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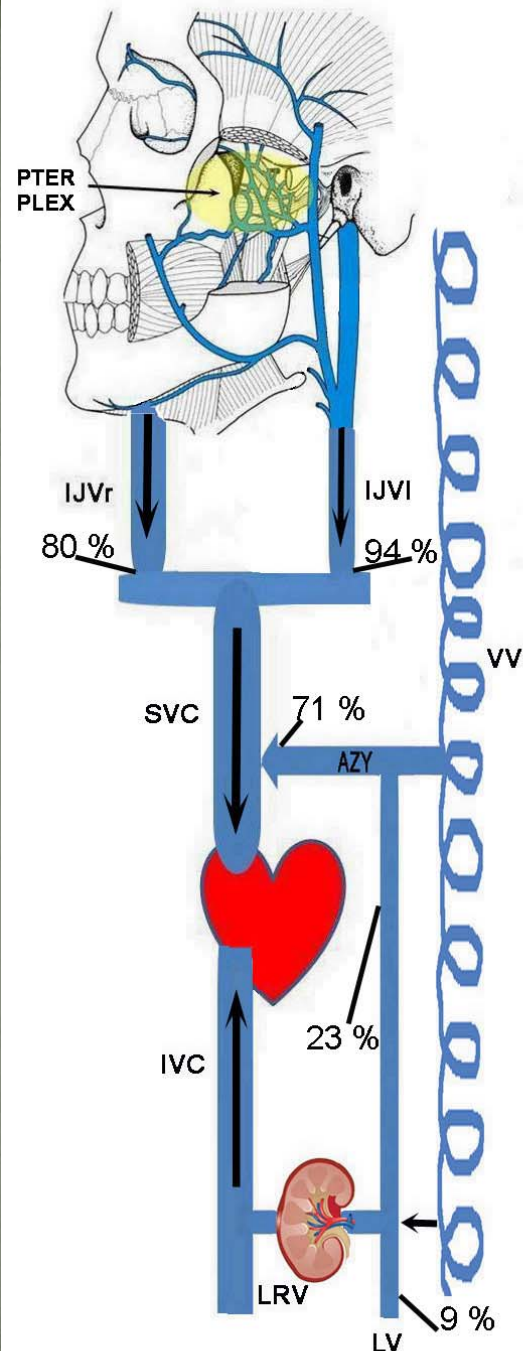
CCSVI DEFINITION

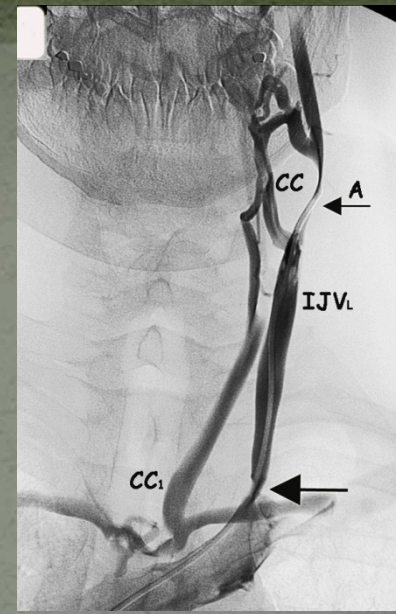
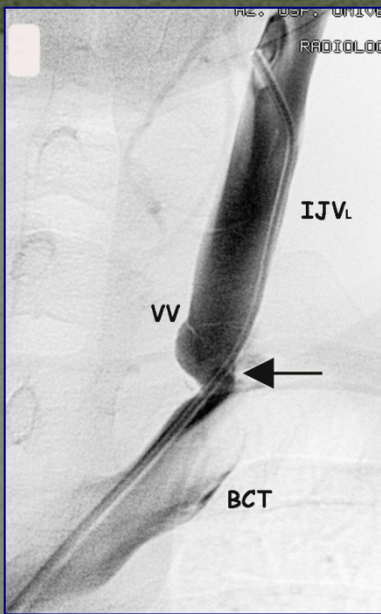
Chronic cerebrospinal venous insufficiency (CCSVI) is a syndrome characterized by stenoses of the internal jugular and/or azygous veins (IJVs-AZ) with opening of collaterals and insufficient drainage proved by increased mean transit time in cerebral MRI perfusional study.

Venous pressure in the IJVs-AZ was measured significantly higher in CCSVI respect to controls

Extracranial blockages and haemodynamic disturbances of the cerebral veins are peculiar of MS, having not been found either in controls or in patients affected by other neurodegenerative diseases

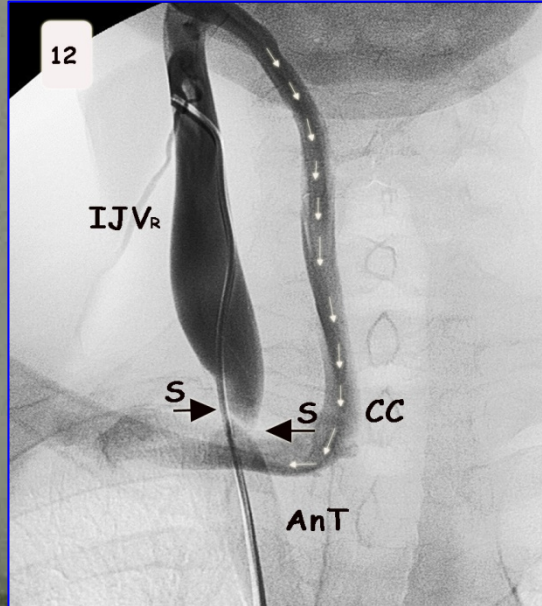
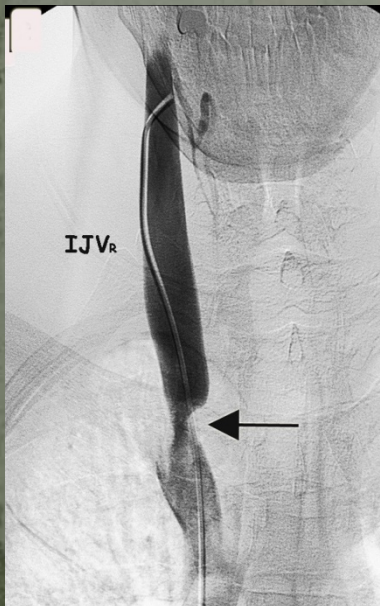
EXTRACRANIAL AND EXTRAVERTEBRAL
VENOUS OUTFLOW BLOCKS, DEEPLY
MODIFY THE PHYSIOLOGY OF CEREBRAL
VENOUS RETURN





The Drama of CCSVI in MS

J Neurol Neurosurg Psychiatry.
2009;80:392-9



CCSVI and MS are highly
And significantly associated
(OR 43, 95% CI 29-65, $p < 0.0001$)

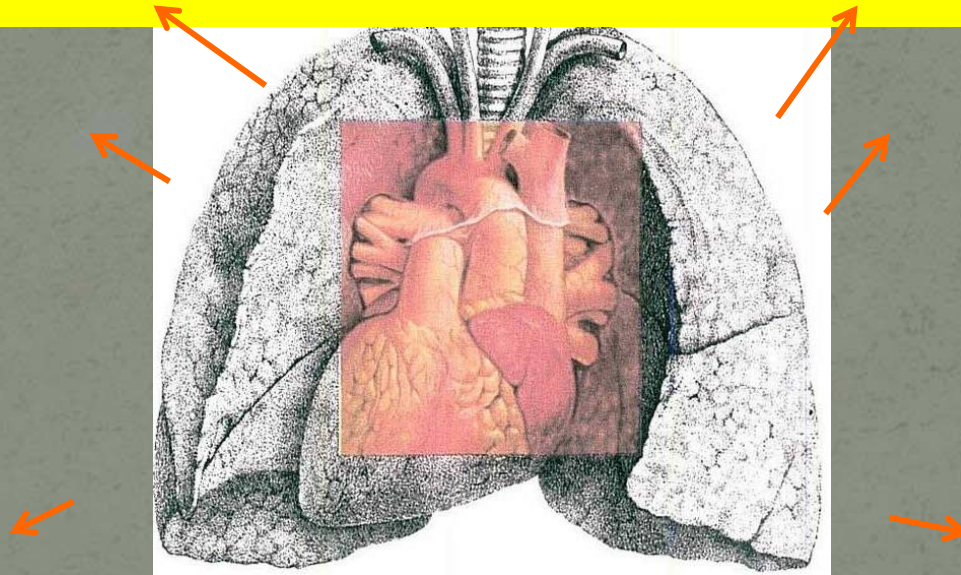
Chronic cerebrospinal venous insufficiency

CCSVI

implications in multiple sclerosis

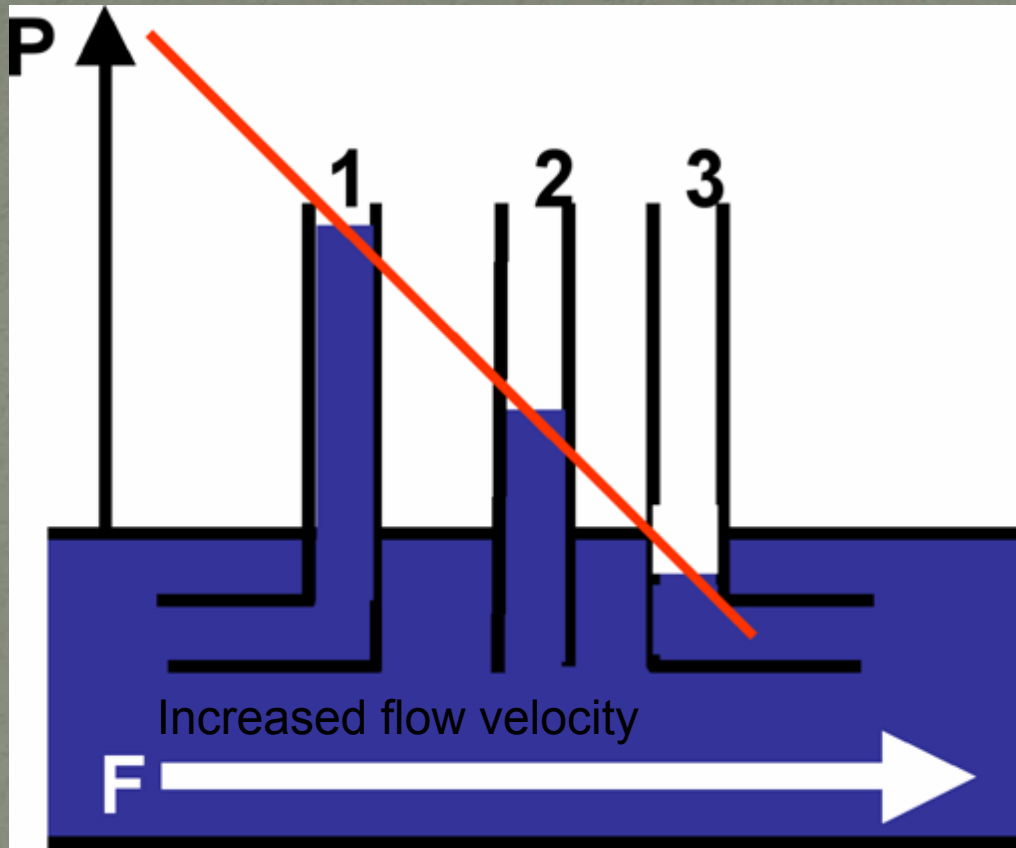
1. The physiology of cerebral venous return assessed by Doppler systems in Vasc.Lab. CCSVI modifications of cerebral venous return.
2. Is CCSVI cause or product of MS?
3. Does CCSVI impact brain pathophysiology?
4. Vascular models of tissue injury in relation to MS
5. Pathology of MS from the venous side

