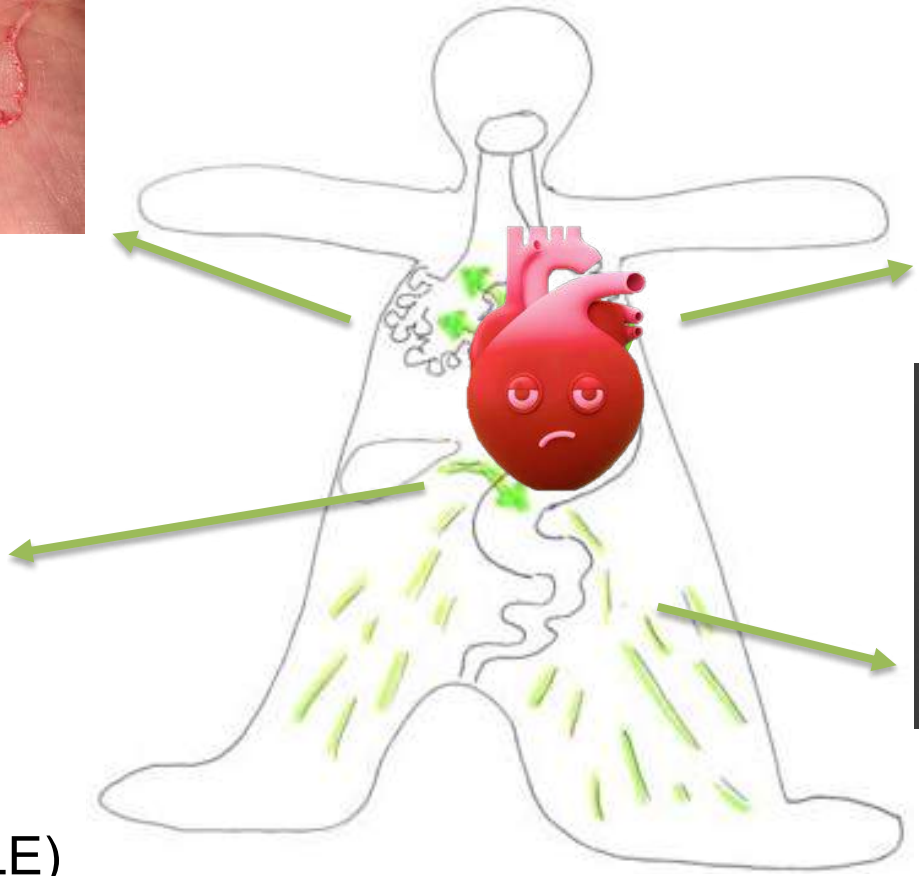
Lymphatic Vasculature

Biology, Form and Function

Plastic Bronchitis

Chylo-thorax

Protein Losing Enteropathy (PLE)

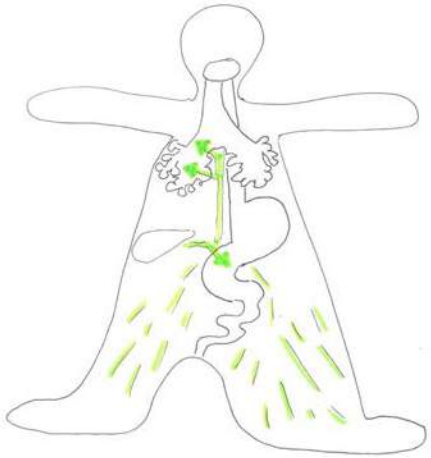


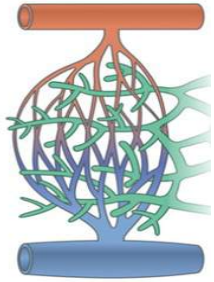
Lymphangiogenesis & Edema

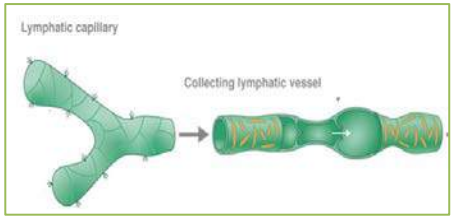
Conflict of interest: No
Disclosures: No

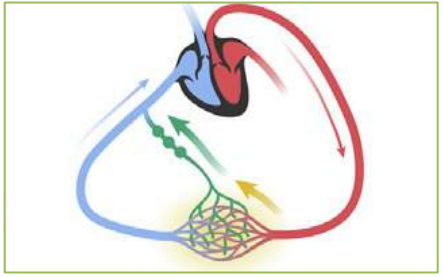
I wish I had developed a drug that improves lymphatic transport

