A CF teenager with facial swelling

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- 17 y.o. female, C.F, PI, CFRD , CF related liver dis. GERD, Helico gastritis, Chronic pan resistant Pseudomonas Infection, poor compliance

- **PMHx**:
- Frequent exacerbations, slow recovery
- Multiple IV AB via Port-a-cath (Oct 14)
- FEV1: 54>>88%
- Chronic Med: Creon, Novarapid via Ins Pump, HS, Pulmozyme, Vitamins, Ursolit, Nexium, Normalax,

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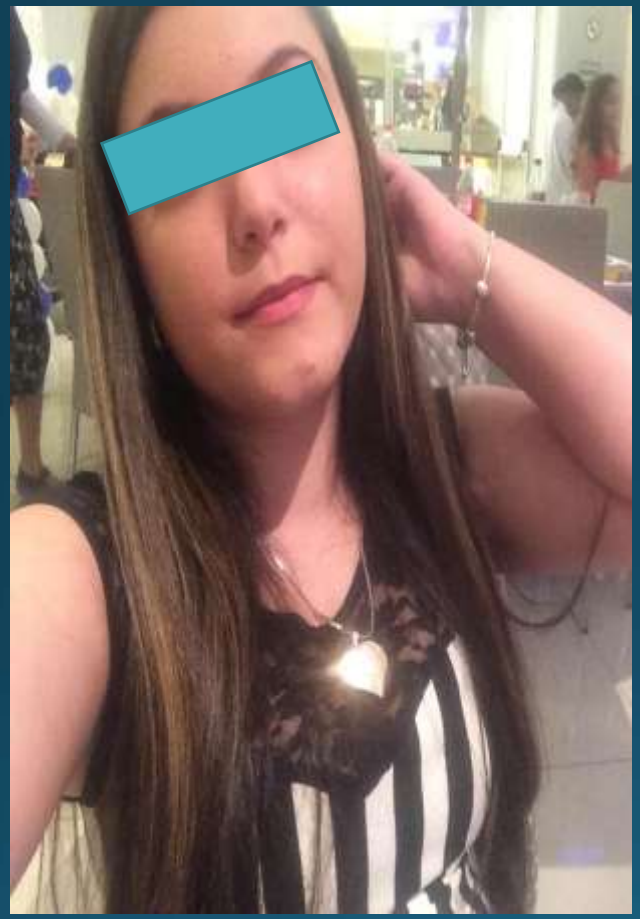
Acute event-Feb 2015

- **Dizziness, Weakness, Dyspnea, throat pain, chest pain, headache, Edema face&neck, Rash**

Vitals: 117, 110/70, O2SAT 97%, 37 °

Was treated in another hospital w/anti **histamins & steroids** >>

temporarily partial relive



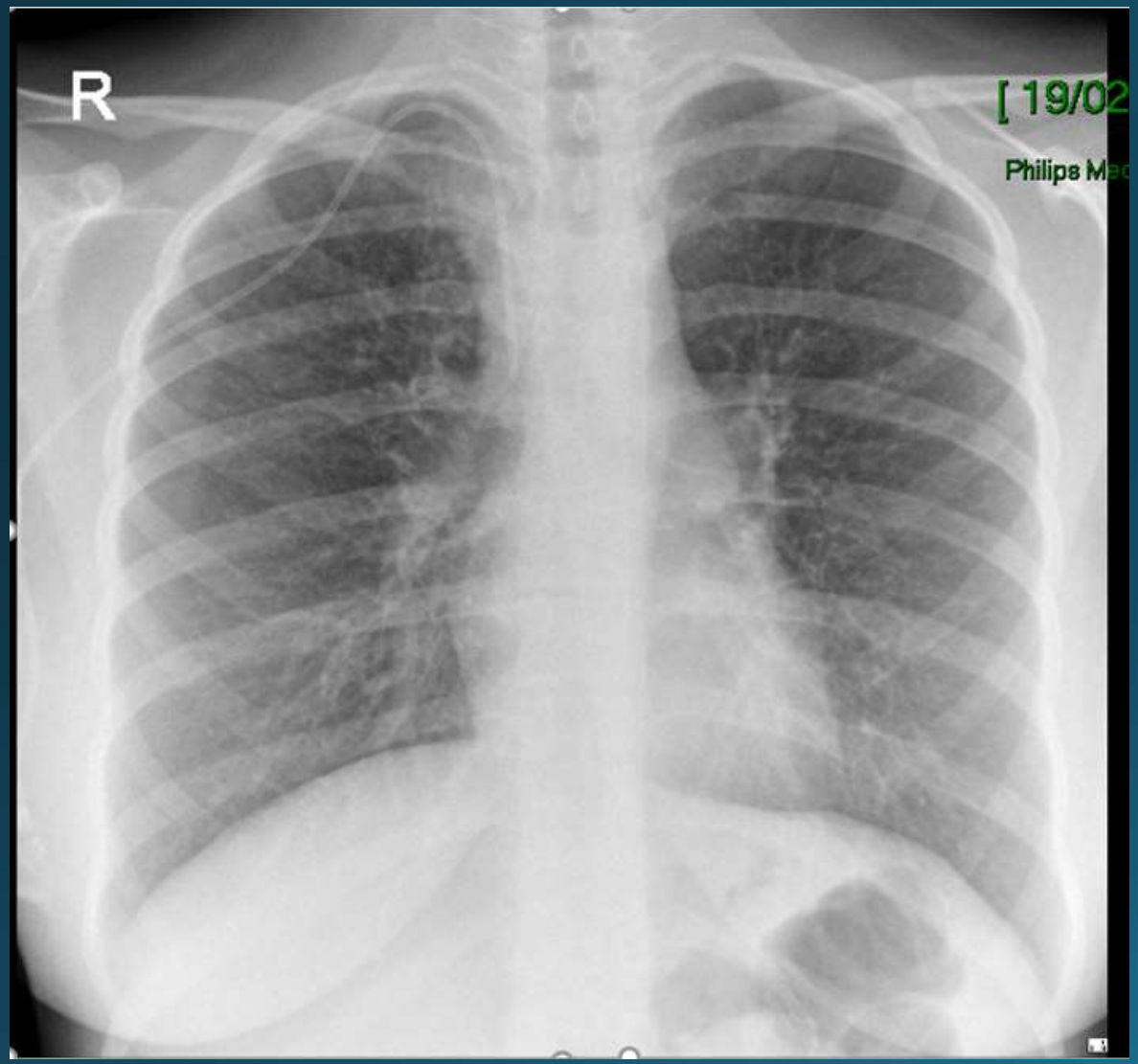
Lab

WBC-7, Hb-13.2, PLT-240K, PMN-65%, Eos- 2%

Glu-138, HbA1C-8.6, Kidney/Elect/Prot-Normal.