The MOTOR Kinetic Energy in ensuring cerebral venous return =
Residual Arterial Pressure +
Thoracic Aspirating
Pump



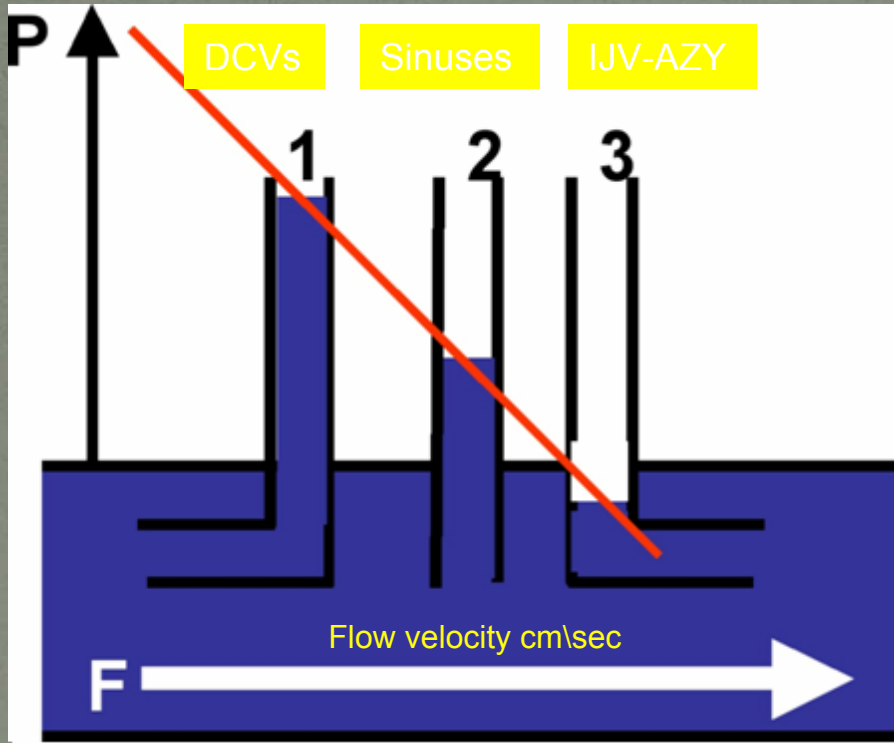
Negative thoracic pressure
-8cmH₂O insp
-3cmH₂O exp.

Physics of fluid in motion



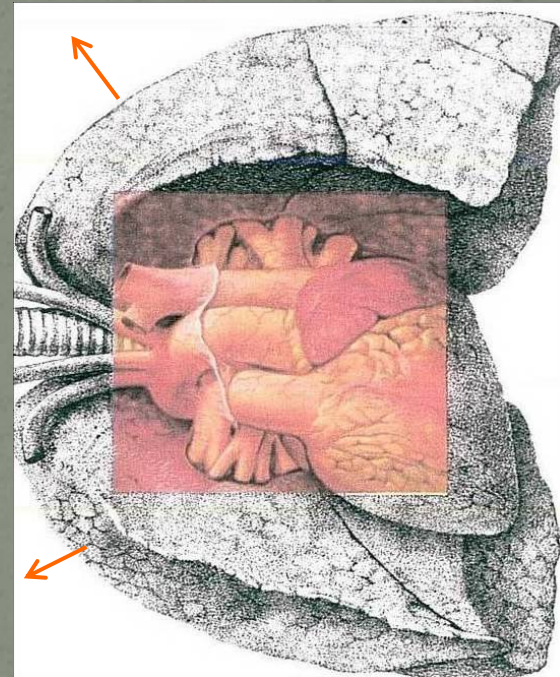
According to **Bernoulli's principle** the sum of potential energy (lateral and gravitational pressure) and kinetic energy is constant at any point.

Concept of hierarchical order of emptying in the cerebral venous system



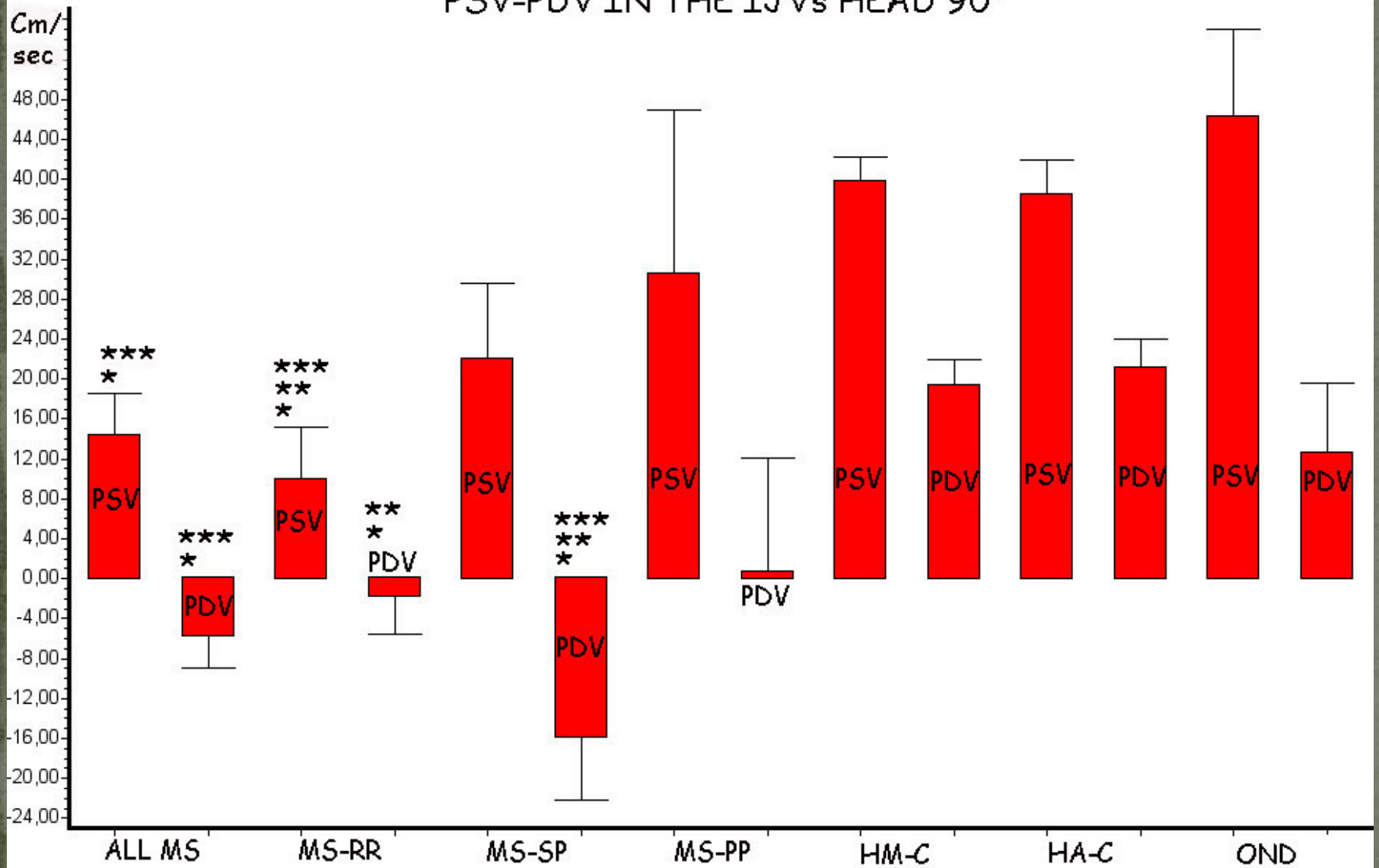
Velocity ↑
Lateral Pressure ↓

The Aspirating Pump



Negative thoracic pressure
-8cmH₂O insp
-3cmH₂O exp.

PSV-PDV IN THE IJVs HEAD 90°



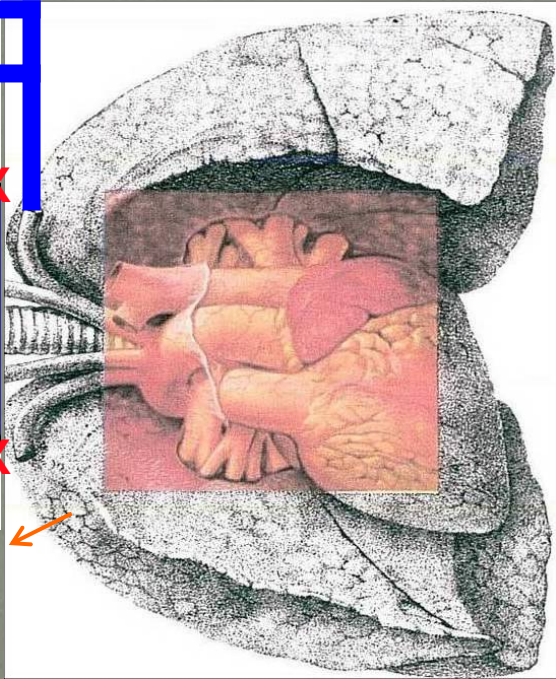
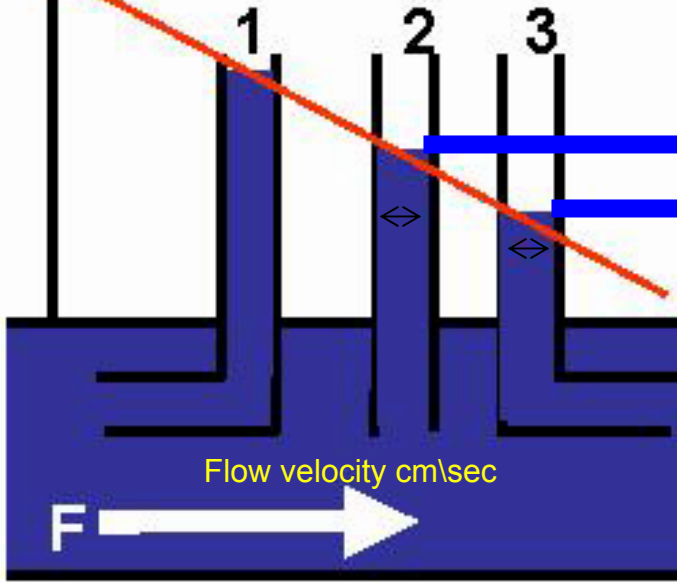
CCSVI MS

