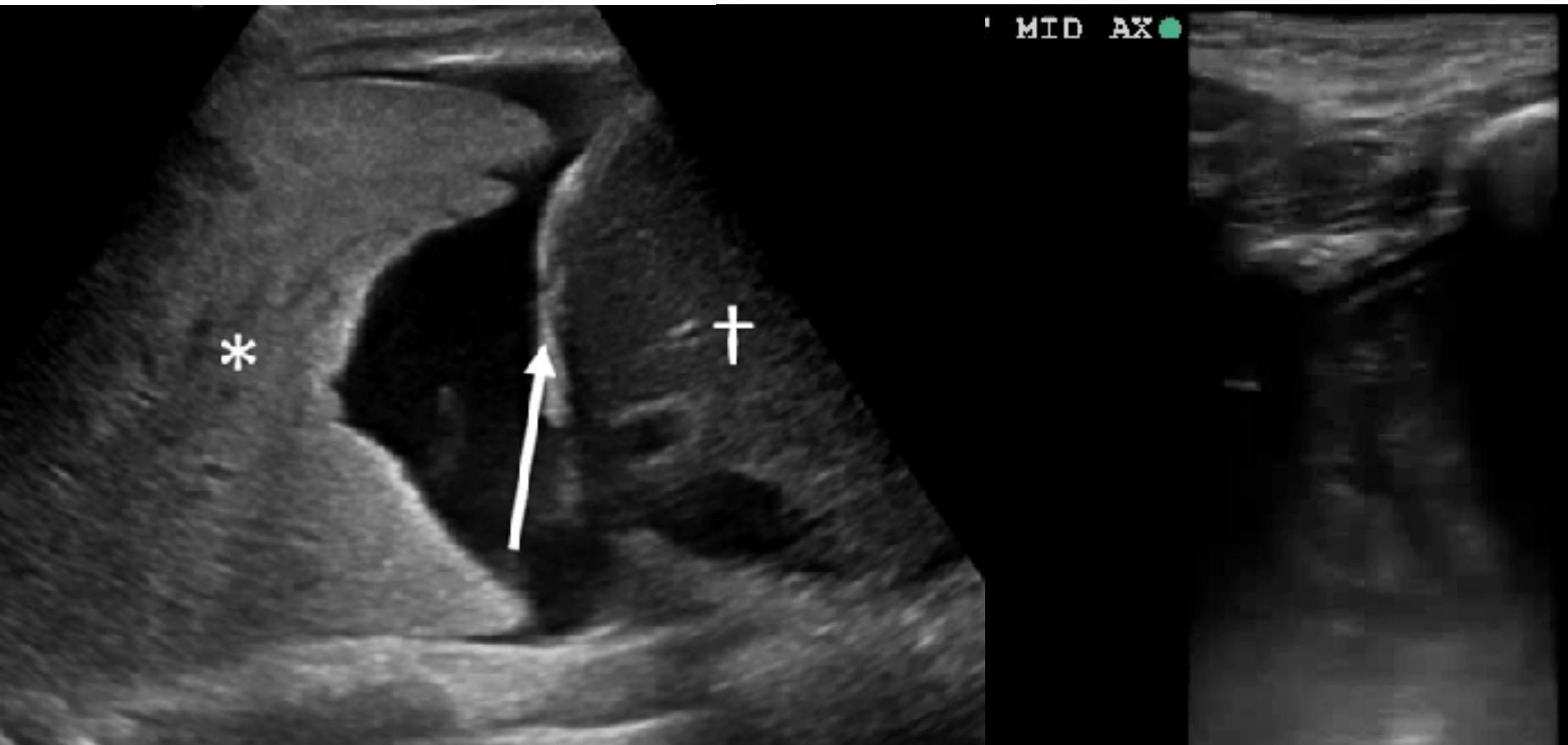
Lung: Pneumonia

Subpleural consolidation

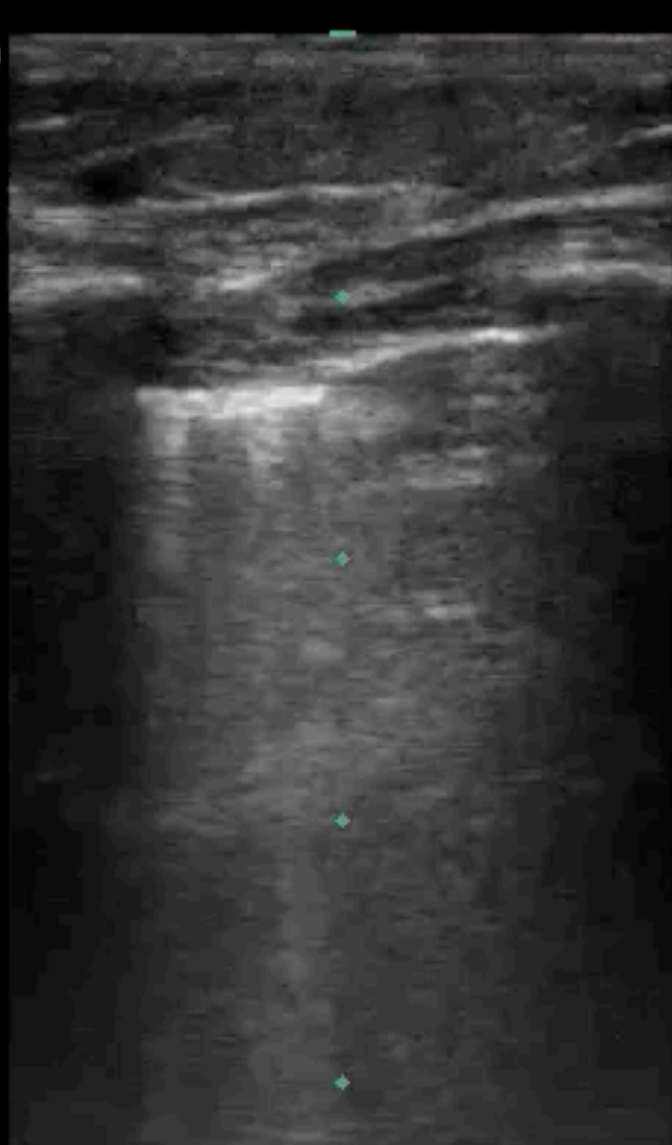


Lung: Pneumonia

Hepatization



Lung: Pneumothorax



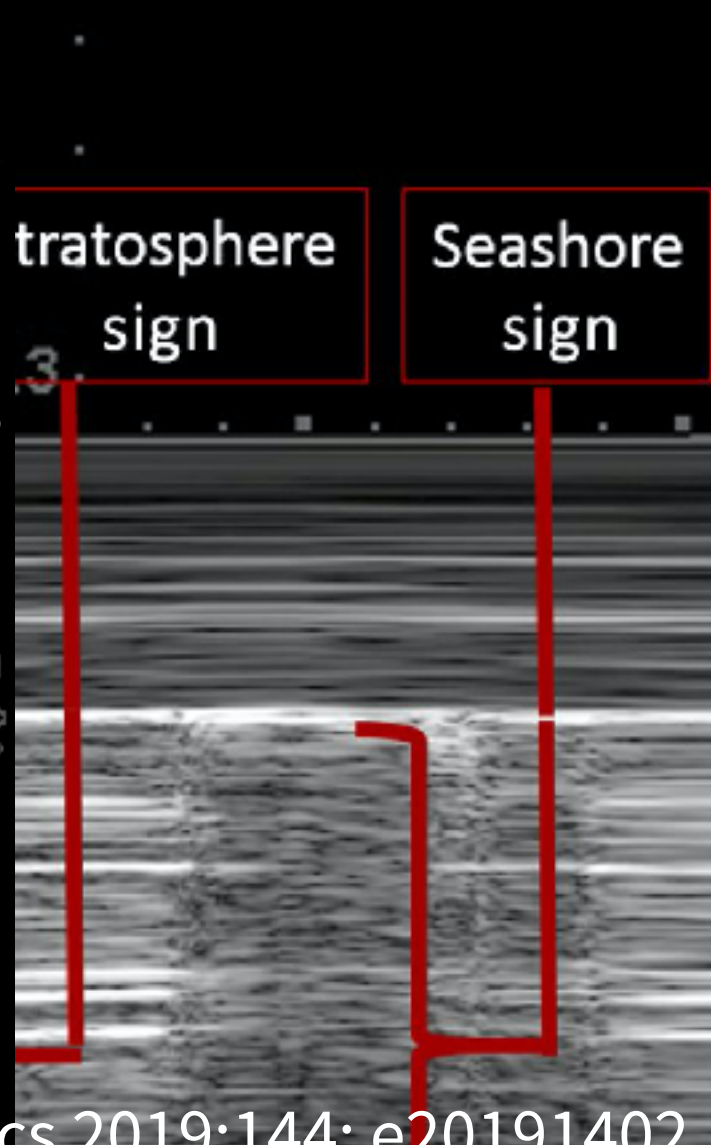
Diagnosis

Size

Drain

tratosphere
sign

Seashore
sign

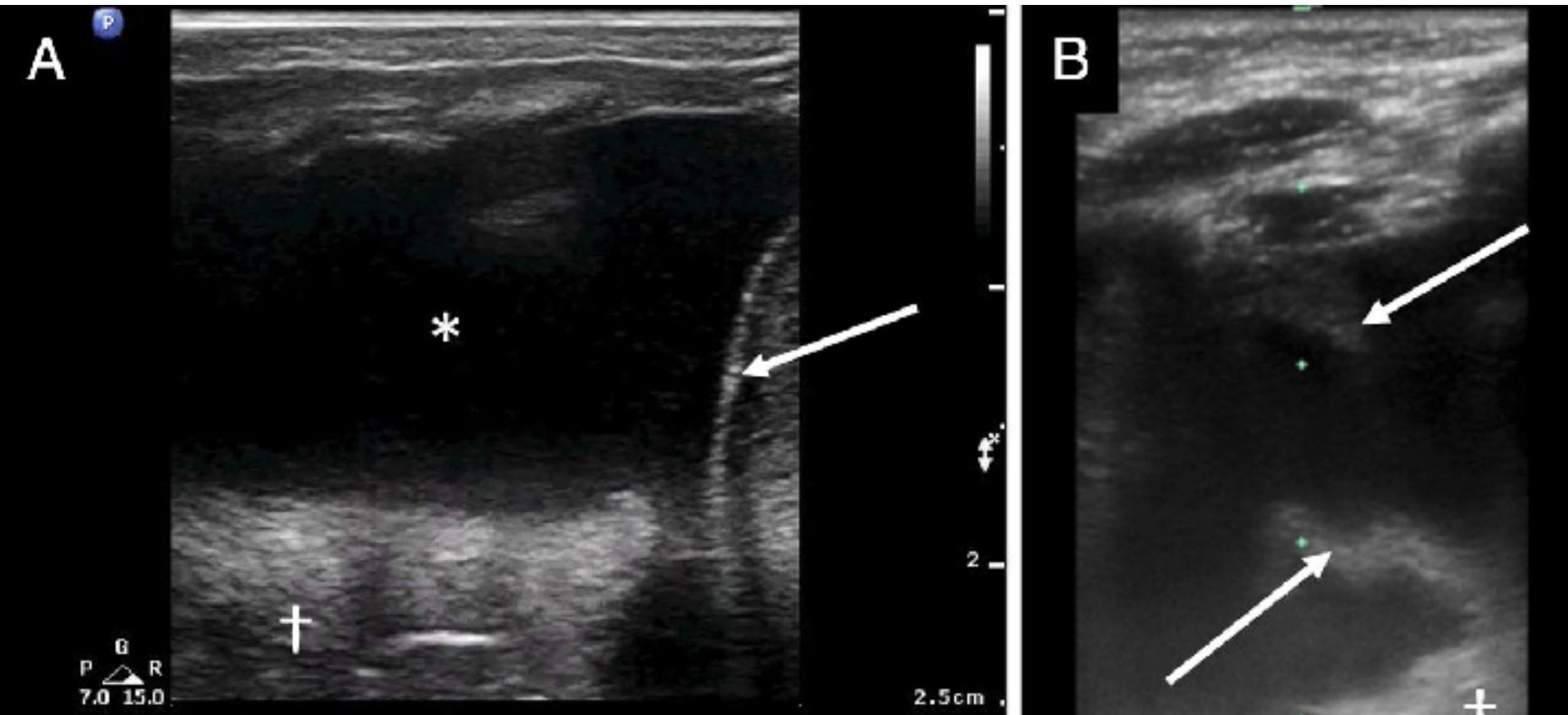


Lung: Pleural effusion

Diagnosis

Nature

Drainage

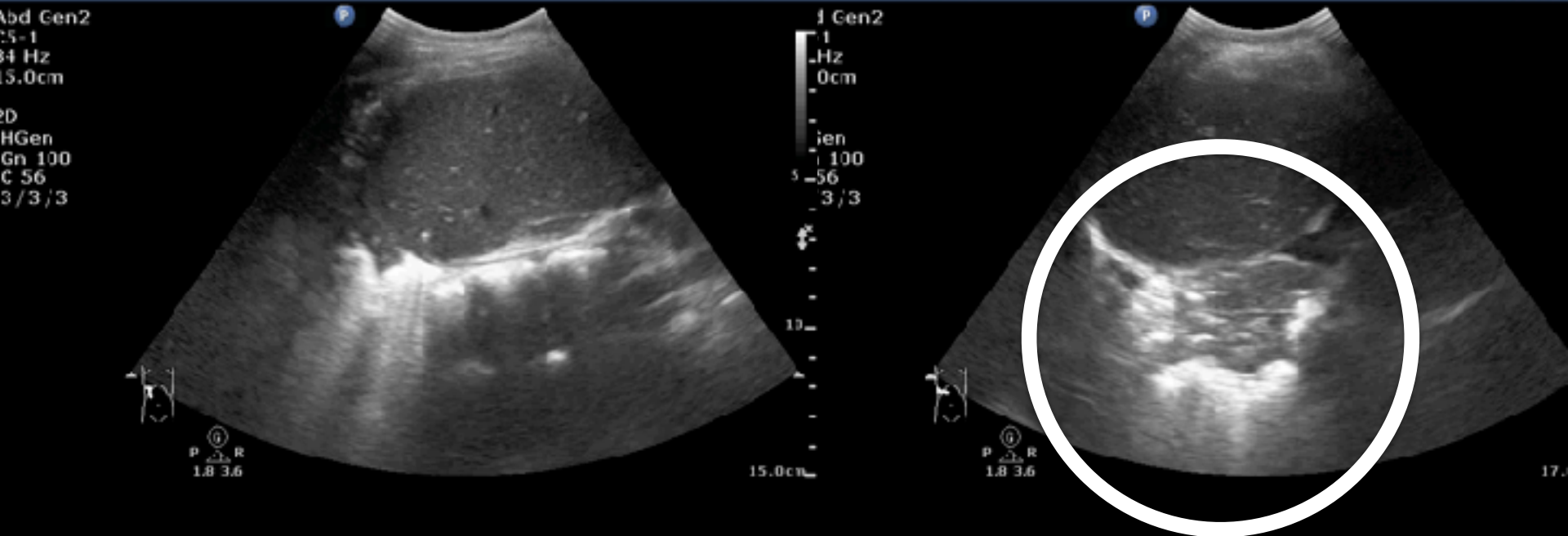


Pediatric ABDOMEN

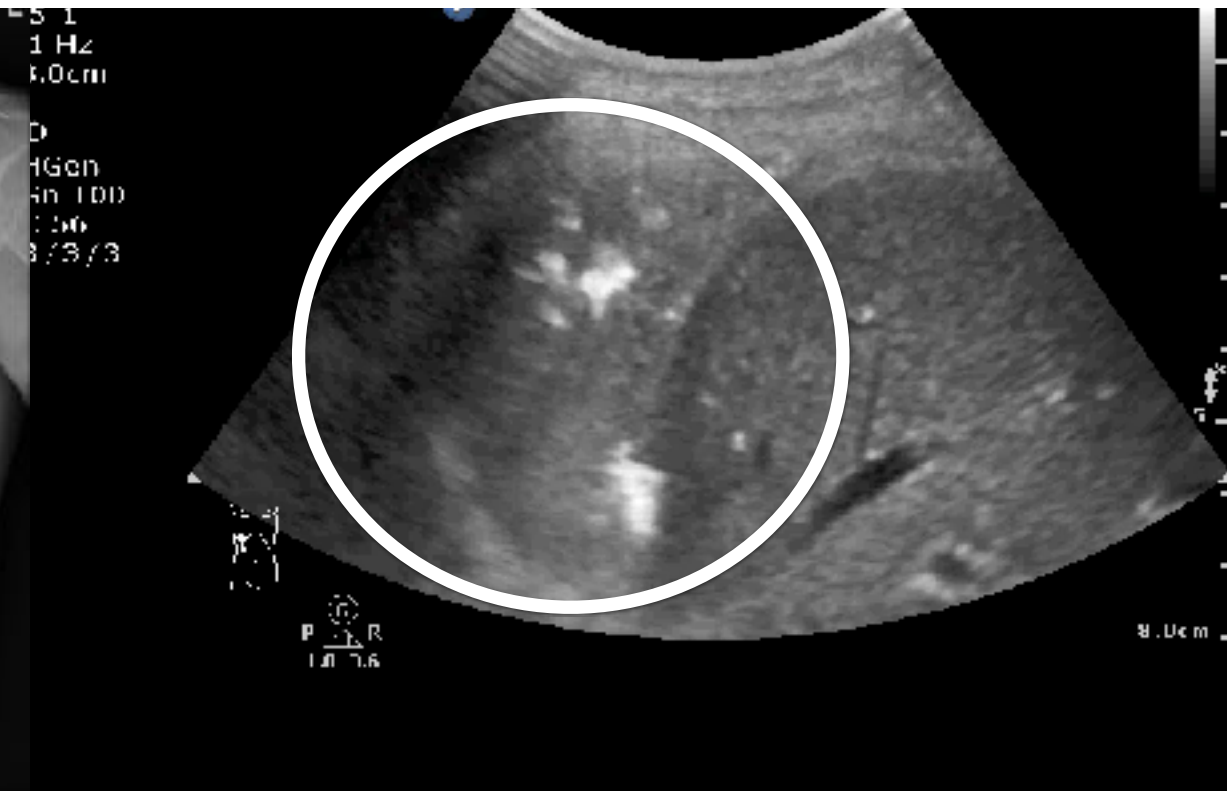
P	Pyloric stenosis
A	Appendicitis / Adenitis
B	Biliary
D	Diaphragm