Liver- GOT-39, GPT- 49 ,GGT-25 Alk Phos-122

- US neck- Suspected thyroiditis
- Consult- Cardio, Surgeon- functional Port-A-Cat (easy In-no return)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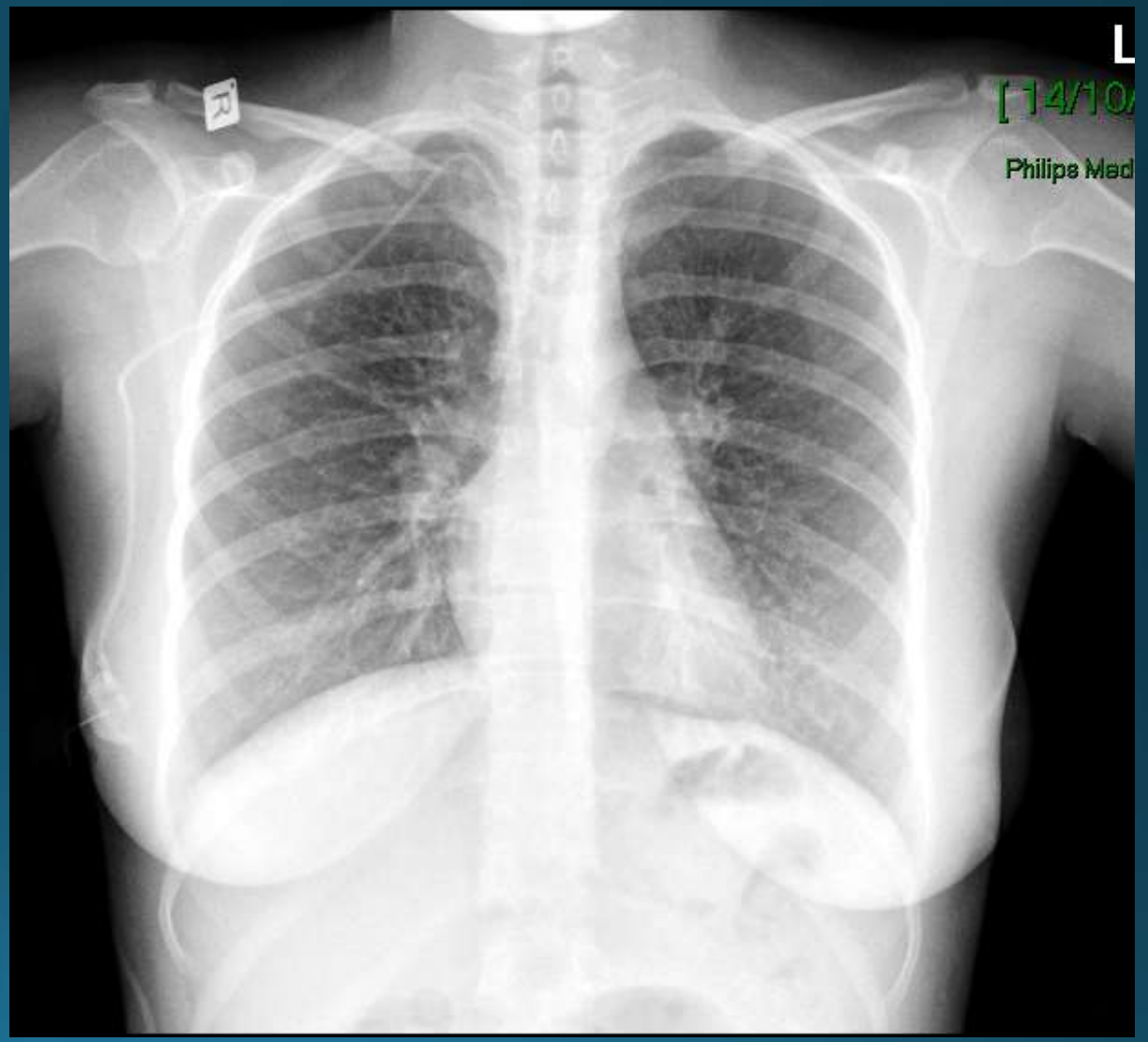