Vibeke Hjortdal MD, PhD, DMSc
Professor CHD surgery
Copenhagen, Denmark

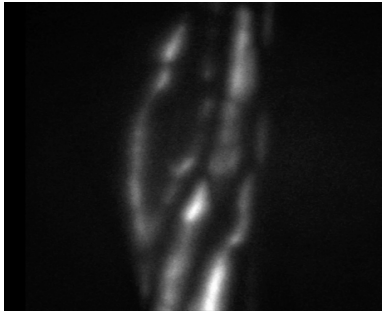


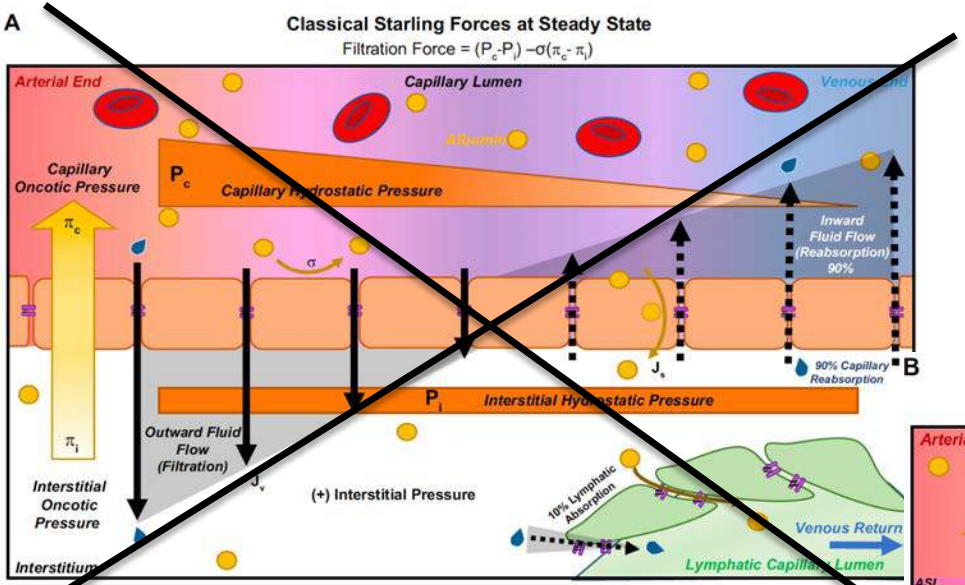


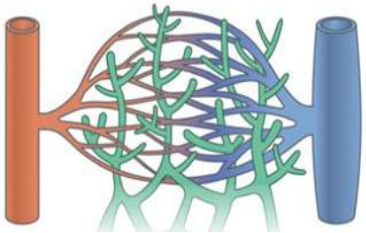


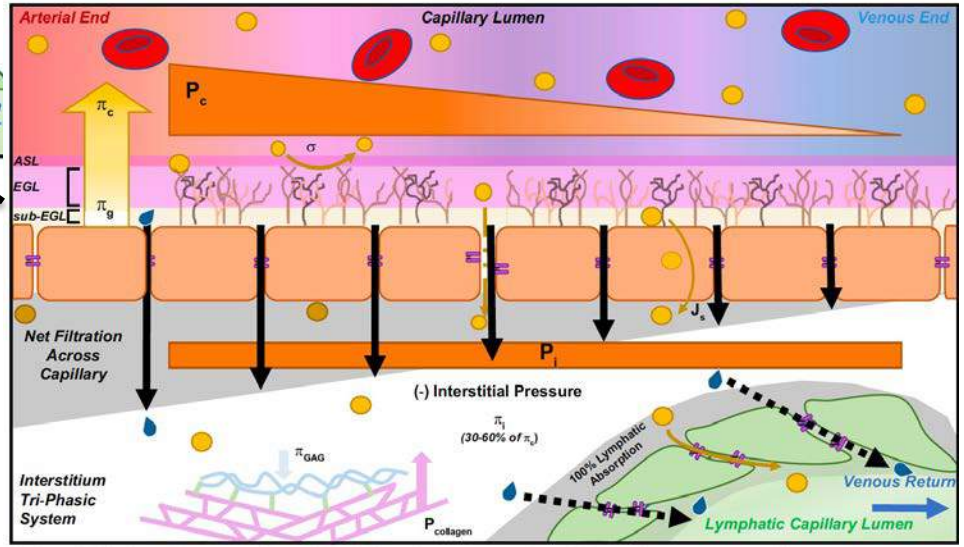


Lymphatic System
Biology, Form and Function









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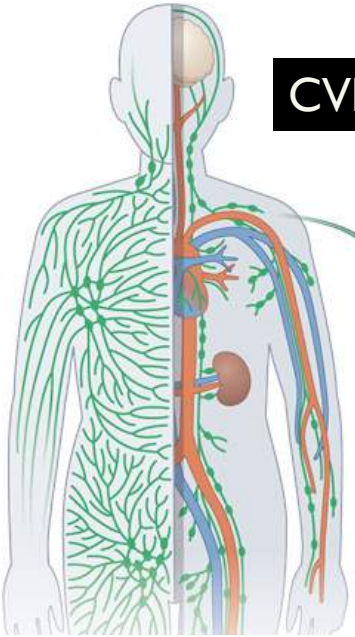
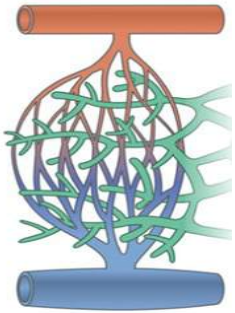
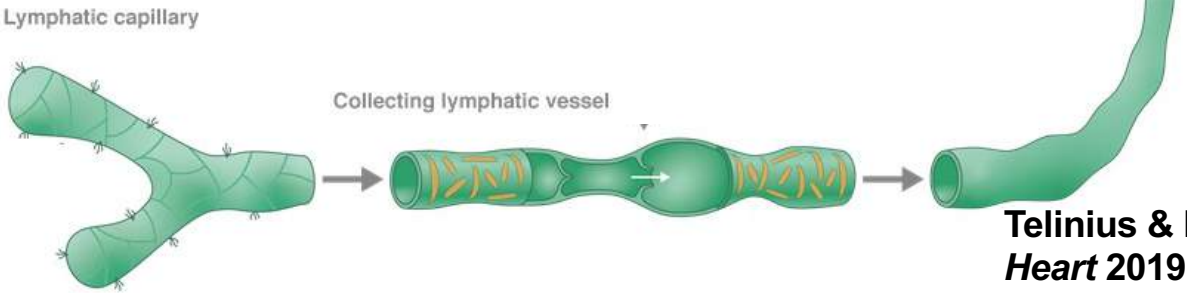
CVP = 5 mmHg

