Port of Entry

Dr Du Qian
Intensive Care Unit
HKU-SZH

Our patient

F/35

- Chief complaint: vomit x 3/7, fever x 1/7
- 3 Jan 2016: admitted to Oncology
- Past medical history:

1. Right breast invasive ductal carcinoma (T2N1M0)
   - ER+/PR+/Her-2(-)
   - SPECT: no distant metastasis
   - 17 Dec 2015: right jugular vein port implanted
   - 21 Dec 2015: first cycle of chemotherapy given

2. HBV carrier, on Entecavir

Our patient

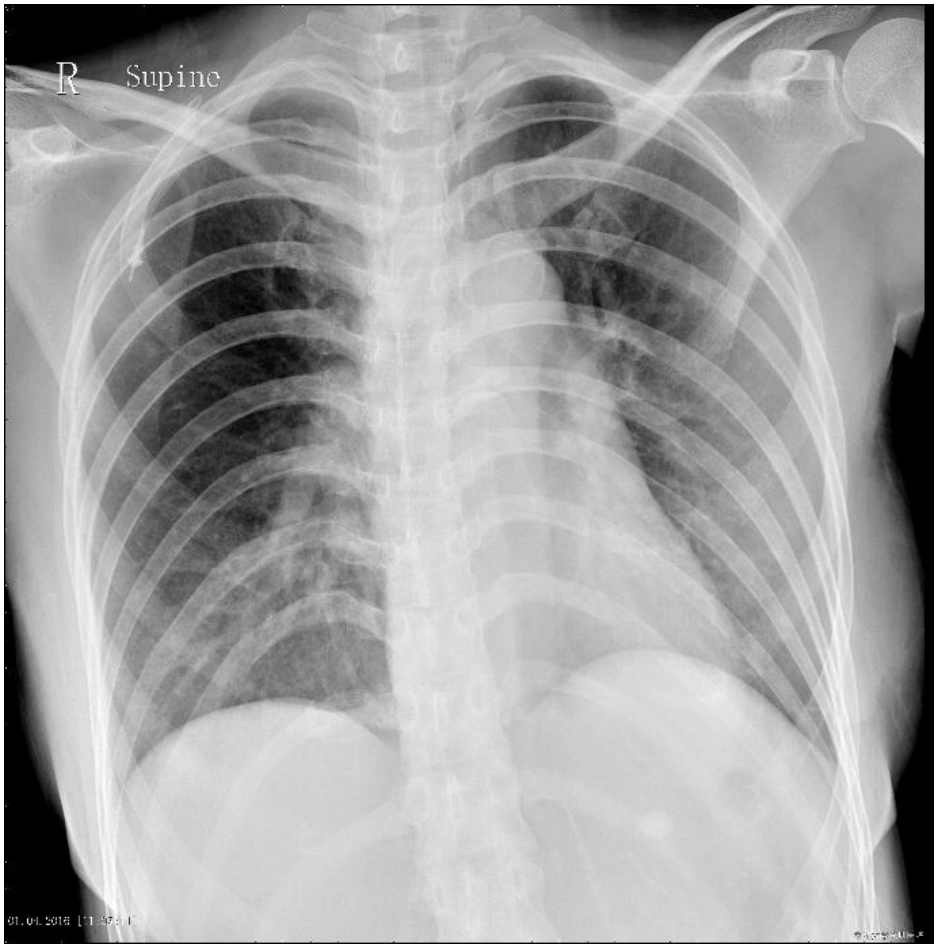
- Physical examination:
  - Temp: 39.4℃, HR 116bpm, BP 99/68mmHg
  - GCS 15
  - Right breast:
    - 4x3.5cm mass in outer upper quadrant, not tender, boundary not clear.
    - 2x2cm mass in outer lower quadrant near nipple.
  - Enlarged LNs in right axilla
  - Skin over Implanted port: red and swollen, tender, warm

Our patient

Investigation:

- CRP 254mg/L, PCT 0.44ng/mL
- WBC 2.69, NEUT 1.84
- PLT normal
- LFT, RFT: normal

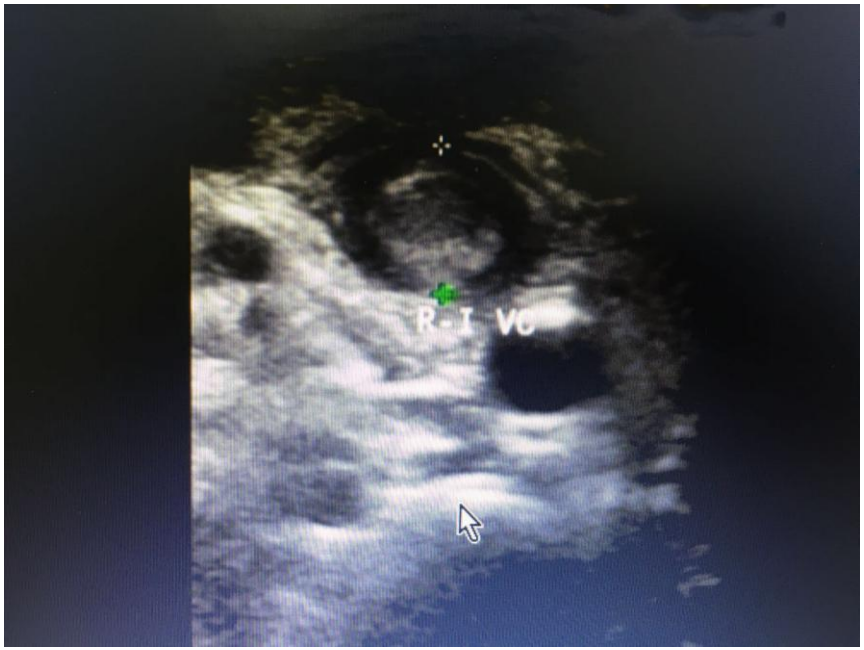
CXR

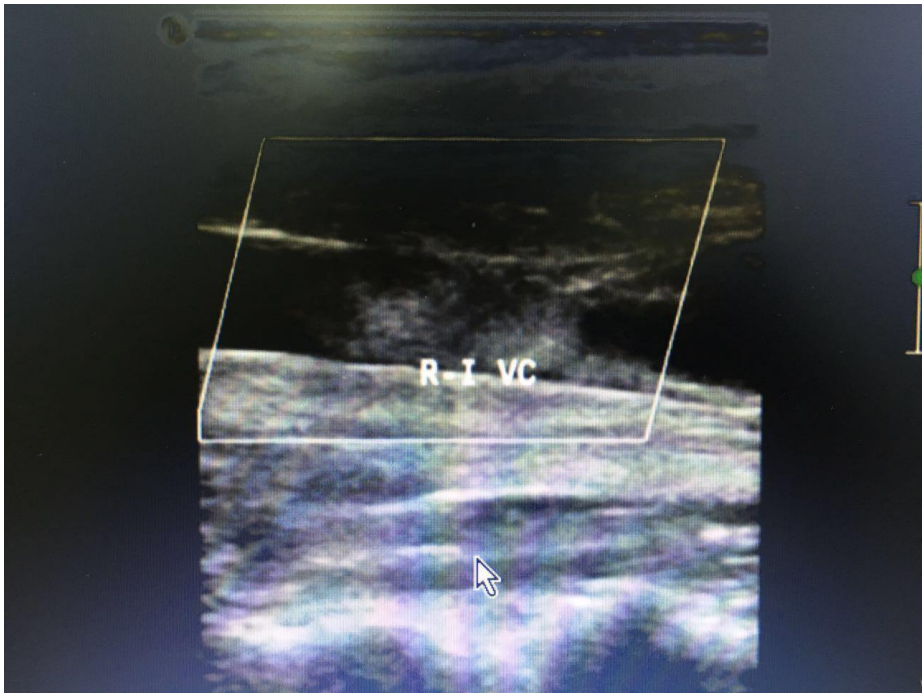


Care in Oncology

- 3 Jan: Augmentin
- 5 Jan:
  - Blood cultures taken on 3 Jan: MSSA
  - Change to Cefazolin
  - Remove implanted port: yielded pus
- 8 Jan:
  - Ultrasound: clot in the right jugular vein
  - Started LMWH

