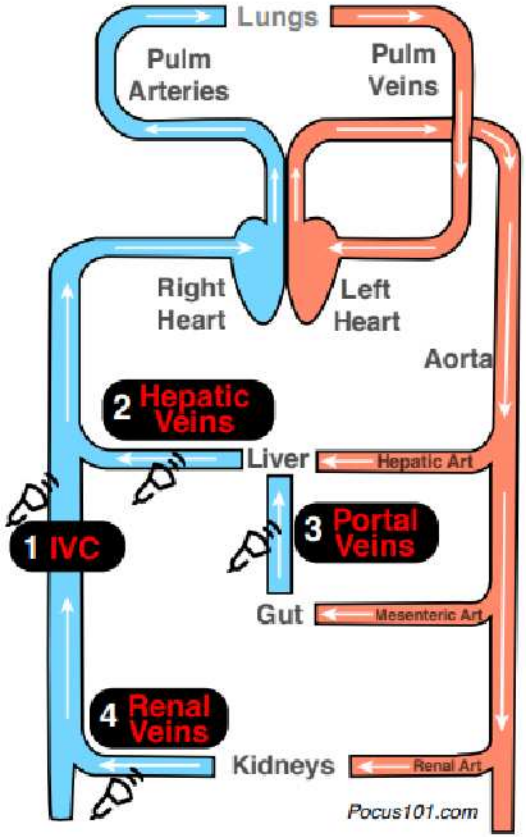
VExUS

Hendrik Vaaks // Rad II // 2023

Venous Excess Ultrasound Score

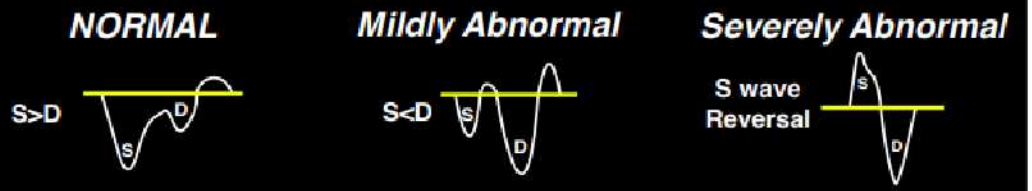
William Beaubien-Souligny, Philippe Rola, Korbin Haycock, Rory Spiegel

Venous Excess Ultrasound VExUS

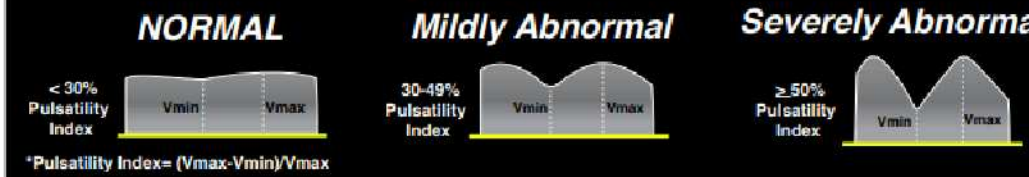


Step 1: IVC Diameter: If ≥2cm, proceed to step 2

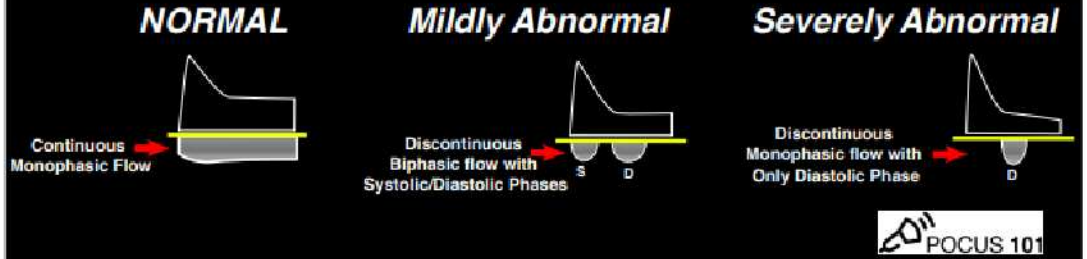
Step 2: Hepatic Vein Doppler



Step 3: Portal Vein Doppler



Step 4: Renal Vein Doppler



Interpretation

Grade 0
(no congestion)
IVC < 2cm

Grade 1
(Mild congestion)
IVC ≥2cm and any combo of Normal or Mildly Abnl Patterns