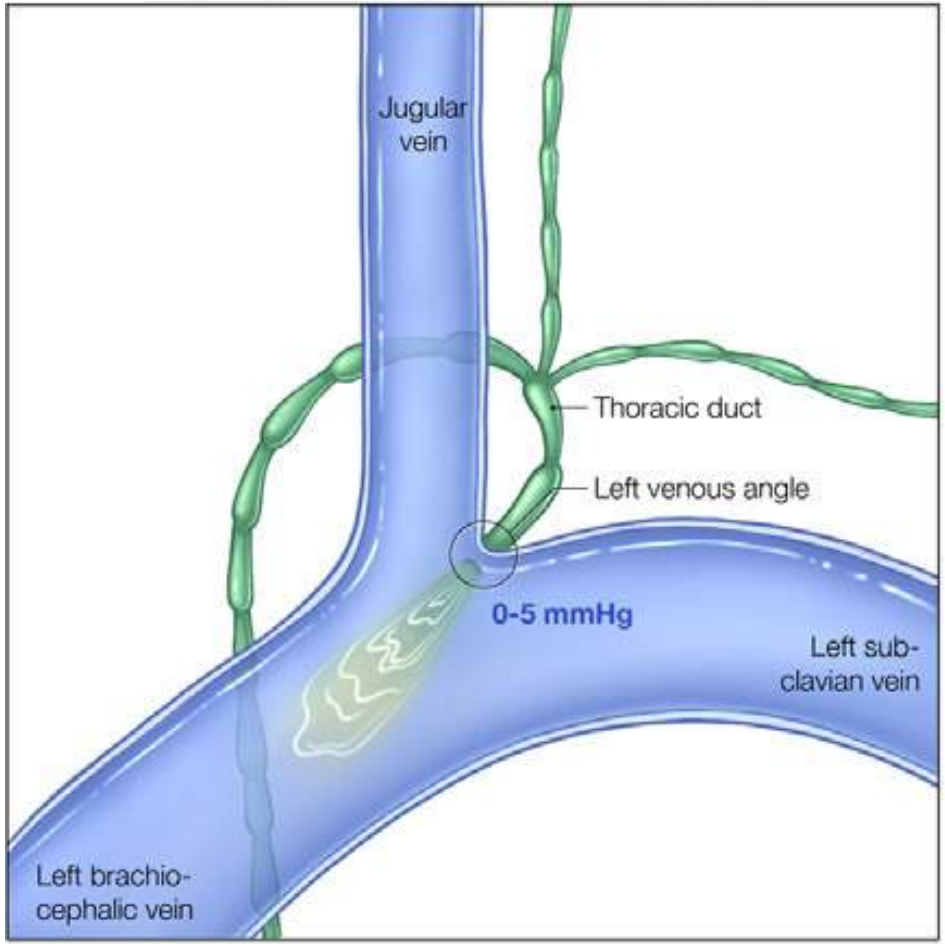




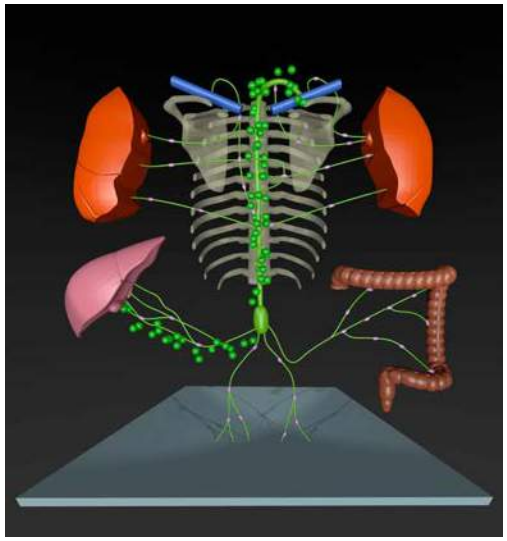


Telinius & Hjortdal.
Heart 2019;105:1777-84

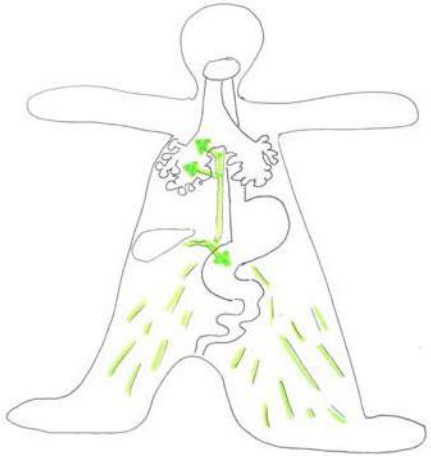
Normal: Thoracic Duct Function

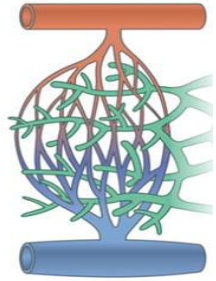


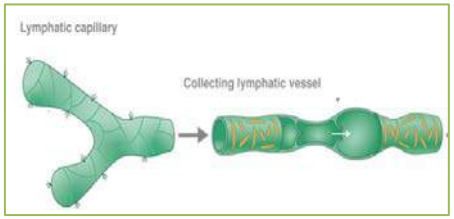
8-12 litres/day

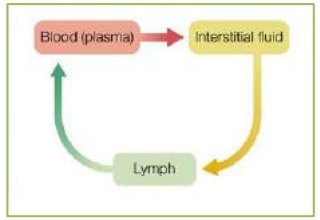


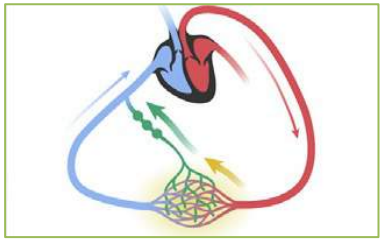
Courtesy of Dr Dori



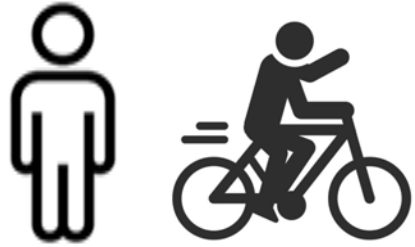


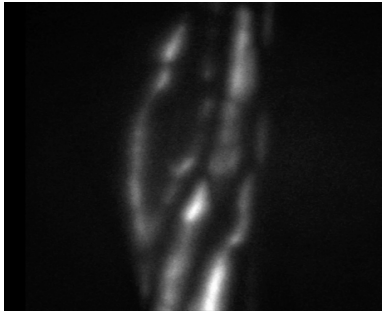




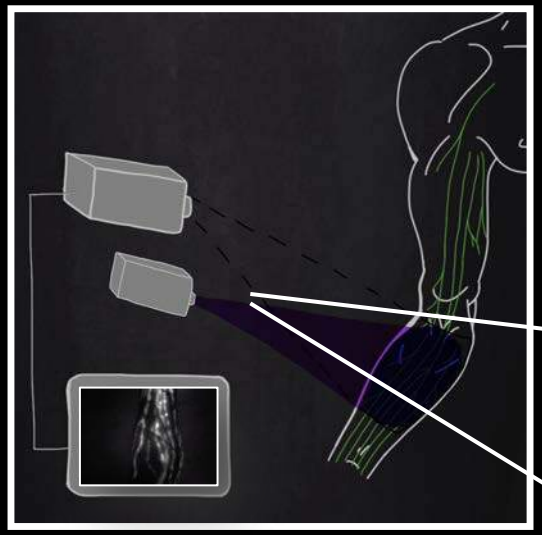


Lymphatic System





Near-infrared fluorescence

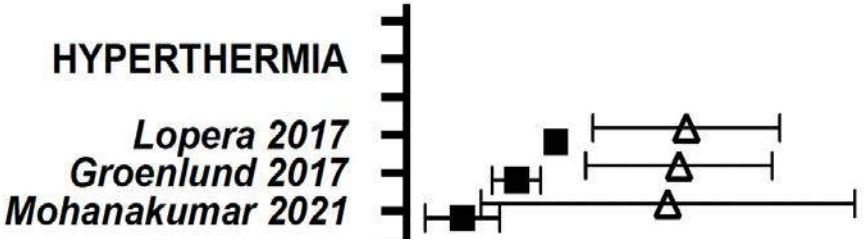


Injection sequence. Speed x4

Lymph vessel

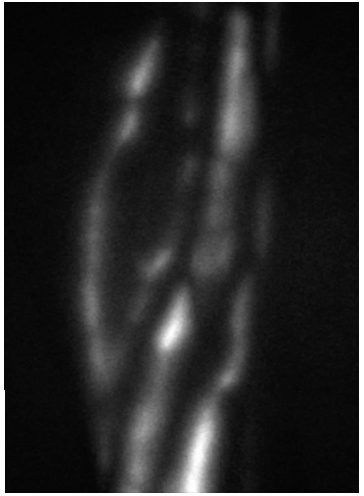
Contraction Rate
Lymph Velocity
and
Max Pressure