O	Intussusception / SBO
M	Moving fluid or gas
E	Ectopic pregnancy
N	Nephropathy

9M, Fever and ABD pain

Diaphragm for outsider



Upper ABD pain consider pneumonia

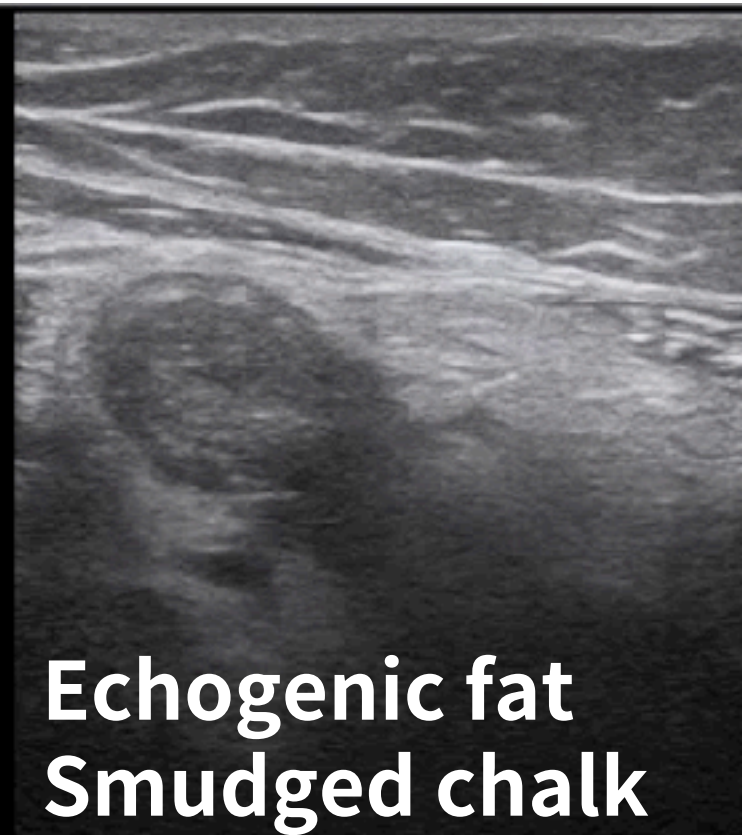
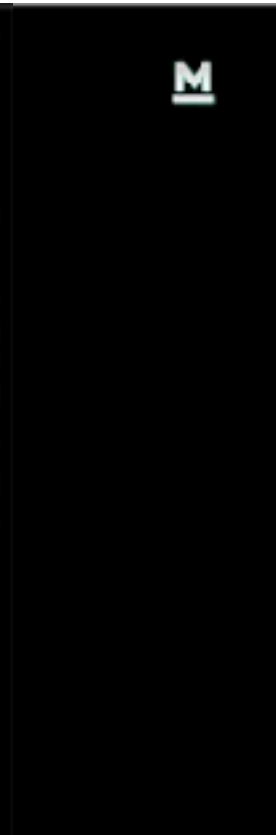
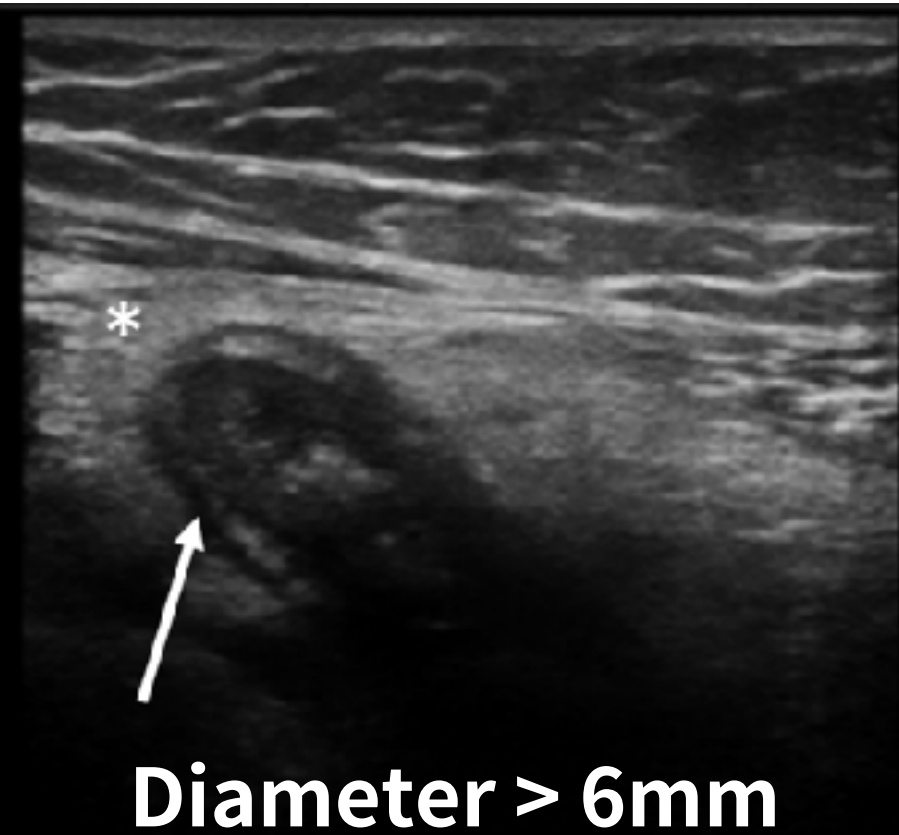


Abdominal pain

Landmark

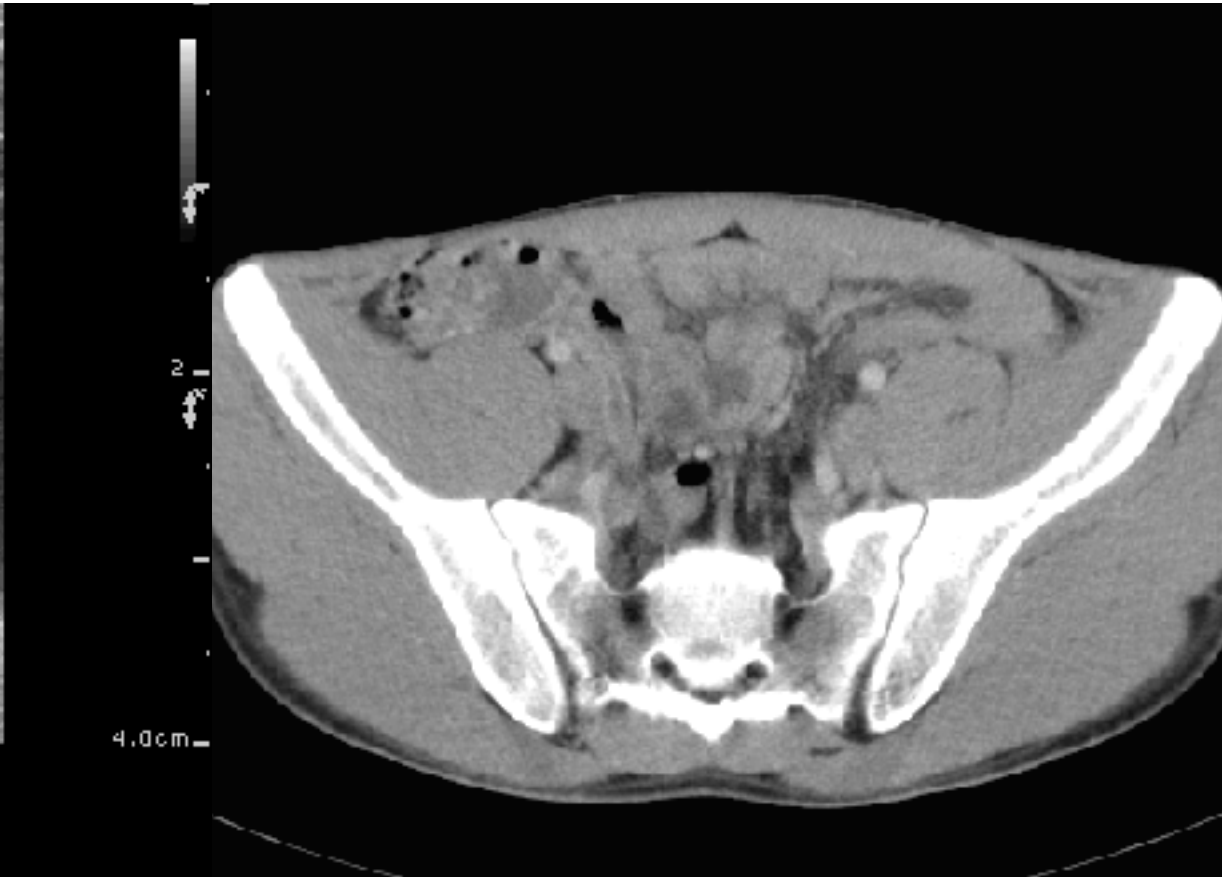
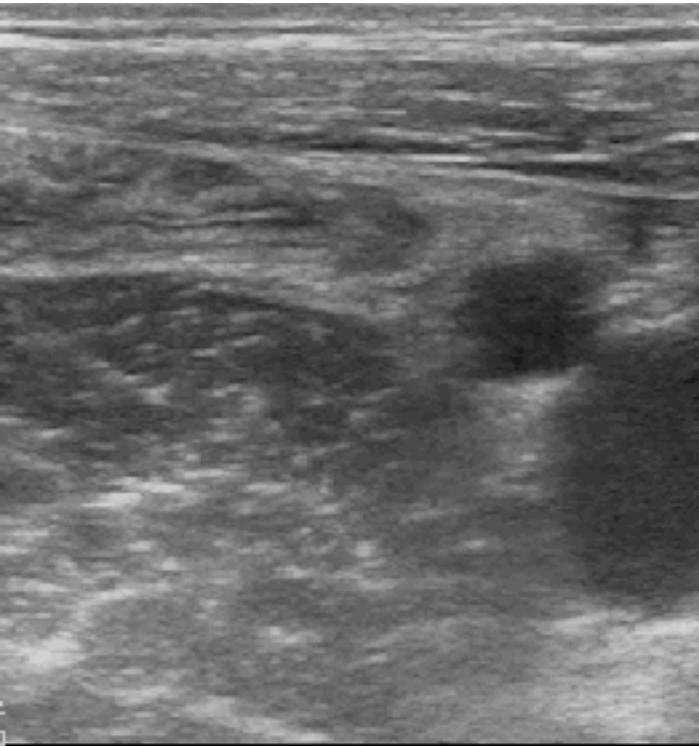
Linear

Compression



	Peristalsis	Compressible	Connects To Cecum	Blind End	Diameter
Appendix		✓	✓	✓	< 6mm
Appendicitis			✓	✓	> 6mm
Small Intestine	✓	✓	✓		Variable