Grade 2
(Moderate congestion)
IVC ≥2cm and ONE Severely Abnl Pattern

Grade 3
(Severe congestion)
IVC ≥2cm and ≥ 2 Severely Abnl Patterns

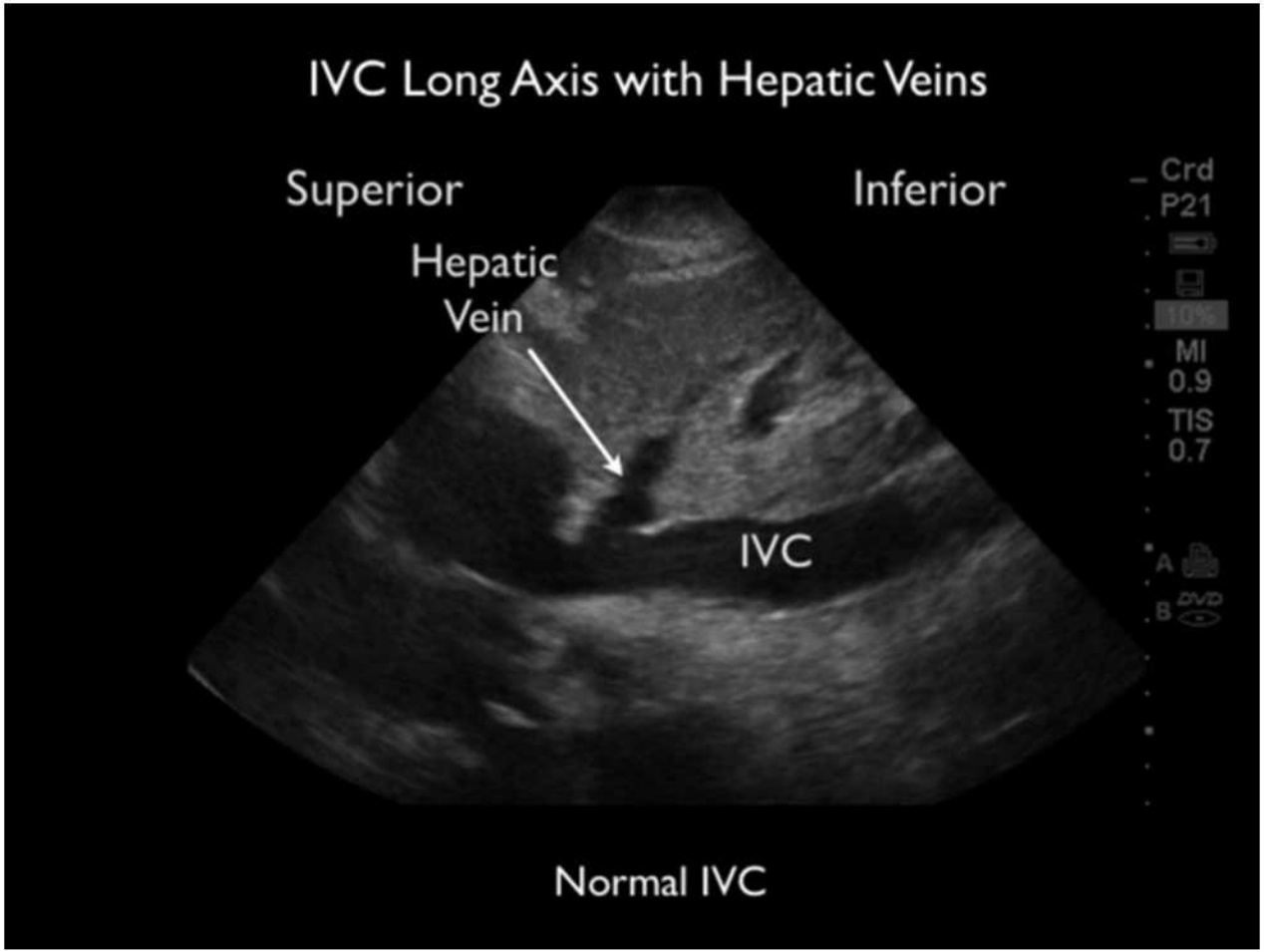
Fookus

IVC

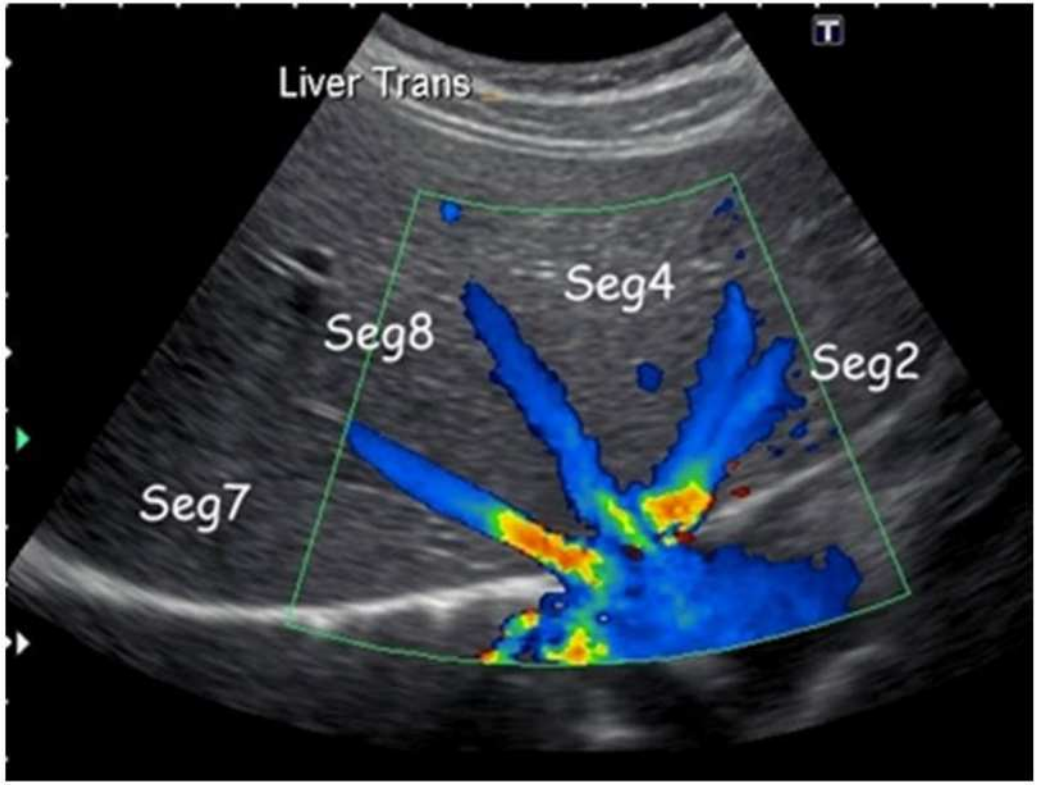
Maksaveenid

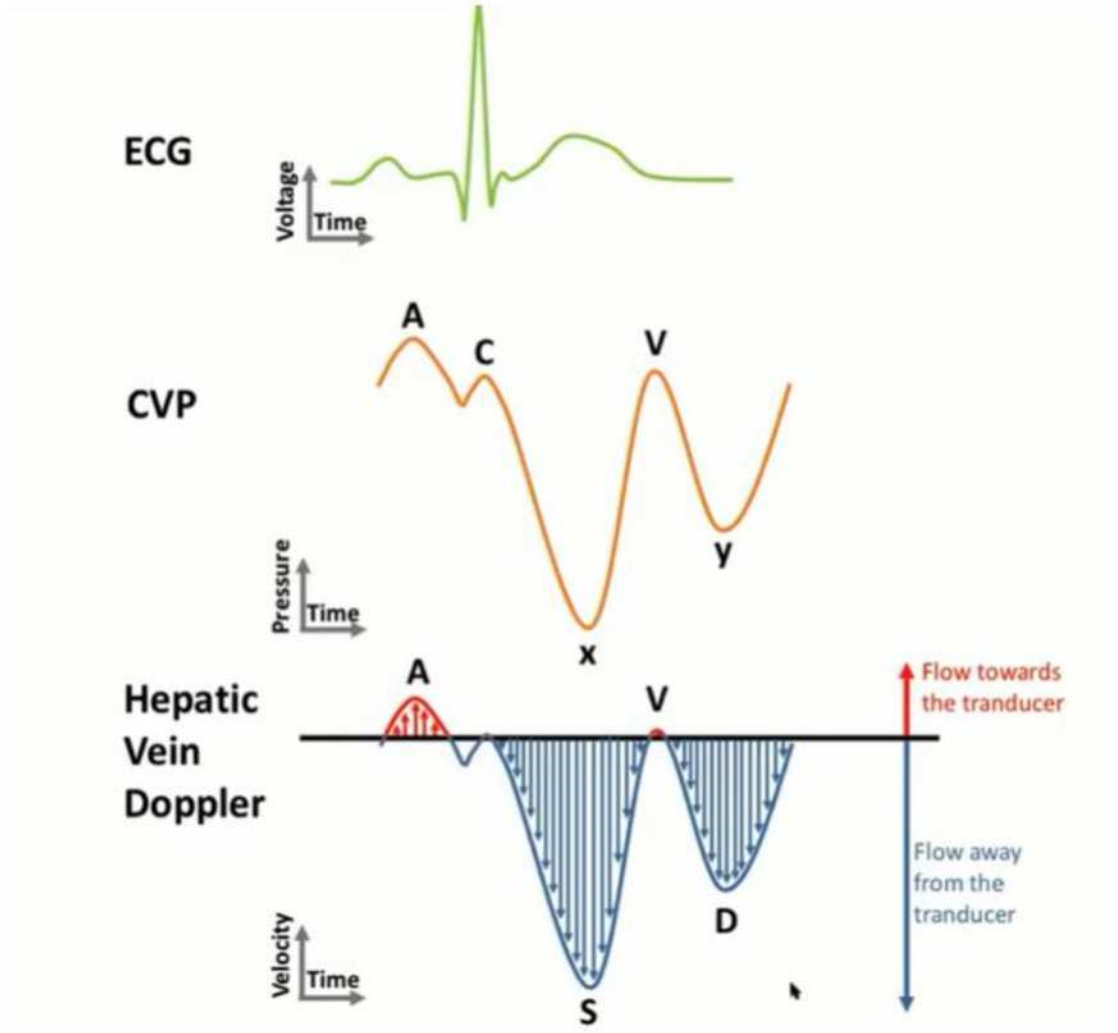
Portaalveen

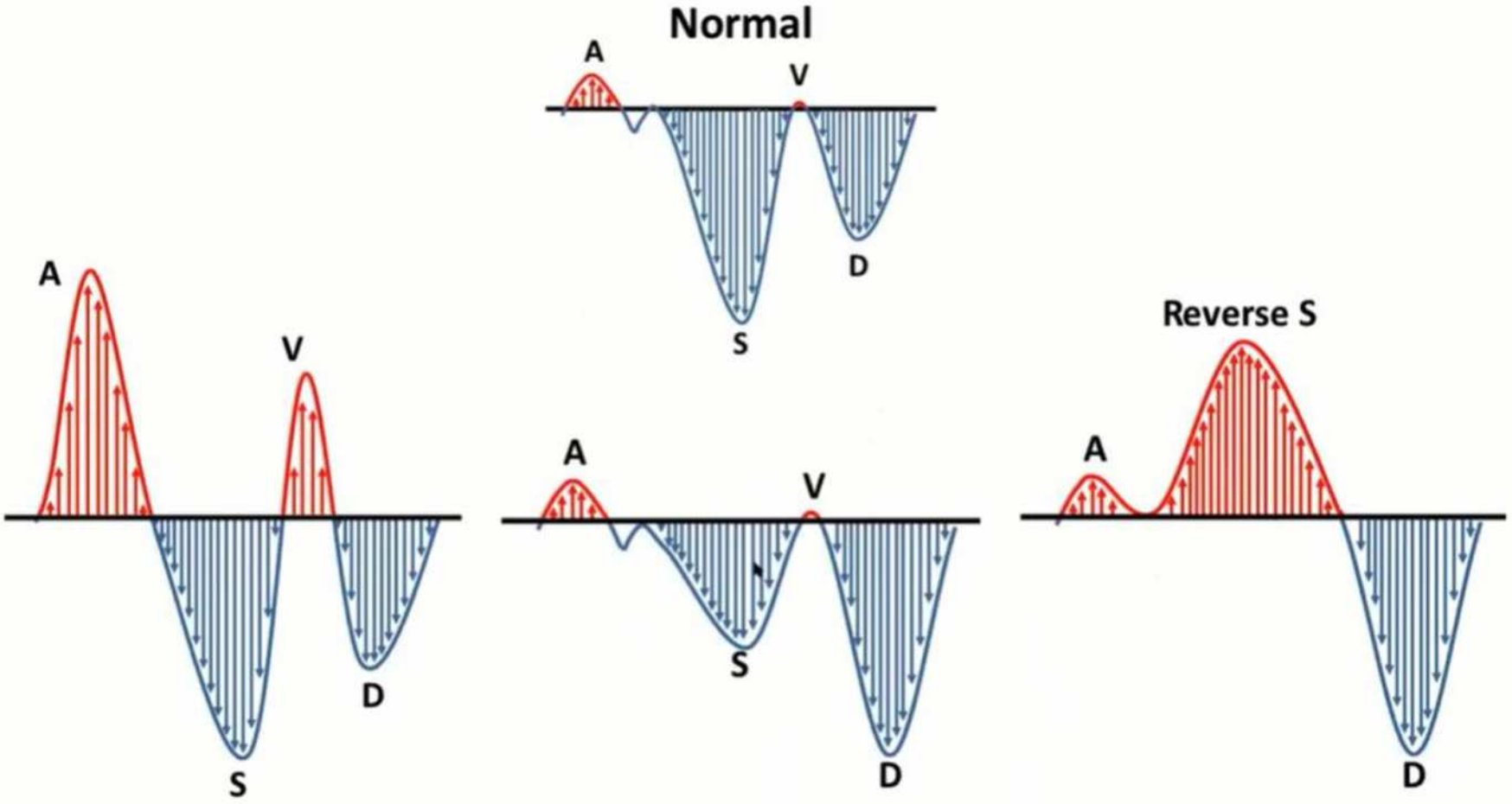
Interlobaarne neeruveen


IVC Long Axis with Hepatic Veins
Superior
Inferior
Hepatic
Vein
IVC
Crd
P21
10%
MI
0.9
TIS
0.7
A
B
DVD
Normal IVC

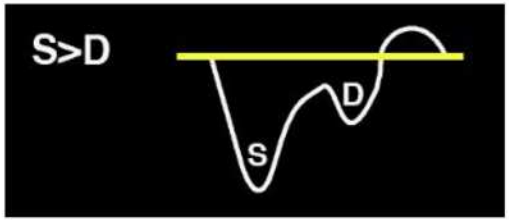
Hepatic Veins - US

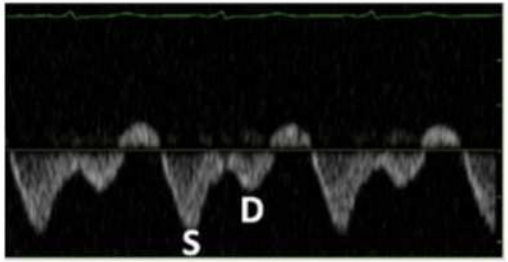