Controls

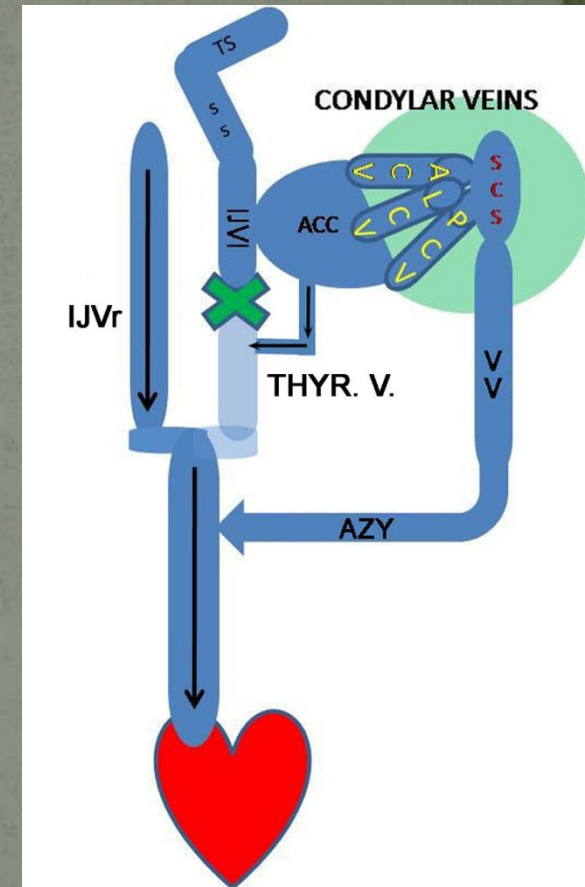
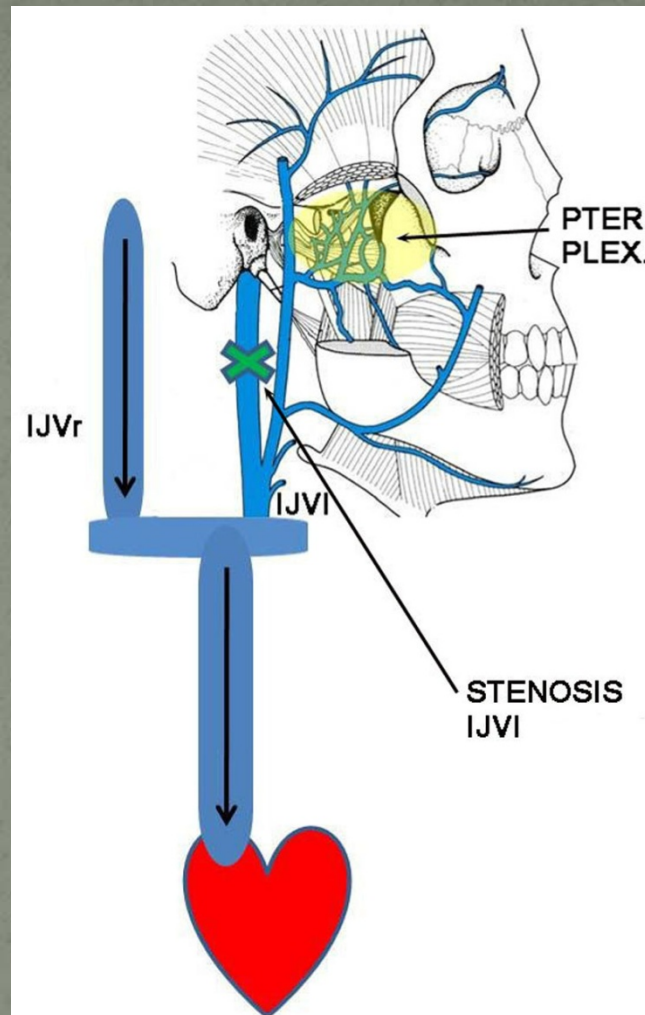
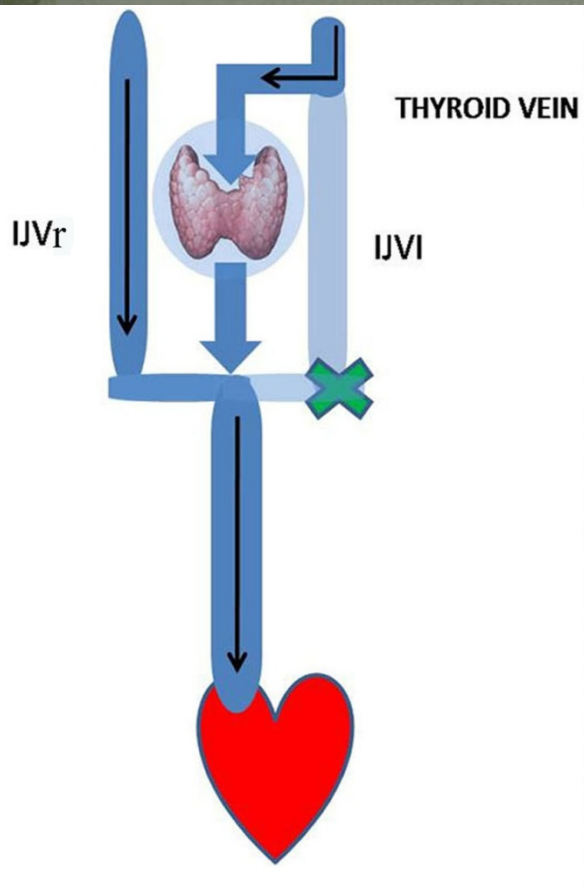
PROXIMAL VENOUS BLOCK Impairs the Aspirating Effect



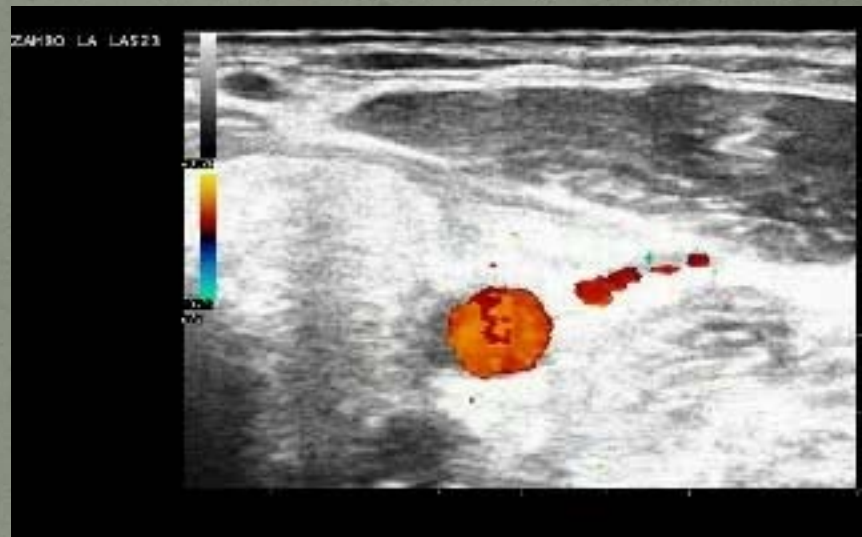
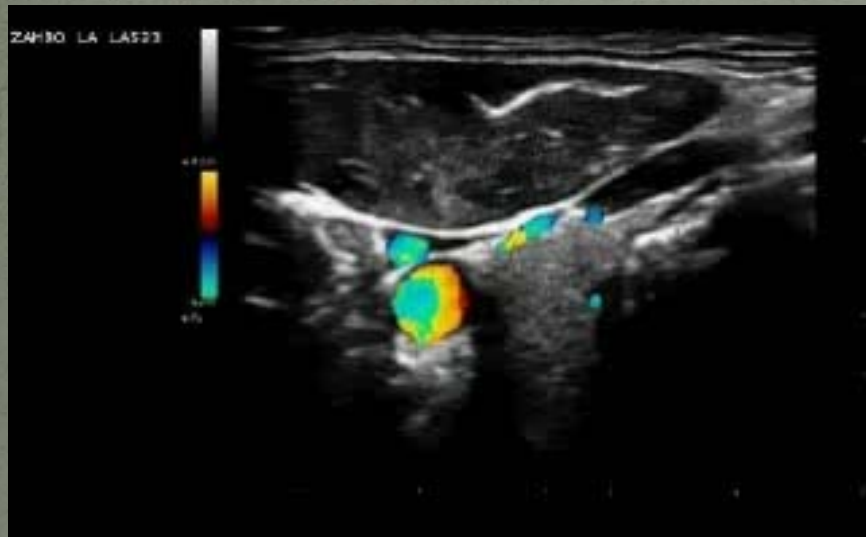
P ↑ DCVs Sinuses IJV-AZY

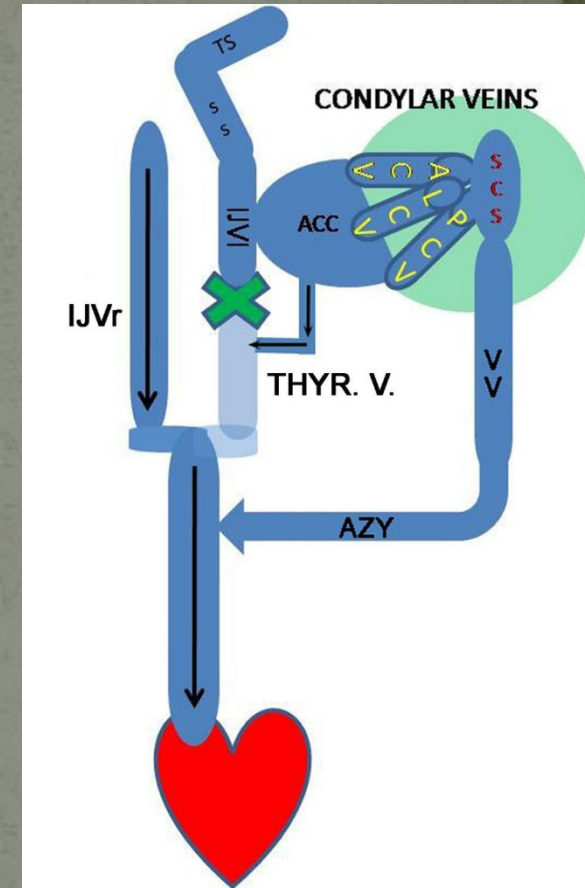
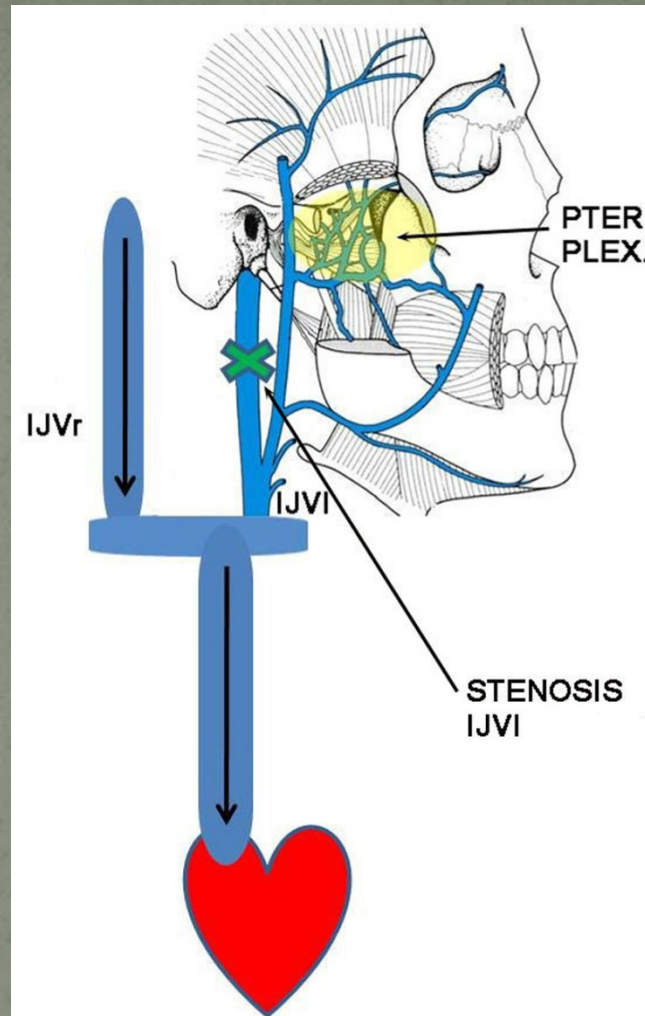
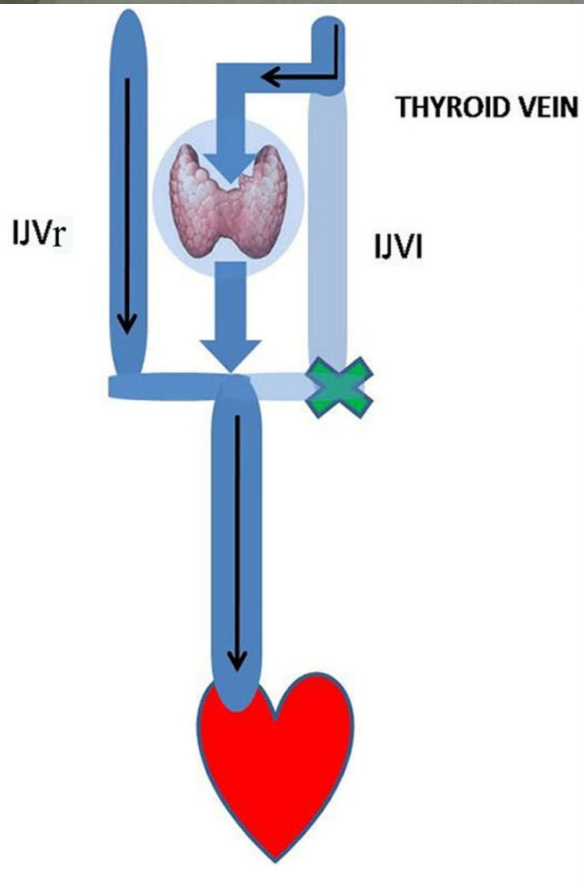