Appendicitis



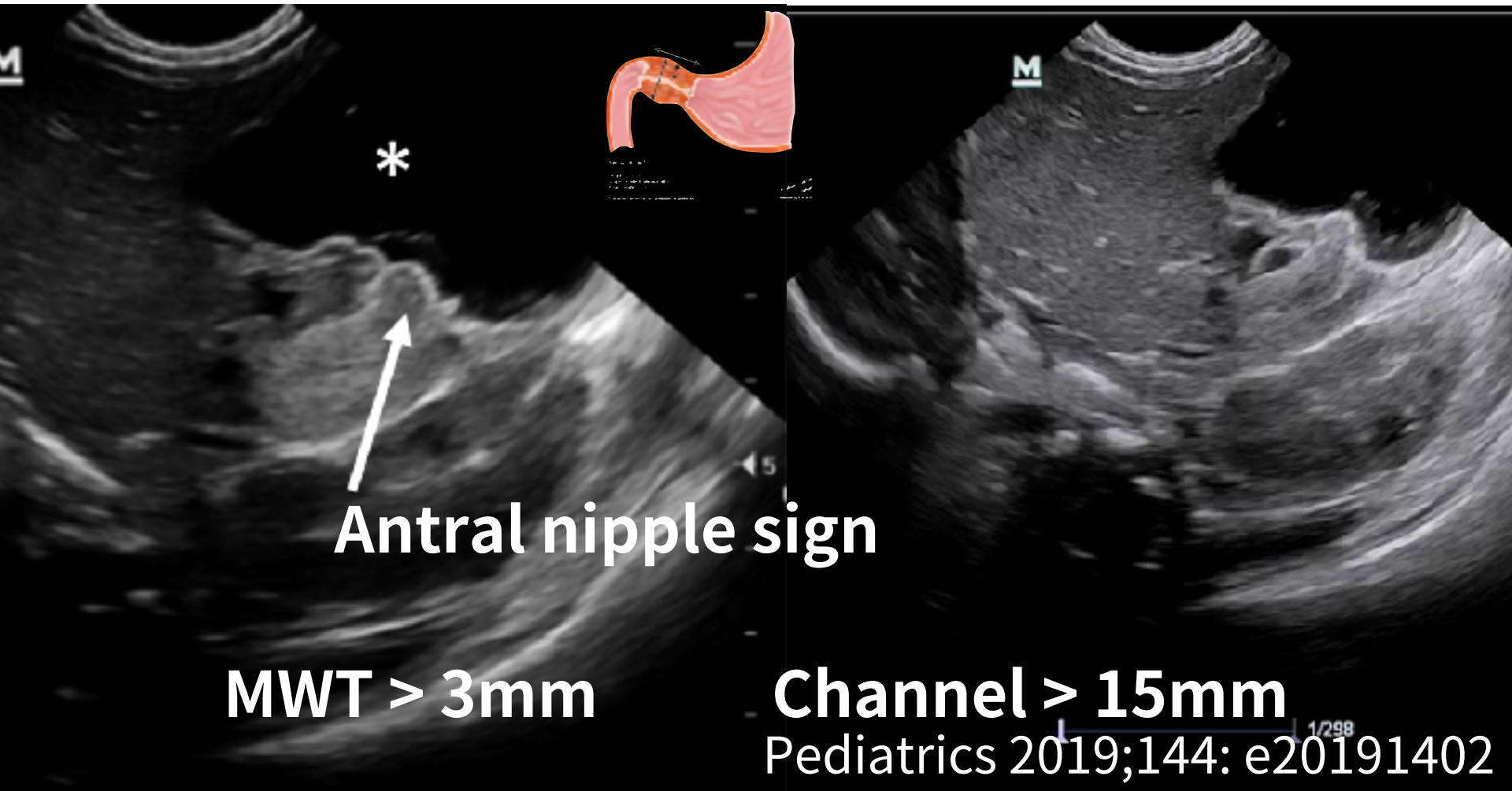
Mesenteric adenitis

POCUSAcademy©ChenKC



Vomiting

1 ~ 3 m ; nonbilious vomiting

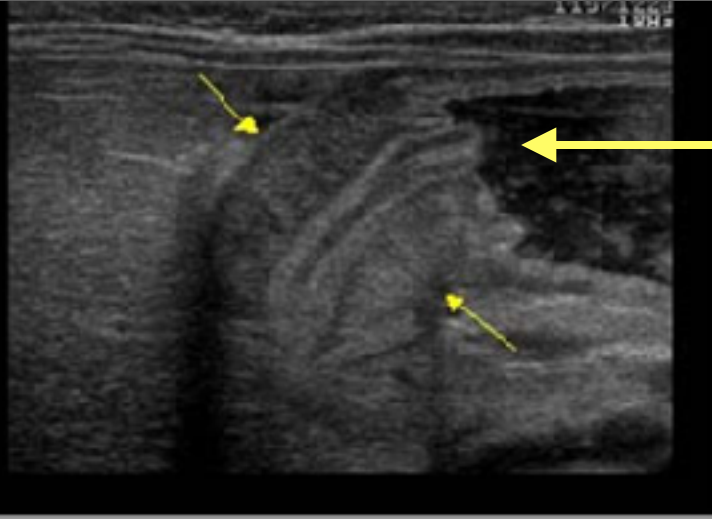


MWT > 3mm

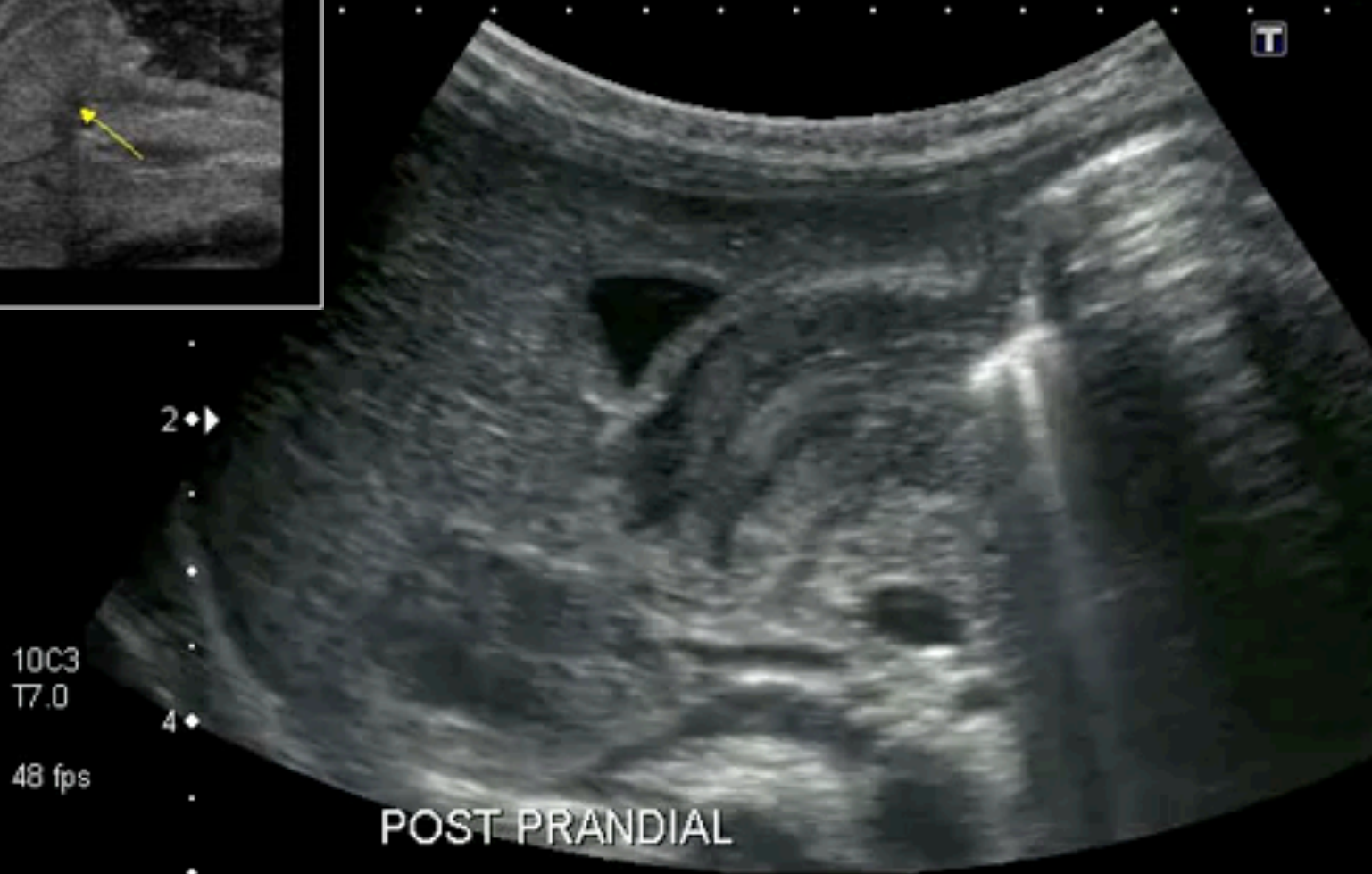
Channel > 15mm

Pediatrics 2019;144: e20191402

Pyloric stenosis

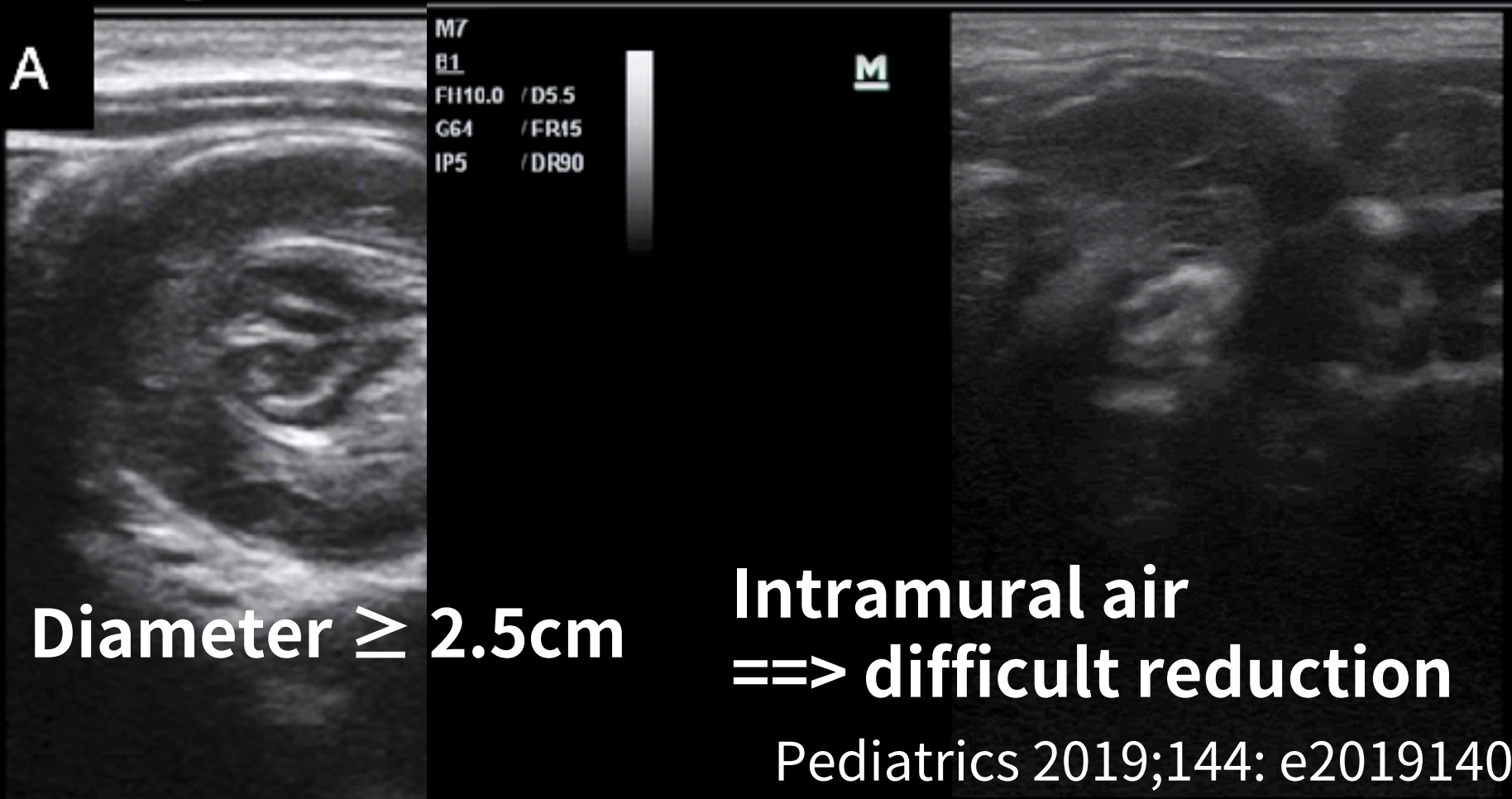


antral nipple sign

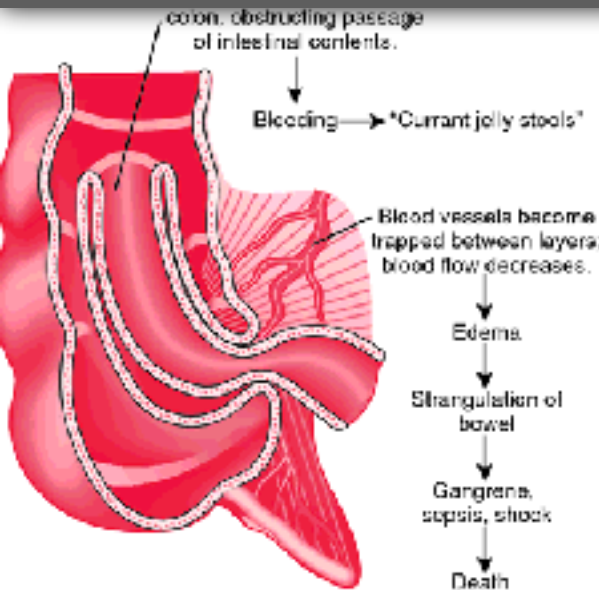


Vomiting

High suspicion; Periodic pattern



Intussusception



PHILIPS

POCUSAcademy@ChenKC

Abd Gen2

C5-1

51 Hz

8.0cm