ECG
Voltage
Time
CVP
A
C
V
x
y
Pressure
Time
Hepatic
Vein
Doppler
A
V
S
D
Flow towards
the tranducer
Flow away
from the
tranducer
Velocity
Time

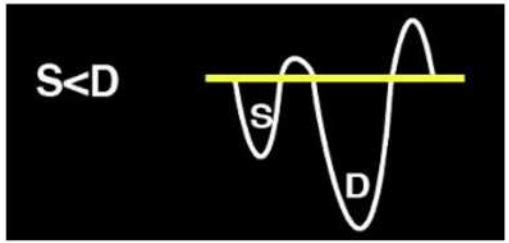

Normal
A
V
D
S
A
V
S
D
A
V
S
D
Reverse S
A
D

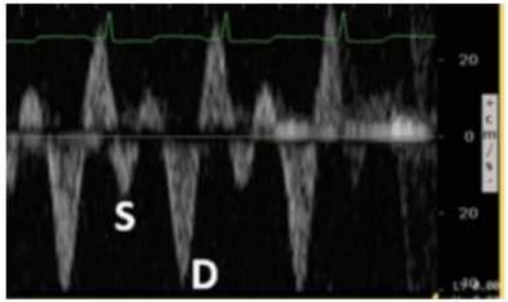
Normal Hepatic Vein Doppler: S>D



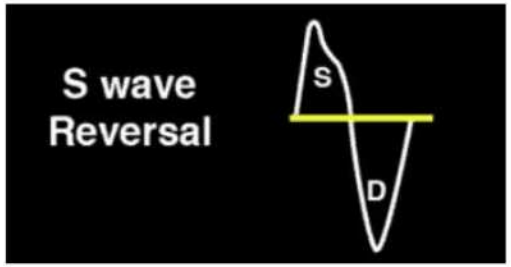


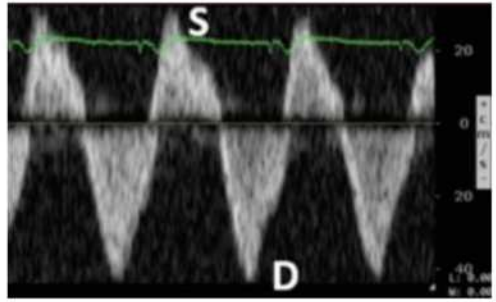
Mild Hepatic Vein Abnormality: S<D

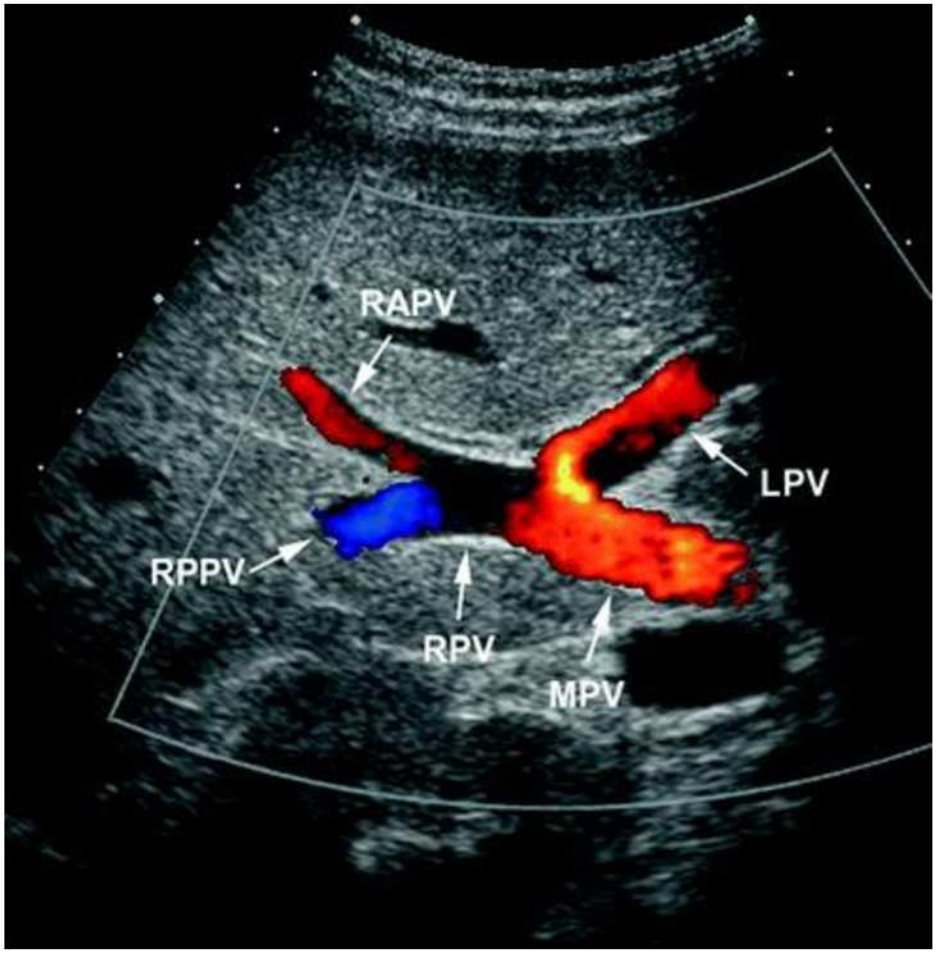




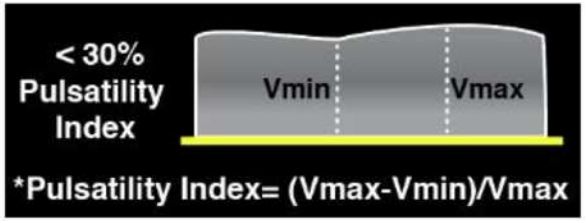
Severe Hepatic Vein Abnormality: S Reversal