clot in the right jugular vein

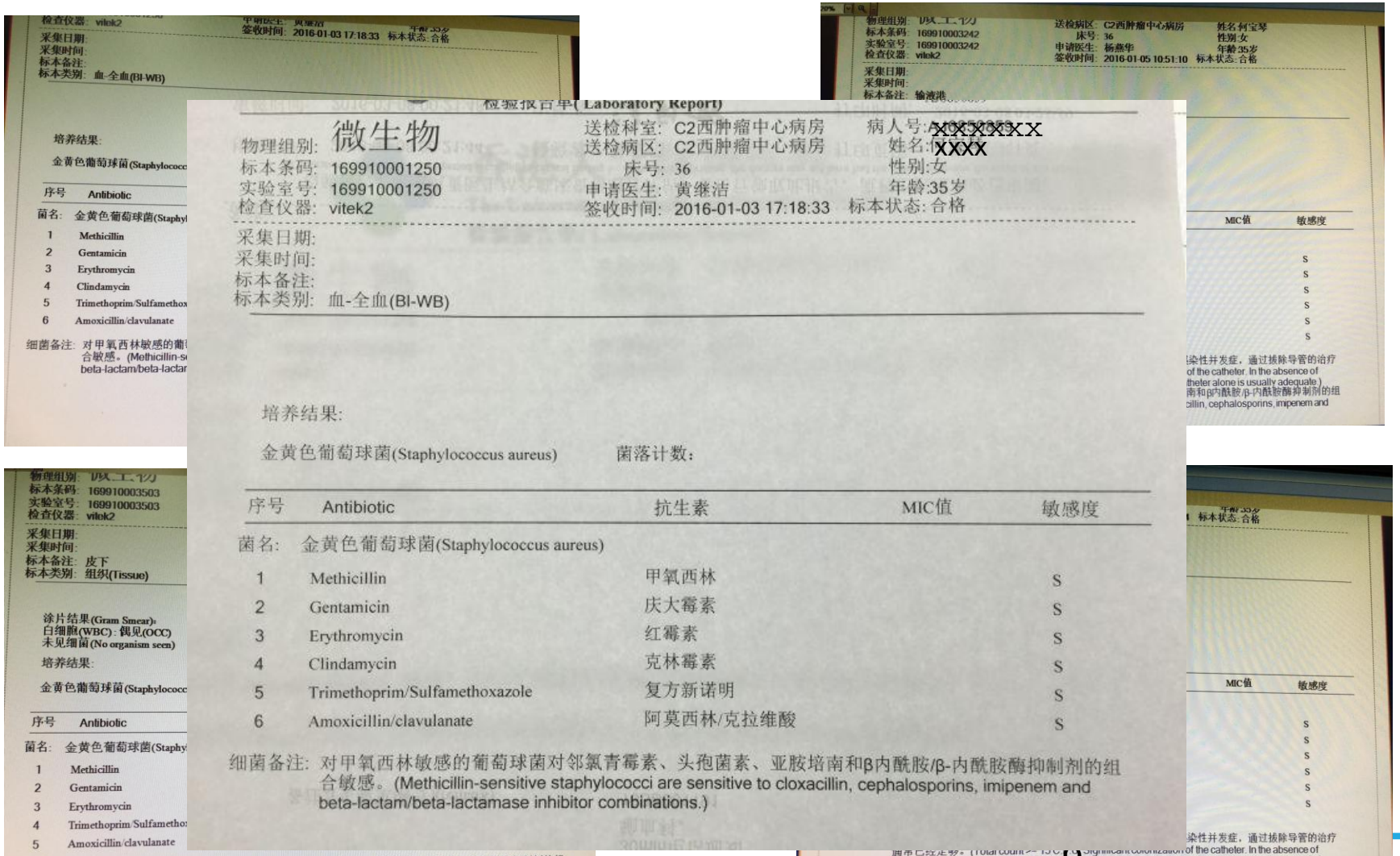




Care in Oncology

- Port catheter tip and reservoir culture: MSSA
- Blood culture taken on 8 Jan: MSSA

Blood culture



检验报告单(Laboratory Report)

物理组别: 微生物	送检科室: C2西肿瘤中心病房	病人号: XXXXXXXX	
标本条码: 169910001250	送检病区: C2西肿瘤中心病房	姓名: XXXX	
实验室号: 169910001250	床号: 36	性别:女	
检查仪器: vitek2	申请医生: 黄继洁	年龄:35岁	
	签收时间: 2016-01-03 17:18:33	标本状态: 合格	

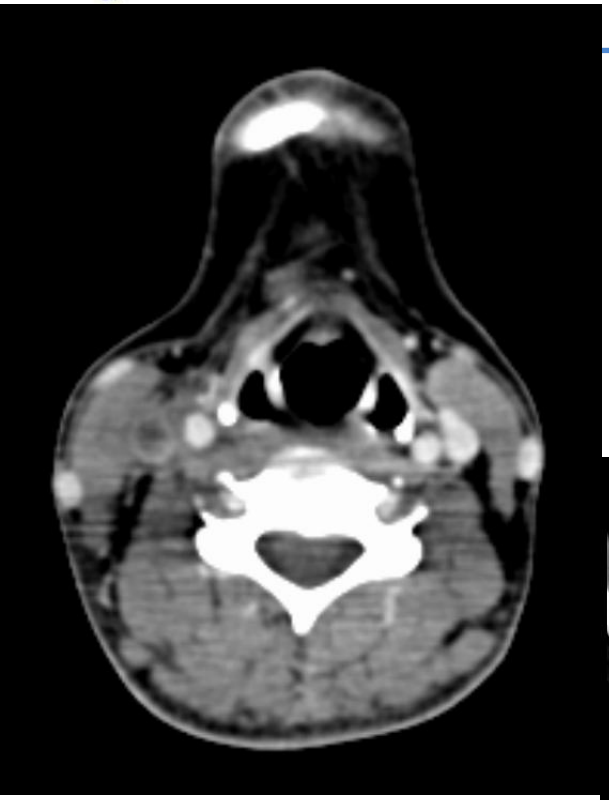
采集日期:
采集时间:
标本备注:
标本类别: 血-全血(BI-WB)

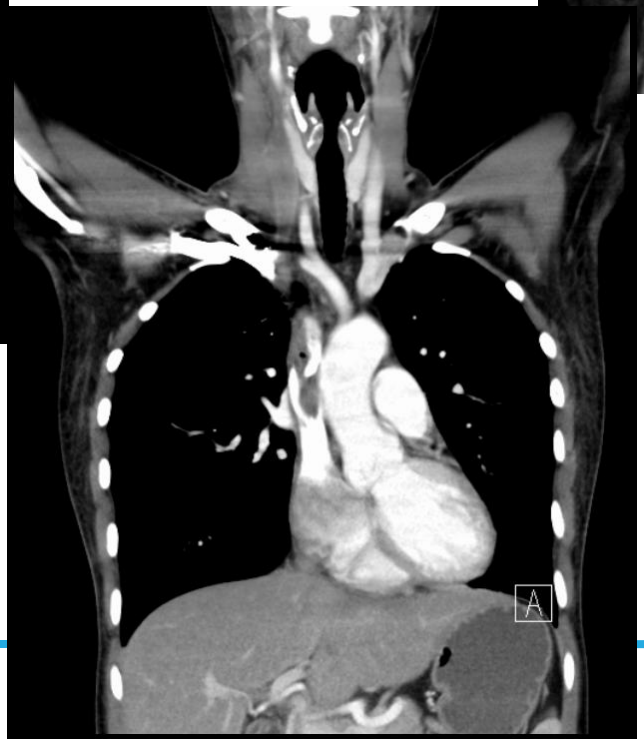
培养结果:

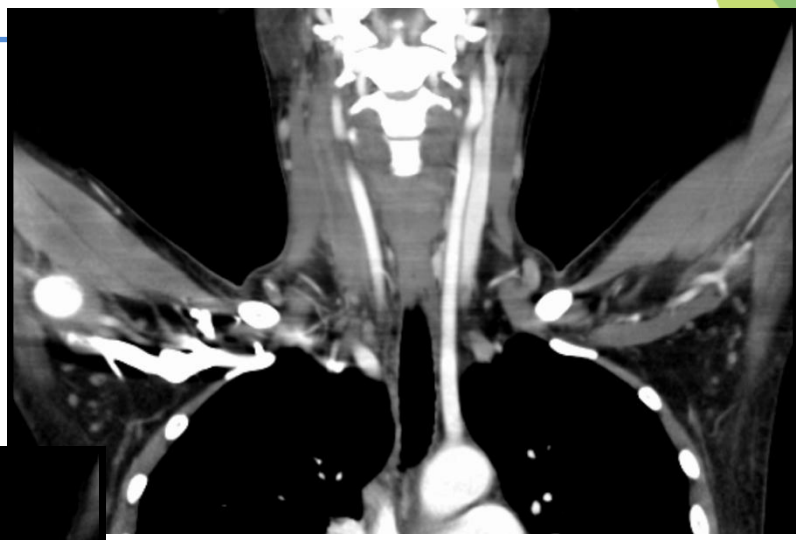
金黄色葡萄球菌(Staphylococcus aureus) 菌落计数:

序号	Antibiotic	抗生素	MIC值	敏感度
菌名:	金黄色葡萄球菌(Staphylococcus aureus)			
1	Methicillin	甲氧西林		S
2	Gentamicin	庆大霉素		S
3	Erythromycin	红霉素		S
4	Clindamycin	克林霉素		S
5	Trimethoprim/Sulfamethoxazole	复方新诺明		S
6	Amoxicillin/clavulanate	阿莫西林/克拉维酸		S

细菌备注: 对甲氧西林敏感的葡萄球菌对邻氯青霉素、头孢菌素、亚胺培南和β内酰胺/β-内酰胺酶抑制剂的组合敏感。(Methicillin-sensitive staphylococci are sensitive to cloxacillin, cephalosporins, imipenem and beta-lactam/beta-lactamase inhibitor combinations.)