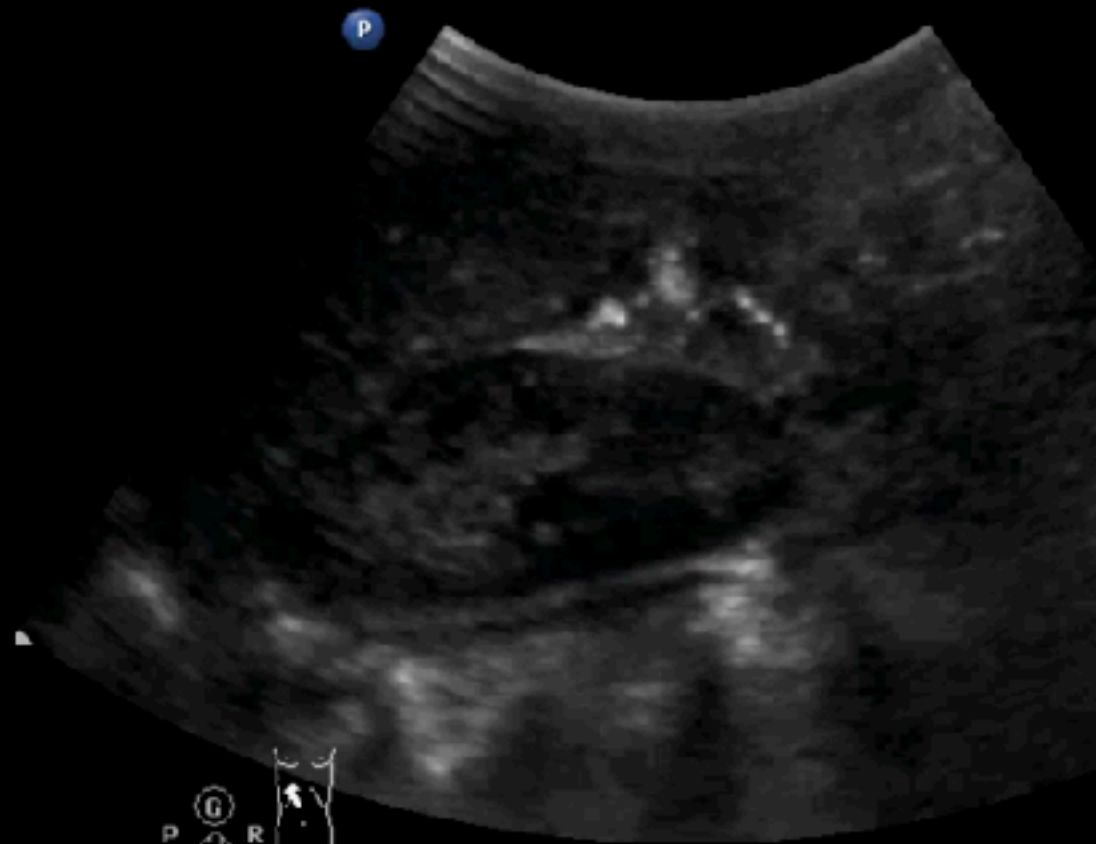
2D

HGen

Gn 60

C 56

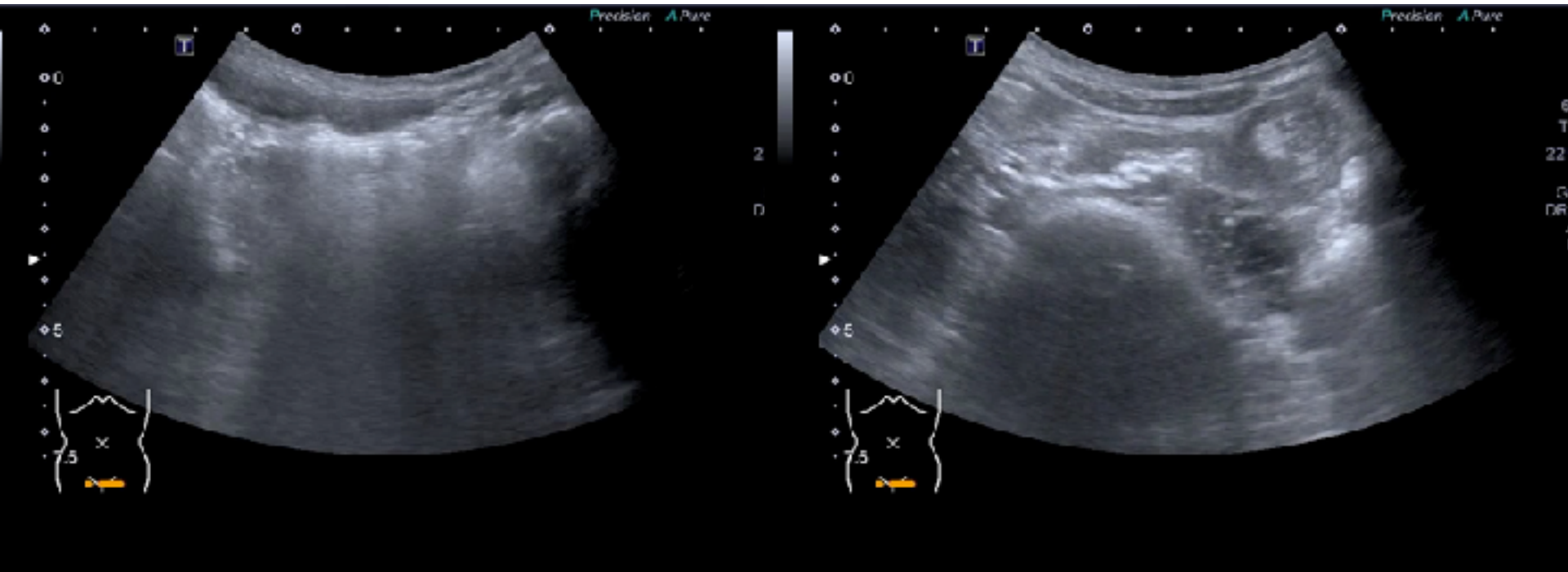
3 / 3 / 3



①
P R
1.8 3.6

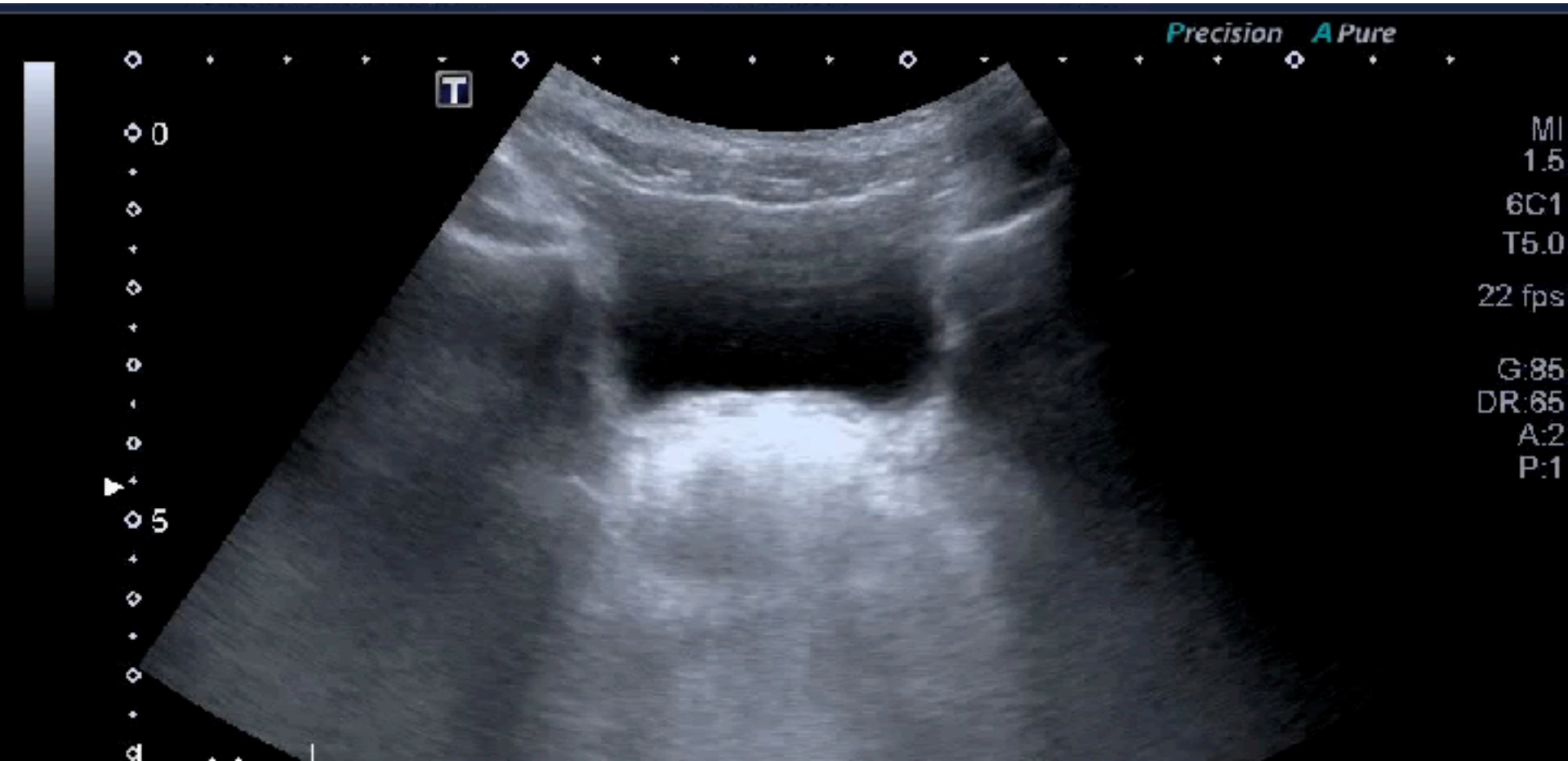
7F, severe ABD pain & sweating, subsided now

Small bowel intussusception w/ Spontaneous reduction



5M, abdominal pain for one hour

Stool impaction



Trauma

Up to 30% pediatric solid organ injury
—no free fluid on FAST

Children with hemoperitoneum
—most managed non operatively

Lung / Heart / Procedure

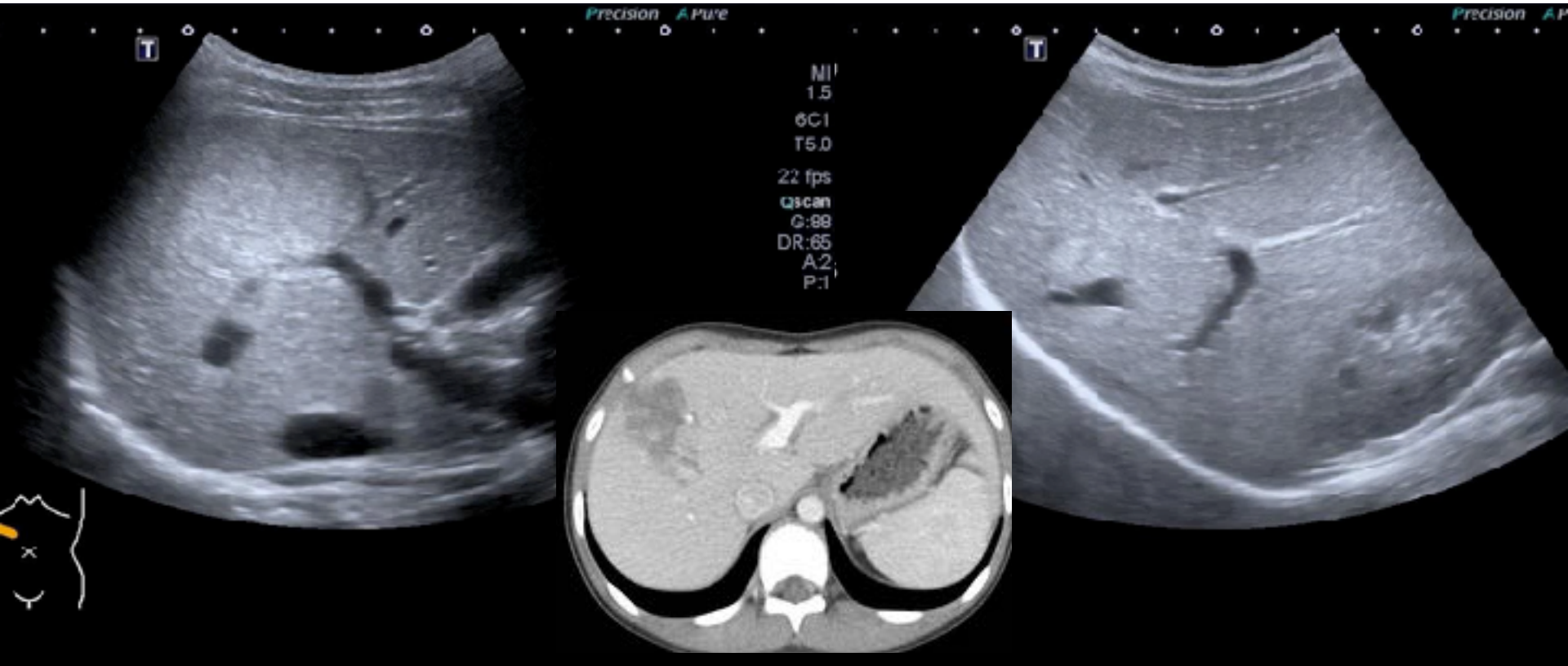
Find bleeder in unstable & multiple injuries