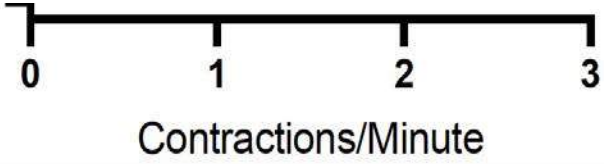
Contraction Frequency before and after intervention



Baseline

Intervention

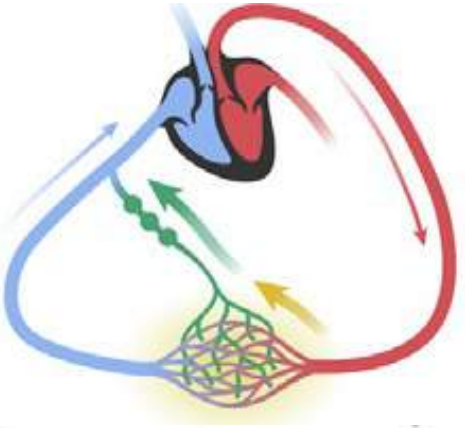


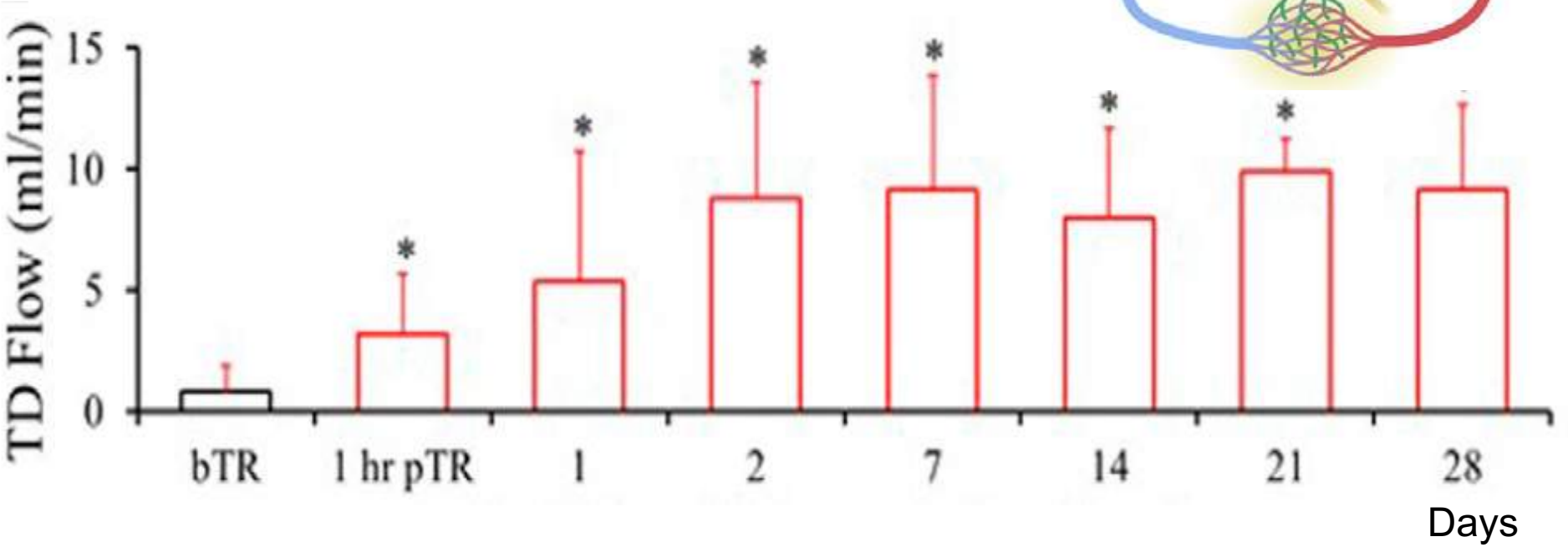


Lymphatic dysfunction

Acute Tricuspid Regurgitation

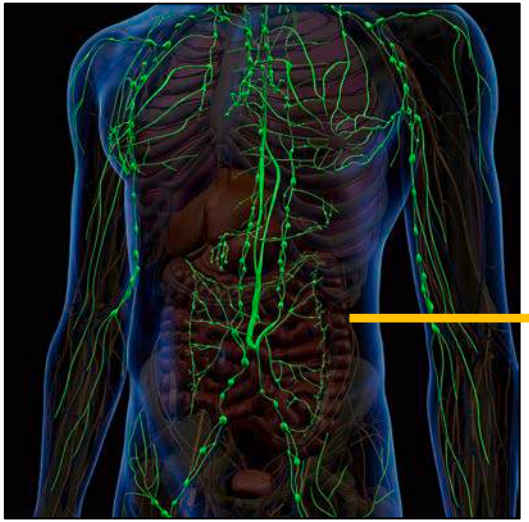
CVP increase from 4 to 10 mmHg

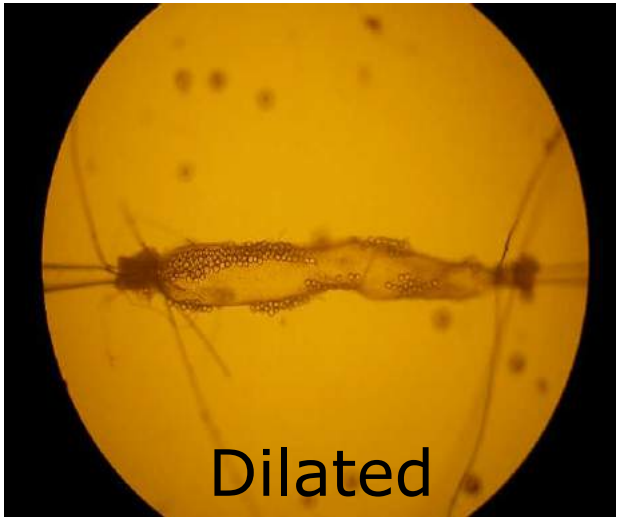




frontiers | Frontiers in Physiology
Lu et al.
TYPE Original Research
PUBLISHED 08 August 2022
DOI 10.3389/fphys.2022.798284