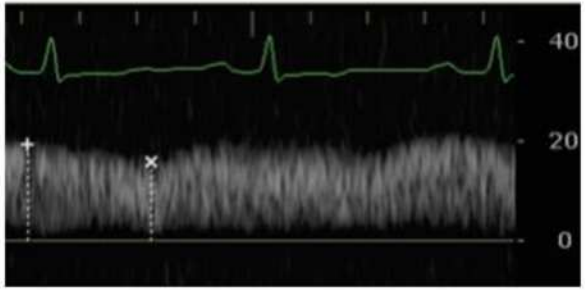




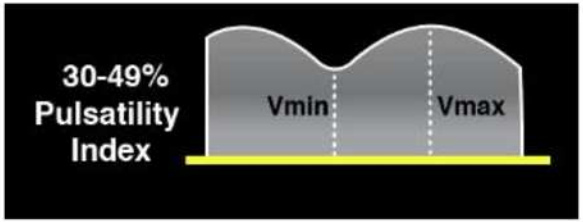

RAPV
LPV
RPPV
RPV
MPV

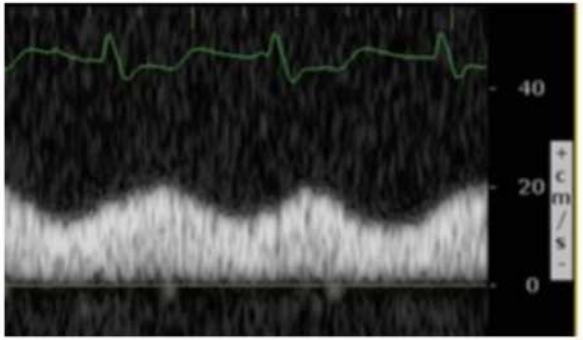
Normal Portal Vein Doppler



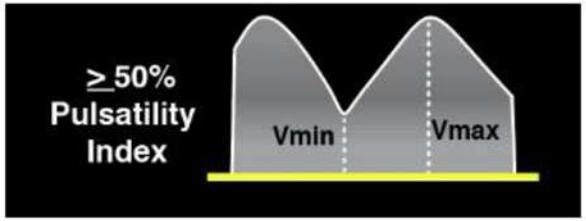


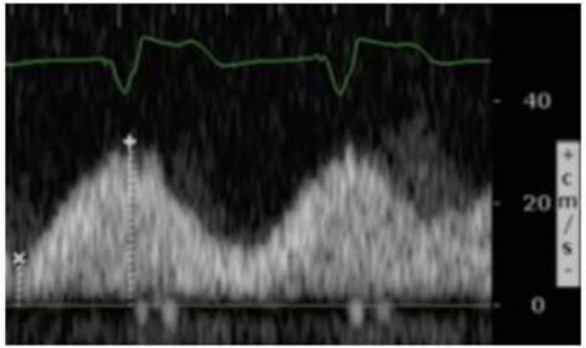
Mild Portal Vein Abnormality

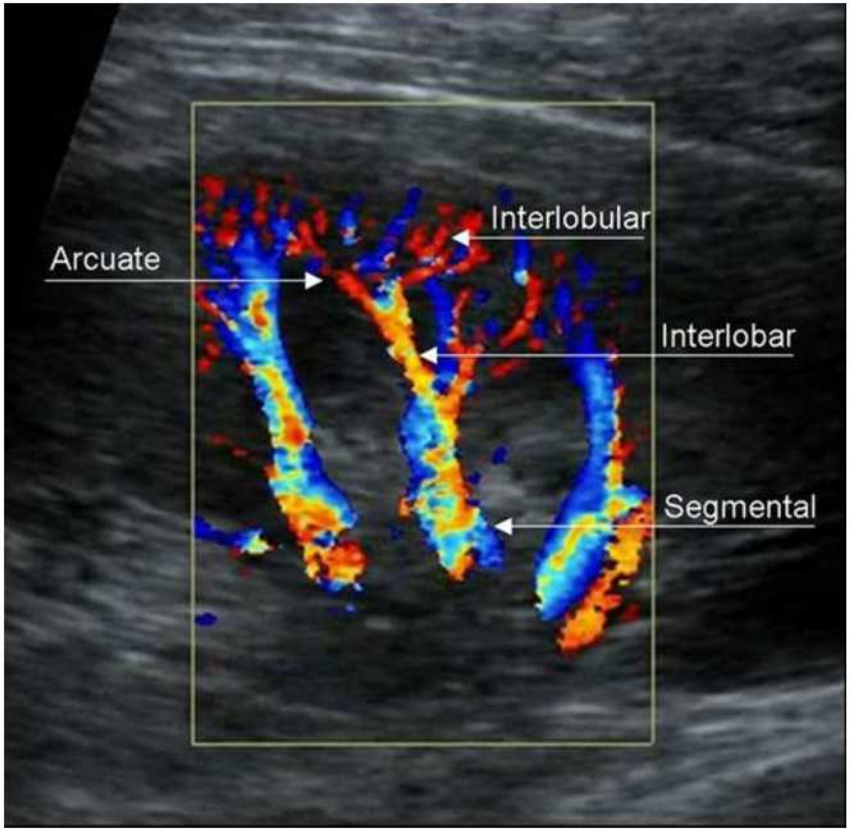


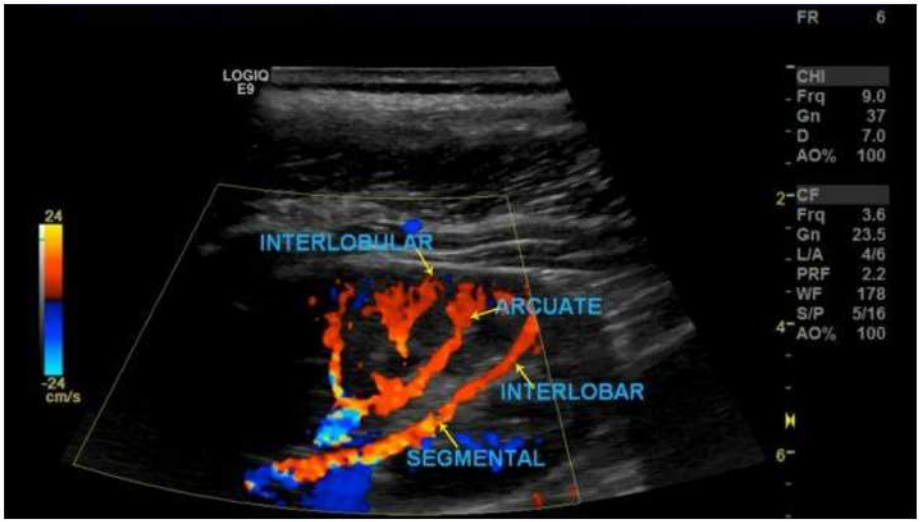


Severe Portal Vein Abnormality

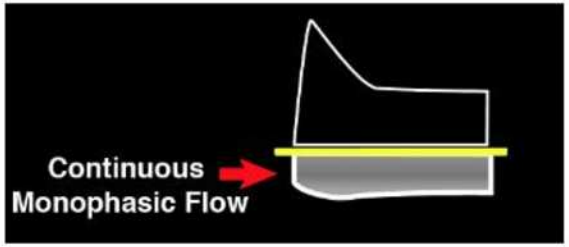


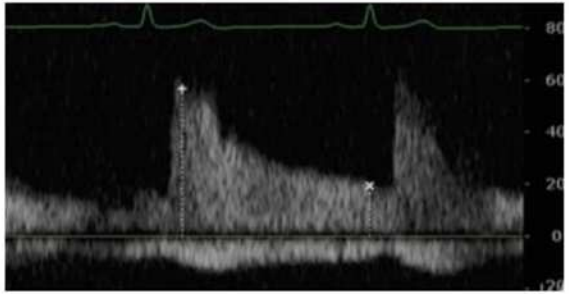



Arcuate
Interlobular
Interlobar
Segmental

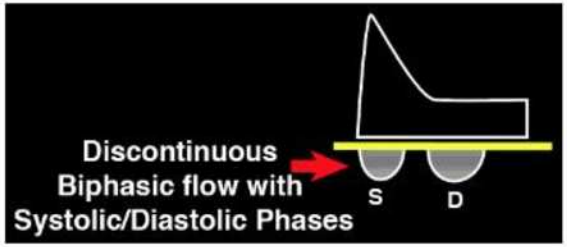

LOGIQ
E9
FR 6
CHI
Frq 9.0
Gn 37
D 7.0
AO% 100
CF
Frq 3.6
Gn 23.5
L/A 4/6
PRF 2.2
WF 178
S/P 5/16
AO% 100
24
-24
cm/s
INTERLOBULAR
ARCUATE
INTERLOBAR
SEGMENTAL