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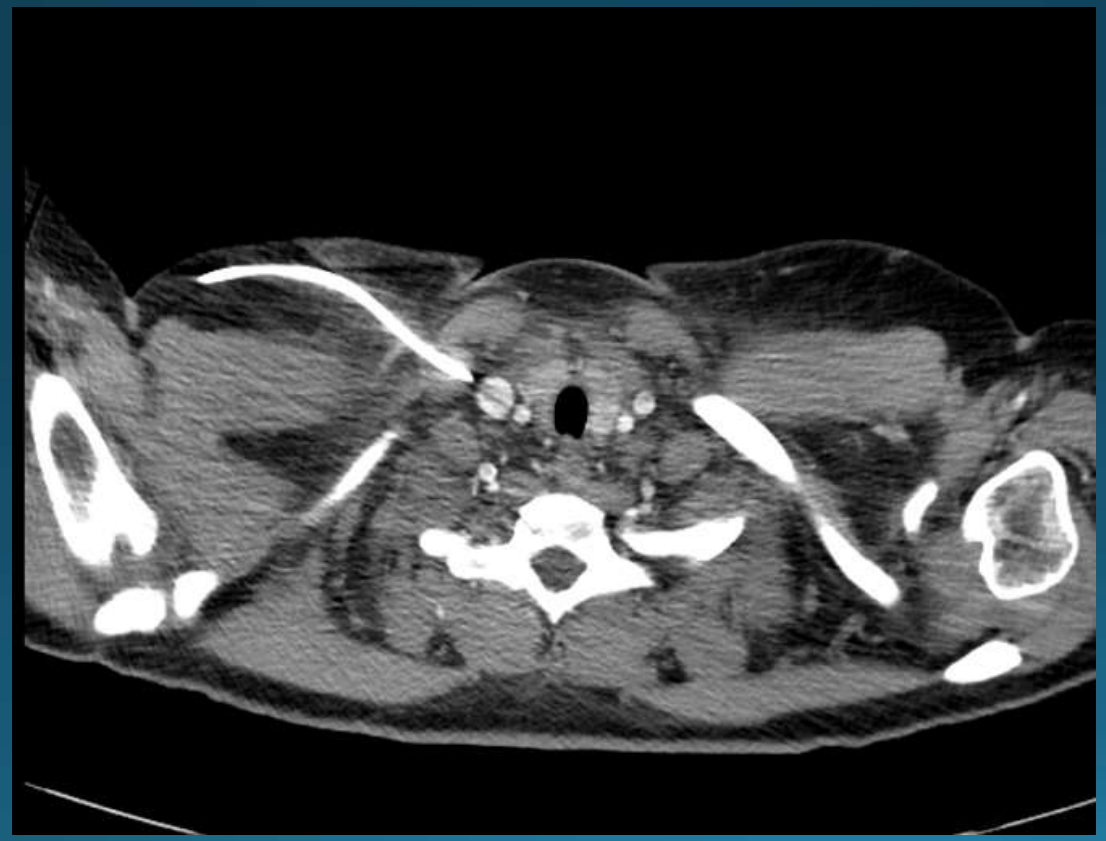
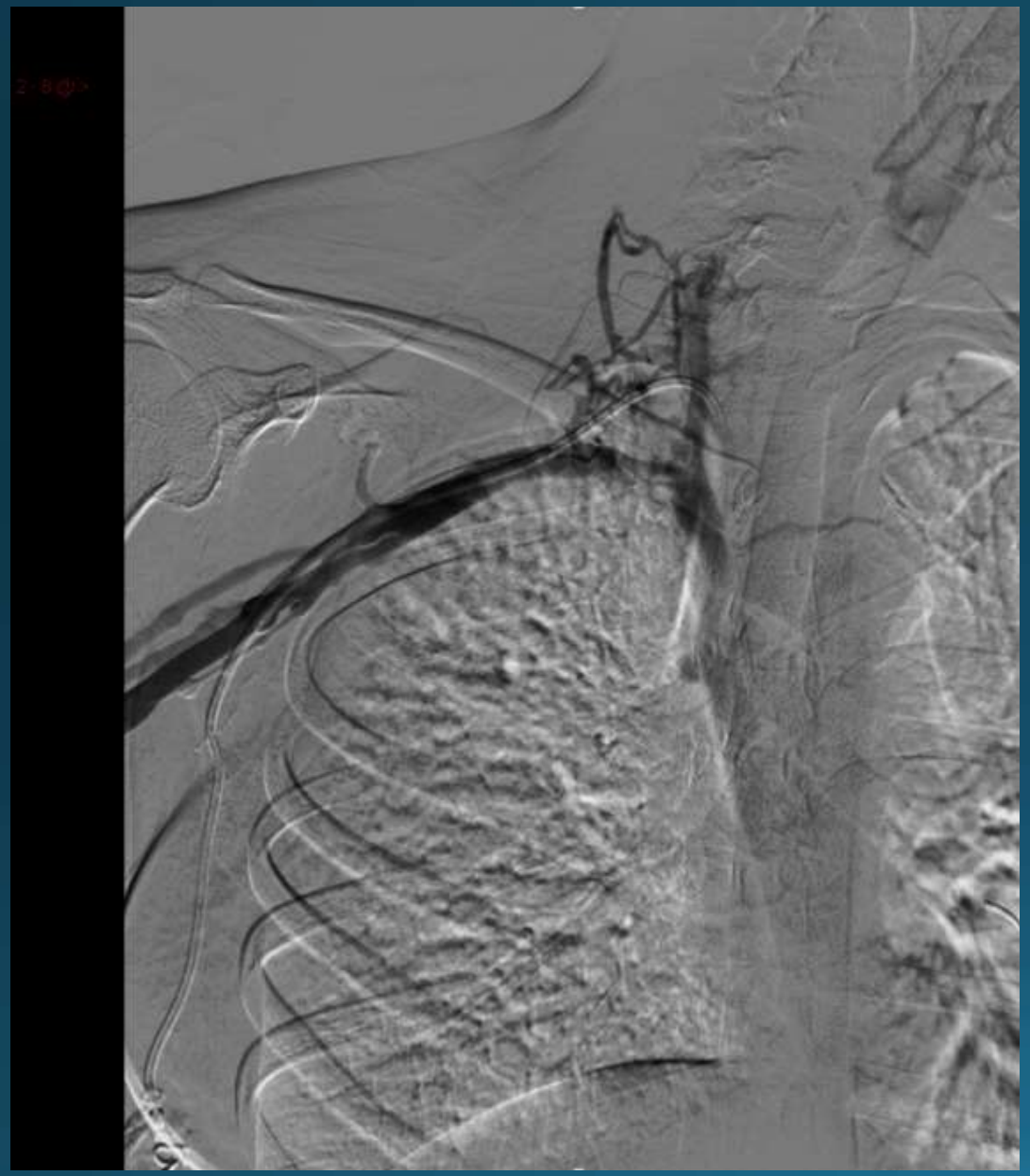
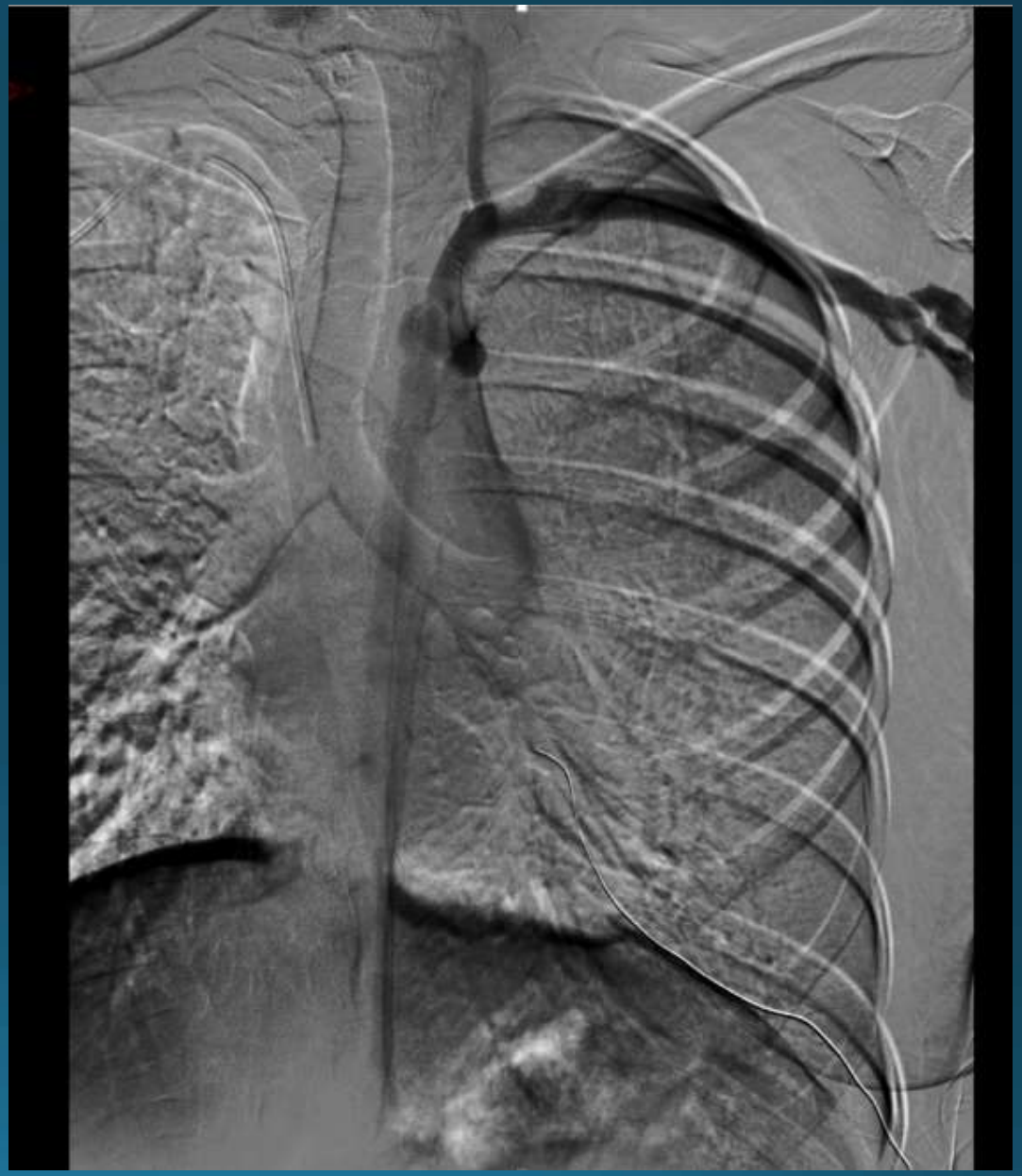
What would you do next