Dynamic or Serial FAST for BAT

CEUS: Contrast-enhanced US

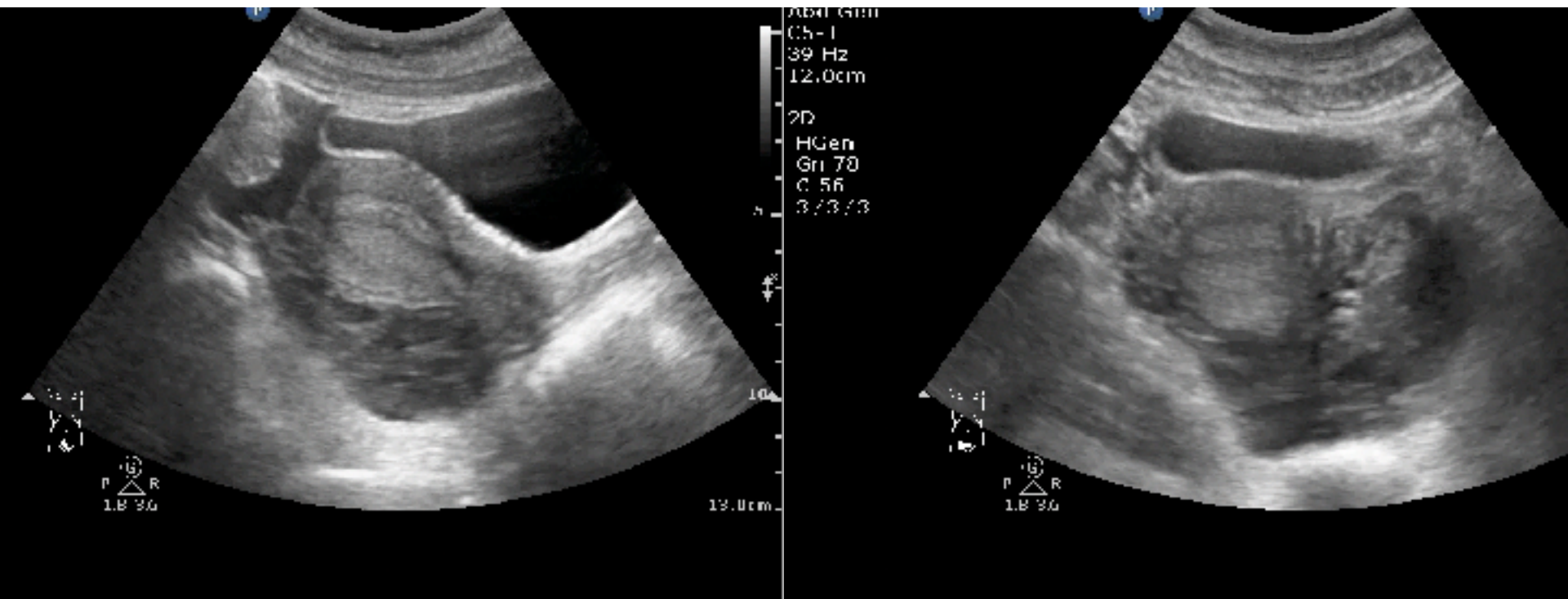
10/M, Traffic accident with RUQ pain

EFAST focused on **Free** things

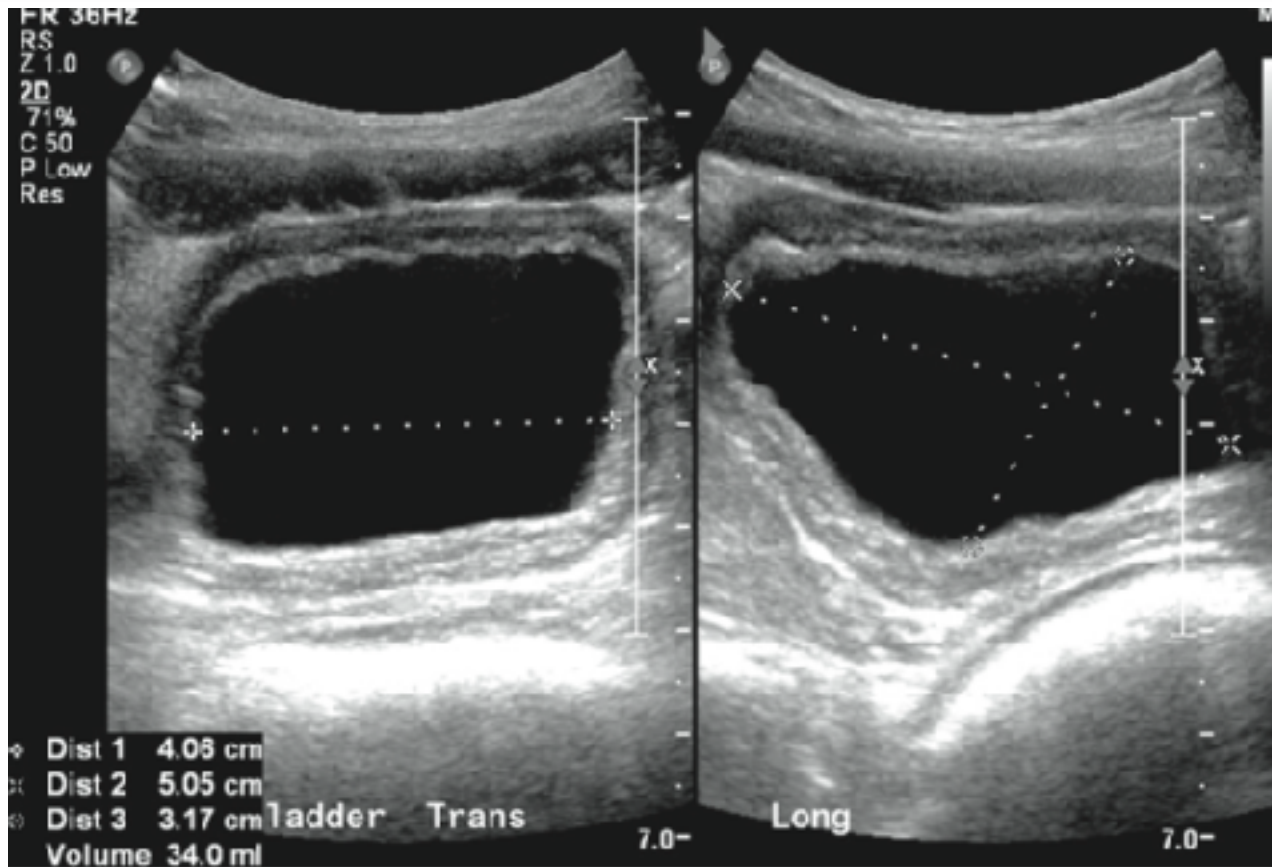


14F, acute lower ABD pain w/ cold sweating

FAST for moving fluid



Before the catheter

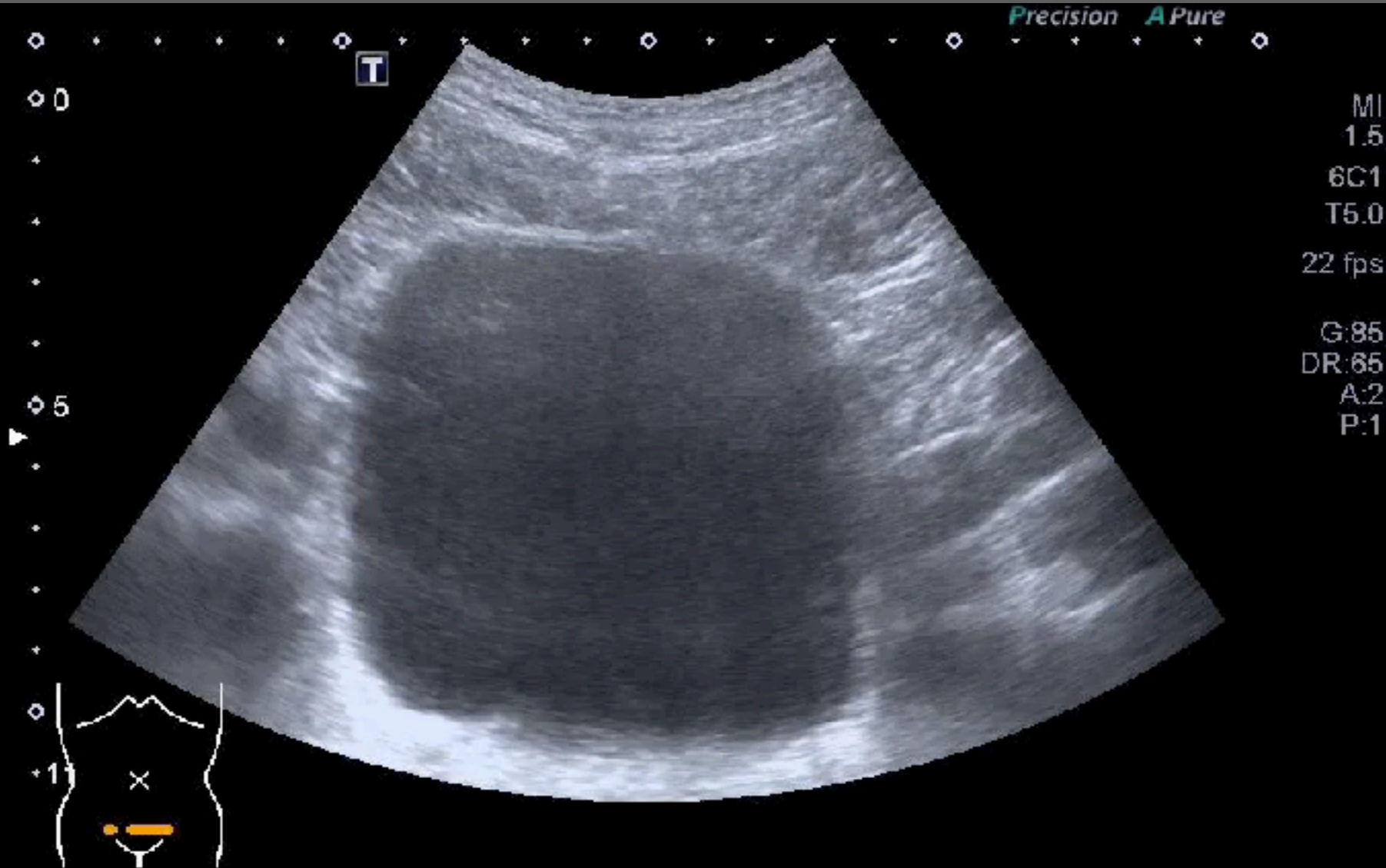


Transverse diameter ≥ 2 cm

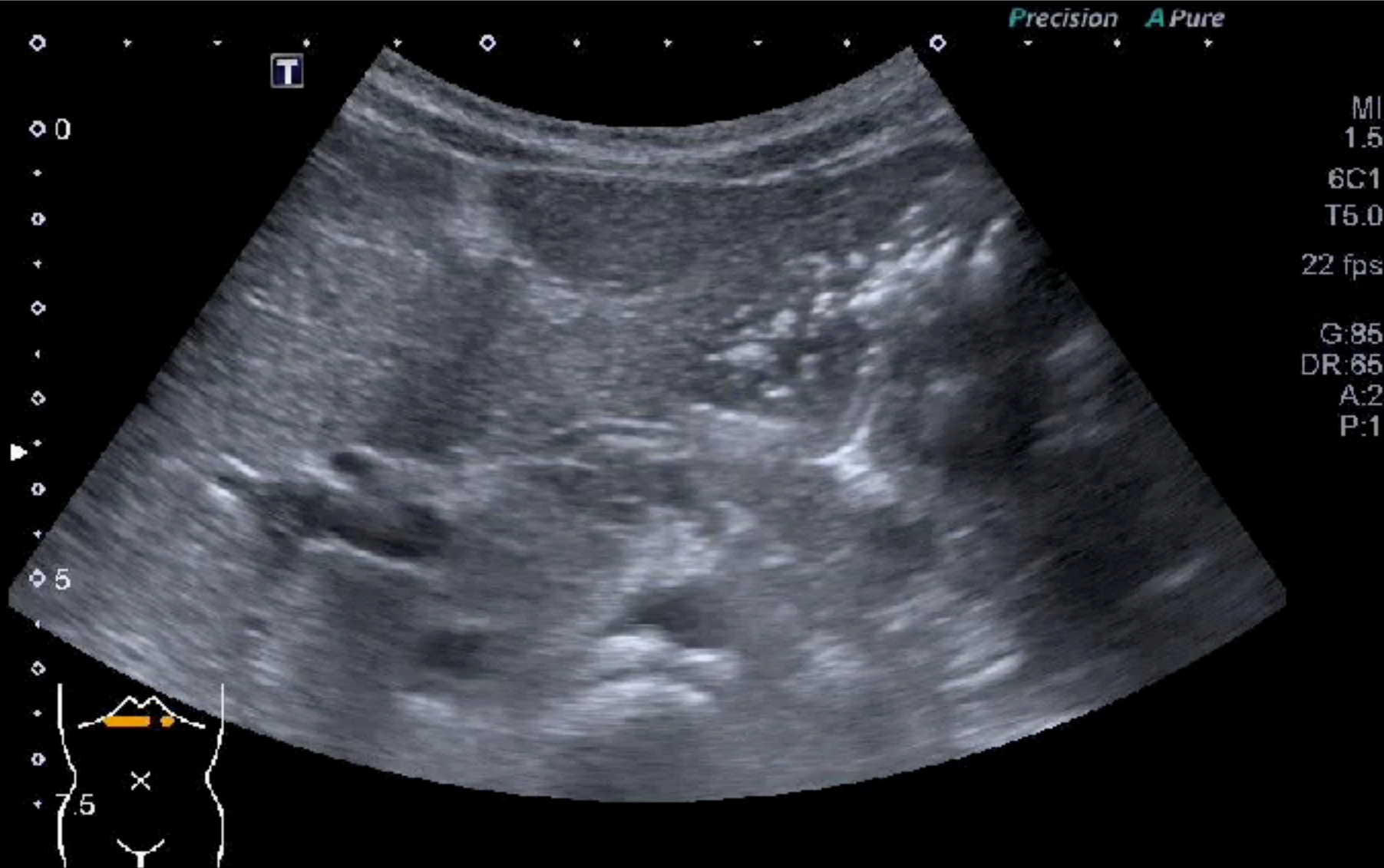
~ bladder volume ≥ 2.5 cm³