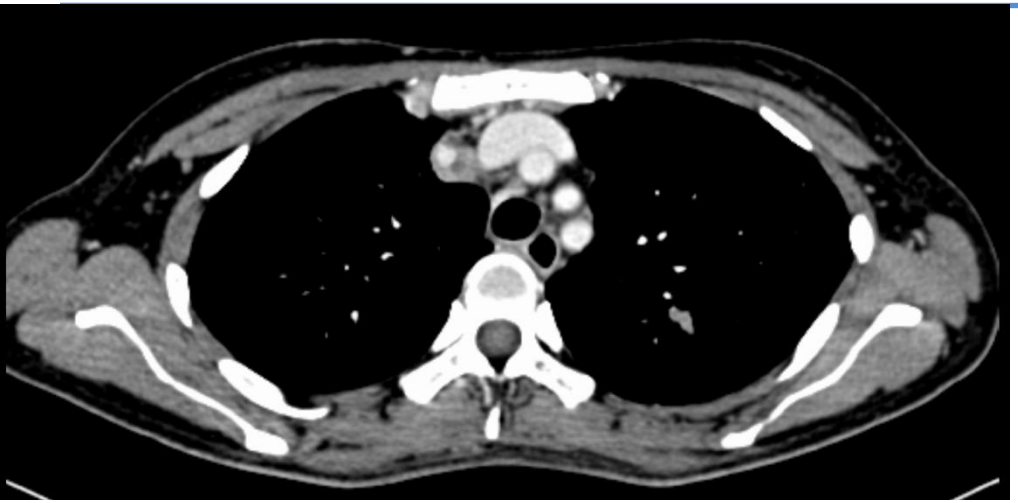


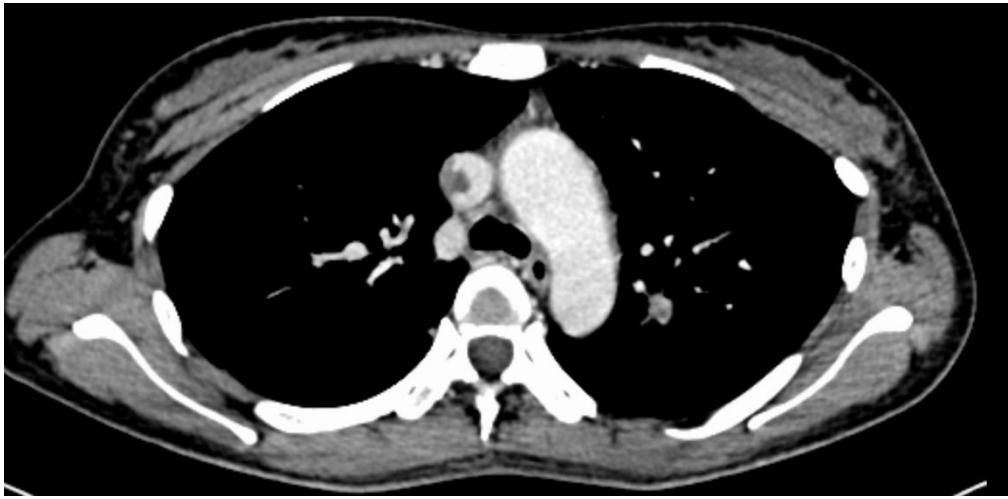


Thrombus in
right internal jugular vein
and
superior vena cava

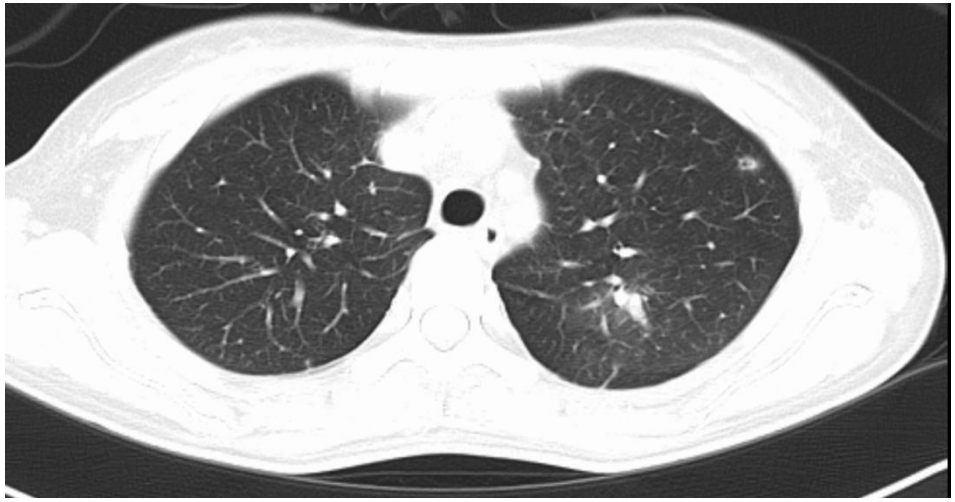
香港大学深圳医院
The University of Hong Kong-Shenzhen Hospital