Velocity ↓ Lateral Pressure ↑

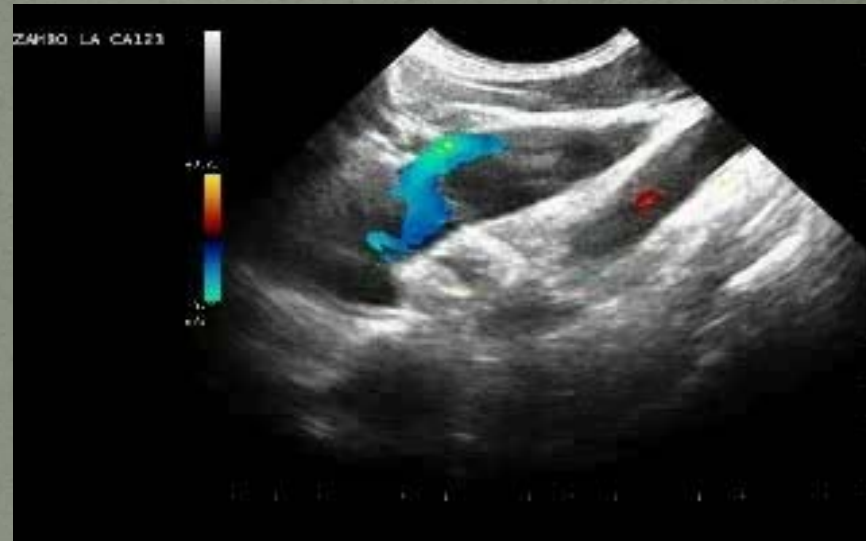
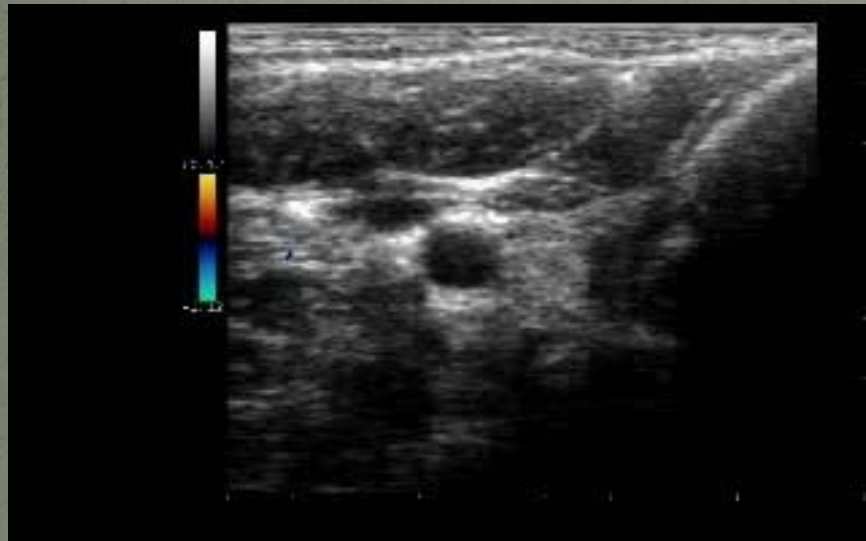


CONCEPT OF SUBSTITUTES CIRCLES





SUBSTITUTES CIRCLES



ZAMBON LA LASZ

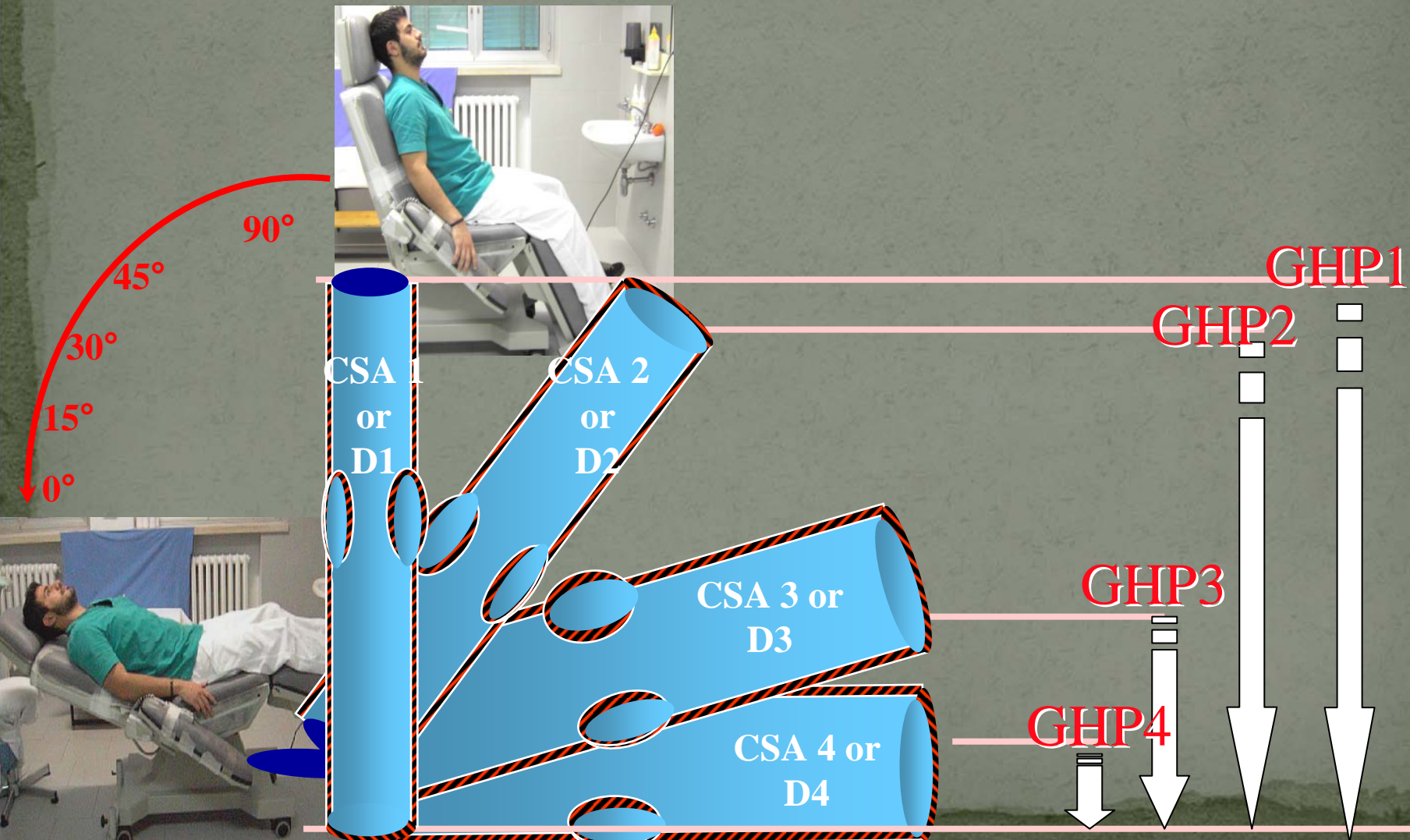


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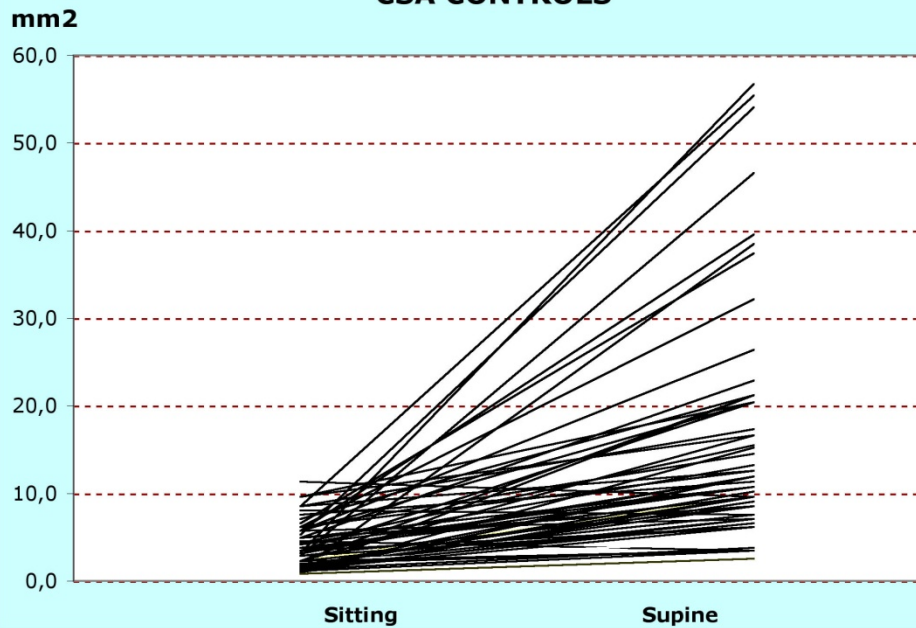
Compliance of the IJV