Witt et al. AEM 2005

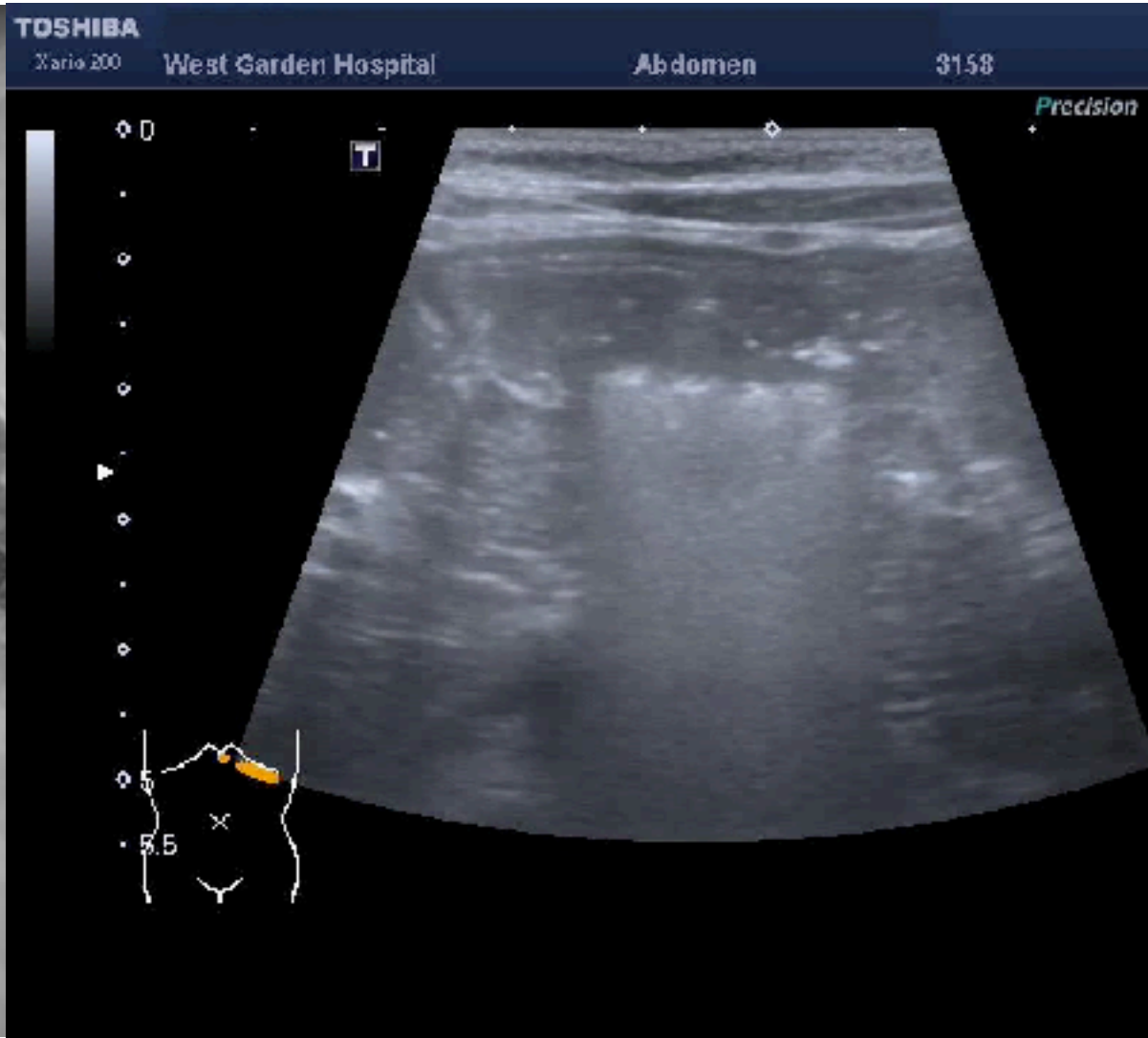
Suprapubic aspiration



2F, Swallow coin

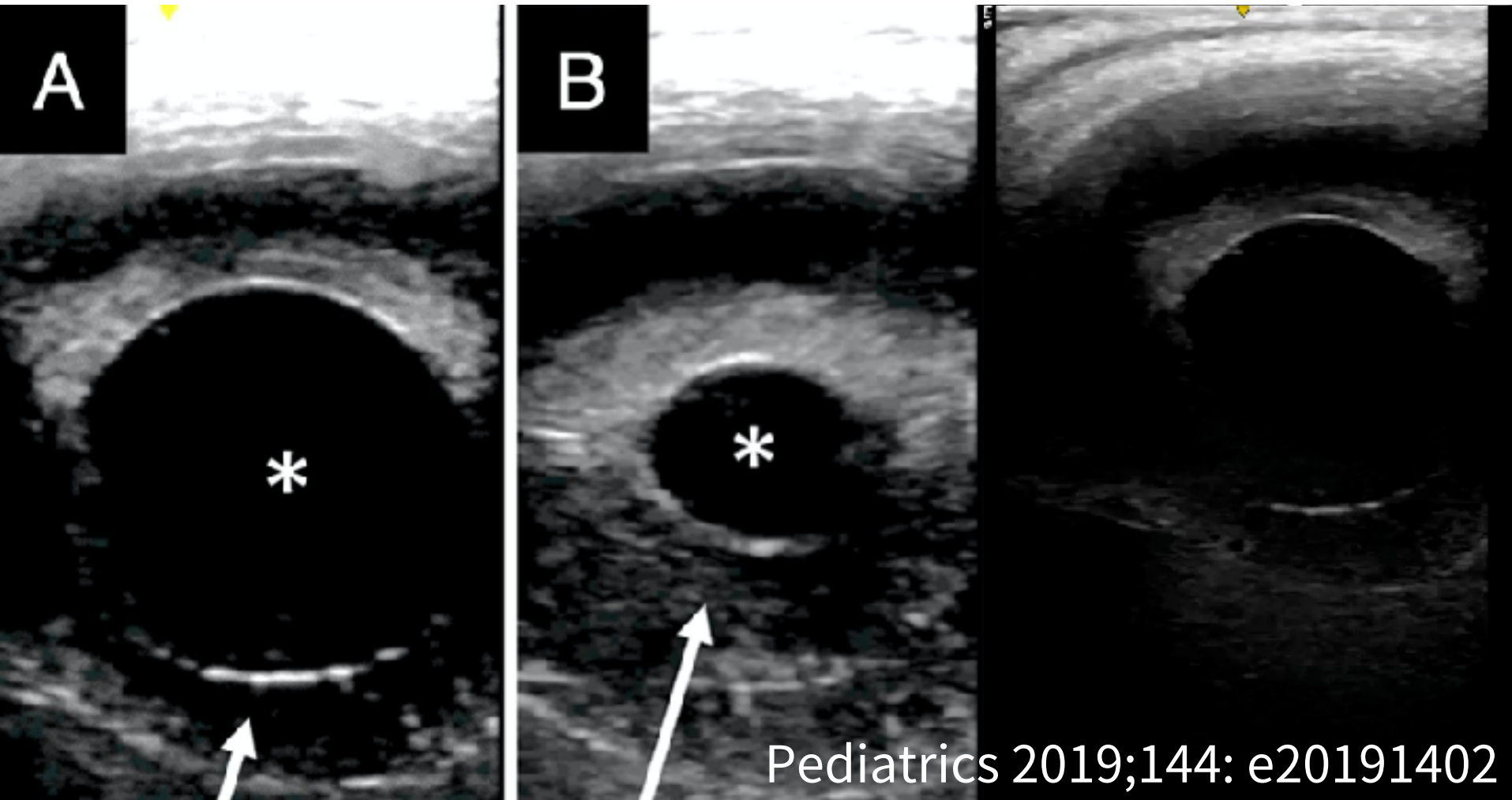


Coin in stomach



Neurosonology

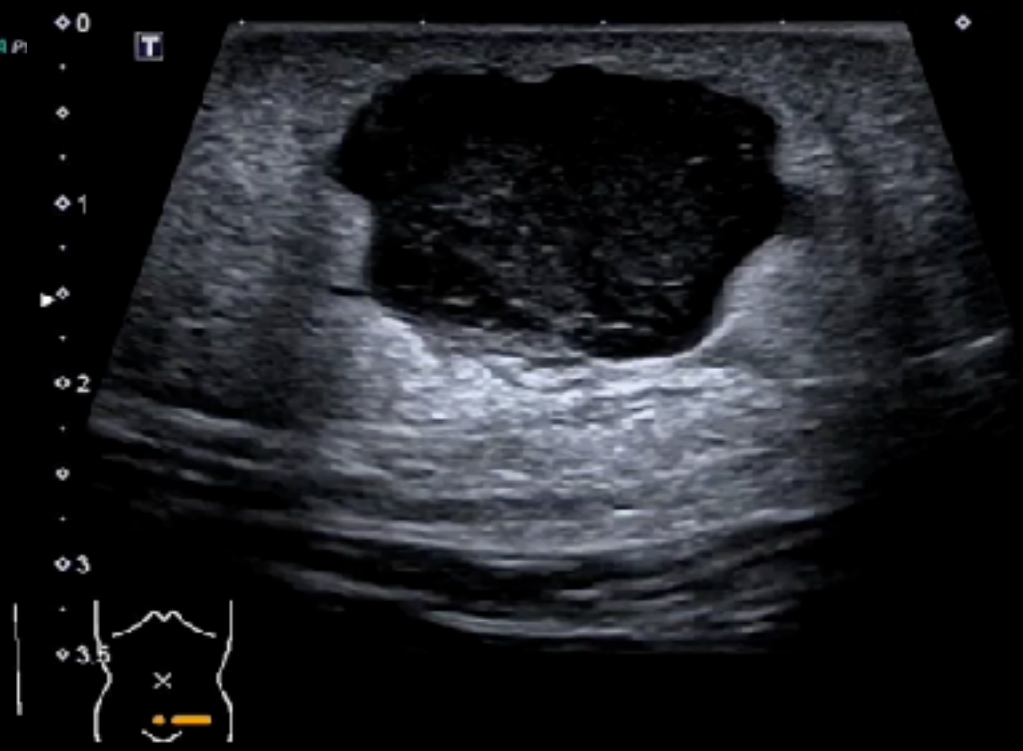
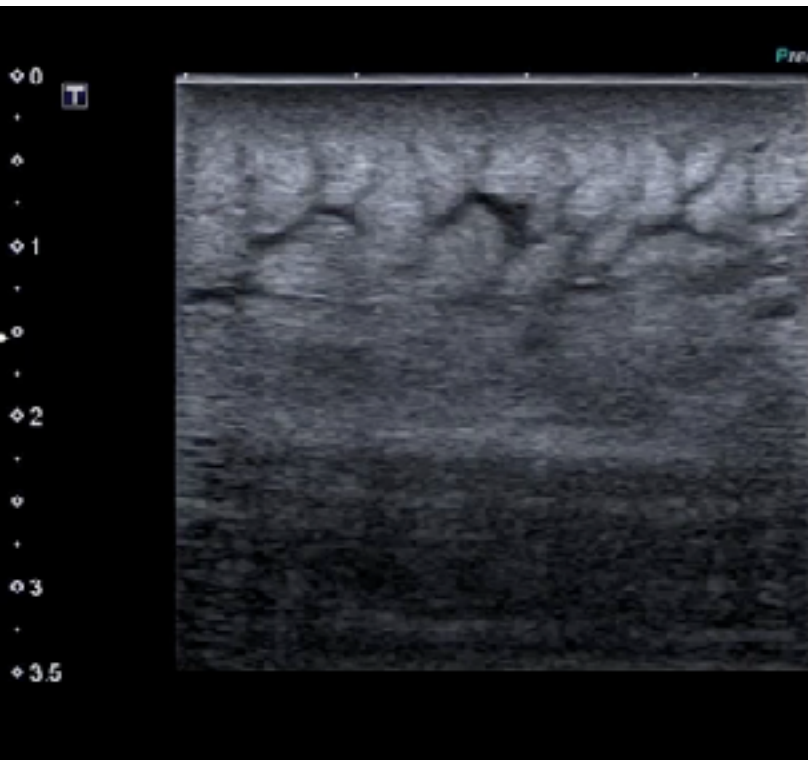
Pupillary reflex; ONSD



Soft tissue infection

Cellulitis

Abscess

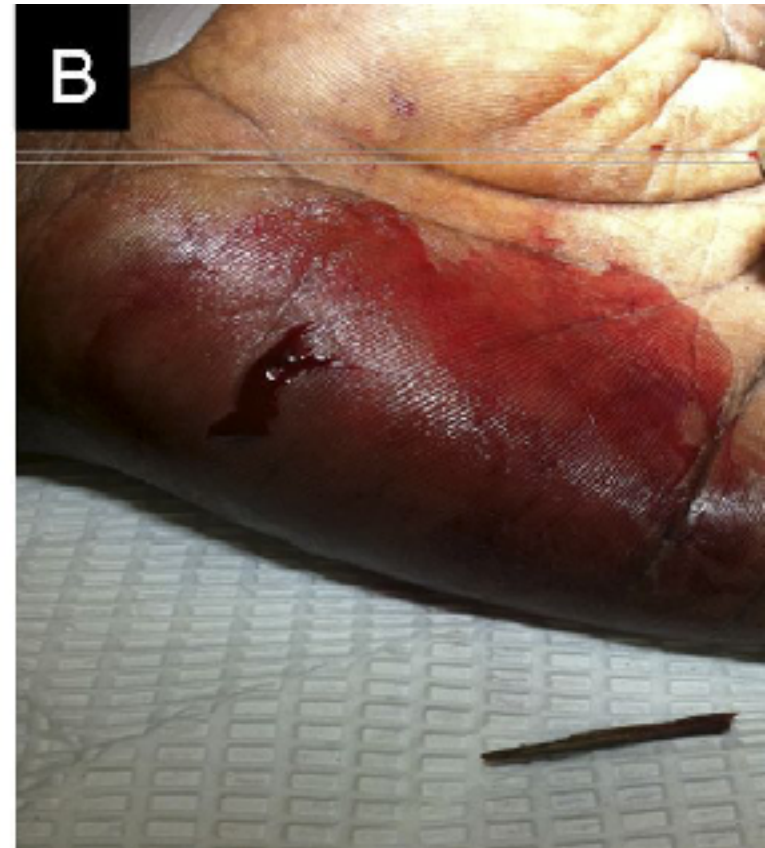
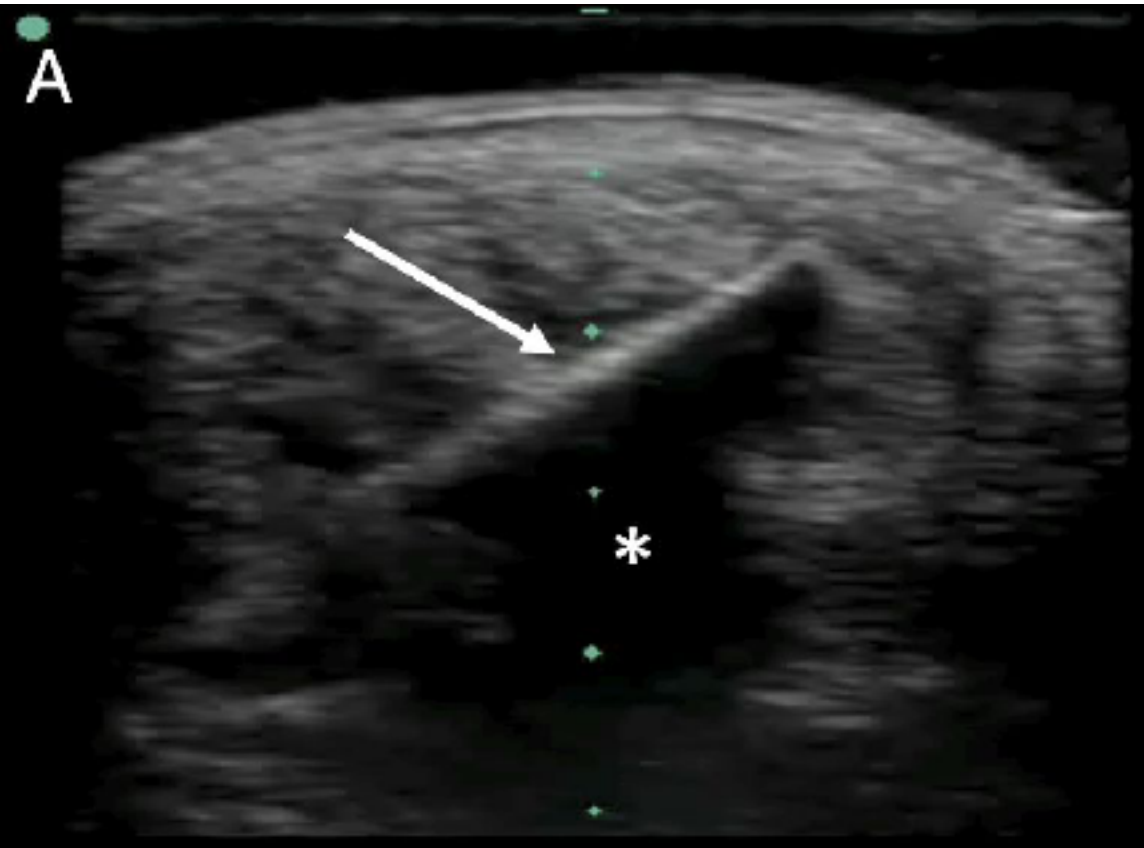