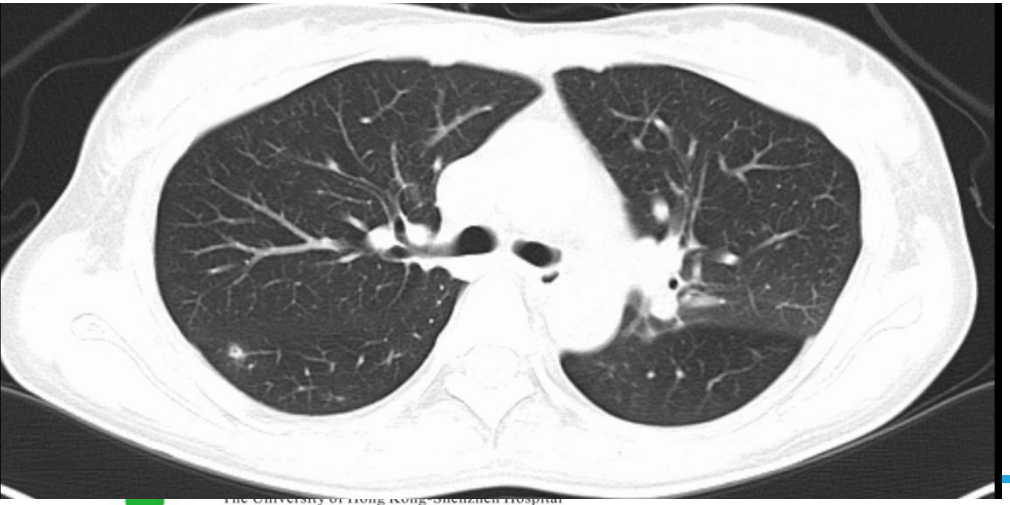
CT Thorax

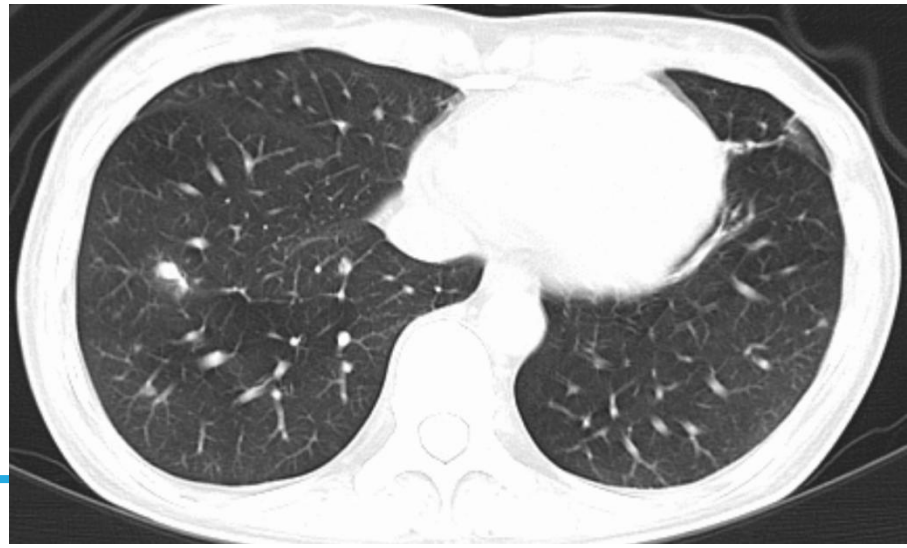




CT Thorax



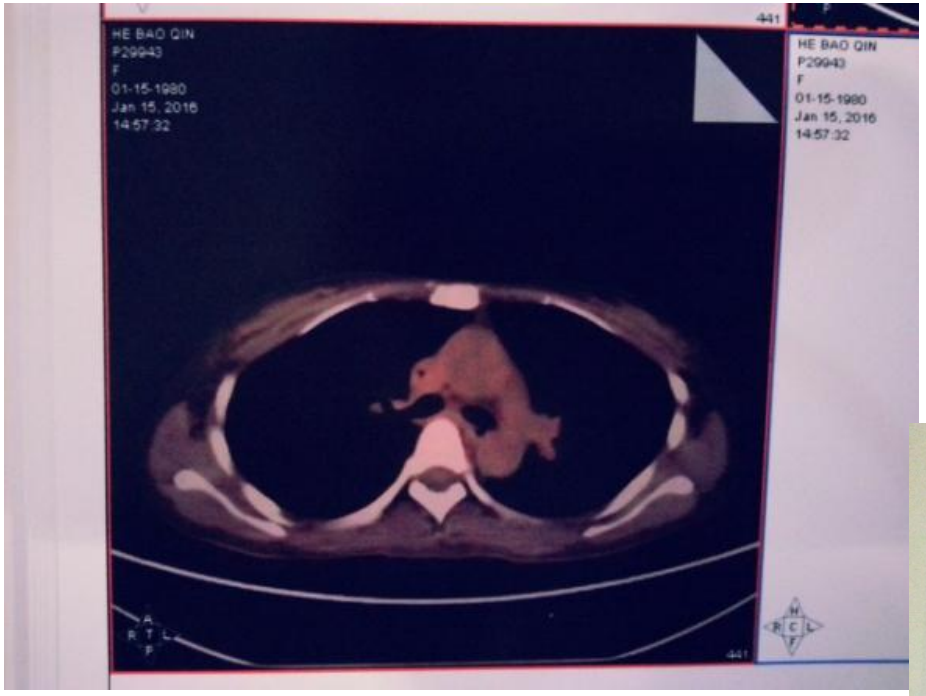




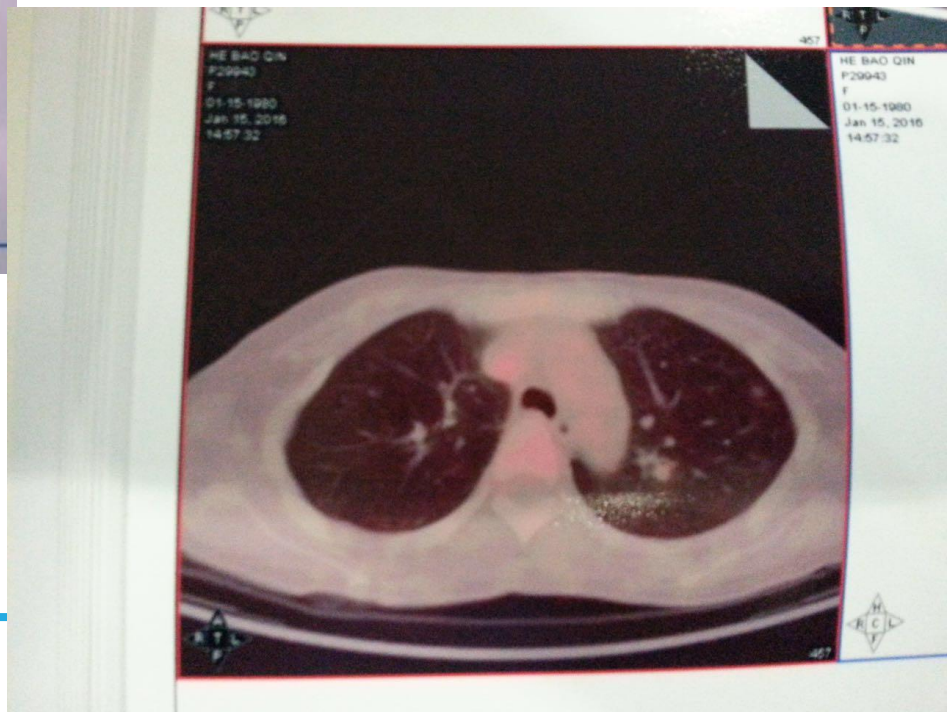
ICU care

- On 12 Jan: persistent fever and hypotension
  - Transthoracic Echocardiogram: no vegetations
- 15 Jan:
  - PET-CT
  - Transesophageal echocardiogram
    - No vegetation

PET-CT



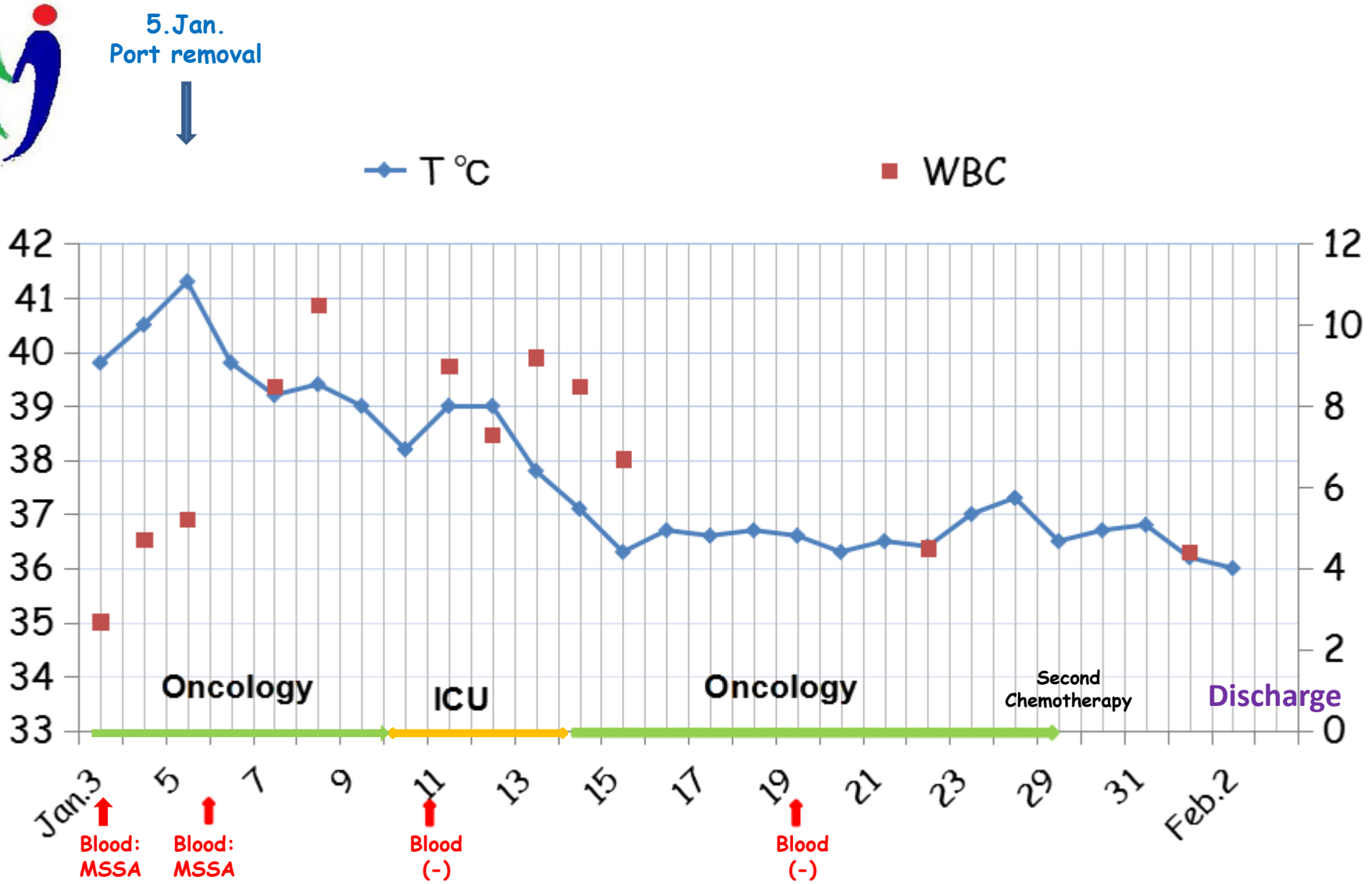
Higher radioactivity uptake in the superior vena cava



Multiple bilateral pulmonary nodules, some with increased metabolism.
? infection or metastasis

ICU care

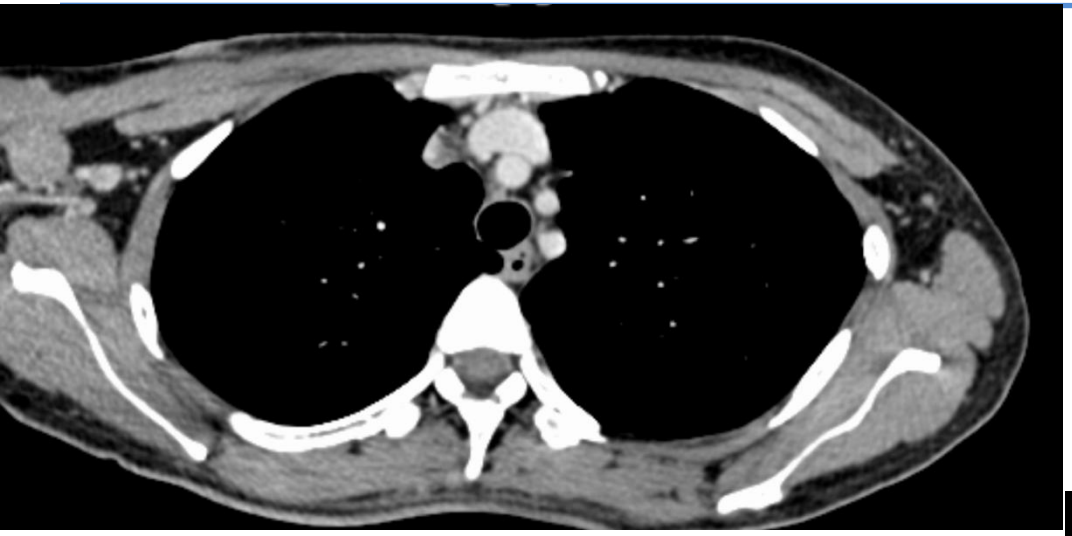
- Transesophageal echocardiogram on 15 Jan: no vegetation
- Continue Flucloxacillin iv
- Sepsis control improved and transferred to Oncology on 16 Jan