Lab Work

- CT angio (PE protocol) : CT Angio via port: 50% obstruction by a clot with many collaterals







Is it urgent?

- tPa>> Clexan 50mgX2/d
- Normal PT/PTT/Fibrinogen

- Clinical improvement
- D-Dimer 500>> 3000
- Post tPa-LDH-300»836, GOT-232, GPT-40»160, GGT-25»65

- Low Prot S, Prot C, plasminogen
- APCR, B2 glycoprotein, Anticardiolipin- normal

SVC ≠ Slow Vital Capacity

Catheter-related upper extremity venous thrombosis

INTRODUCTION

- IV catheters cause endothelial trauma and inflammation>>venous thrombosis
- 70-80% due to intravenous catheters
- 20-30% mechanical compression
- Deep veins thrombosis (ie, subclavian, axillary, brachial) can lead to pulmonary embolism
- 6% of PE are from upper extremity

EPIDEMIOLOGY AND RISK FACTORS

- **Catheter-related factors** — PICCs, previous DVT, malposition of the catheter tip. The diameter of the catheter relative to the size of the vein, infection

- **Prothrombotic states** — recent surgery, cancer, Thrombiphilia-Factor V Leiden and prothrombin gene mutation, contraceptive

- **Chemical irritation** — KCl, Diazepam, antibiotics (eg, vancomycin), chemotherapy agents

- The incidence per month was 0.2%

CF- Special population !

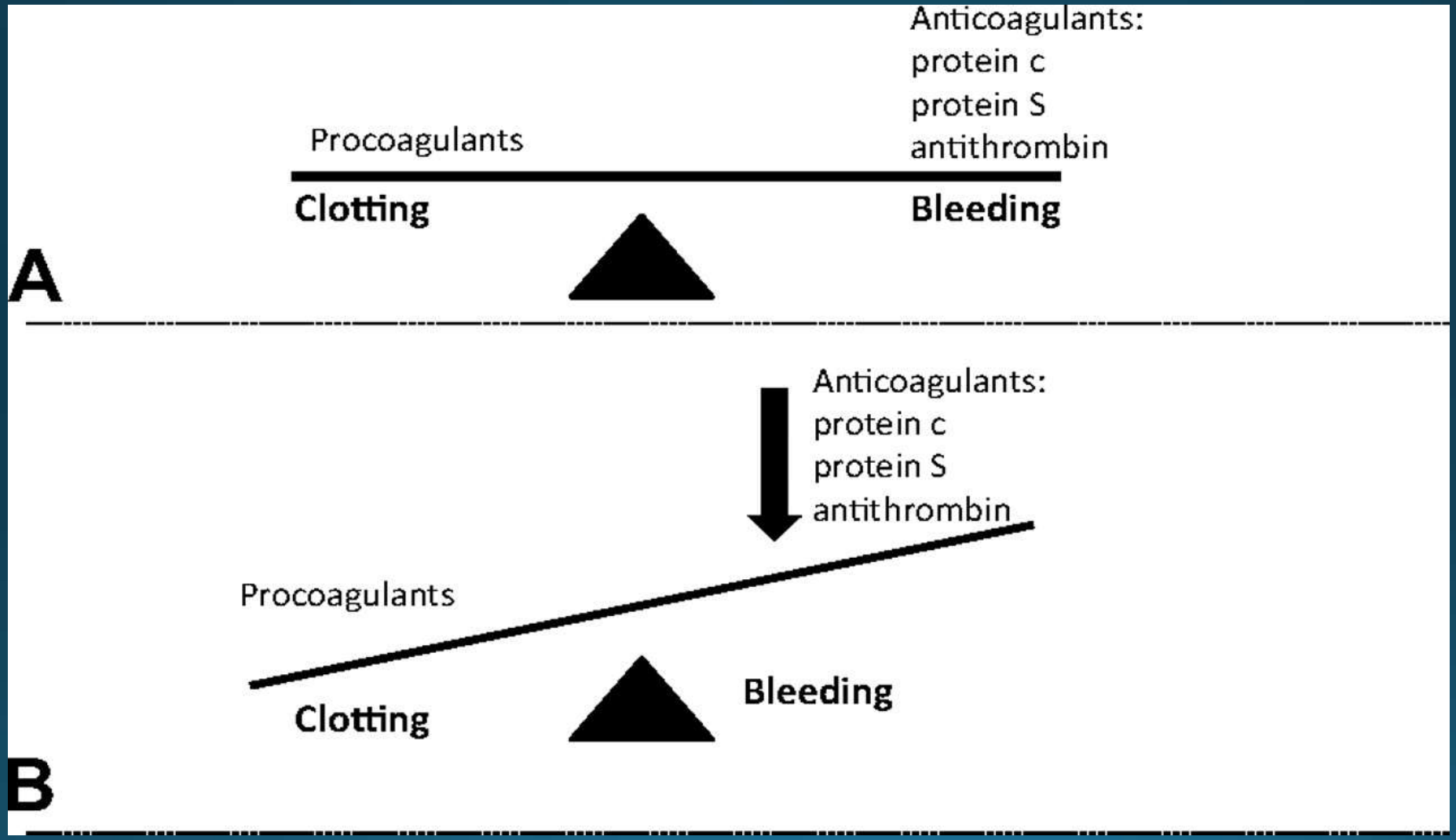
- Central venous catheters
- Acquired thrombophilia
  - Inflamation
  - deficiencies of anticoagulant proteins- Liver dysfunction>Vit K Def>Prot C/S def.