Cobblestone

Collection

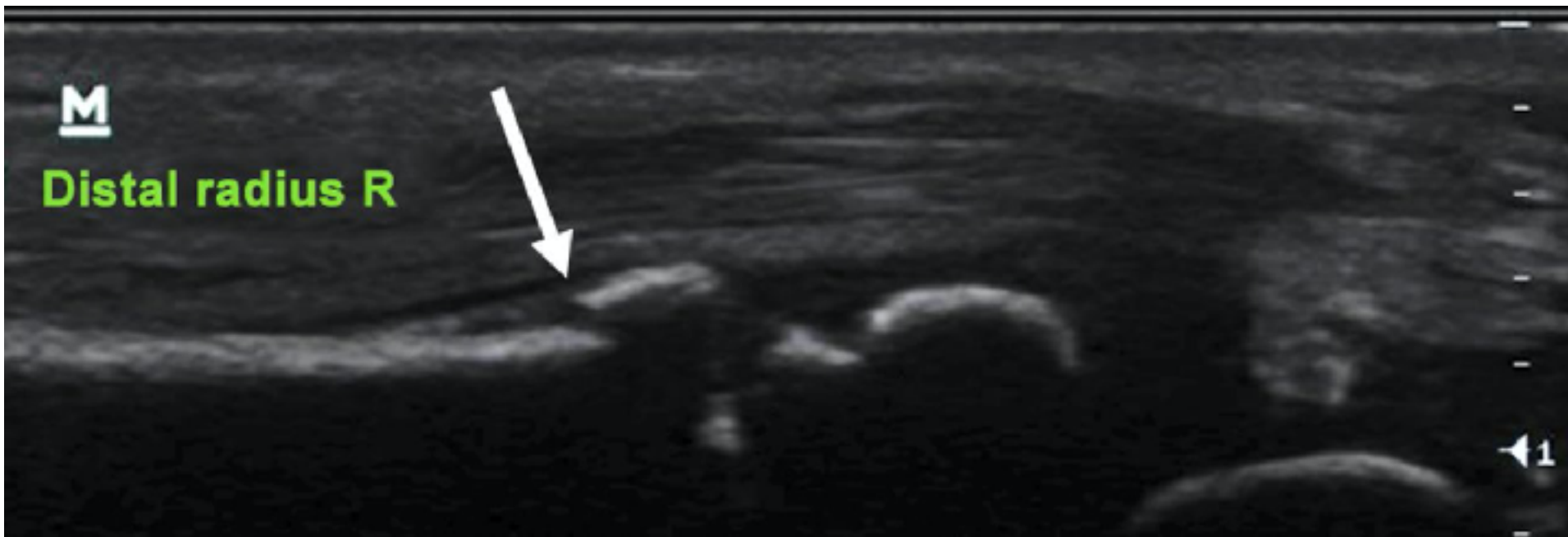
Soft tissue & MSK

Foreign body



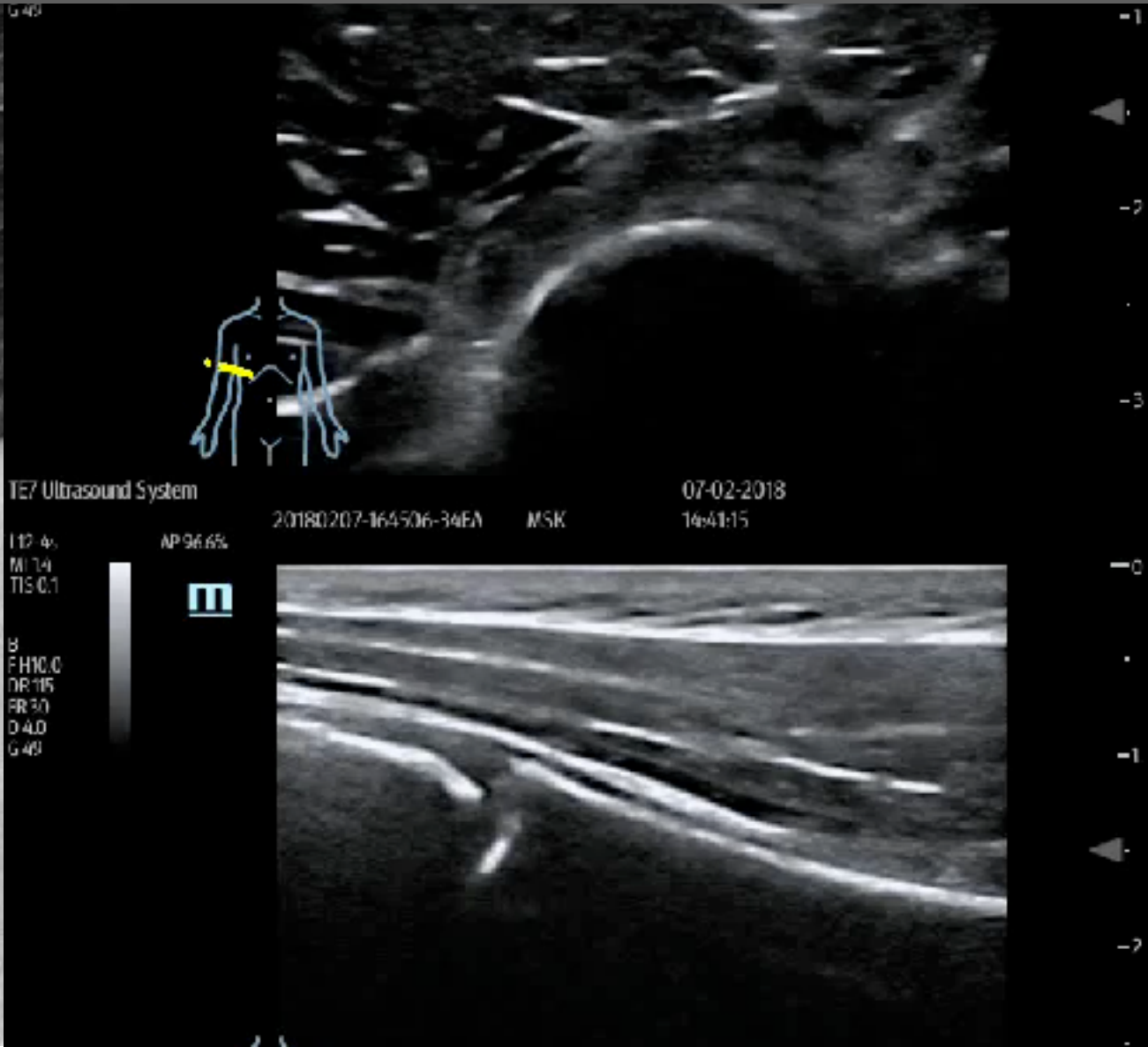
Soft tissue & MSK

Fracture / Reduction / Effusion

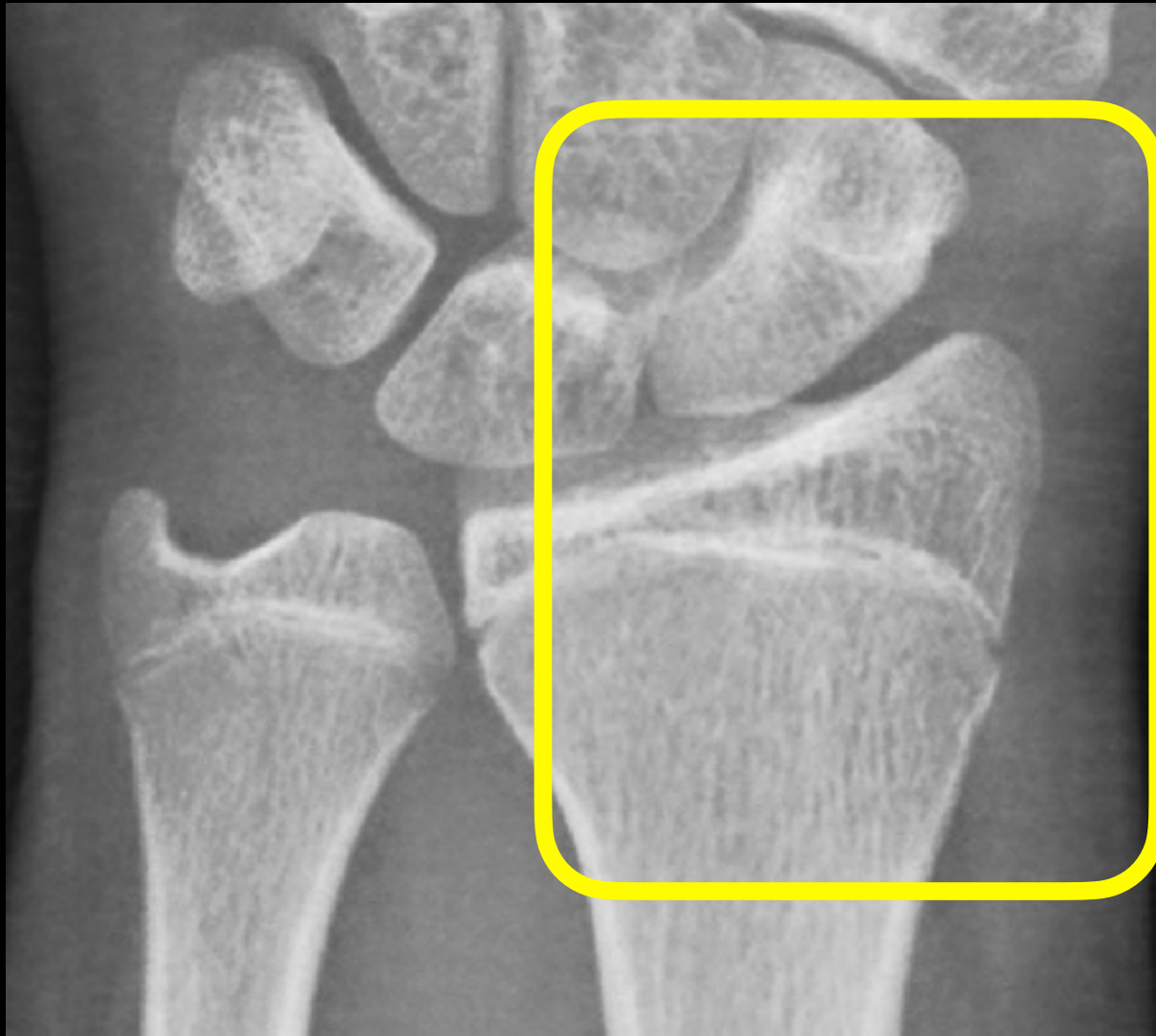


Salter Harris type 2 fracture

Humeral fracture

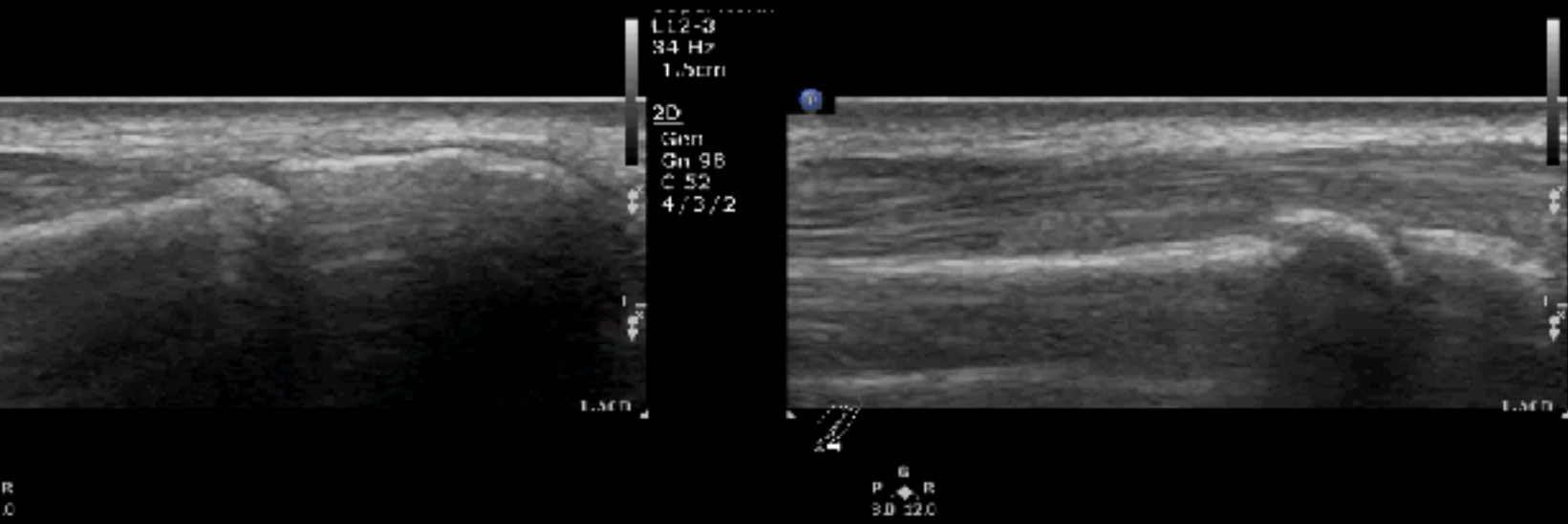


15M with left wrist pain

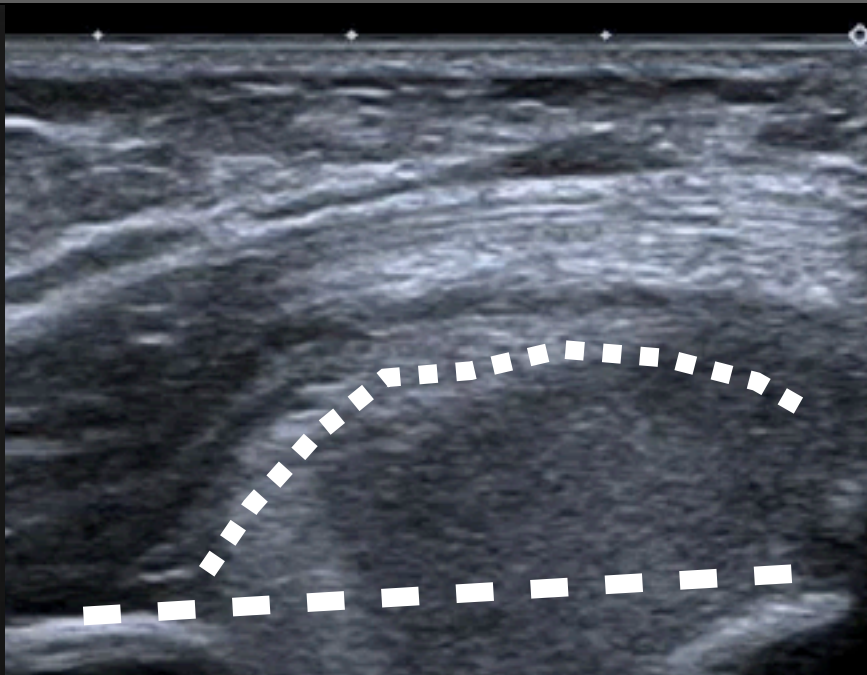


Right radius

Left radius



Elevated fat pad sign



olecranon fossa

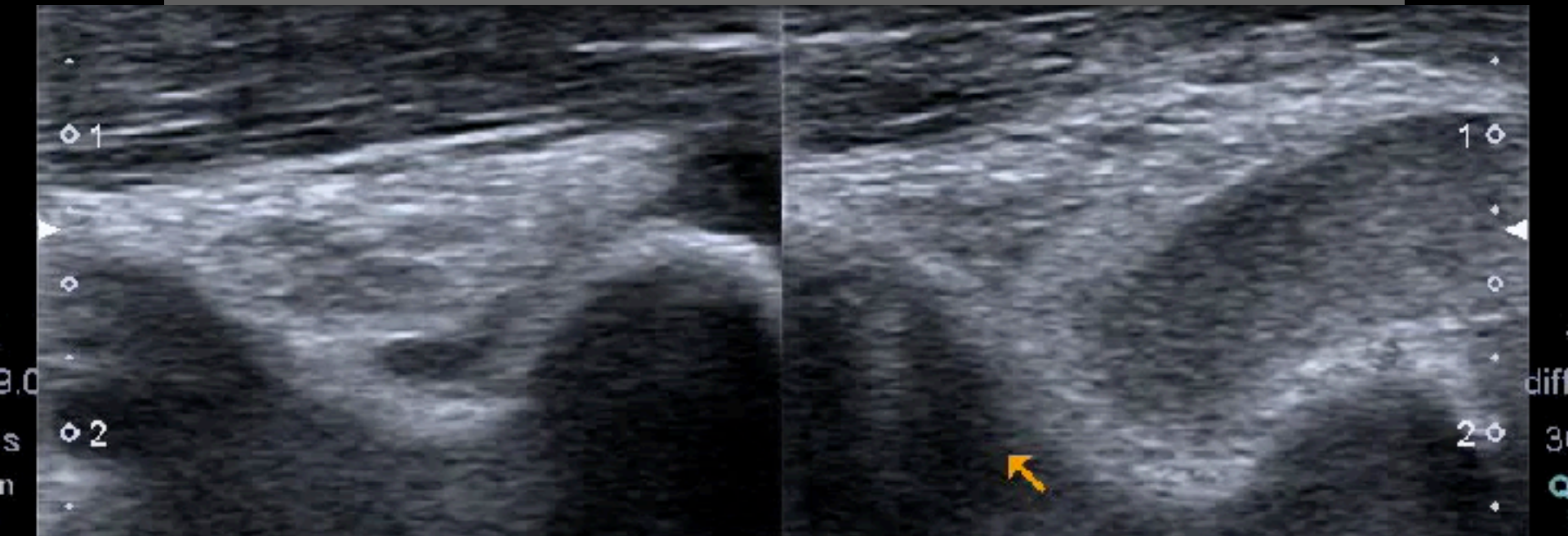


R **6 歲男童，左肘受傷** L



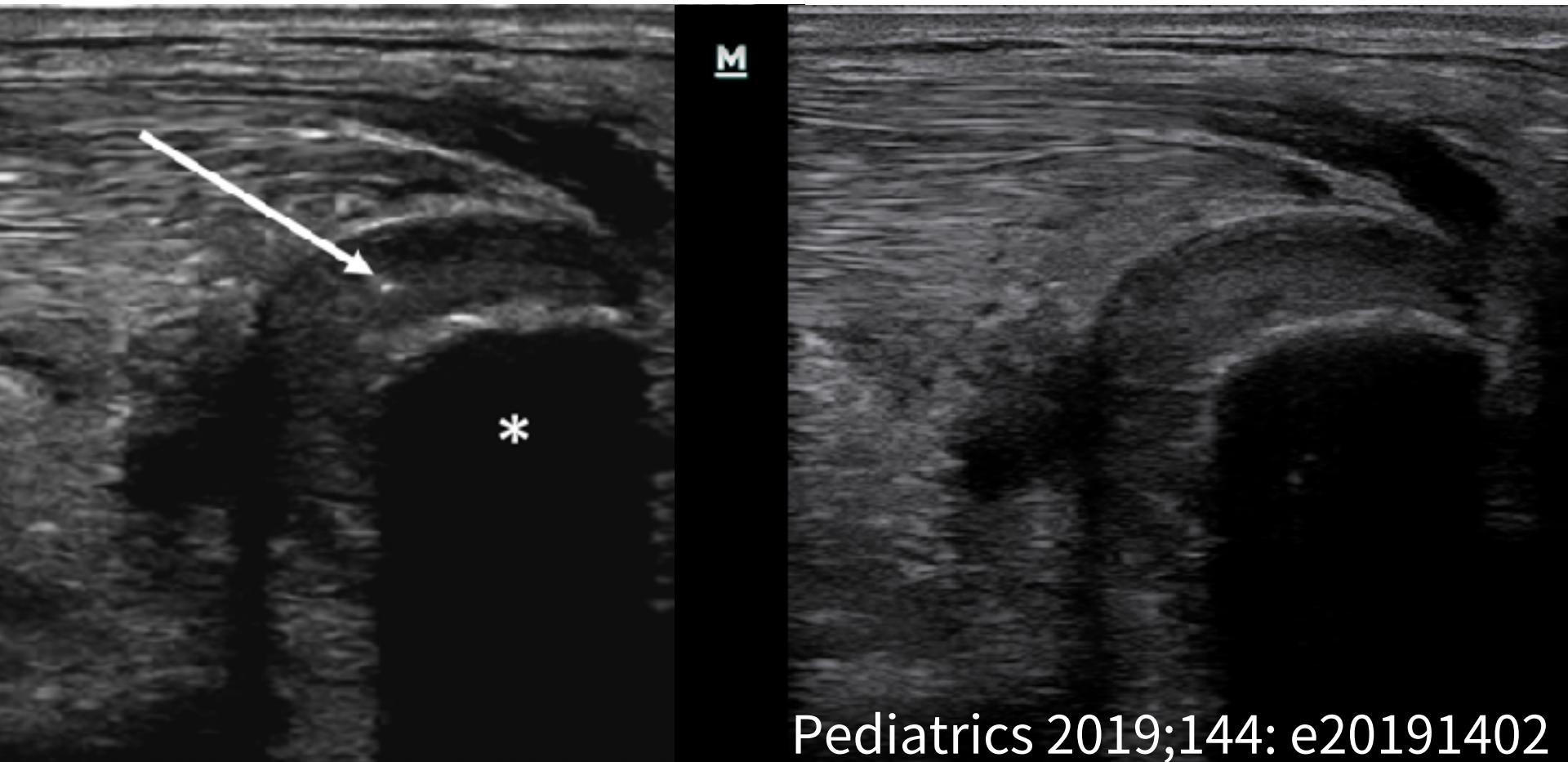


Hemarthrosis



Osteomyelitis

Diagnosis / Aspiration



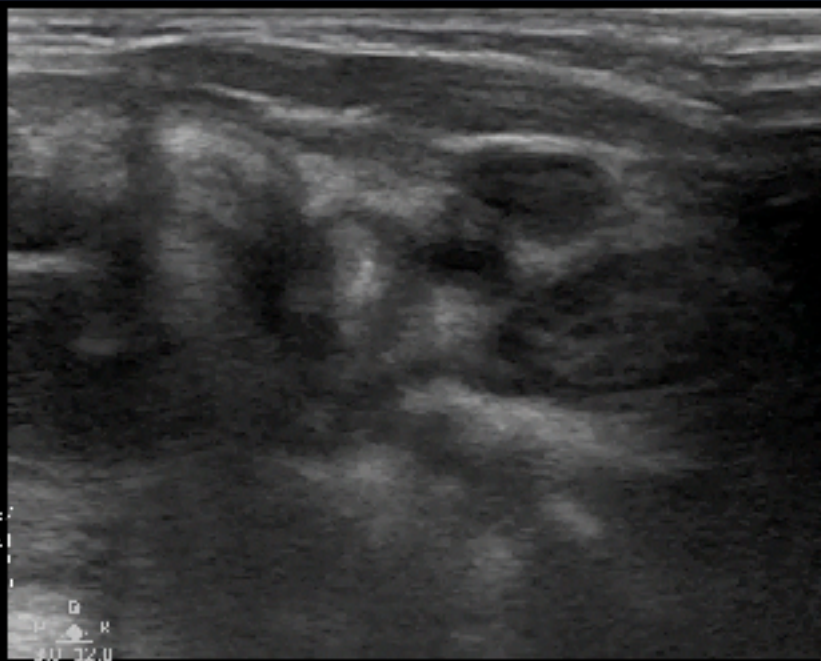
4 month girl, SpO2 70%

superficial