Change in D-CSA in response in change of gravitational hydrostatic pressure

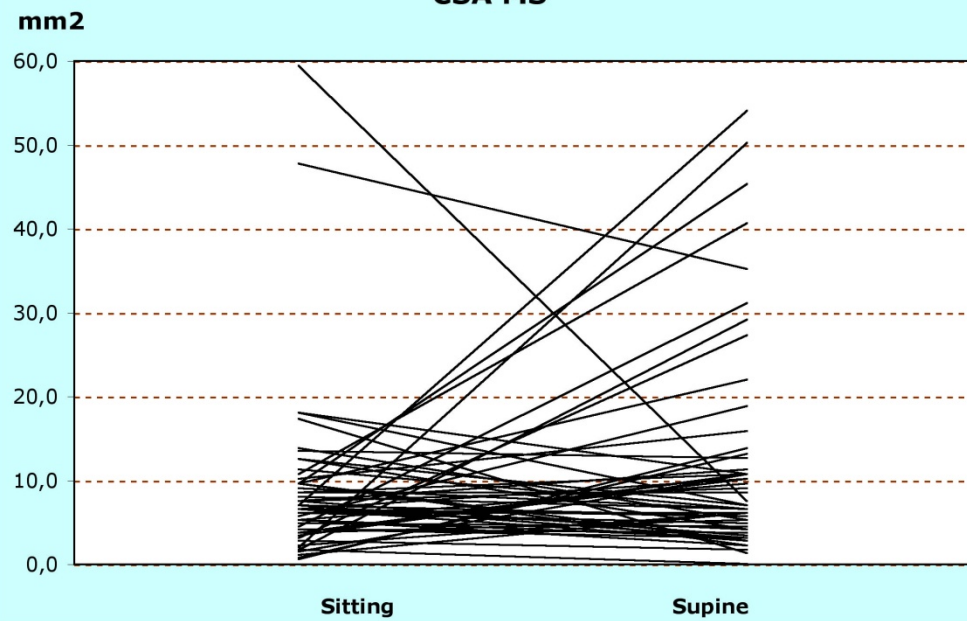
GHP



CSA CONTROLS



CSA MS



A NOVEL ECD PROTOCOL ANALYSIS



SCREENING CCSVI CON ECD

CCSVI-MS CONTROLS p

1) Reflusso nelle IJV e/o VV con il capo in qualsiasi posizione

70%	0%	0.0001
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2) Reflusso nelle vene cerebrali profonde

50%	0%	0.0001
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3) Stenosi evidenziate mediante sonda Doppler ad alta risoluzione

28%	0.5%	0.0001
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4) Flusso Doppler non rilevabile nelle IJV o VV

32%	0.5%	0.0001
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5) Perdita del controllo posturale sul deflusso venoso dei vasi cerebrali (Δ csa negativo)

50%	12%	0.0001
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ANALISI CONCLUSIVA
 ≥ 2 CRITERI

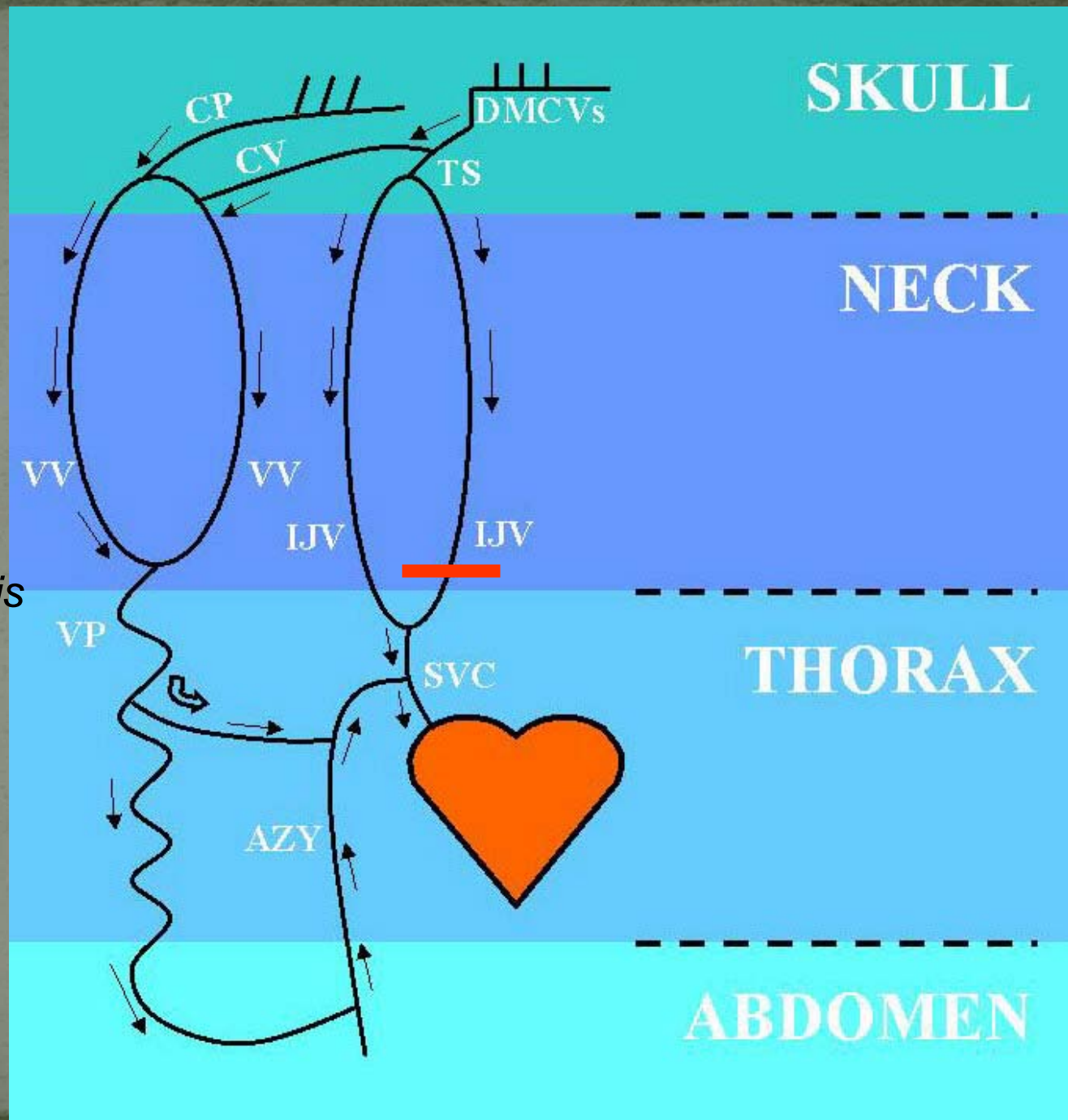
SENS. 100%	SPEC. 100%	0.0001
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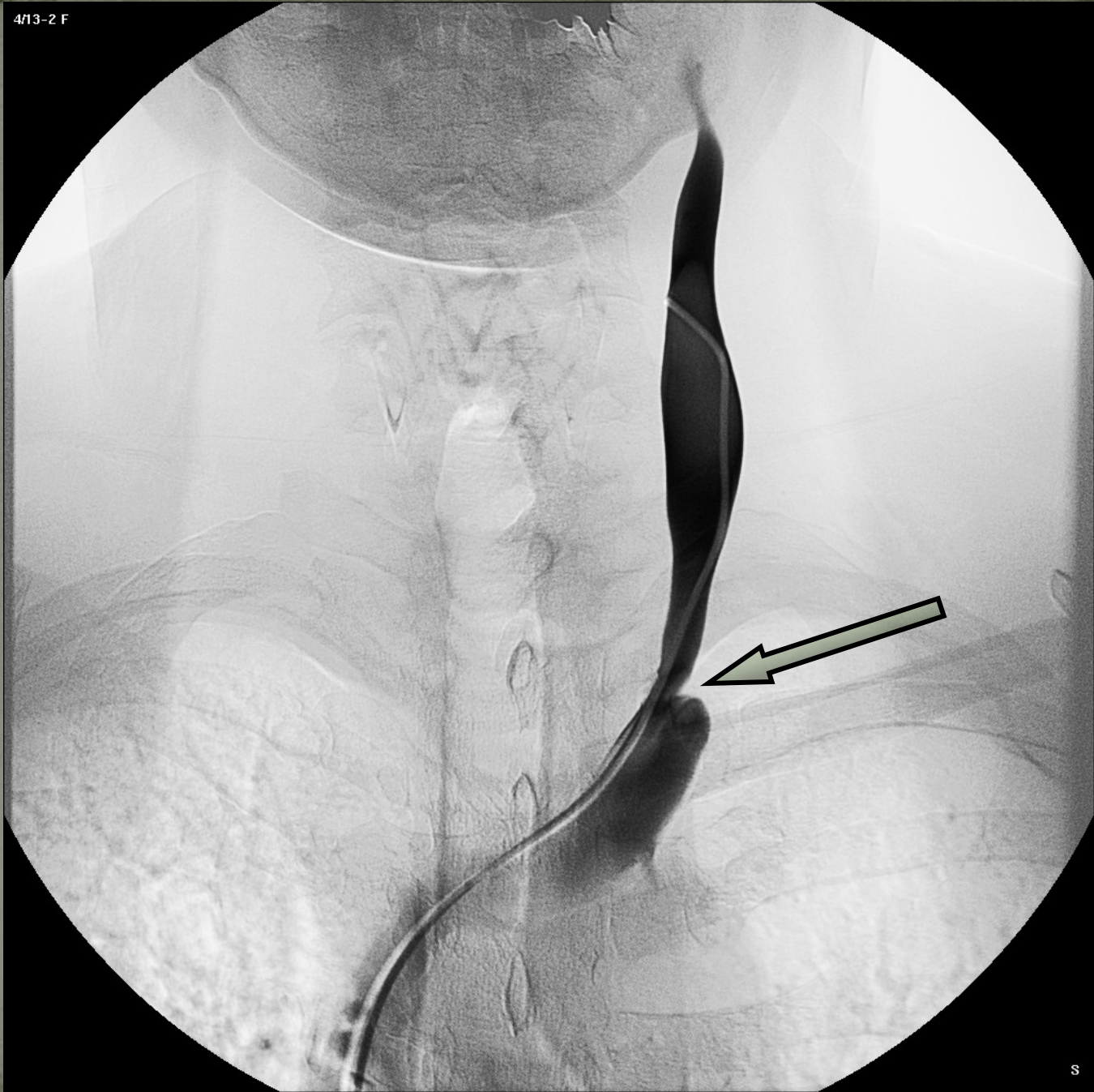
Vs FLEBOGRAFIA SELETTIVA