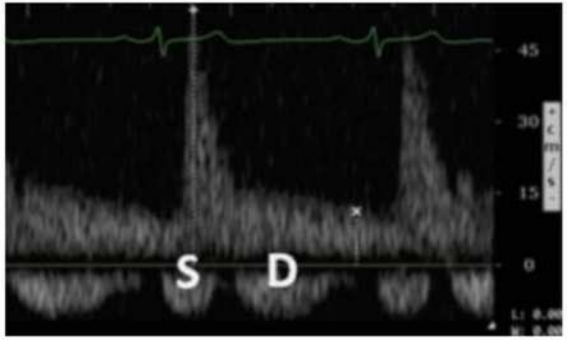
Normal Intrarenal Vein Doppler



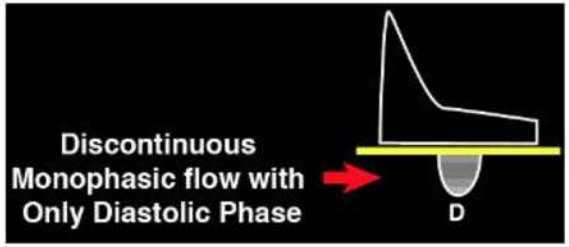


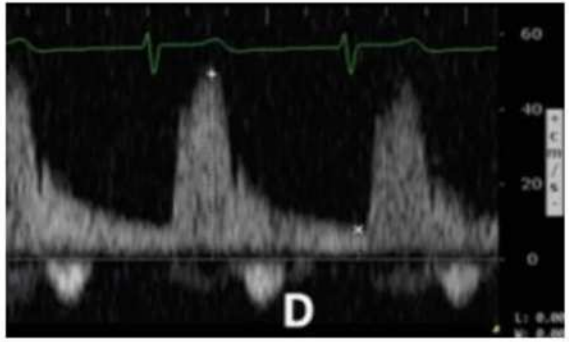
Mild Intrarenal Vein Abnormality

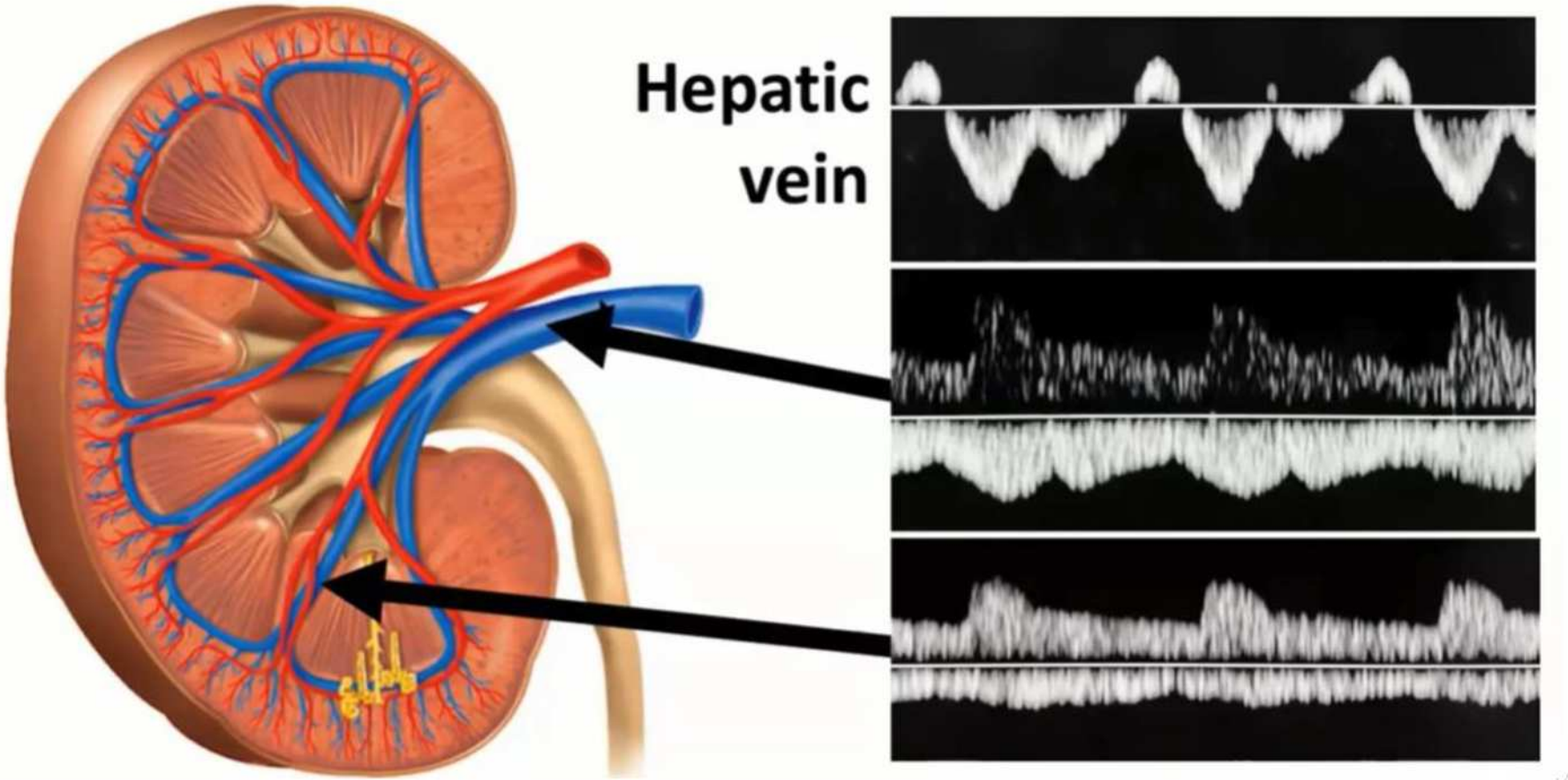


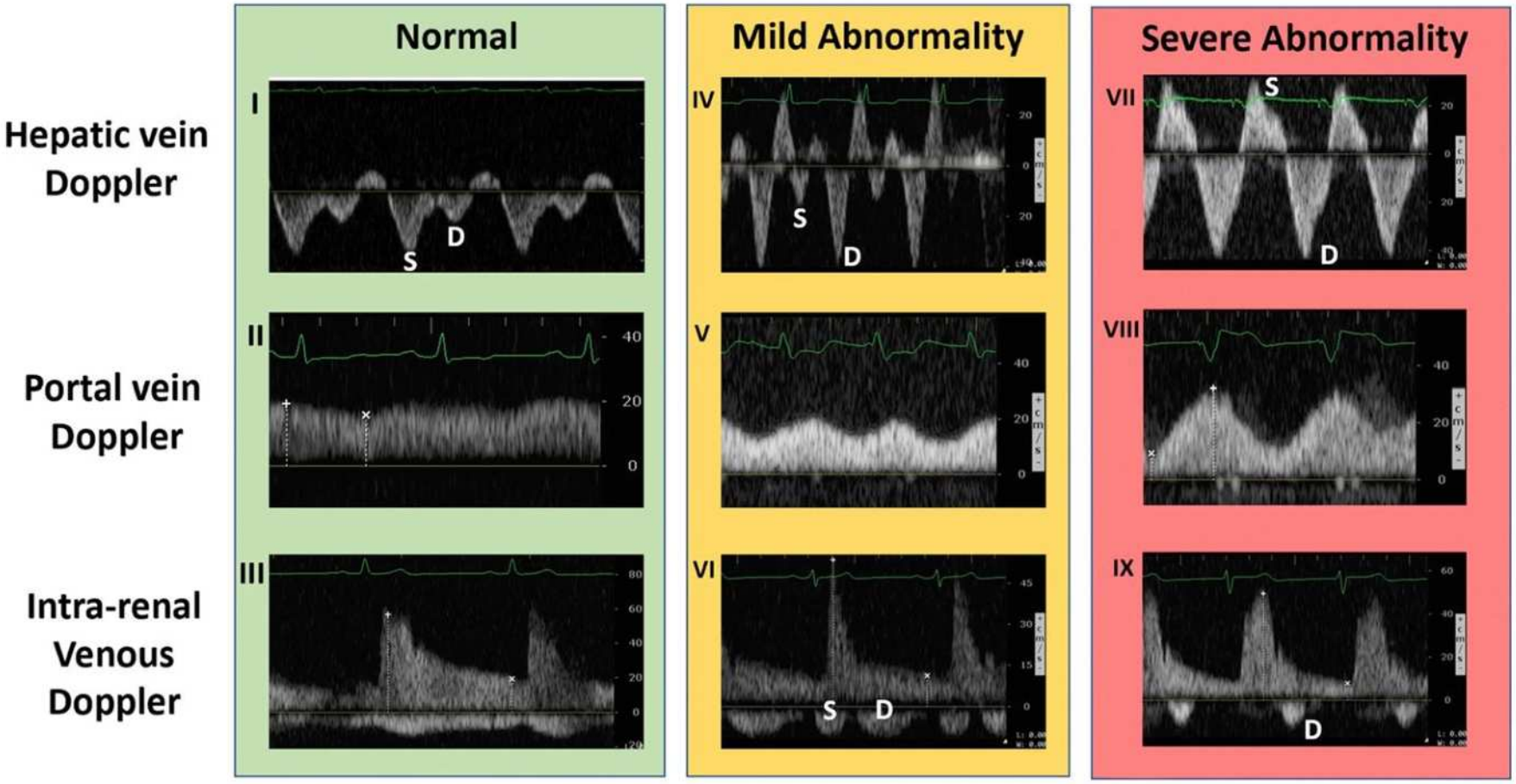


Severe Intrarenal Vein Abnormality






Hepatic
vein


Normal
Mild Abnormality
Severe Abnormality
Hepatic vein Doppler
Portal vein Doppler
Intra-renal Venous Doppler
I
II
III
IV
V
VI
VII
VIII
IX
S
D