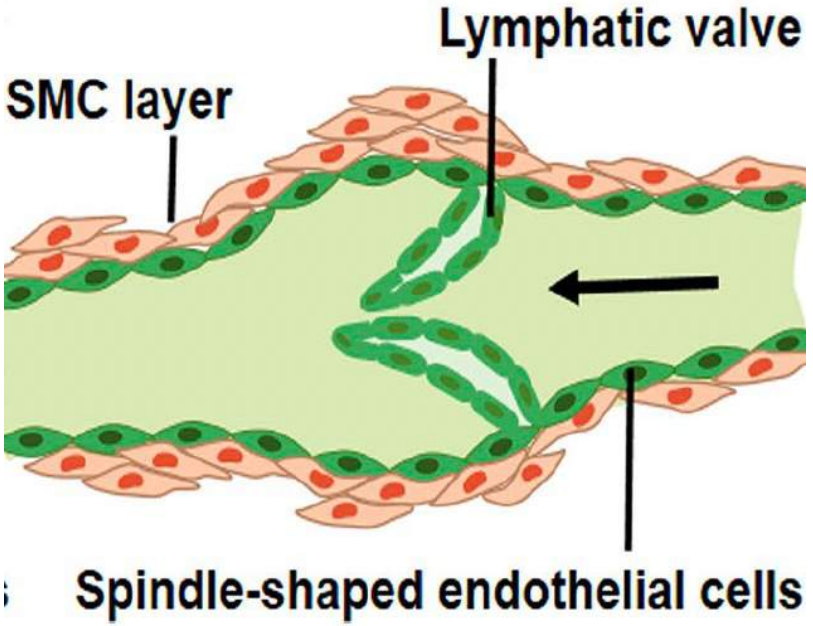
Human lymph vessel exposed to acute volume / pressure overload





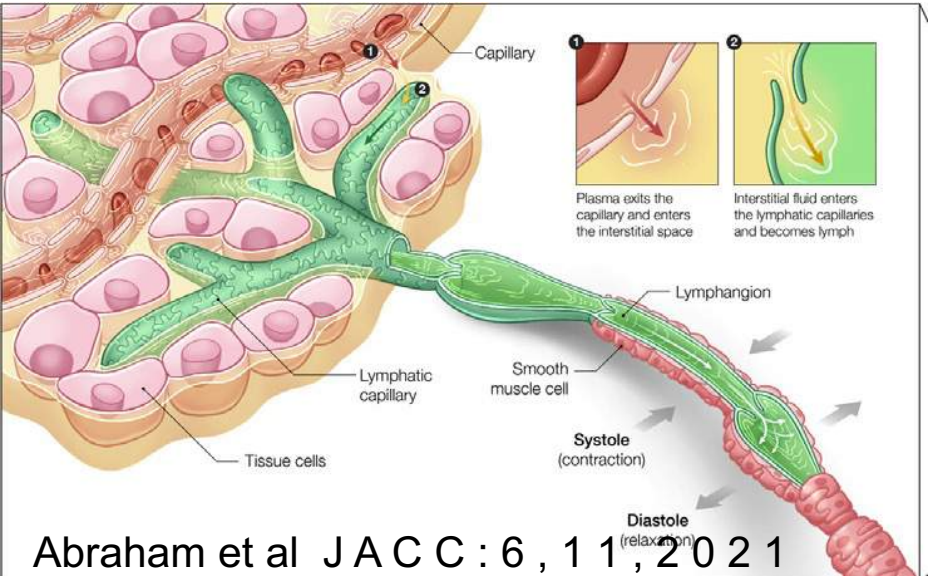
Chronic = 28 days:
Lymphatic vessel dilatation and Smooth muscle cell hypertrophy