- Complication: DVT, SVC
- Young Age group
- Low compliance

CF- Special population !

- 53% of CF patients have Thrombophilic abnormalities Barker et al
- deficiency of protein C (20%), protein S (30%), presence of anti-phospholipid antibody (APA) (9%)

The normal balance between clotting and bleeding is disrupted when there is a deficiency of one of the natural anticoagulants.



Brea Lipe, and Deborah L. Ornstein Circulation. 2011;124:e365-e368

TABLE 1—Reported Complications of Thrombosis or SVC Syndrome in CF Patients With Totally—Implantable Vascular Access Devices

Reference	Patients (n)	Catheters (n)	Thrombosis		SVC	
			n	% catheters	n	% patients
Stead et al., 1987[16]	9	9	0	0.0	0	0.0
Cassey et al., 1988[12]	13	15	0	0.0	0	0.0
Ball et al., 1989[14]	26	26	0	0.0	0	0.0
Morris et al., 1990[11]	58	68	0	0.0	0	0.0
Sola et al., 1992[8]	15	22	3	13.6	3	20.0
Peckham et al., 1994[9]	1	1	0	0.0	1	100.0
Yung et al., 1996[10]	25	33	3	9.1	0	0.0
Burdon et al., 1998[4]	57	75	0	0.0	0	0.0
Rodgers et al., 1998[15]	42	61	4	6.6	0	0.0
Deerojanawong et al., 1998[13]	44	57	4	9.0	0	0.0
Aitken and Tonelli, 2000[1]	65	87	14	16.1	2	3.1
Kariyawasam et al., 2000[3]	74	115	4	3.5	3	4.1
Munck et al., 2004[2]	315	452	21	4.6	0	0.0
Barker et al., 2005[17]	16	20	5[1]	25.0	0	0.0

[1]Authors did not specifically report occurrence of SVC syndrome, but described two patients with symptoms and radiographic findings suggestive of SVC syndrome.

Garwood et al.

SCV- What is NOT a presenting symptom?

- **Common** complication of Central Venous Catheters
- Asymptomatic
- OSA
- Un-resolving stridor
- protein-losing enteropathy
- lymphadenopathy.

Choni Rinat at al; Complications of central venous stenosis due to permanent central venous catheters in children on hemodialysis. Pediatr Nephrol (2014) 29:2235–2239

Asymptomatic?

30 asymptomatic patients with transvenous pacemaker wires underwent contrast venography. Sticherling C, Am Heart J 2001;141:813–816.

- One patient had complete occlusion of the subclavian vein
- One patient had severe (>90%) stenosis with collateral vessels
- 4 patients (14%) had stenosis of 75-90%
- 11 patients (37%) had stenosis of 50–74%
- and only half had no stenosis (defined as <50%)

SVC- Symptoms & Signs

- Depend on speed of onset
- SOB most common
- Fascial swelling- exacerbation by bending forward or lying down
- Head fullness, Headache: ICP
- Cough, Chest pain, Dysphagia
- Venous distension
- Facial plethora
- Cyanosis
- Upper extremity edema
- Glossal edema
- Dilated vessels of the retina
- Inability to withdraw blood from or infuse into an catheter

SVC- Symptoms & Signs, beyond

- Cough, Chest pain, Dysphagia
- Horner's syndrome, Proptosis
- OSA, Croup
- Lymphadenopathy
- Pemberton Sign
- **Postthrombotic syndrome** (PTS) in DVT 50% w/chronic leg pain, swelling, redness, and ulcers (sores)
- Inability to withdraw blood from or infuse into an catheter
- **Phlebitis-** Induration, erythema, or congestion of tributary veins may be appreciated at the base of the neck, infraclavicular fossa, shoulder…
- **pulmonary emboli** or acute neurologic insult.

A now 15-year-old girl presented with infantile nephrotic syndrome at the age of 1 month. She required CVCs for daily albumin infusion as an infant, for HD when her kidneys failed and again for another HD course once her transplanted kidney failed (overall 3.6 years). An upper arm arteriovenous fistula (AVF) was then constructed. Within the following years new problems appeared:

1. Obstructive sleep apnea (OSA) presented with snoring and restless sleep. Her tonsils were only mildly enlarged and an upper airway radiography revealed no abnormalities. Polysomnography revealed extreme OSA, with 607 apneas, each with a duration of 15–50 s (80 apneas/h; moderate OSA 15–30 apneas/h, severe OSA >30/h) and oxygen desaturation down to 70 %. She was treated with continuous positive airway pressure (CPAP).
2. Glaucoma: Intra-ocular pressure (IOP) was repeatedly found to be normal during 8 years of corticosteroid anti-rejection treatment. Surprisingly, 2.5 years after the discontinuation of this treatment, there was an increase in IOP (22–24 mmHg) which required medical treatment.
3. Lymphadenopathy: Marked painful axillary lymphadenopathy developed in both axillae and neck. Workup for infectious, lymphoproliferative and rheumatological disorders was negative.