VExUS ultraheli skoor

Tase 0 = IVC <2 cm - pais puudub

Tase 1 (kerge) = IVC ≥2 cm + normaalne või väheväljendunud hälbeline leid

Tase 2 (mõõdukas) = IVC ≥2 cm + üks väljendunud hälbega leid

Tase 3 (raske) = IVC ≥2 cm + ≥2 väljendunud hälbega leidu

Beaubien-Souligny *et al. Ultrasound J* (2020) 12:16
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The Ultrasound Journal

ORIGINAL ARTICLE Open Access

Quantifying systemic congestion with Point-Of-Care ultrasound: development of the venous excess ultrasound grading system

William Beaubien-Souligny[1,2*], Philippe Rola[3], Korbin Haycock[4], Josée Bouchard[5], Yoan Lamarche[6], Rory Spiegel[7] and André Y. Denault[1,8]

Artikli

Eesmärk töötada välja venoosse paisu hindamissüsteemi prototüüp ägeda neerupuudulikkuse tekkeriski ennustamiseks kardiokirurgilise operatsiooni järgses staadiumis.

Montreali meditsiinikeskus

Prospektiivne kohortuuring 2016-2017 a.

PICO

P - 145 täiskasvanud patsienti (mediaanvanus 66 ± 13 a, ilma raske maksa-/neerupuudulikkuseta või veenitromboosita).

I - Bypass kardiokirurgiline lõikus + VExUS mõõtmised pre- ja vahetu postop + kuni 72h jooksul 1x päevas.

C - 5 skoorimise prototüübi (A-E) korrelatsioon kliinilise + instrumentaalse (CVP) leiu, labori analüüsidega. Mõõtmistulemused korrigeeriti VIS (vasopressor-inotrope score) väärtusega.

O - VExUS C skoorimise prototüüp on statistiliselt olulise spetsiifilisusega ägeda neerupuudulikkuse ennustamisel mõõduka ja raske venoosse paisu tingimustes.

	VExUS A	VExUS B	VExUS C	VExUS D	VExUS E
Grade 0	IVC < 2 cm	IVC < 2 cm	IVC < 2 cm		
Grade 1	IVC ≥ 2 cm **Normal** patterns *(All three of : I, II, III)*	IVC ≥ 2 cm **Normal** patterns *(All three of : I, II, III)*	IVC ≥ 2 cm **Normal** patterns **or** **mild** abnormalitie(s) *(Any combination of : I, II, III, IV, V, VI)*	**Normal** patterns *(All three of : I, II, III)*	**Normal** patterns **or** **mild** abnormalitie(s) *(Any combination of : I, II, III, IV, V, VI)*
Grade 2: Mild congestion	IVC > 2 cm **Mild** abnormality in **at least one** pattern *(At least one of : IV, V, VI)*	IVC > 2 cm **Mild or severe** abnormality in **at least one** pattern *(At least one of : IV, V, VI, VII, VIII, IX)*	IVC > 2 cm **Severe** abnormalities in **at least one** pattern *(At least one of : VII, VIII, IX)*	**Mild or severe** abnormalities **in at least one** pattern *(At least one of : IV, V, VI, VII, VIII, IX)*	**Severe** abnormalities **in at least one** pattern *(At least one of : VII, VIII, IX)*
Grade 3: Severe	IVC > 2 cm **Severe** abnormalities **in at least one** pattern	IVC > 2 cm **Mild or severe** abnormalities **in**	IVC > 2 cm **Severe** abnormalities **in multiple** patterns	**Mild or severe** abnormalities **in multiple** patterns	**Severe** abnormalities **in multiple** patterns *(At least two of : VII, VIII, IX)*

VExUS C (HR 3.69, CI 1.65–8.24, p=0.001)

Table 3 Performance parameters of the different VExUS grading systems assessed at ICU admission to predict acute kidney injury in 145 patients after cardiac surgery

Grading system	Grade	Specificity (CI)	Sensitivity (CI)	+LR (CI)	−LR (CI)
VExUS A	1	41% (31–51%)	73% (59–85)	1.24 (0.98–1.57)	0.65 (0.40–1.07)
	2	67% (56–76%)	55% (40–69%)	1.65 (1.13–2.42)	0.67 (0.49–0.93)
	3	86% (78–92%)	39% (26–54%)	2.86 (1.54–5.30)	0.71 (0.56–0.89)
VExUS B	1	41% (31–51%)	73% (59–85%)	1.24 (0.98–1.57)	0.65 (0.40–1.07)
	2	67% (56–76%)	55% (40–69%)	1.65 (1.13–2.42)	0.67 (0.49–0.93)
	3	77% (67–85%)	43% (29–58%)	1.87 (1.15–3.05)	0.74 (0.58–0.95)
VExUS C	1	41% (31–51%)	73% (59–85%)	1.24 (0.98–1.57)	0.65 (0.40–1.07)
	2	87% (78–92%)	39% (26–54%)	2.86 (1.55–5.30)	0.71 (0.56–0.89)
	3	96% (89–99%)	27% (15–41%)	6.37 (2.19–18.5)	0.77 (0.65–0.91)
VExUS D	2	52% (42–62%)	61% (46–74%)	1.28 (0.94–1.73)	0.74 (0.51–1.08)
	3	70% (59–79%)	45% (31–60%)	1.49 (0.96–2.29)	0.79 (0.61–1.03)
VExUS E	2	79% (69–87%)	41% (27–56%)	1.96 (1.17–3.28)	0.75 (0.59–0.95)
	3	93% (85–97%)	29% (17–43%)	3.92 (1.69–9.07)	0.77 (0.64–0.92)
Portal Doppler only	Mild	73% (64–82%)	39% (25–52%)	1.46 (0.90–2.37)	0.83 (0.65–1.08)
	Severe	91% (86–97%)	27% (14–39%)	3.12 (1.39–7.01)	0.80 (0.67–0.96)
Hepatic vein Doppler only	Mild	56% (46–66%)	51% (37–65%)	1.16 (0.81–1.66)	0.88 (0.62–1.23)
	Severe	84% (76–91%)	34% (20–48%)	2.11 (1.15–3.89)	0.79 (0.63–0.98)
Renal Doppler only	Mild	80% (72–88%)	45% (31–59%)	2.27 (1.36–3.77)	0.69 (0.52–0.90)
	Severe	94% (89–99%)	25% (12–37%)	3.92 (1.57–9.81)	0.81 (0.68–0.95)
CVP	≥ 8 mmHg	48% (37–59%)	77% (61–88%)	1.47 (1.13–1.90)	0.49 (0.28–0.86)
	≥ 10 mmHg	66% (55–75%)	58% (42–73%)	1.71 (1.16–2.51)	0.64 (0.44–0.91)
	≥ 12 mmHg	83% (73–90%)	33% (20–49%)	1.91 (1.02–3.59)	0.81 (0.66–1.01)

CI confidence intervals, *CVP* central venous pressure, *+LR* positive likelihood ratio, *− LR* negative likelihood ratio

Edasine

Kitsaskohad

Südamepuudulikkus (eriti trikuspidaalpuudulikkus)