	Diameter (mm)	Wall Thickness (mm)
Control	3.4	0.1
28 d s/p TR	4.3	0.3



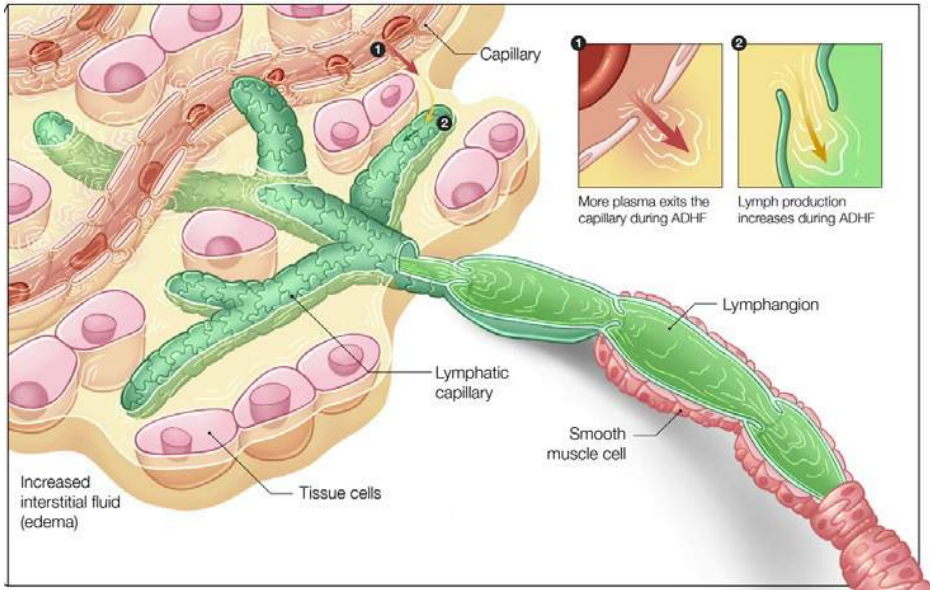
Acute Heart Failure

Normal

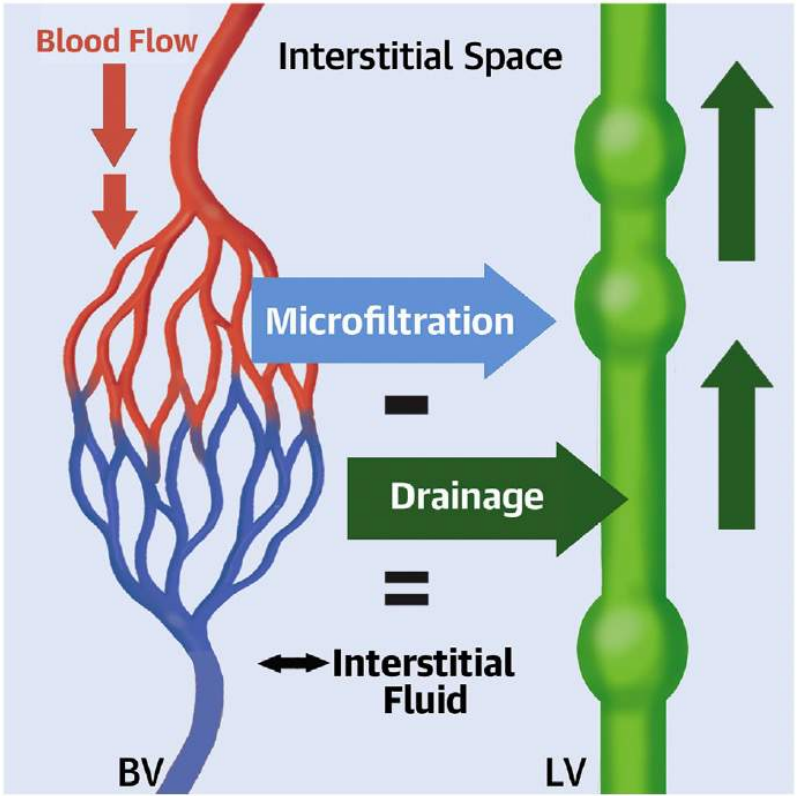


Abraham et al J A C C : 6 , 1 1 , 2 0 2 1

Vascular congestion
Excess extracellular fluid
Elevated CVP opposes drainage



Healthy



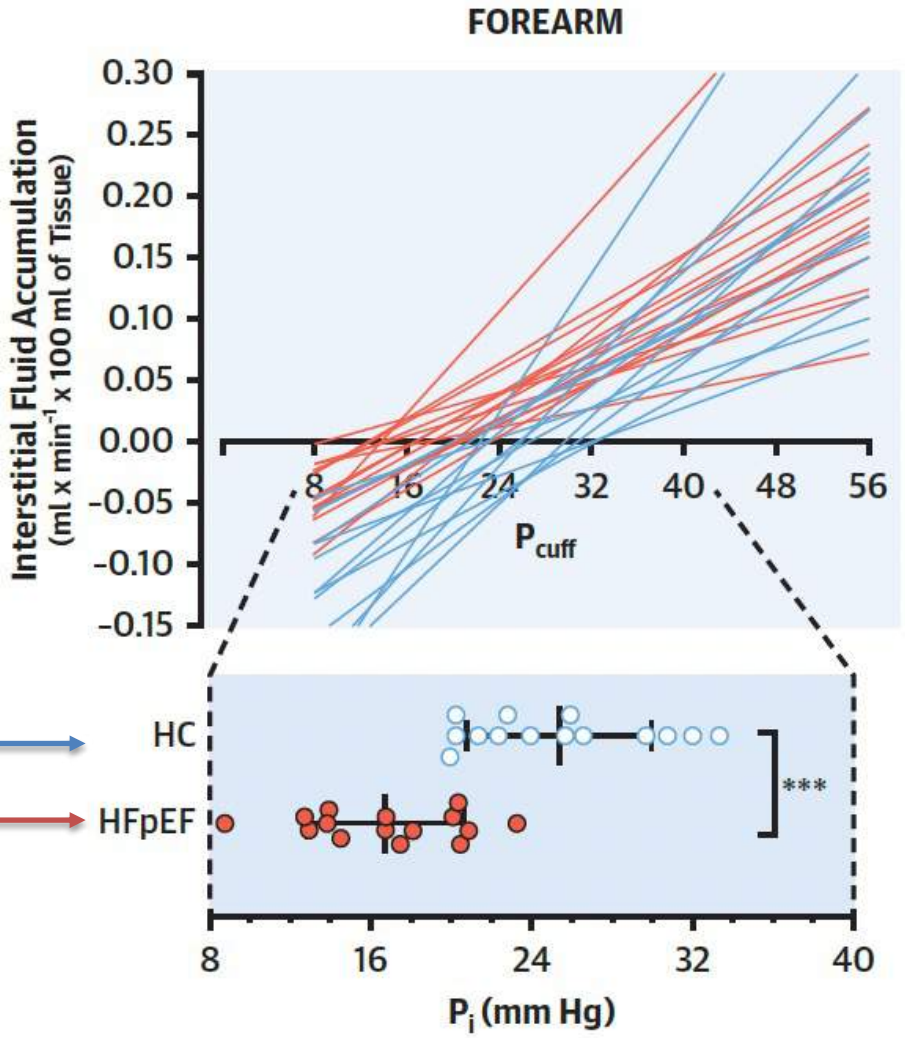
Rossitto, G. et al. J Am Coll Cardiol. 2020;76(24):2817-29.

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY VOL. 76,

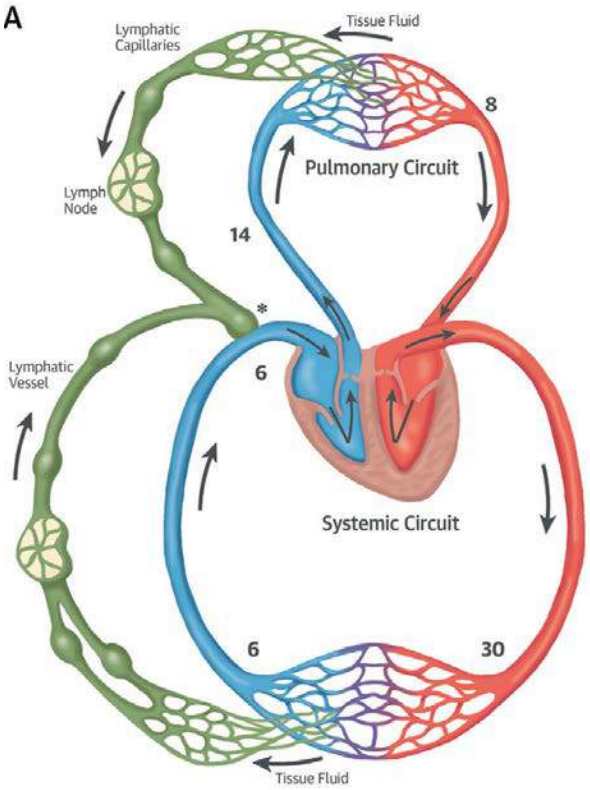
Reduced Lymphatic Reserve in Heart Failure With Preserved Ejection Fraction

Giacomo Rossitto, MD,[a,b] Sheon Mary, PhD,[a] Christine McAllister,[c] Karla Bianca Neves, PhD,[a] Laura Haddow, BSc (Hons),[a] John Paul Rocchiccioli, MBChB,[d] Ninian Nicholas Lang, MBChB, PhD,[a] Clare Louise Murphy, MD,[e] Rhian Merry Touyz, MBChB, PhD,[a] Mark Colquhoun Petrie, MBChB,[a,d] Christian Delles, MD[a]