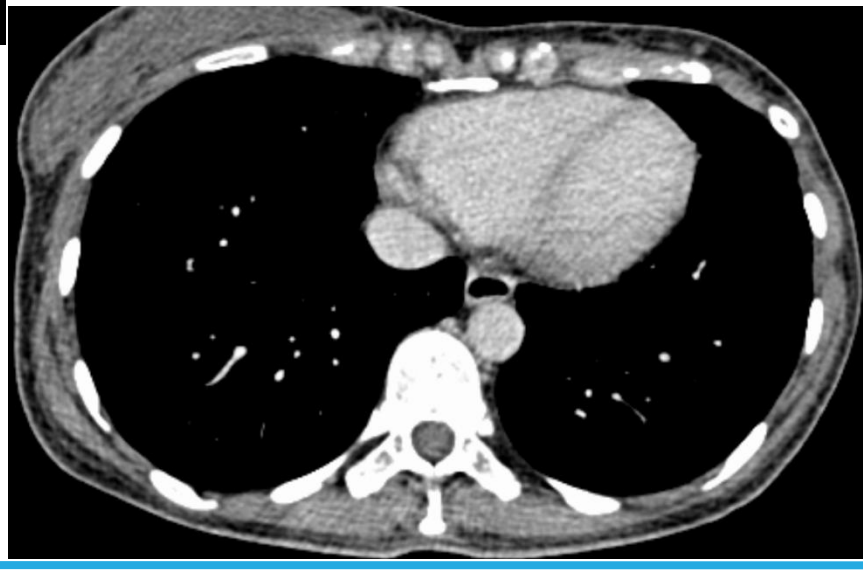

5.Jan.
Port removal
T ℃
WBC
42
41
40
39
38
37
36
35
34
33
12
10
8
6
4
2
0
Oncology
ICU
Oncology
Second Chemotherapy
Discharge
Jan.3
5
7
9
11
13
15
17
19
21
23
29
31
Feb.2
Blood: MSSA
Blood: MSSA
Blood (-)
Blood (-)
Augmentin
cefazolin
Flucloxacillin （11 Jan - 1 Feb）
LMWH

Oncology care

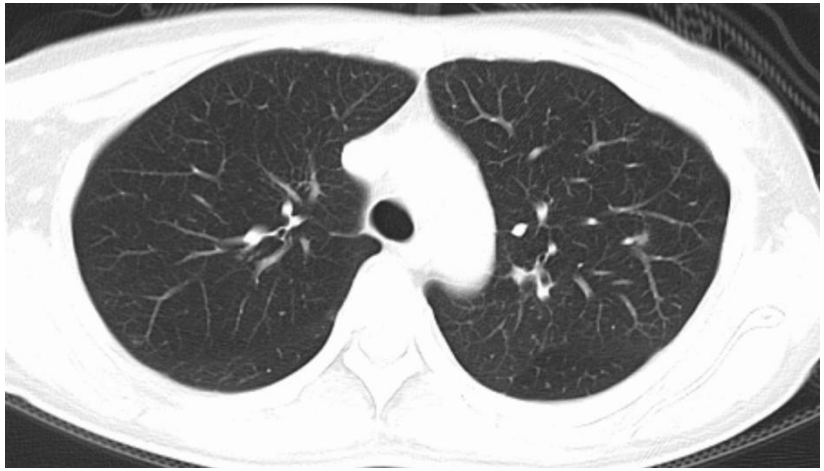
- 28 Jan: CT repeated
  - Pulmonary embolism: improving
  - multiple nodules in both lung: improving
  - thrombus in right jugular and superior vena cava: improving

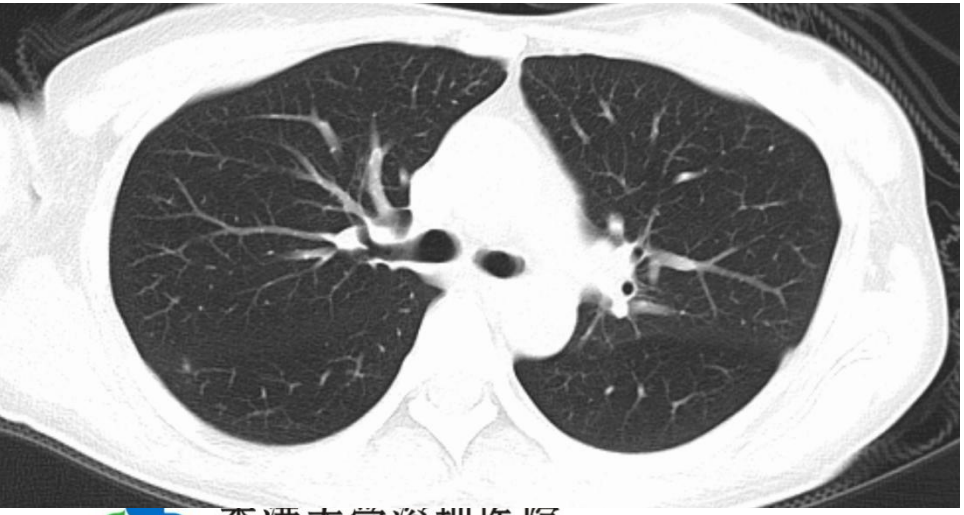
Pulmonary embolism: improving

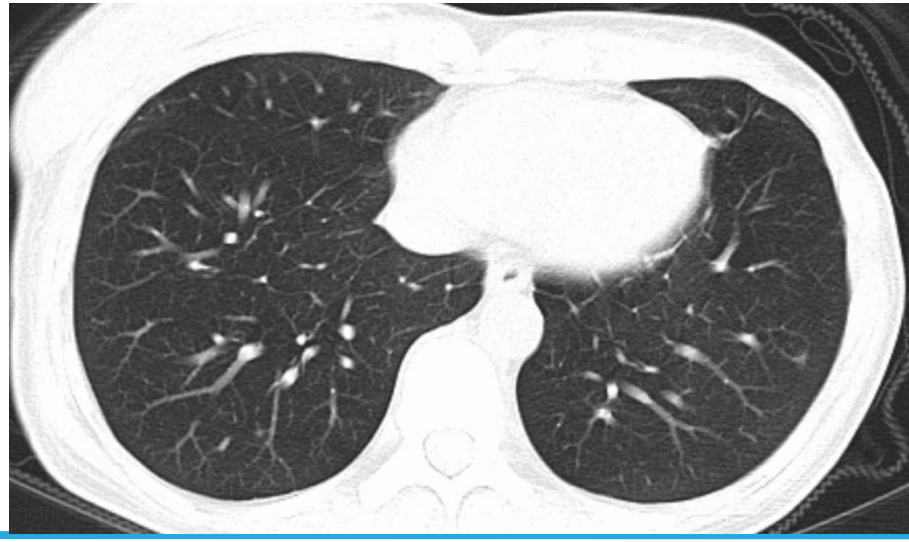




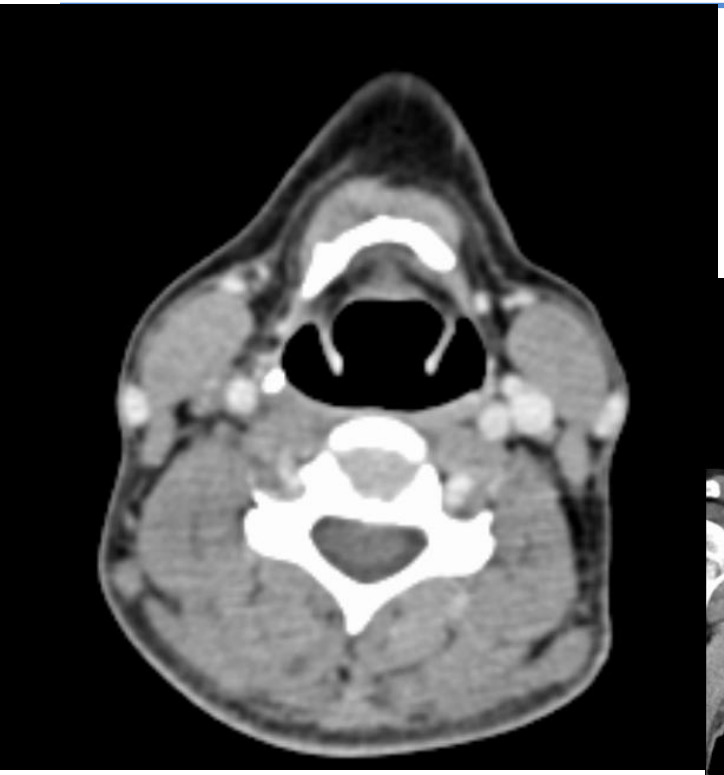
Multiple nodules in both lung: improving