TYPE A

30%

Combination of
IJV monolateral stenosis

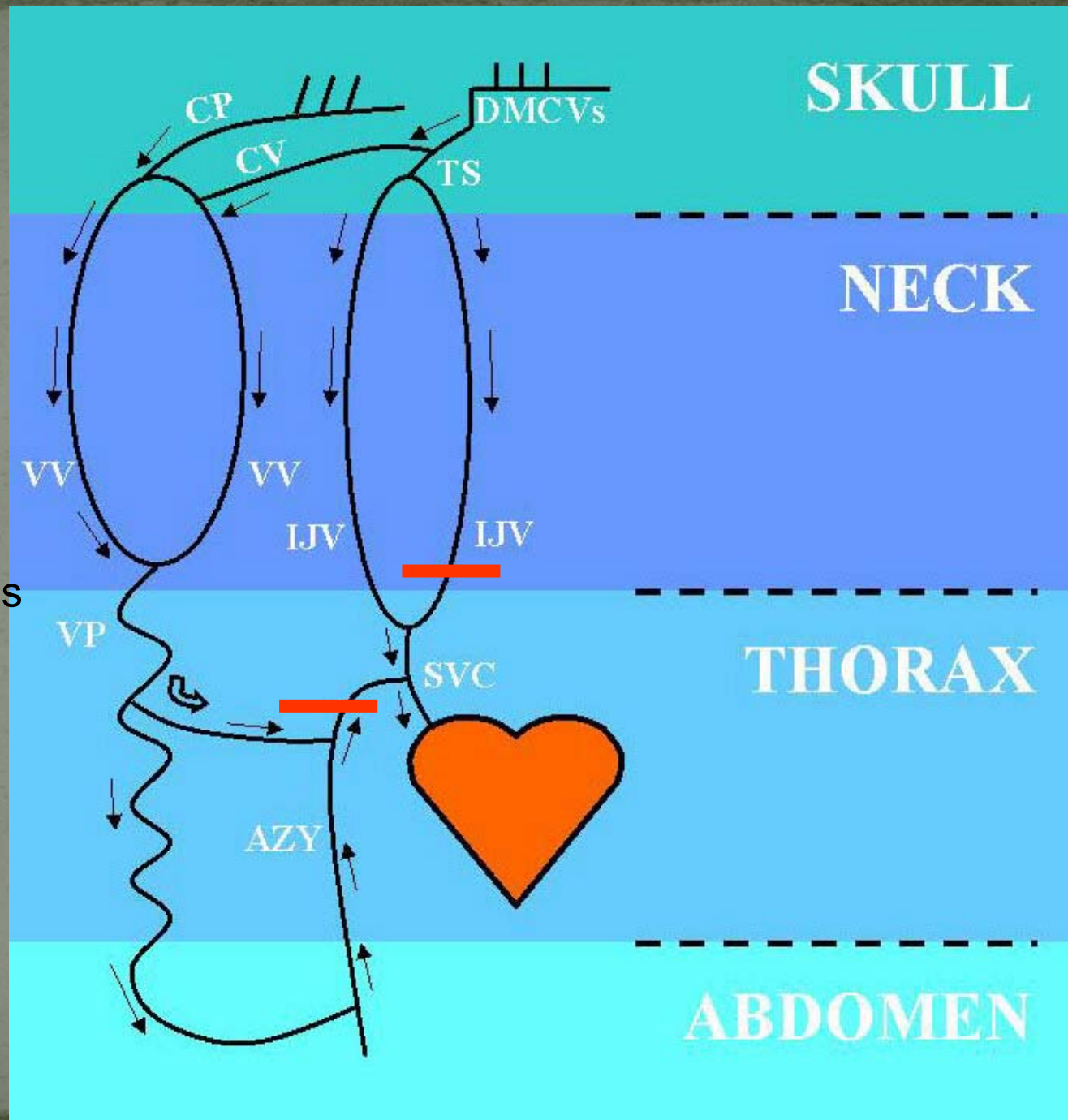


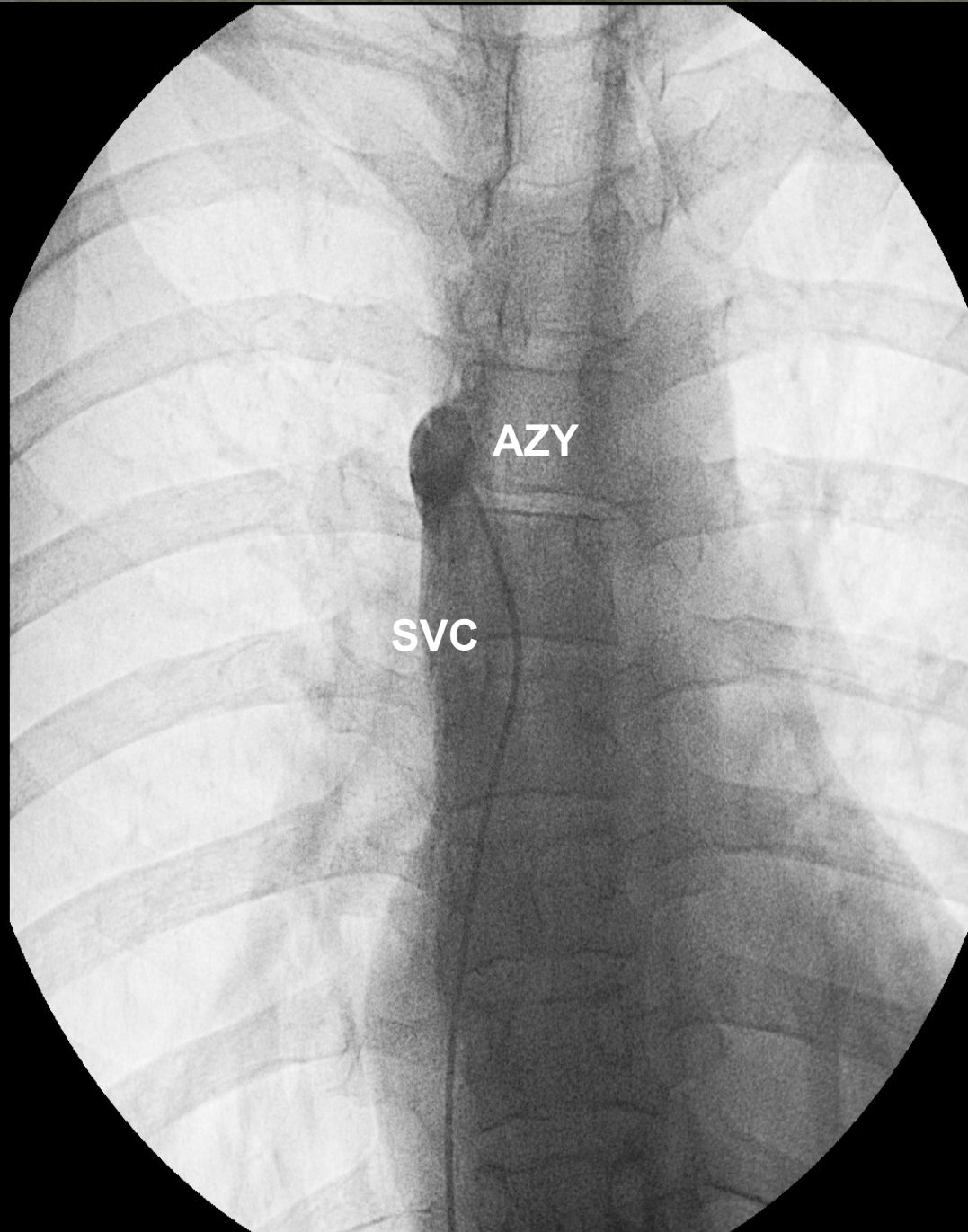
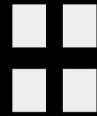