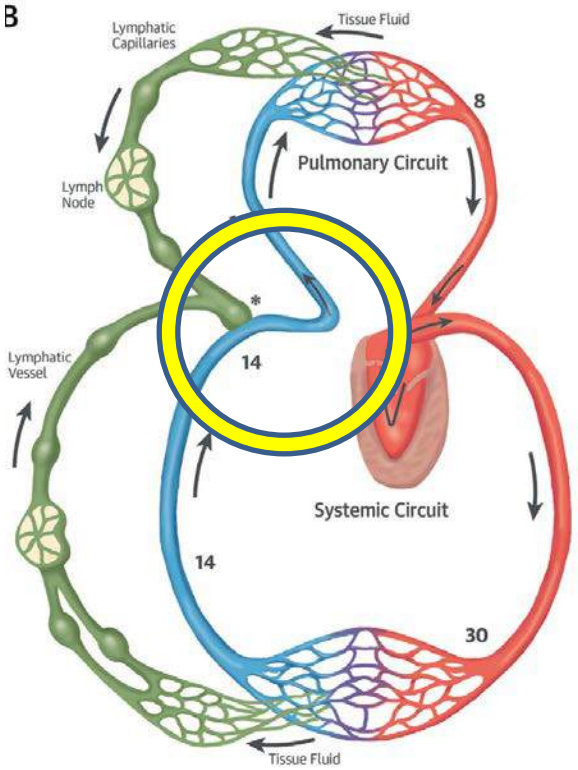
Threshold above which interstitial fluid accumulation starts (isovolumetric)



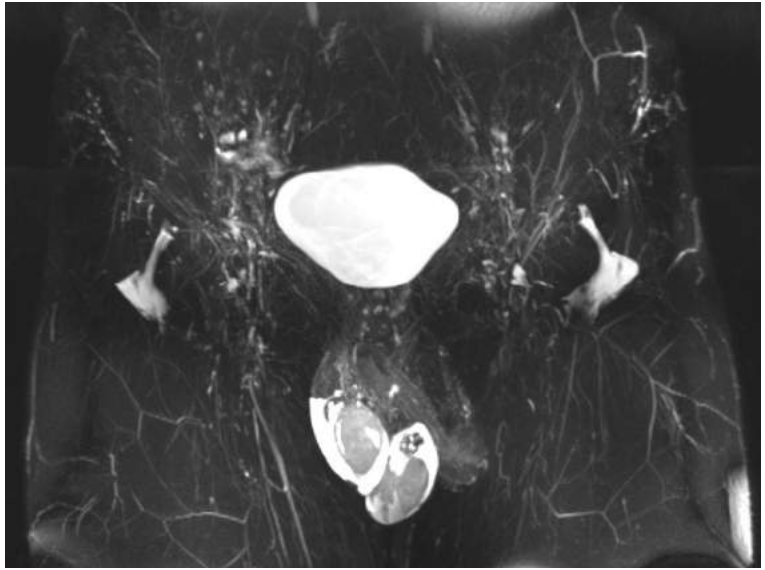
Normal



Fontan



Lymph-angiogenesis in Fontan



Healthy

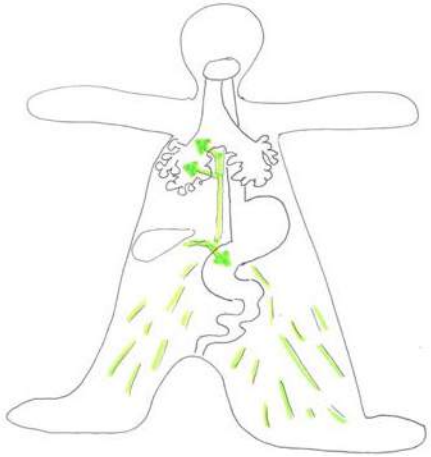
Fontan w/ peripheral edema and lymphangiogenesis

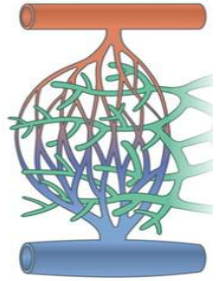
Circulation CVI 2019 12(4)