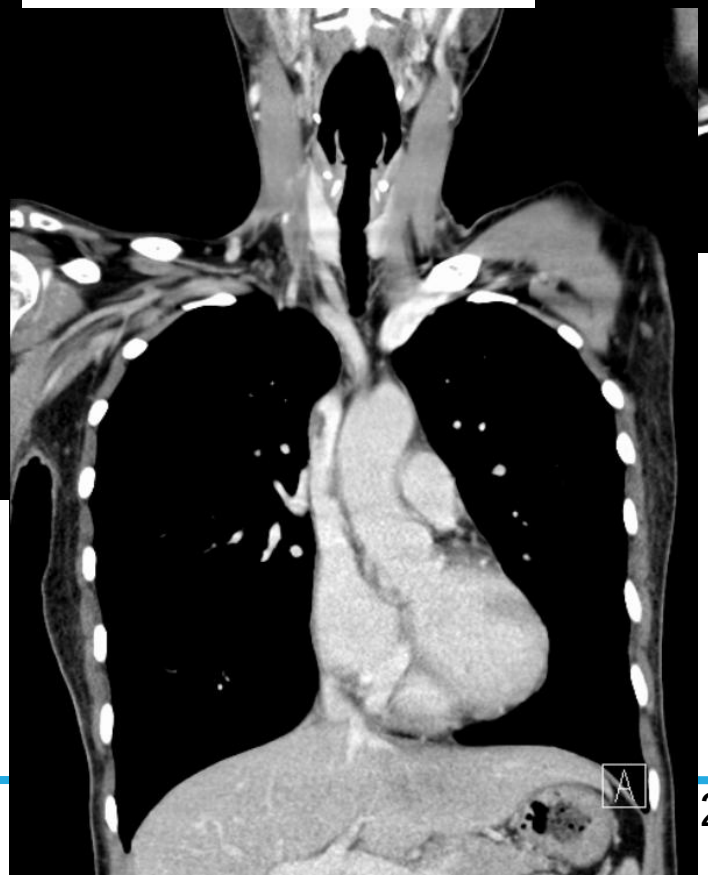


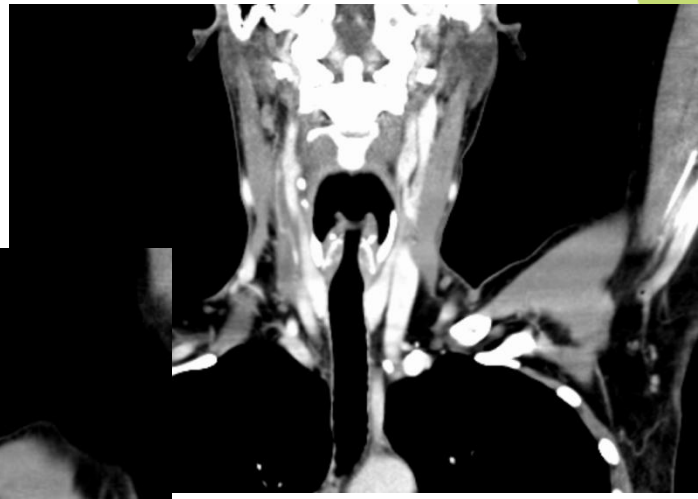




Thrombus in right internal jugular and superior vena cava: improving







Oncology care

- Flucloxacillin for another 3 weeks（11 Jan - 1 Feb）
- 2 Feb:
  - Second dose of chemotherapy
  - Refused PICC insertion
- Enoxaparin: from 8 Jan and continued

Case Summary

- Right breast invasive carcinoma,
  ER+/PR+/Her-2(-),cT2N1M0,IIB, with implanted port in-situ
- MSSA bacteremia, related to port pocket infection
- Suppurative thrombophlebitis of Right jugular vein and superior vena cava, with pulmonary embolism

Suppurative thrombophlebitis

Diganosis:

- Requires
  - Presence of positive blood culture results
  - Plus demonstration of thrombus by radiographic testing (e.g., computed tomography, ultrasonography, or other methods) (A-II)

Clinical Practice Guidelines for the Diagnosis and Management of Intravascular Catheter-Related Infection: 2009 Update by the Infectious Diseases Society of America *Clin Infect Dis. 2009 July 1; 49(1): 1–45.doi:10.1086/599376*

Suppurative thrombophlebitis

- First formally reported by Prof Lemierre in 1936

THE LANCET] [MARCH 28, 1936

ADDRESSES AND ORIGINAL ARTICLES

ON CERTAIN SEPTICÆMIAS DUE TO ANAEROBIC ORGANISMS *

BY A. LEMIERRE, M.D.
PROFESSOR OF BACTERIOLOGY IN THE FACULTY OF MEDICINE, PARIS; PHYSICIAN TO THE CLAUDE BERNARD HOSPITAL

THE septicæmias dealt with in this address arise physicians, including Buigold, Fränkel, Claus, and Kissling. The name given by them to the usual causal organism of such septicæmias is *Bacillus symbiophiles*, and they state that it is usually associated with an anaerobic streptococcus. The present incertitude concerning the classification of anaerobic organisms and the diversity of bacteriological tests employed by different observers to identify them make it possible that *B. funduliformis*

Lemierre's Syndrome

- Report of Prof Lemierre
  - "anaerobic postanginal septicaemias"
  - Group of young, healthy patients
    - *B. fundiliformis (F. necrophorum)*
    - tonsillitis
    - suppurative thrombophlebitis
    - distant metastatic abscess :

      especially to lung (triad of pleuritic chest pain, dyspnea and hemoptysis), also joint

Lemierre's syndrome

- High mortality (pre-antibiotic era)
  - Mass production of penicillin after 1940
  - Metronidazole discovered after 1960
- Incidence dropped dramatically after 1960s,
  - "A forgotten disease"
  - Incidence rises recently but still uncommon
- A rare, but life threatening illness.

Laryngoscope, 125:863–868, 2015

Lemierre's Syndrome – still exists

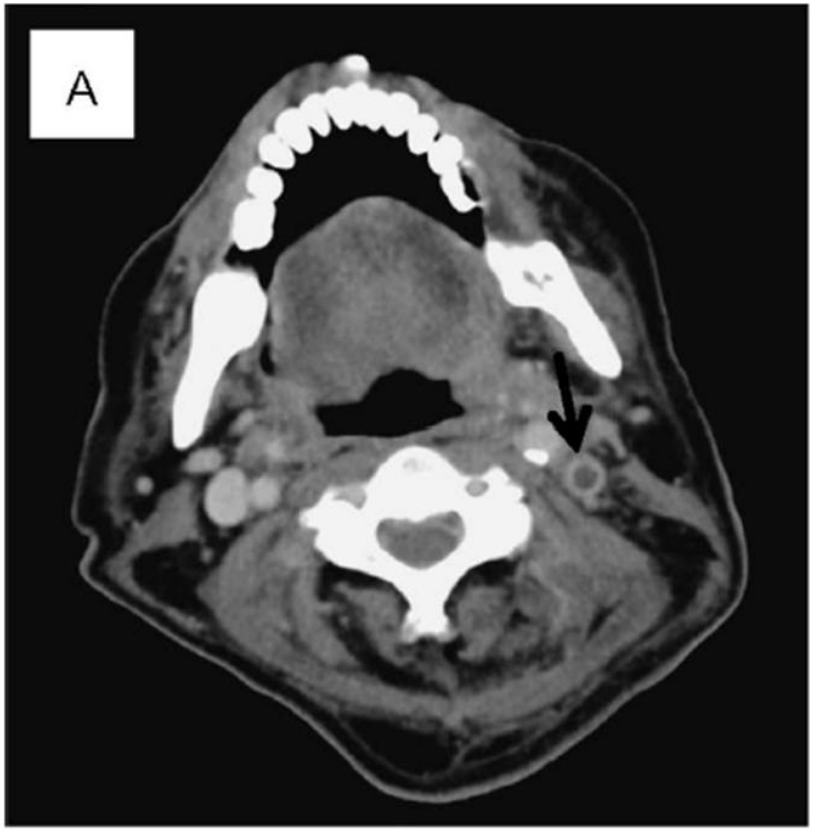
TABLE II.

Intensive Care Data of Patients: Indication for Intensive Care, Requirement of Intubation and Its Duration, Requirement of Vasoactive Medication or Reanimation, and Length of Stay in the ICU.