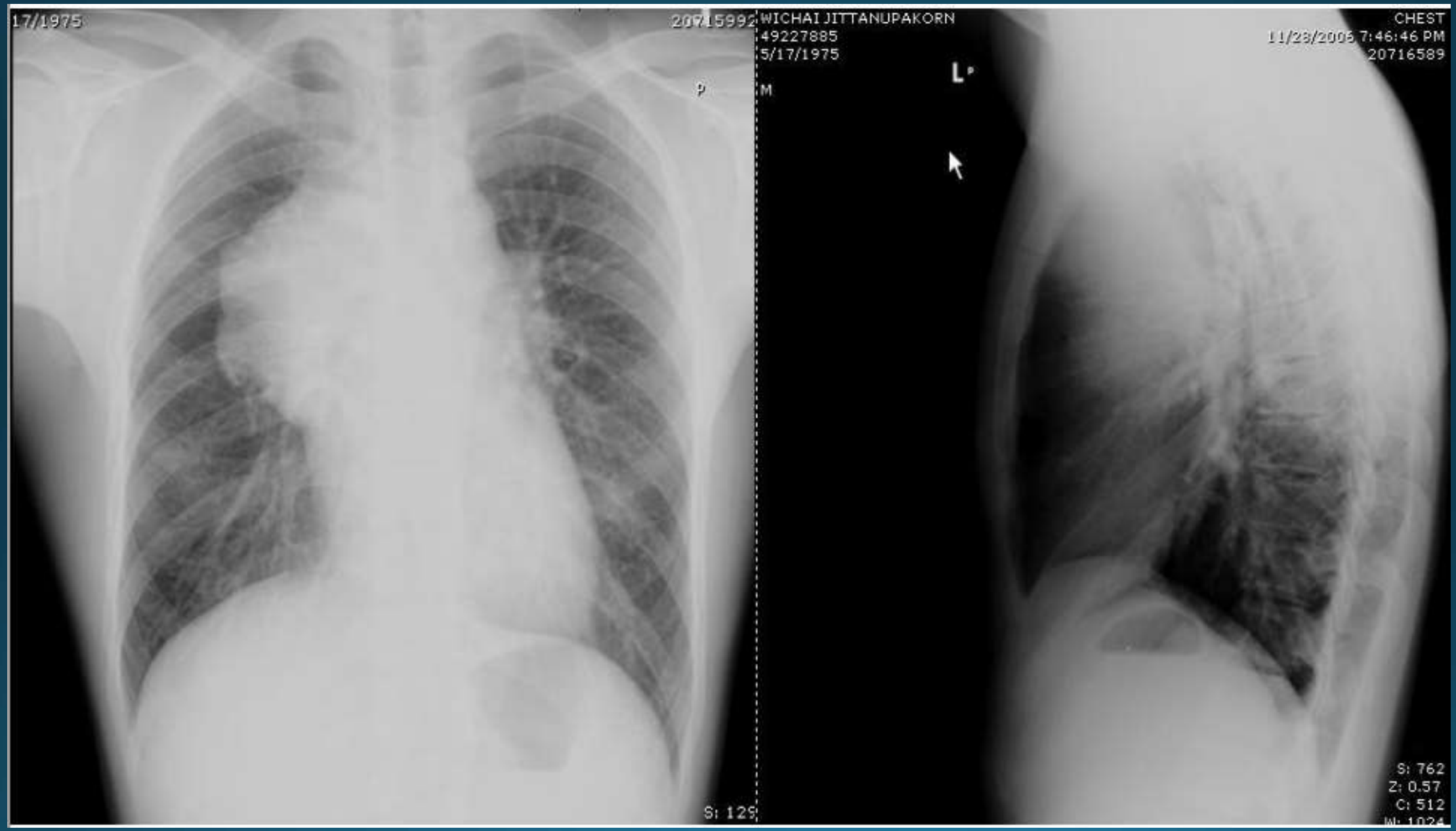
A 6.5-year-old boy had end-stage renal disease (ESRD) in infancy due to dysplastic kidneys. He had been treated with chronic HD since the age of 5 months, overall for 5 years. Facial swelling developed, and venography showed full-length obliteration of the SVC and partial-length obliteration of both innominate veins with many engorged collaterals (Fig. 1a). Renal transplantation was performed at 5.5 years of age, and fluid intake subsequently increased. Marked worsening of his facial edema was noted, and the following signs gradually developed:

1. Increased intracranial pressure (ICP), asymptomatic, manifested as optic disc elevation. No mass lesion was detectable on the magnetic resonance imaging (MRI)/MR angiography scan. Opening cerebrospinal fluid pressures were 50–55 cmH_2O (normal <15 cmH_2O).
2. Recurrent stridor unrelated to upper airway infection.
3. Recurrent right transudative pleural effusion (Fig. 1b).
4. Protein-losing enteropathy (PLE), with a serum albumin concentration of 1.2 g/dl, no proteinuria and stool α1 antitrypsin of >90 mg/dl (normal <27 mg/dl). Cytomegalovirus gastritis as an etiology was ruled out.
5. Lymphadenopathy, cervical and axillary, with no identified etiology.

Diagnostic Evaluation

Diagnosis - Radiographic studies

- **Duplex ultrasonography –for symptomatic!** Noncompressibility of the vein with or without visible intraluminal thrombus is the major criterion for the diagnosis **Sensitivity and specificity 90%** .The chances of a false positive study are very low;
- Venography if US nondiagnostic
- CXR- Mediastinal widening, Pleural effusion
- CT-angio
- MRI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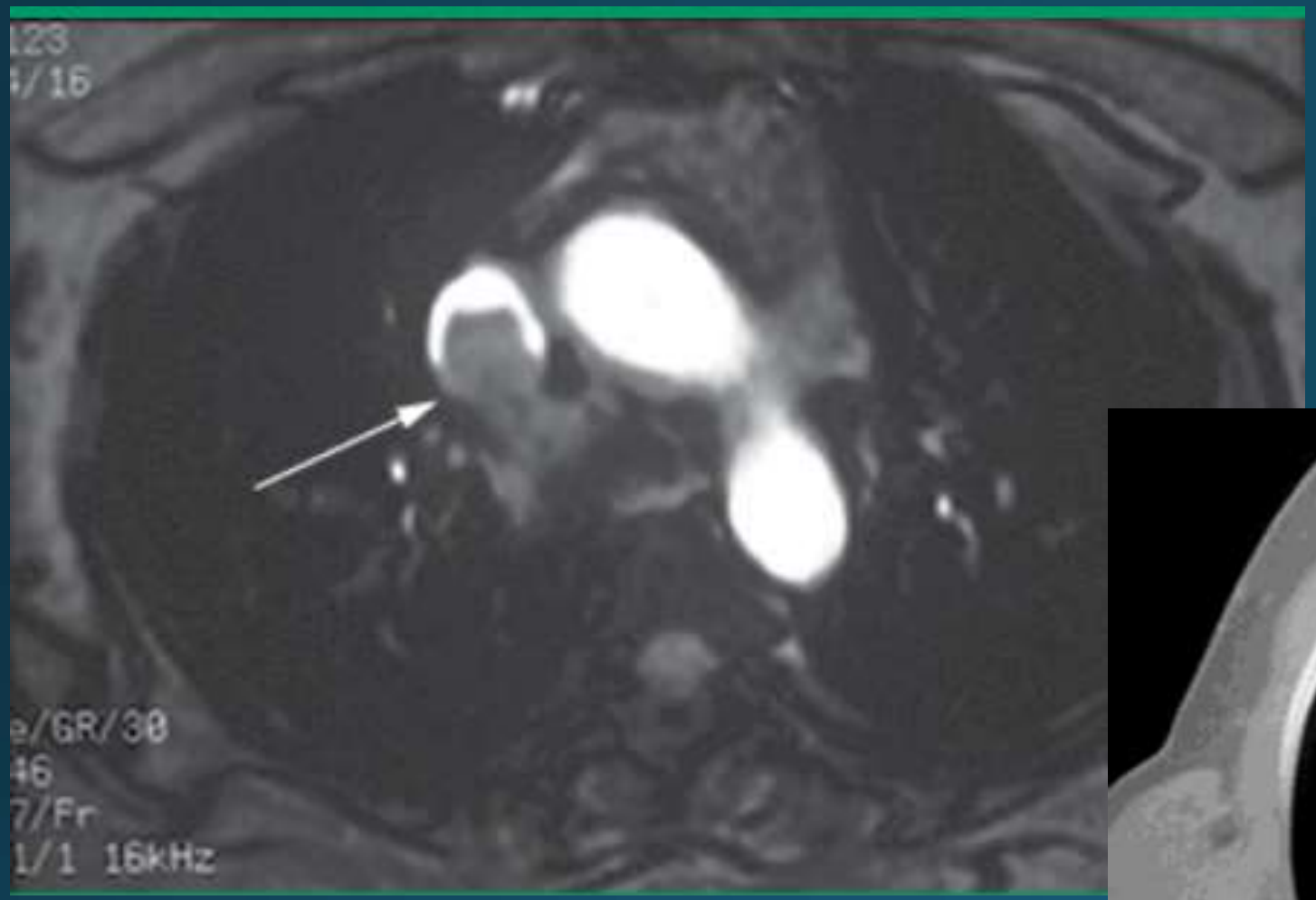