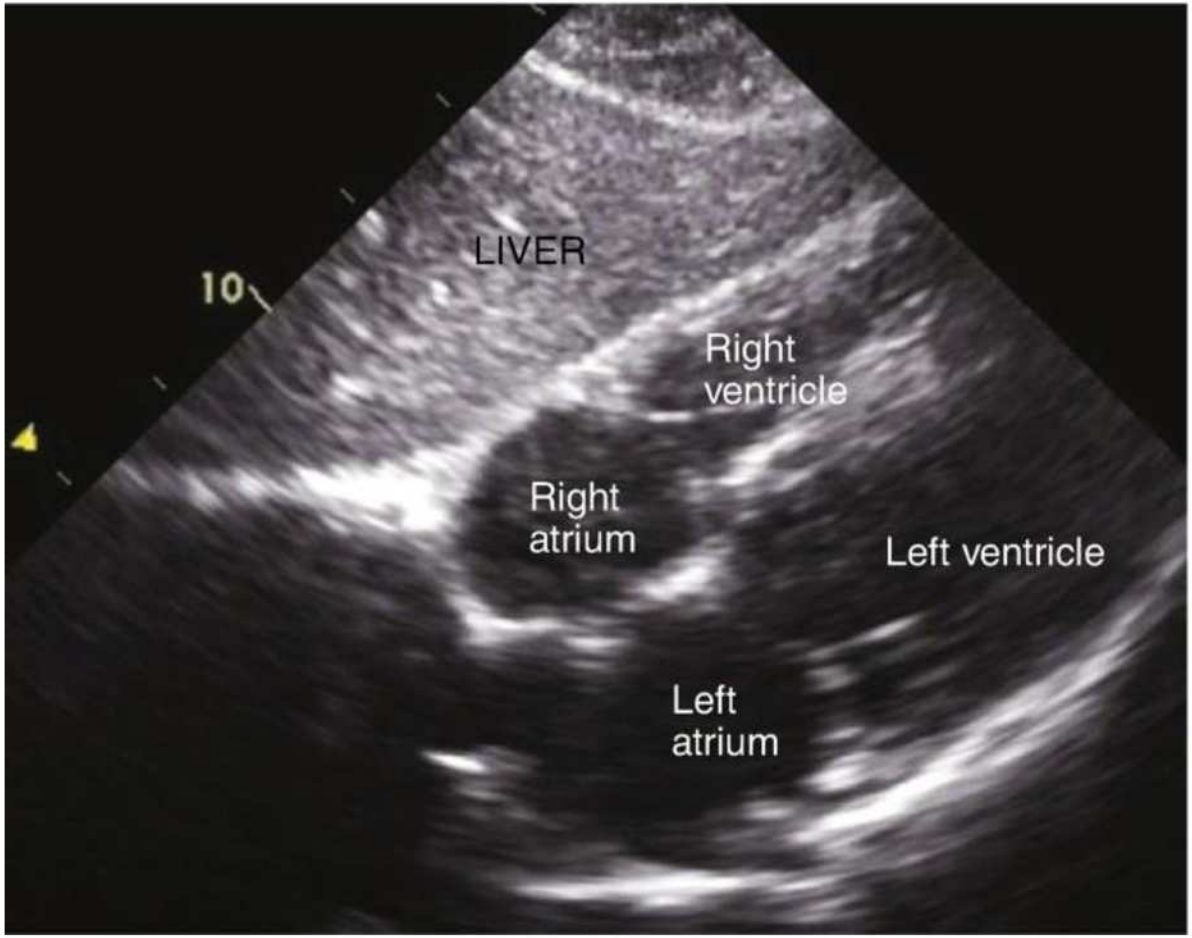
Pulmonaalhüpertensioon

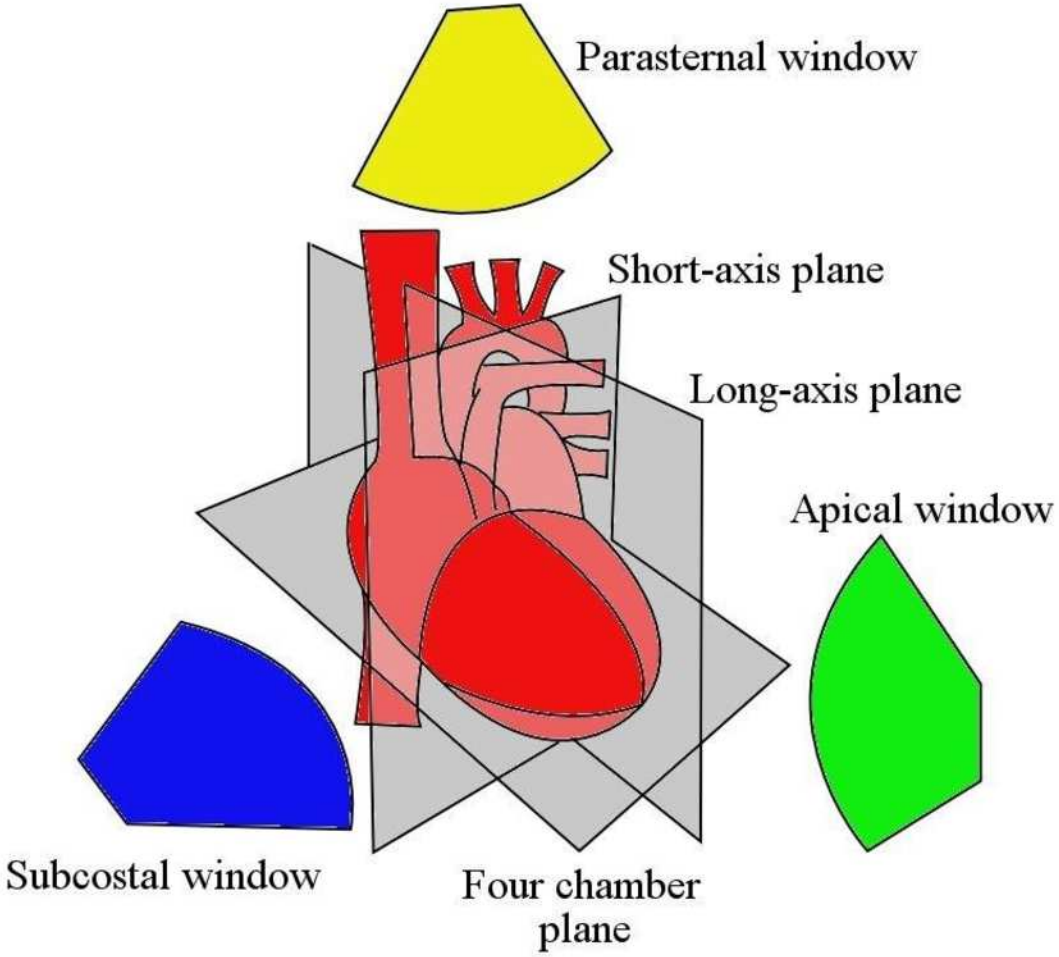
Lisastruktuurid (tuumorid, trombid jm) mis võiksid soone valendiku läbitavust mõjutada

Perspektiivid:

Lisada uuringule

- kopsu UH? Vt 04/03/20 dr Kocyse kopsu UH ettekannet.
- ehhoKG subkostaalselt 4-kambri vaade?


LIVER
10
Right
ventricle
Right
atrium
Left ventricle
Left
atrium


Parasternal window
Short-axis plane
Long-axis plane
Apical window
Subcostal window
Four chamber plane

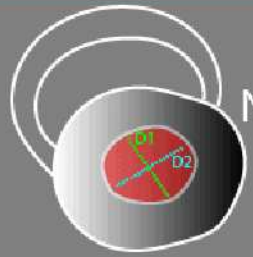
D-Sign on Ultrasound

Right Ventricular Pressure vs Volume Overload

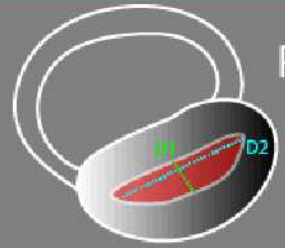
POCUS 101

Eccentricity Index (EI)