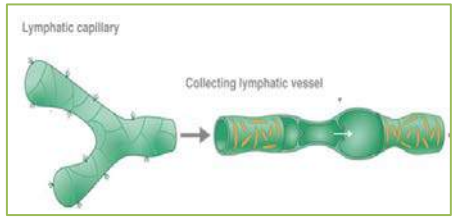
Fontan response to Heat test

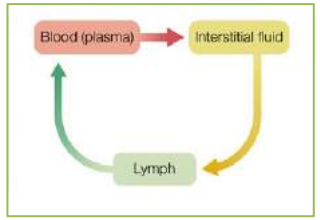
37-40°C, 5 min

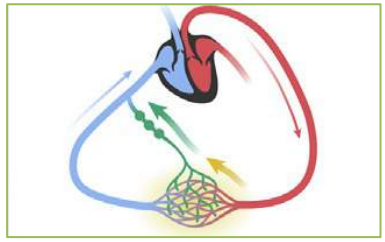
Physiol Rep 2021





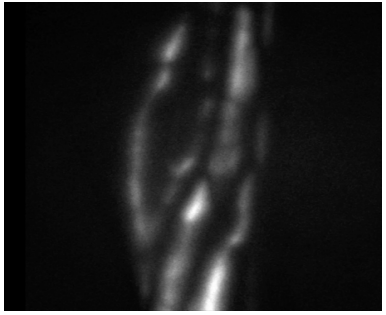






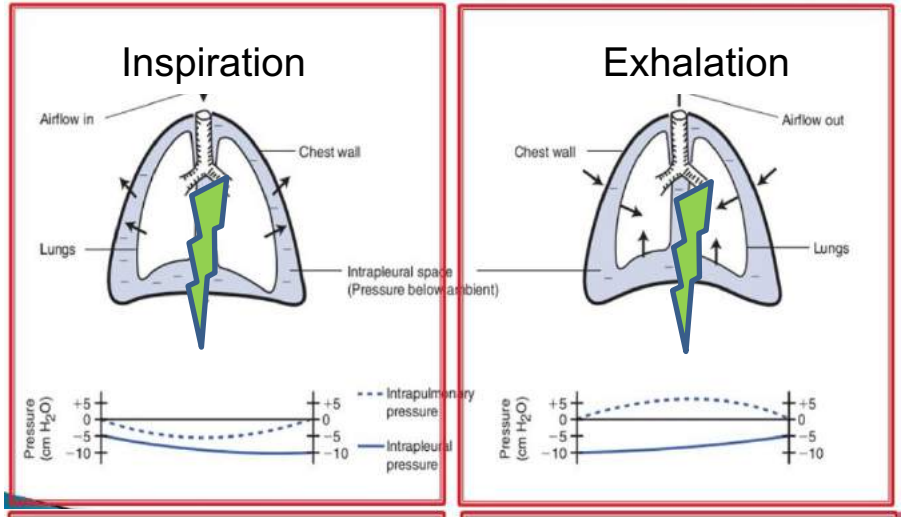
Lymphatic System

HF, Fontan



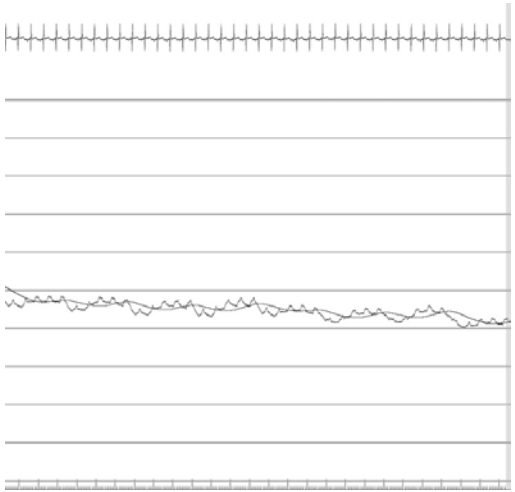
Respiration and ventilation

Spontaneous breathing

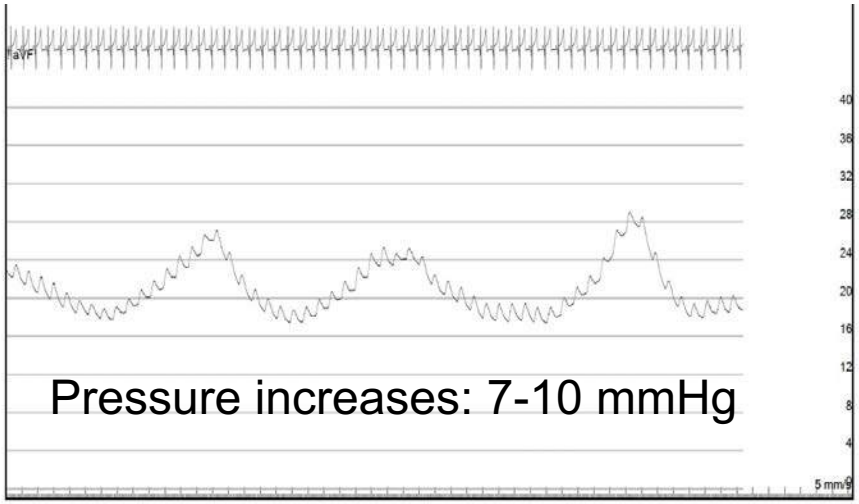


Thoracic duct pressures in Fontans

Mechanical ventilation



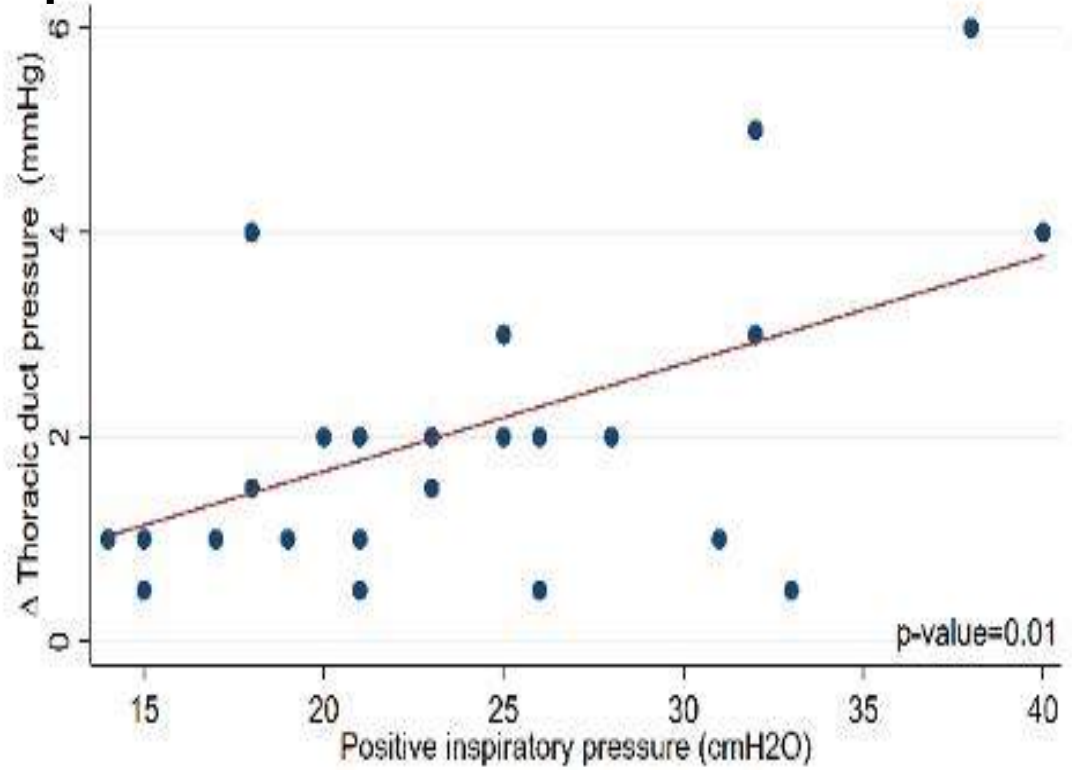
Ventilator disconnected



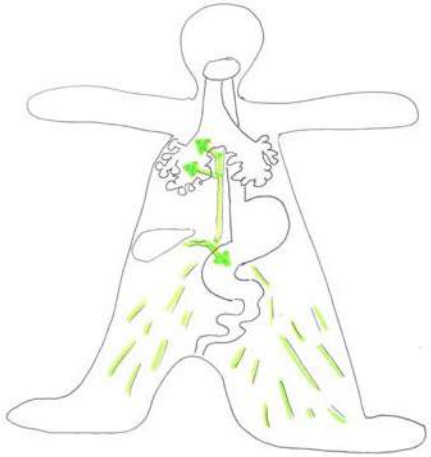
Pressure increases: 7-10 mmHg

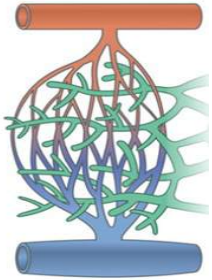
Kelly, …Dori, Hjortdal
Physiol Rep 2022

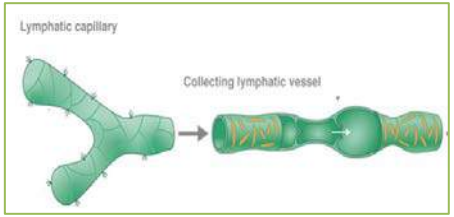
Mechanical ventilation and increase in Thoracic Duct pressure

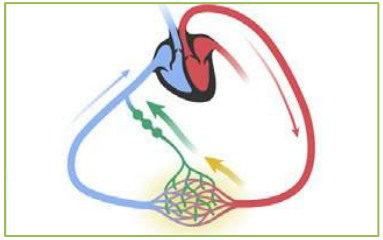


Kelly, …Dori, Hjortdal
Physiol Rep 2022









Lymphatic System

HF, Fontan