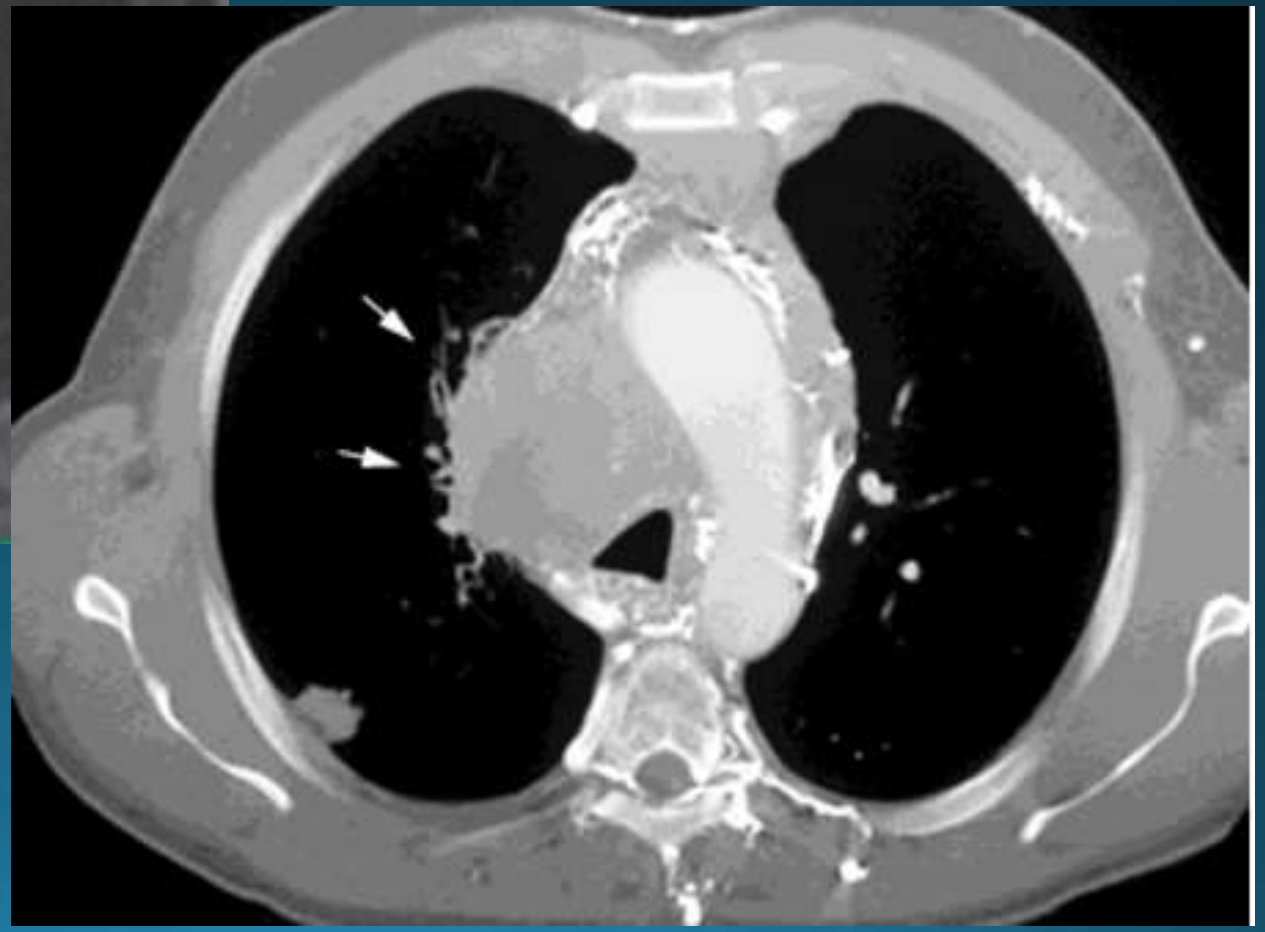

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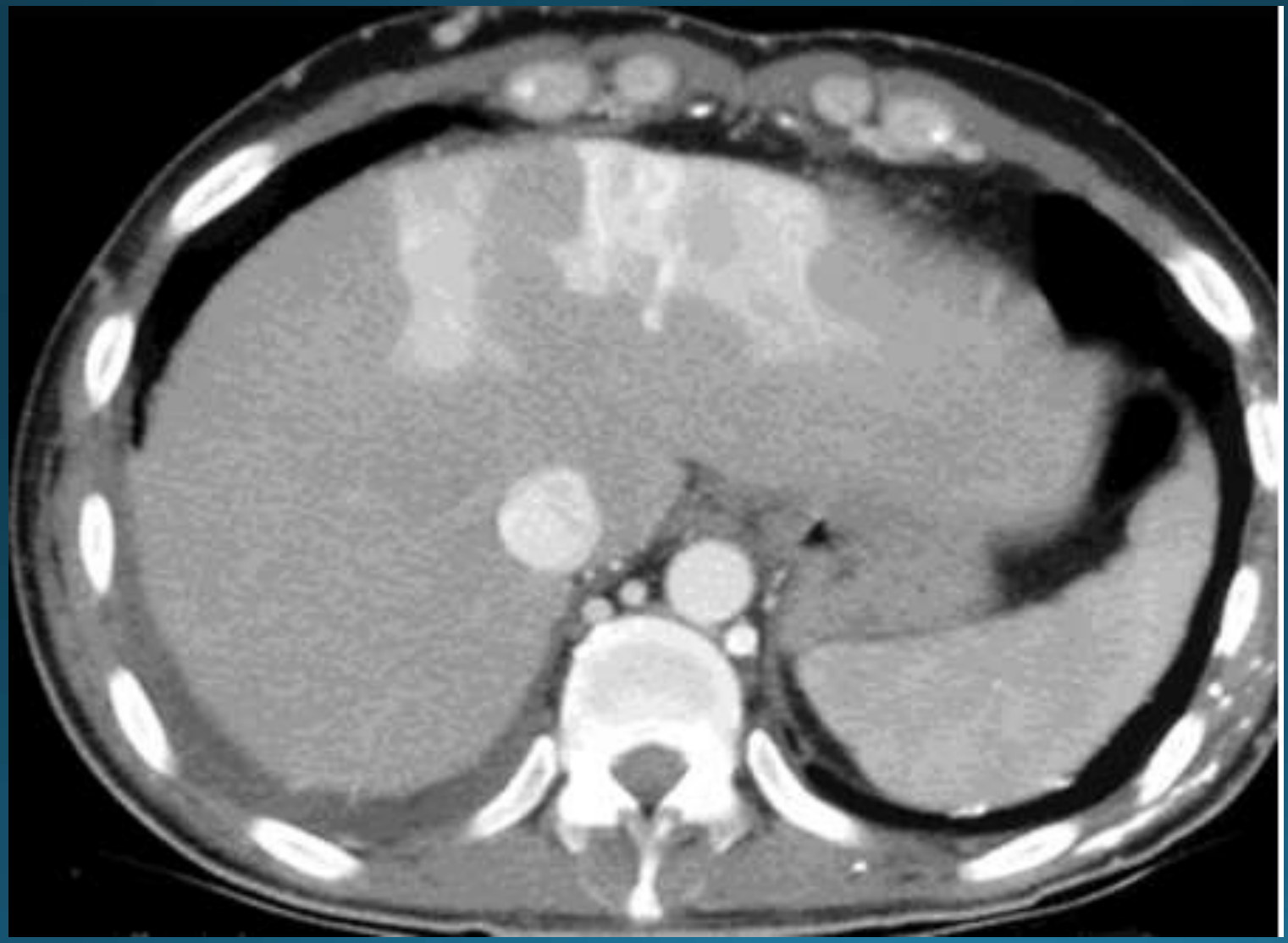
Liver "hot Spot" d/t internal mammary collateral flow



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Grading System for SVC Syndrome

TABLE 2. Proposed Grading System for Superior Vena Cava Syndrome

Grade	Category	Estimated Incidence (%)	Definition[a]
0	Asymptomatic	10	Radiographic superior vena cava obstruction in the absence of symptoms
1	Mild	25	Edema in head or neck (vascular distention), cyanosis, plethora
2	Moderate	50	Edema in head or neck with functional impairment (mild dysphagia, cough, mild or moderate impairment of head, jaw or eyelid movements, visual disturbances caused by ocular edema)
3	Severe	10	Mild or moderate cerebral edema (headache, dizziness) or mild/moderate laryngeal edema or diminished cardiac reserve (syncope after bending)
4	Life-threatening	5	Significant cerebral edema (confusion, obtundation) or significant laryngeal edema (stridor) or significant hemodynamic compromise (syncope without precipitating factors, hypotension, renal insufficiency)
5	Fatal	<1	Death

[a] Each sign or symptom must be thought due to superior vena cava obstruction and the effects of cerebral or laryngeal edema or effects on cardiac function. Symptoms caused by other factors (e.g., vocal cord paralysis, compromise of the tracheobronchial tree, or heart as a result of mass effect) should be not be considered as they are due to mass effect on other organs and not superior vena cava obstruction.

CT Diagnosis of Superior Vena Cava Syndrome: Importance of Collateral Vessels

- It was believed at that time that CT diagnosis of obstruction of the superior vena cava (SVC) or its major tributaries required at least two findings:
- One was lack of (or decreased) opacification of central venous structures distal to the site of obstruction.

  (This may be associated with a visible, obstructing lesion or intraluminal filling defects.)
- The other CT finding was opacification of collateral venous vessels. The fulfillment of either criterion alone was insufficient for an accurate CT diagnosis of venous obstruction.