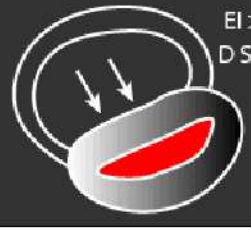
EI = D2/D1

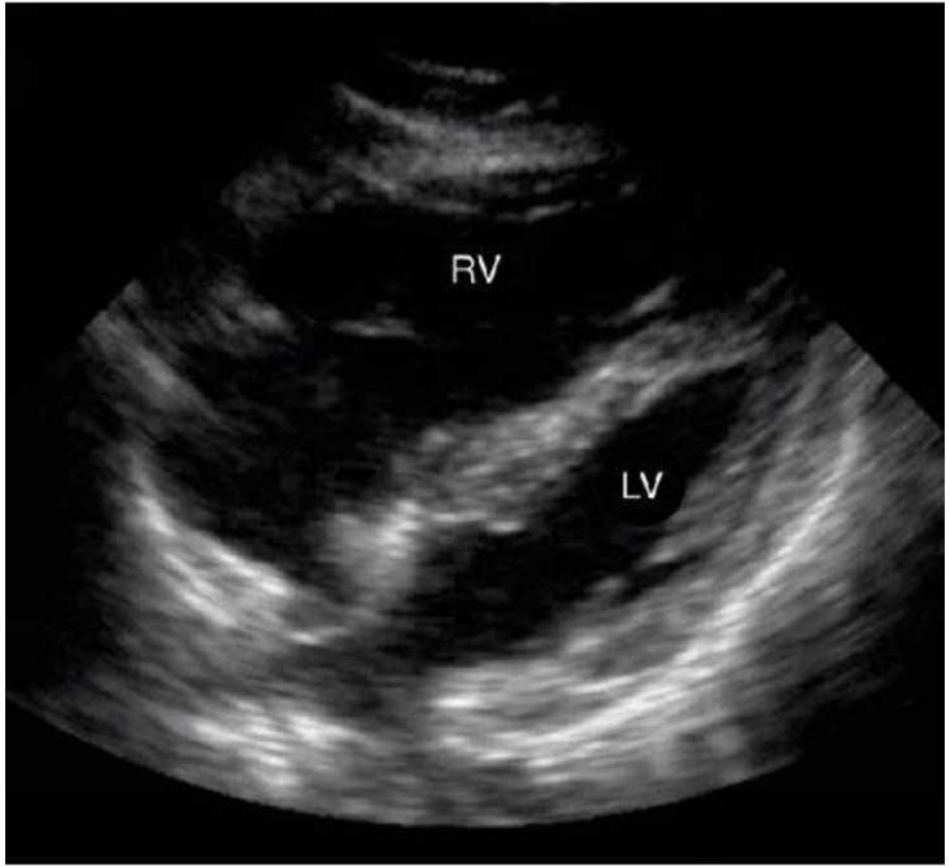


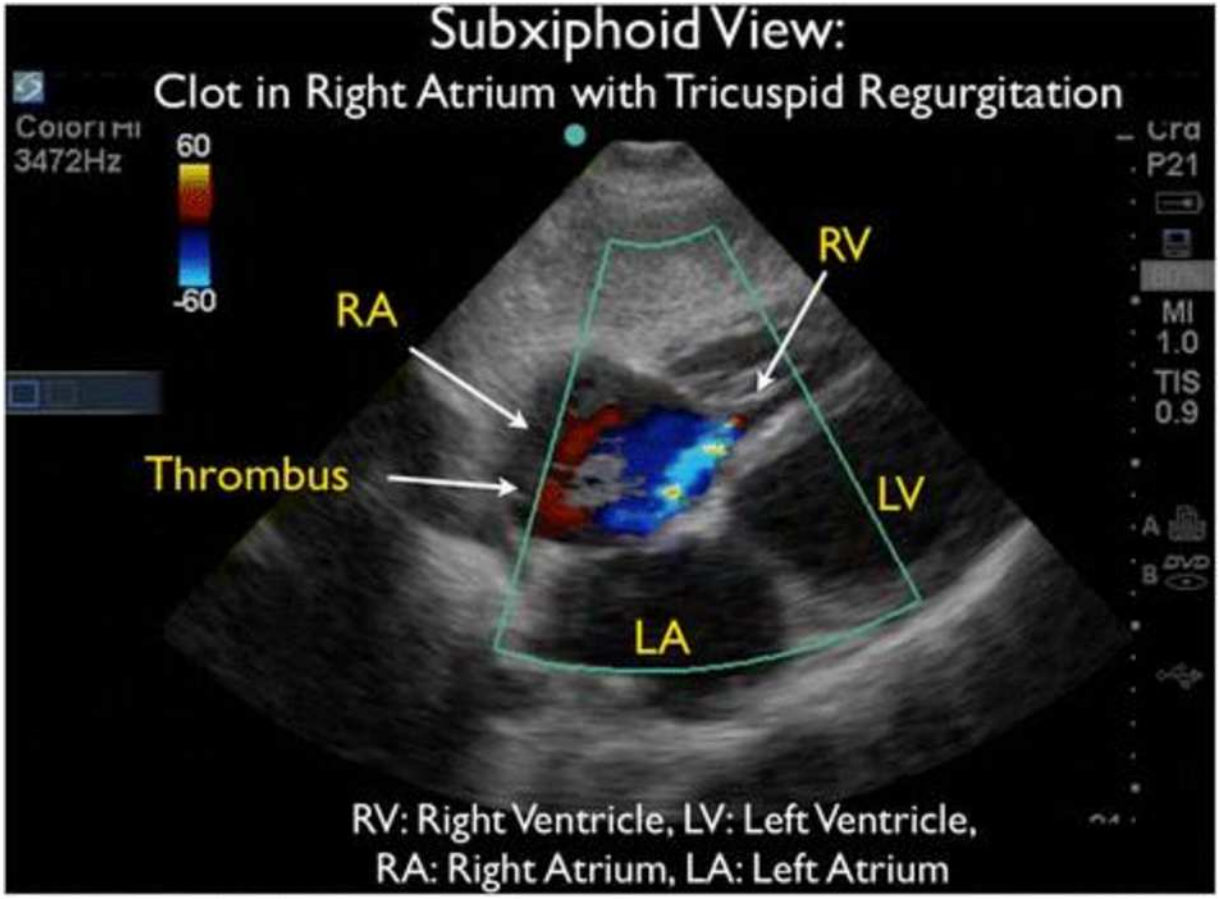
Normal
EI ≤ 1

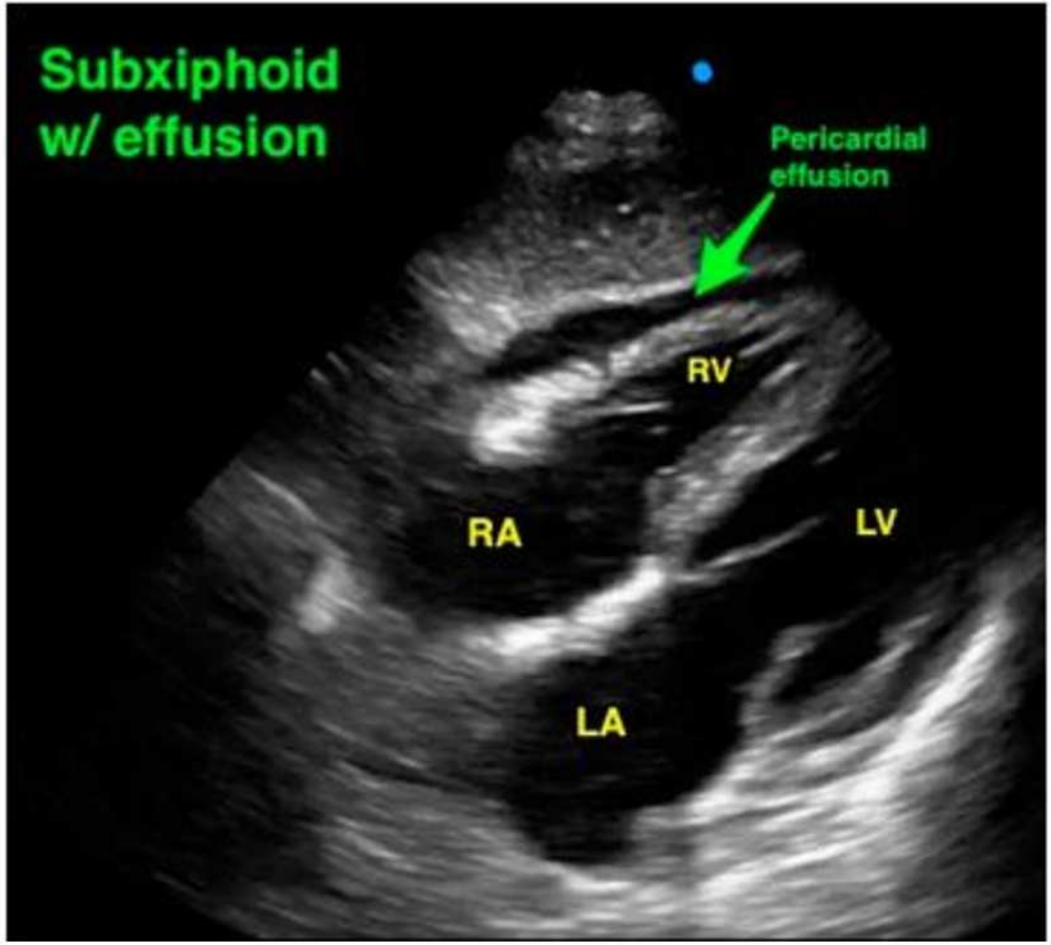


RV Overload
"D Sign"
EI > 1

	Normal	Pressure Overload	Volume Overload
Systole	 EI ≤ 1	 EI > 1 D Sign	 EI ≤ 1
Diastole	 EI ≤ 1	 EI > 1 D Sign	 EI > 1 D Sign


RV
LV


Subxiphoid View:
Clot in Right Atrium with Tricuspid Regurgitation
Color PRF
3472Hz
60
-60
RA
RV
Thrombus
LV
LA
P21
MI
1.0
TIS
0.9
RV: Right Ventricle, LV: Left Ventricle,
RA: Right Atrium, LA: Left Atrium


Subxiphoid
w/ effusion
Pericardial
effusion
RV
RA
LV
LA

Tänan kuulamast!

Allikad

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