12-3
1 Hz
3.0cm

D
Gen
Gn 96
C 52
4/3/2



Correct intubation

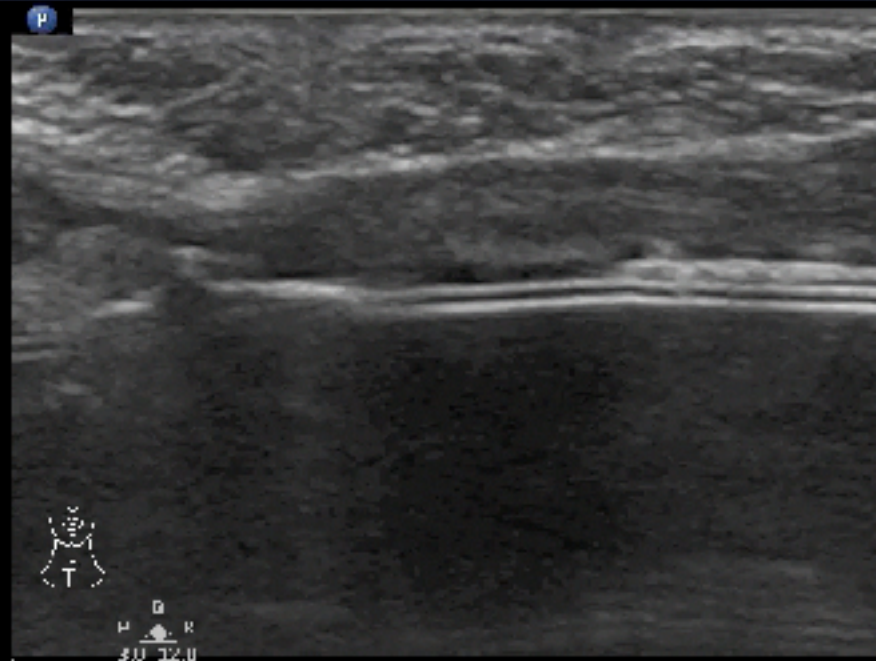


Superficial P

1 12-3
34 Hz
2.5cm

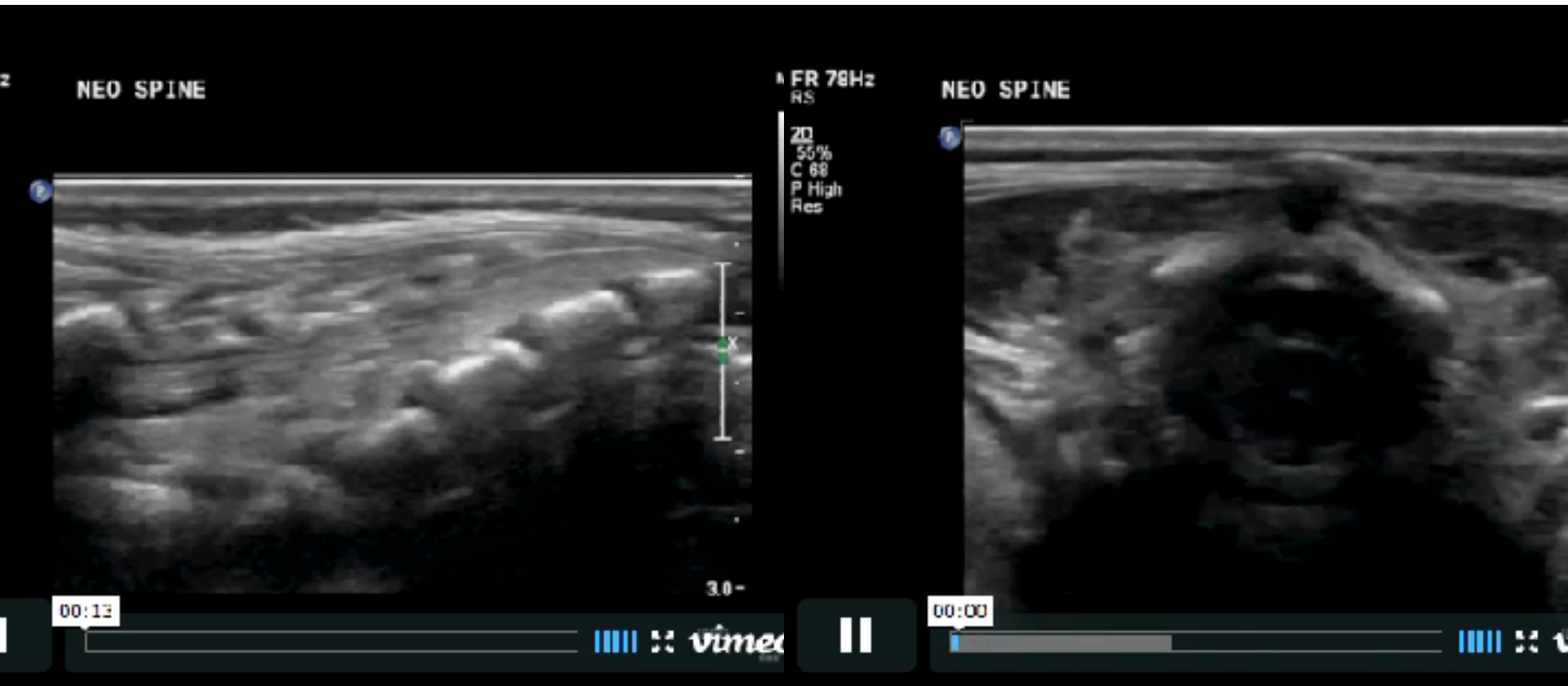
2D

Gen
Gn 90
C 52
4/3/2



D
M R
3.0 12.0

Pediatric Spine



#: 364

20:51:15

MI: 0.8

TI: 0.2

25/Apr/2015



4cm

Lumbar Puncture

I-AIM

Indication



Acquire



Interpret



**Make
decision**

Scope of Practice

Application



Amenability
超音波適用嗎



Measurability
有辦法測量嗎



Frequency
臨床上常見嗎

Finally, defining the scope of practice may avoid conflicts with other specialists. We do not

diagnose cardiac disease because we should. Diagnostic POCUS makes us better physicians within our own respective domains of expertise. In