- **Results of their study: The presence of collateral vessels, regardless of the number and location of the vessels shown on CT scans, was highly accurate as a predictor of superior vena cave syndrome, with a sensitivity of 96% and a specificity of 92%.**
- **The most common site of venous obstruction seen on CT scans was the SVC *(n* = 41), followed by the brachiocephalic vein *(n* = 20) and the jugular vein *(n* = 2).**

KIM ET AL. AJA:161, September1993

Treatment

- Historically- emergency. Today- finding etiology and than…

Treat cause!

- Emergency-
- Stridor! Reflect central airway obstruction

Treatment- for clot

- **Anticoagulant***- LMWH or warfarin for 3-6 mo for "removable risk"

*No treatment scheme has been rigorously evaluated for its efficacy in preventing embolization from upper extremity sources

- **Fibrinolysis**-t-PA/Urokinase. acute stages of thrombosis (< 14 d), low risk for bleeding, lifestyles require vigorous use of the affected arm. 1-2X2 mg of t-PA over 30-120 m
- **IVC Filter , Thrombectomy ?**
- Phlebitis- Symptomatic. elevation, warm or cool compresses, NSAID

- **No prophylactic! Grade 1A. If Cancer Grade 2A**
- **No fibrinolysis as a first line therapy- 2c**

Prevention?

- Anticoagulant prophylaxis at time of cath insertion . Munck A, Follow-up
- of 452 totally implantable vascular devices in cystic fibrosis patients. Eur Respir J 2004;23:430–434.

- Aspirin therapy in all patients without coagulopathy or liver disease. Sola JE. Atypical thrombotic and septic complications of totally implantable venous access devices in patients with cystic fibrosis. Pediatr Pulmonol 1992;14: .242–239

- Low-dose warfarin (1 mg/day) decreased the incidence of vascular thrombosis from 38% to 10% in an oncology cohort. Bern MM, Ann Intern Med 1990;112:423–428.

Future Manegment?

- Ensure mobility and adequate hydration.
- Extra precautions and short-term thromboprophylaxis may be needed at times of increased risk - eg, surgery, immobility, pregnancy and postnatal.
- Avoid oestrogen-containing contraceptives and HRT:
  - These increase VTE risk (the extent of risk depending on the nature of the thrombophilia) - and should generally be avoided.
  - Progestogen-only contraceptives can be used.
- Pre-pregnancy counselling.[14]