TYPE A

30%

Combination of
IJV monolateral stenosis
and
proximal AZY stenosis

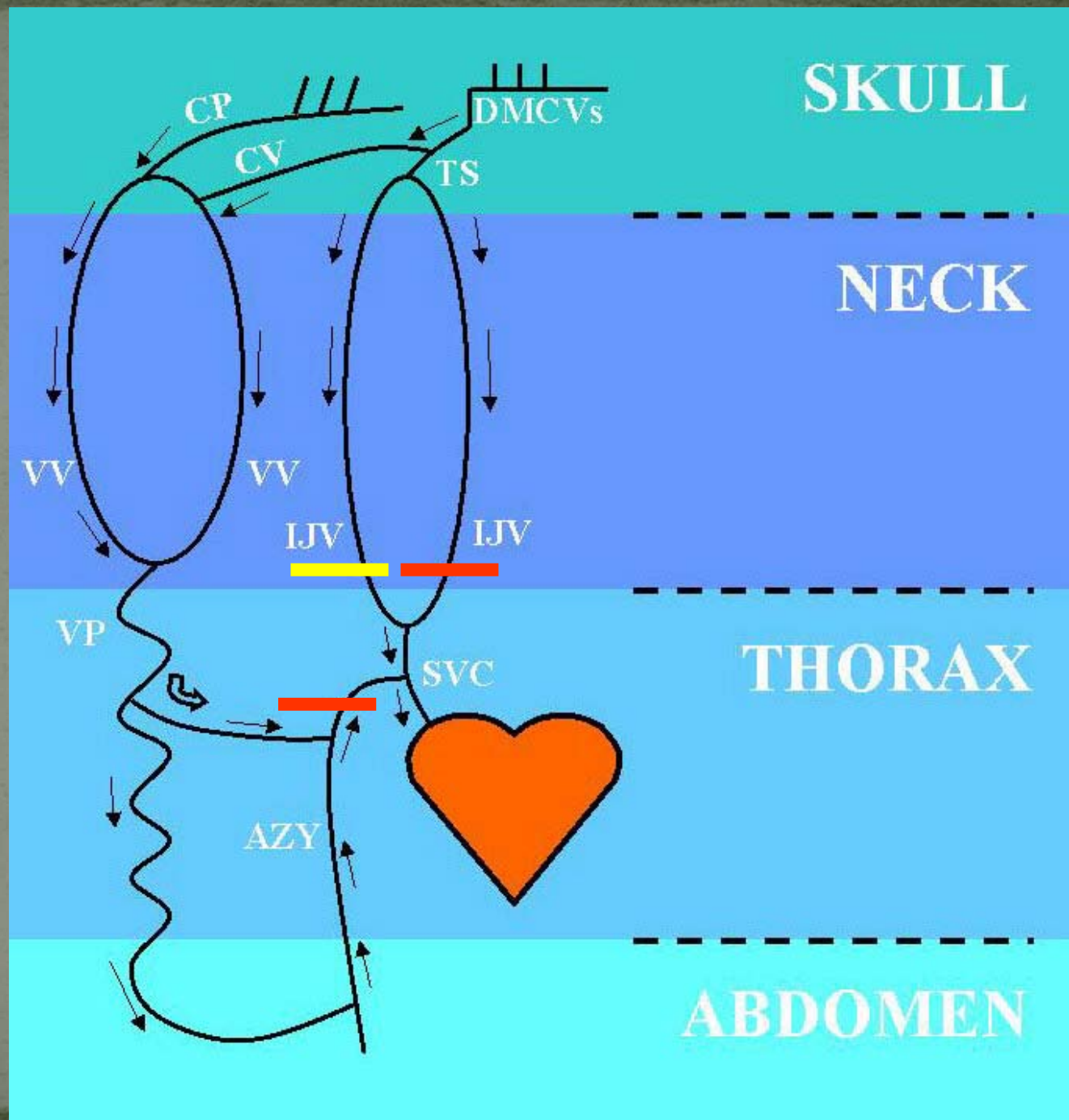


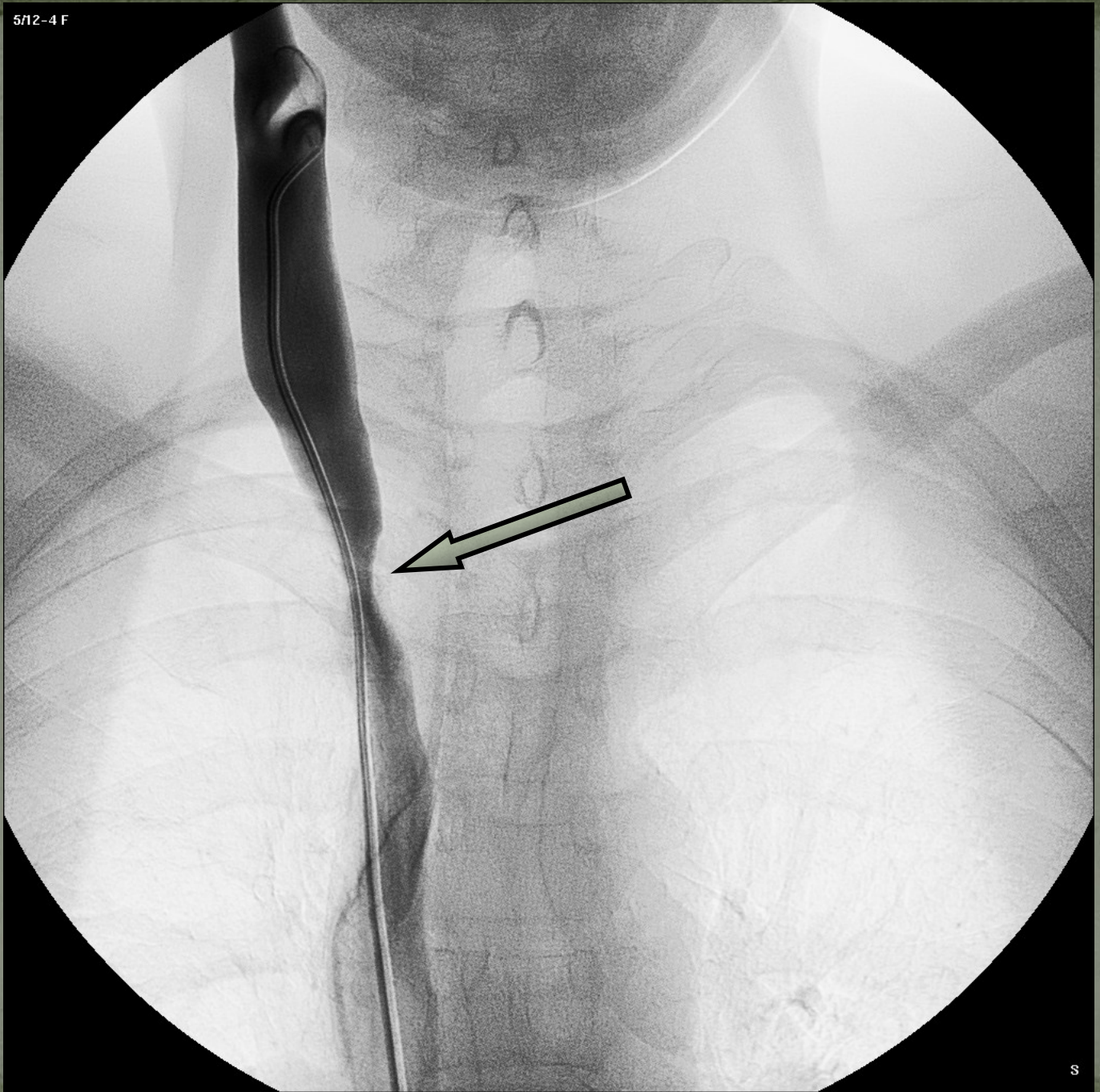


TYPE B

38%

Includes stenosis of both IJV and AZY





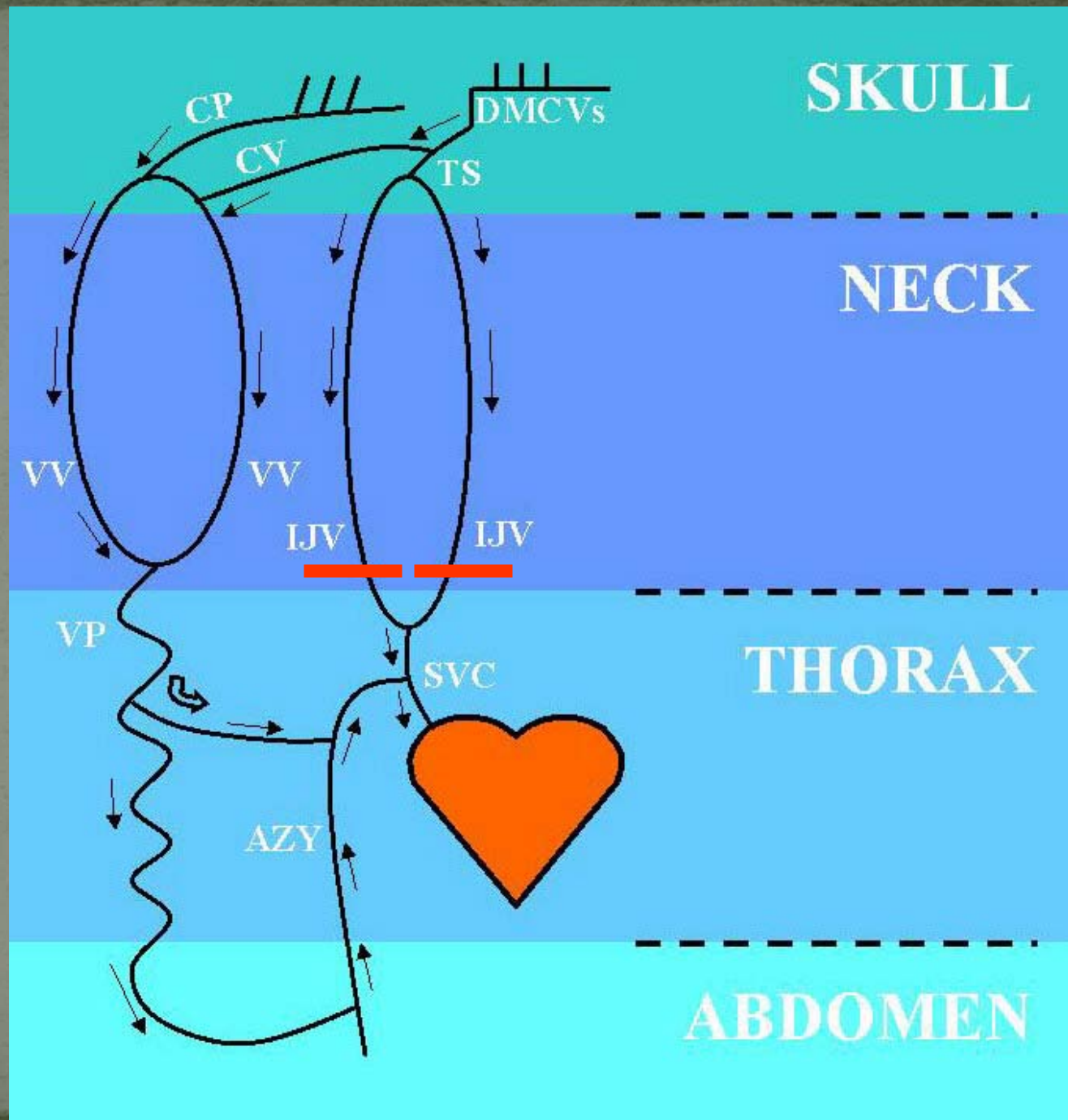
TYPE C

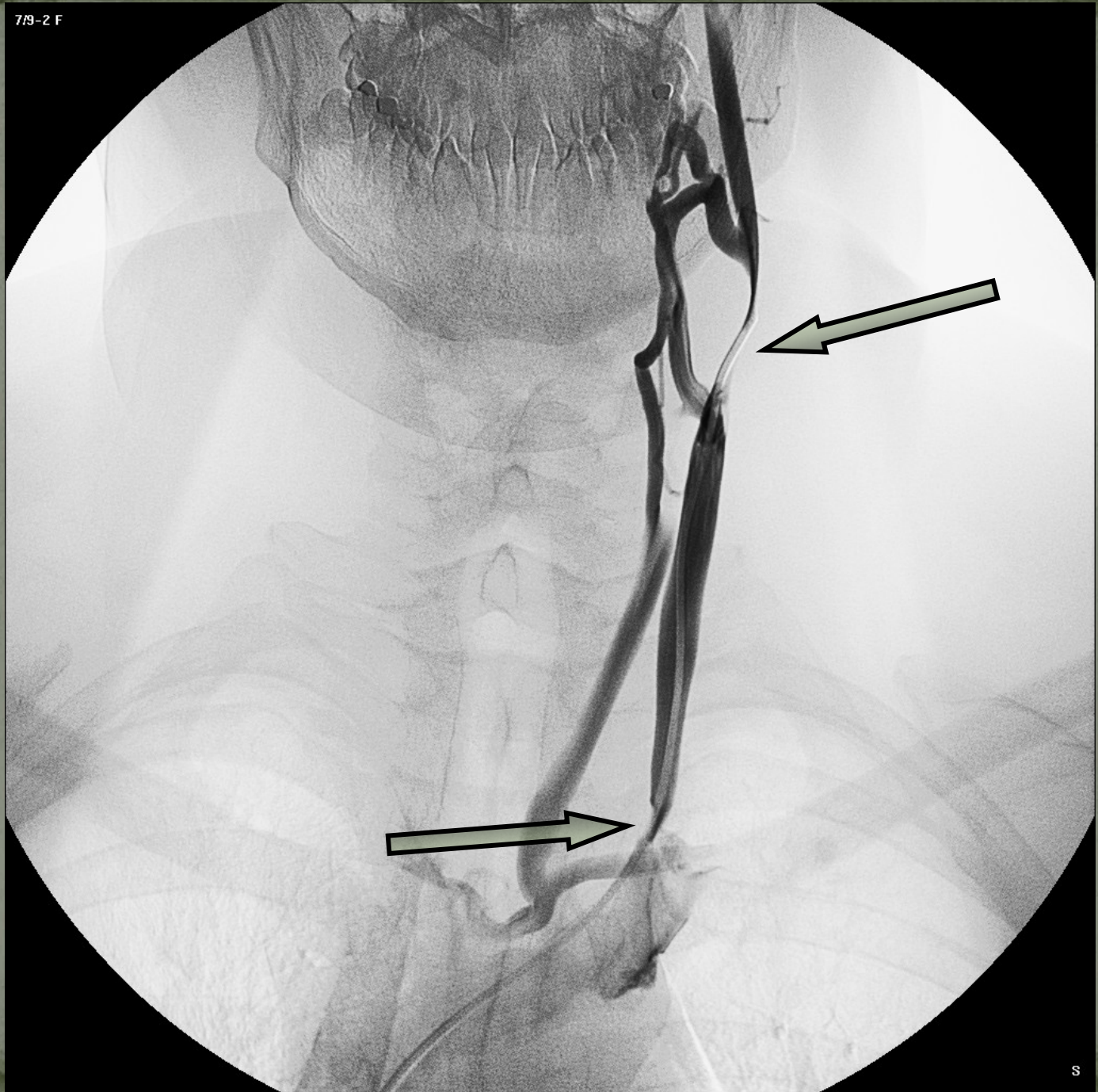