Patient	Indication	Intubation (days)	Vasoactives	ICU Stay (days)
2	Respiratory failure	16	yes	17
3	Septic shock	3	yes	4
4	Respiratory failure	1	no	3
5	Postoperative monitoring	no	no	4
9	Respiratory failure	14	yes	21
11	Cardiovascular instability	no	yes	2
12	Neurological deterioration/meningismus	1	no	2
14	Neurological monitoring after mastoidectomy	no	no	2
15	Venous sinus thrombosis with mastoiditis	no	no	2
16	1. venous cerebellar infarction; 2. after craniotomy	no	no	(5 + 3) 8
18	Neurological monitoring after mastoidectomy	1	no	3
19	Neurological deterioration	no	no	3
20	Neurological deterioration	no	no	5
22	Neurological deterioration	1	yes	4

ICU = intensive care unit.

Lemierre's Syndrome



- Usually sore throat (tonsillitis or pharyngitis)
- Followed by neck pain, rigors, high fever (39-41^{o}C)
- Then dyspnea, chest pain

Laryngoscope, 125:863–868, 2015

Lemierre's Syndrome

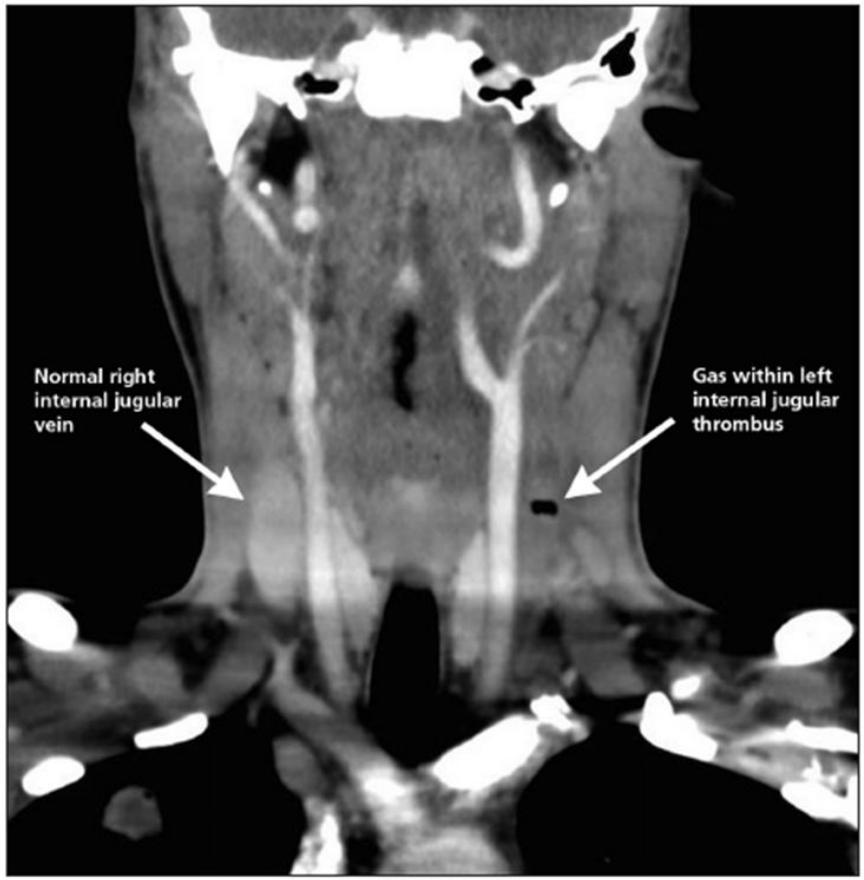


Figure 1: Computed tomographic image of the neck of a 16-year-old boy showing left thrombosed internal jugular vein and gas within the thrombus.

Laryngoscope, 125:863–868, 2015

Lemierre's Syndrome

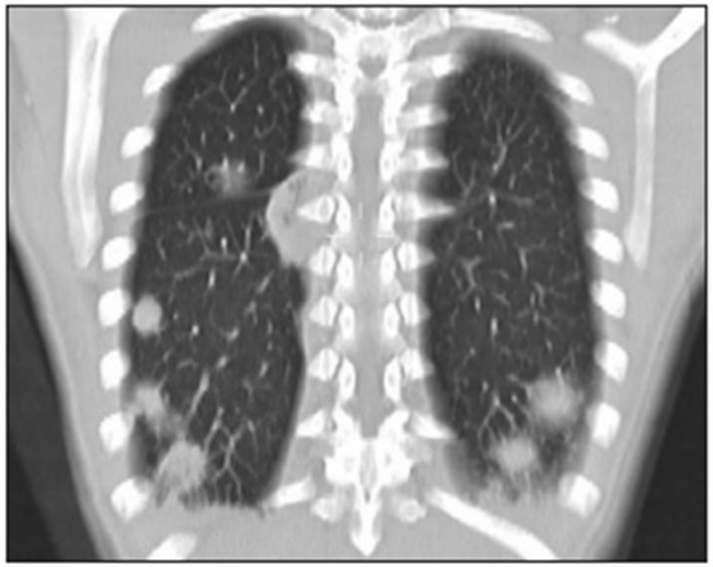
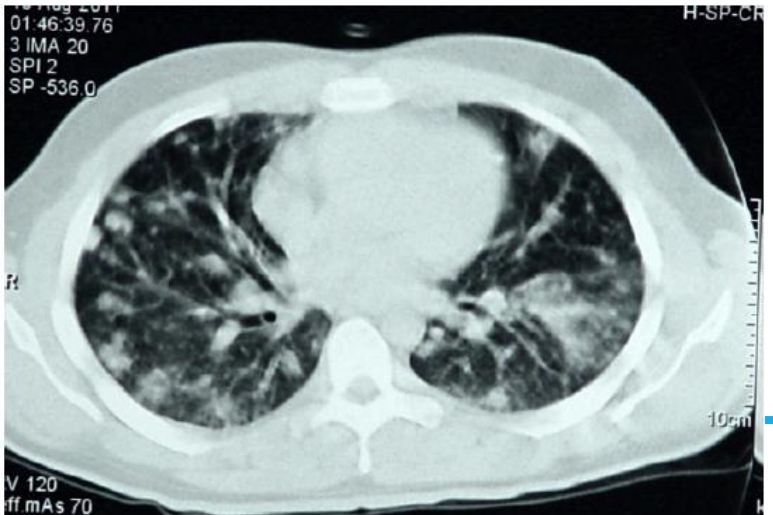


Figure 2: Computed tomographic image of the thorax showing multiple septic pulmonary emboli.



- Can be
  - Nodular infiltrates
  - Empyema
  - Pleural effusion
  - Lung abscess
  - Pneumothorax
  - Pneumatocele

Laryngoscope, 125:863–868, 2015

Modern Lemierre's

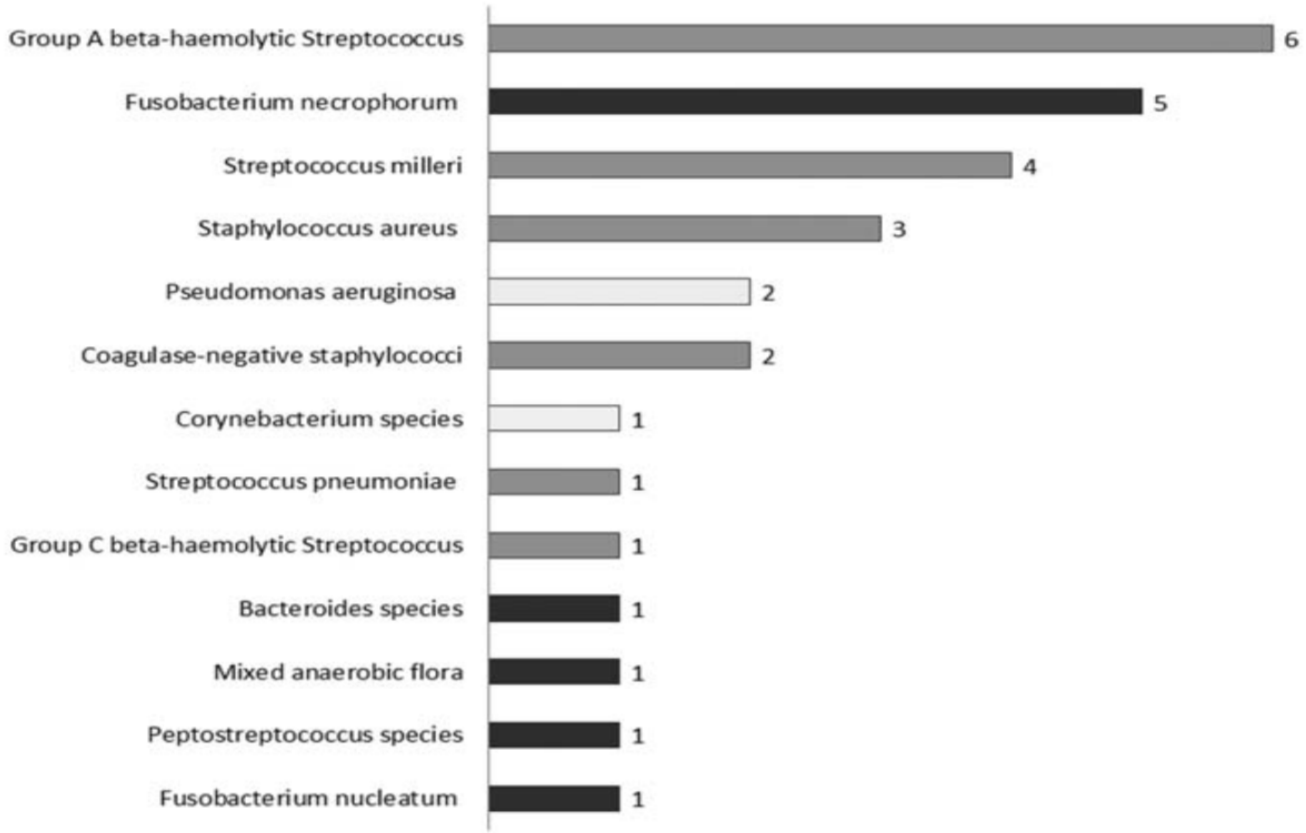


Fig. 1. Microbiological data found in intraoperative swabs or in blood cultures. dark grey = aerobic; gray = facultative aerobic; light gray = anaerobic.