14%

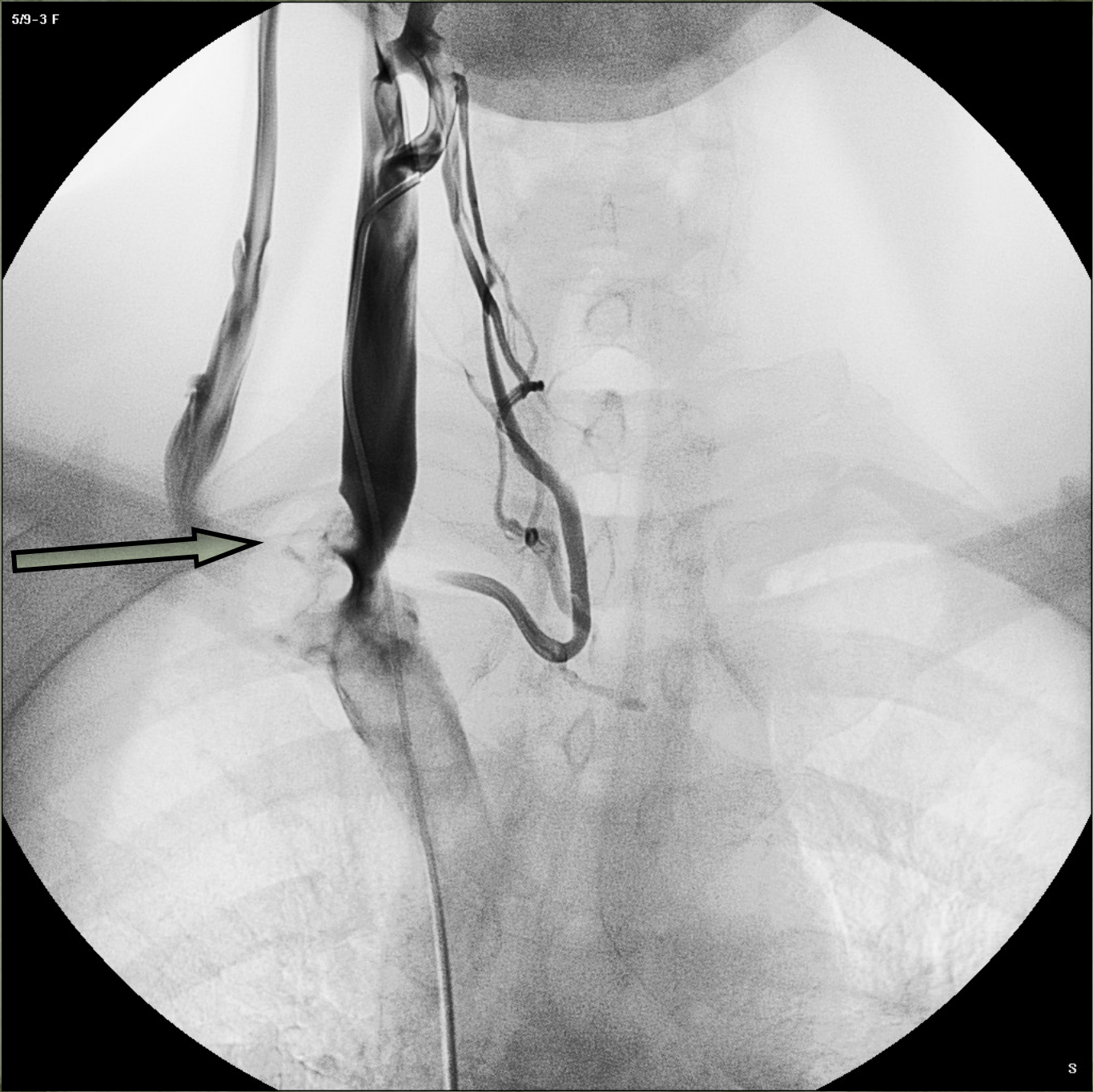
Patent AZY

and

stenosis of both IJV





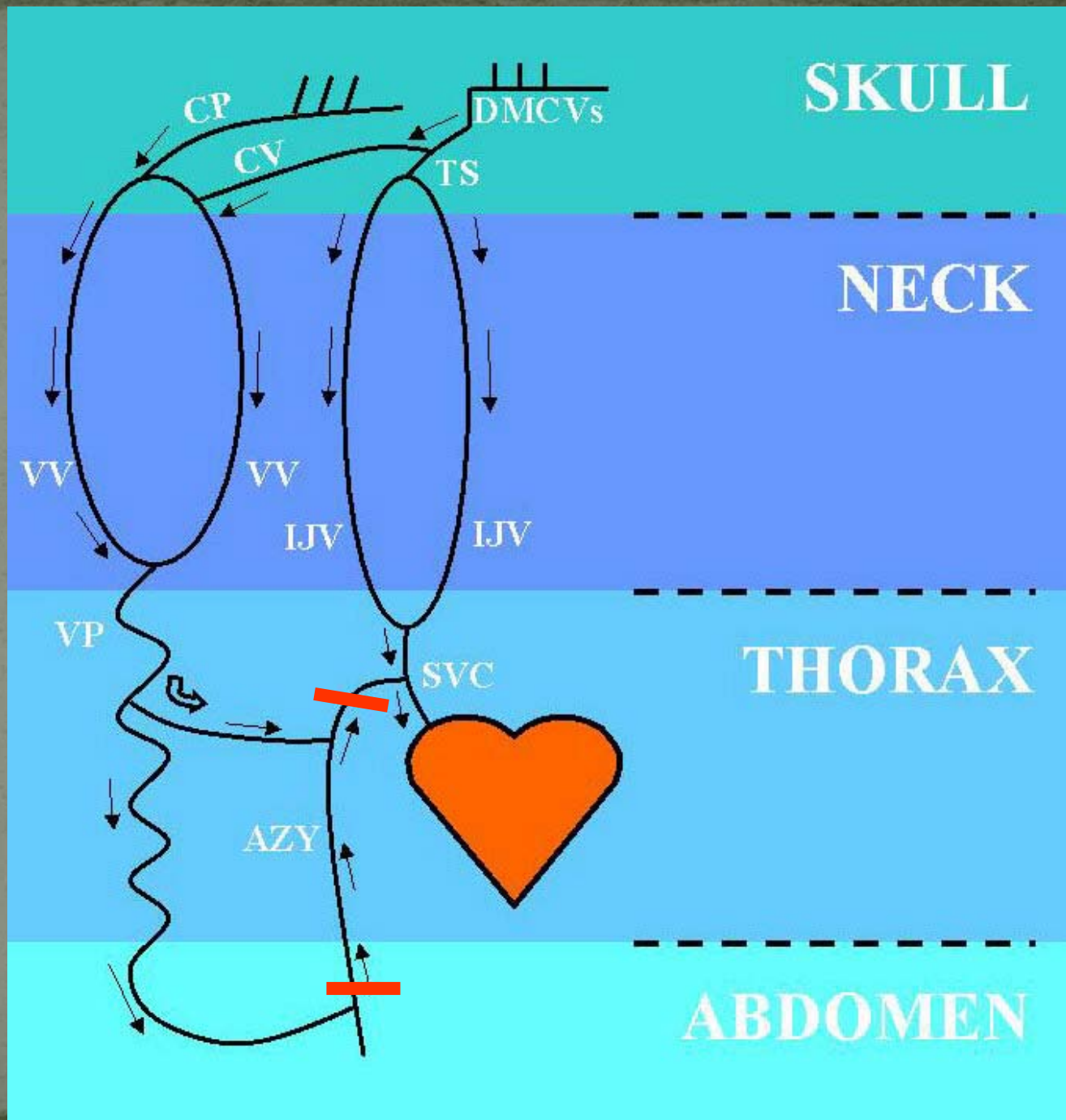


TYPE D

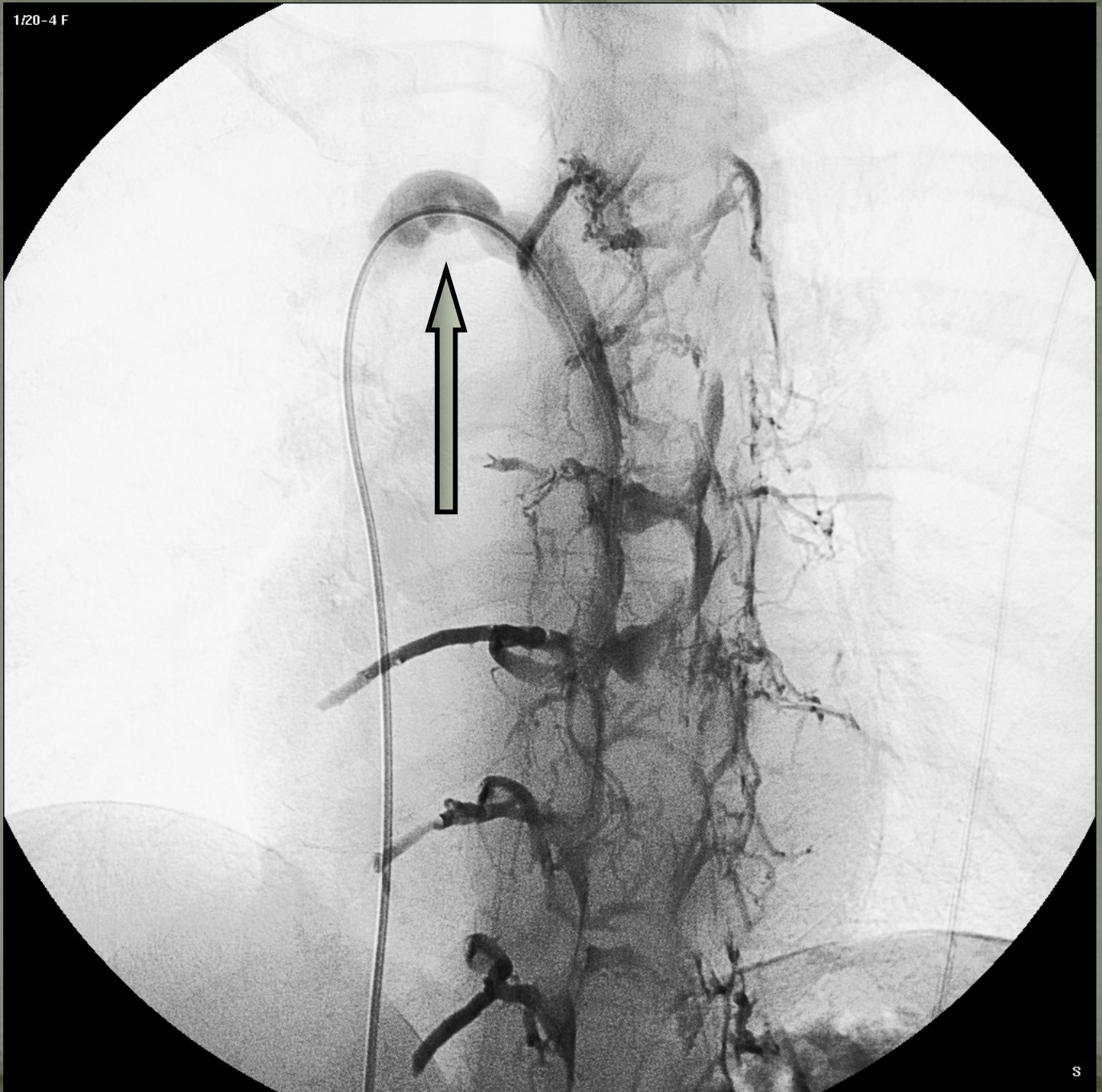
18%

Multiple stenosis of the

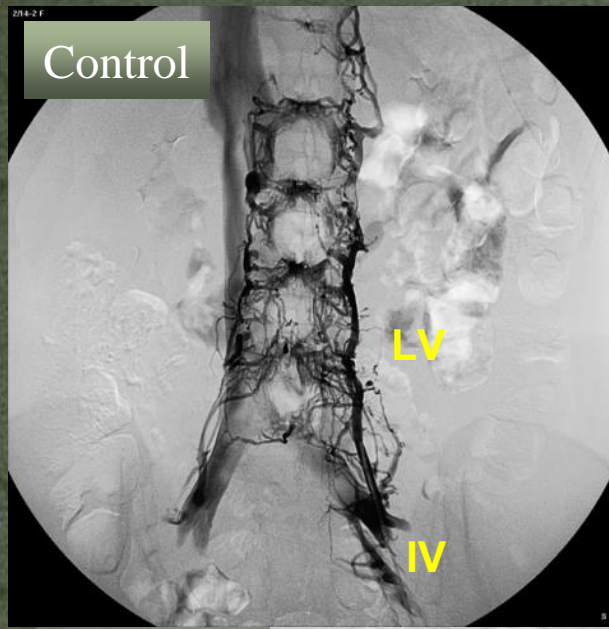
AZY system



1/20-4 F



Control



MS