Laryngoscope, 125:863–868, 2015

Lemierre's Syndrome

- Streptococcus family and not Fusobacterium necrophorum as the most frequent microbe in STIJV (septic thrombosis of the internal jugular vein)
- STIJV can be caused by a multitude of microbes
- Compared to other microbes, Fusobacterium necrophorum infection showed no distinctive differences in diagnosis, therapy, and prognosis.

Laryngoscope, 125:863–868, 2015

Our patient

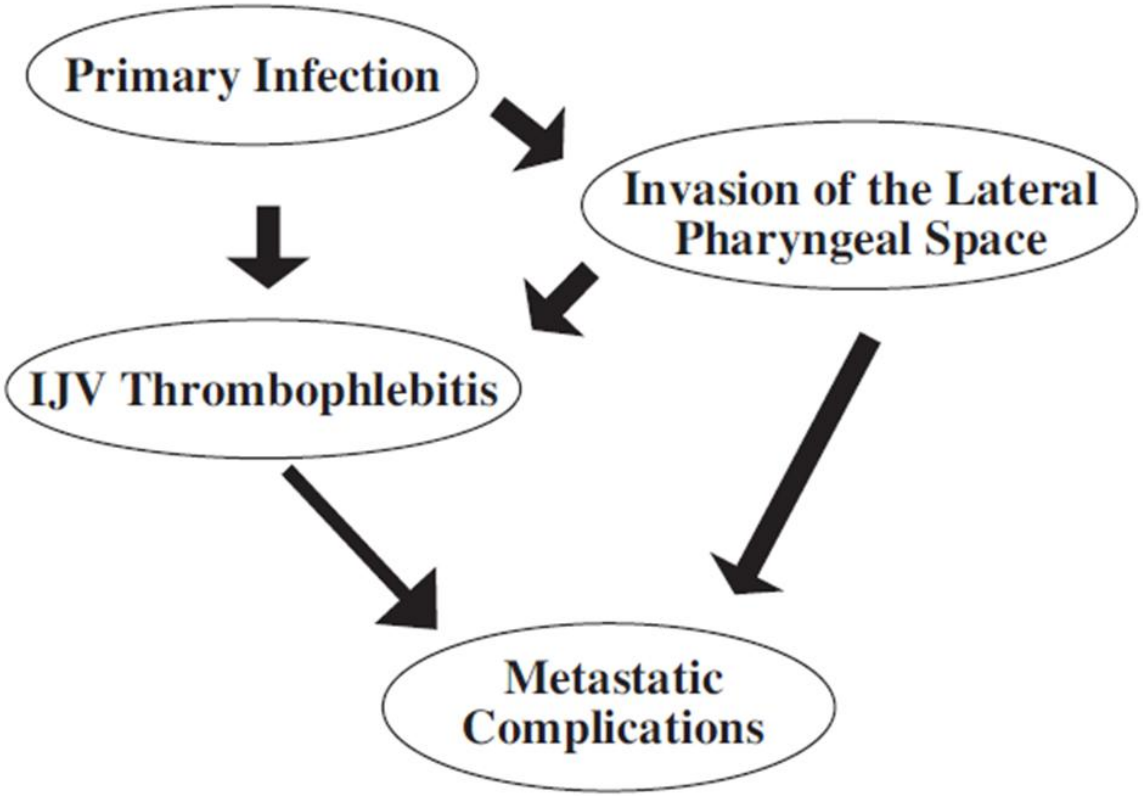


FIG. 2. Stages of Lemierre syndrome. IJV = internal jugular vein.

Or,
Lemierre's-like Syndrome?

0025-7974/02/8106-0458/0
MEDICINE® 81:458-65, 2002

Our patient

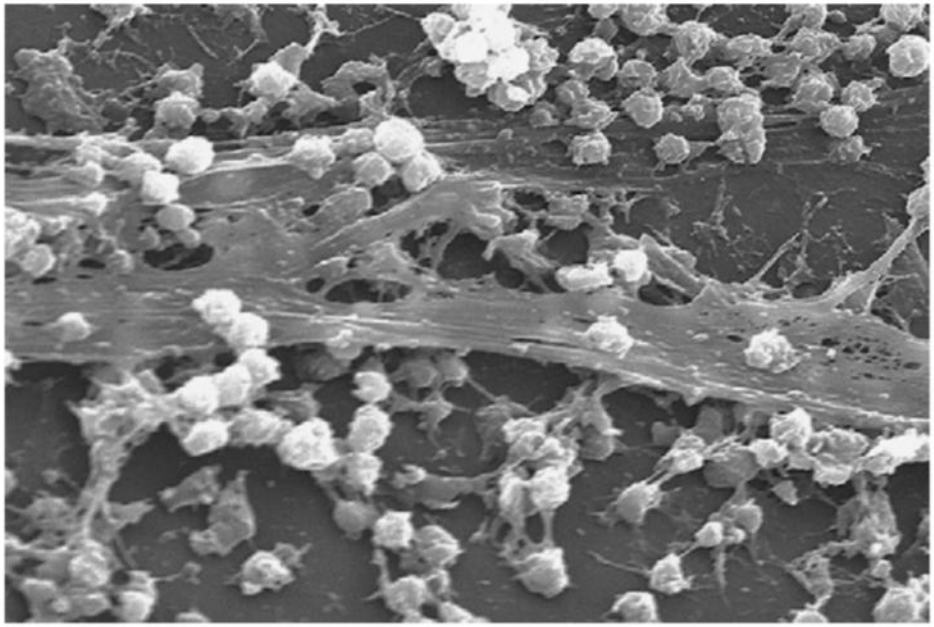


Fig. 1. Electron micrograph of *Staphylococcus aureus* biofilm. (*Courtesy of* CDC/Rodney M. Donlan, PhD, Janice Carr.)

MSSA & Lemierre's Syndrome

Chanin et al.:

- *S. aureus has been reported as a* notable cause of Lemierre's syndrome since 2002.

Yr	Case (reference)	Patient age (yr)	Bacterium	PVL	Internal jugular vein affected	Complications	Interventions other than antibiotics[a]	Outcome
2008	Puymirat et al. (10)	22	MSSA	Not reported	Right	Multiple pulmonary nodules; cavitation; cavernous sinus thrombosis	SC heparin, excision of internal and external jugular	Recovered
2008	Shivashankar et al. (13)	32	MSSA	+	Left	Bilateral pulmonary nodules; pulmonary abscesses; cavernous sinus thrombosis; bilateral cerebellar, left frontal, and brain stem infarcts	IV heparin, activated protein C, warfarin	Recovered
2009	Gokce Ceylan et al. (6)	80	MSSA	Not reported	Right	Bilateral pulmonary nodular infiltrates; bibasal pleural effusions	None	Died
2010	Aouad, Melkane, and Rassi (1)	4	MSSA	Not reported	Right	Extension of thrombophlebitis to cavernous sinus; multivisceral emboli to the brain, orbits, lungs, and heart valves	Anticoagulation therapy, abscess drainage	Died
2012	Our case	18	MSSA	+	Right	Pulmonary infiltrates; cavitation	SC heparin, warfarin	Recovered

[a] SC, subcutaneous.

Journal of Clinical Microbiology p. 3144-3145 September 2012 Volume 50 Number 9

MSSA & Lemierre's Syndrome

- Postulate that alpha-hemolysin plays a role in the pathogenesis of this aggressive condition.

- Panton-Valentine leucocidin (PVL) appears to have pathogenic synergism with alpha-hemolysin, which is almost ubiquitously expressed by staphylococci (5).

- The ability to lyse leukocytes and erythrocytes to assist immune evasion and bacterial replication seems to be a shared feature of PVL-producing *S. aureus and Fusobacterium necrophorum.*

MSSA & Lemierre's Syndrome

- Pitsiou et al reported similar cases:
  - Community-acquired MSSA strains, despite the antibiotic susceptibility, have the potential to be extremely virulent, increased attention has to be paid to early detect them.

American Journal of Emergency Medicine (2013) 31, 268.e5–268.e7

Our patient

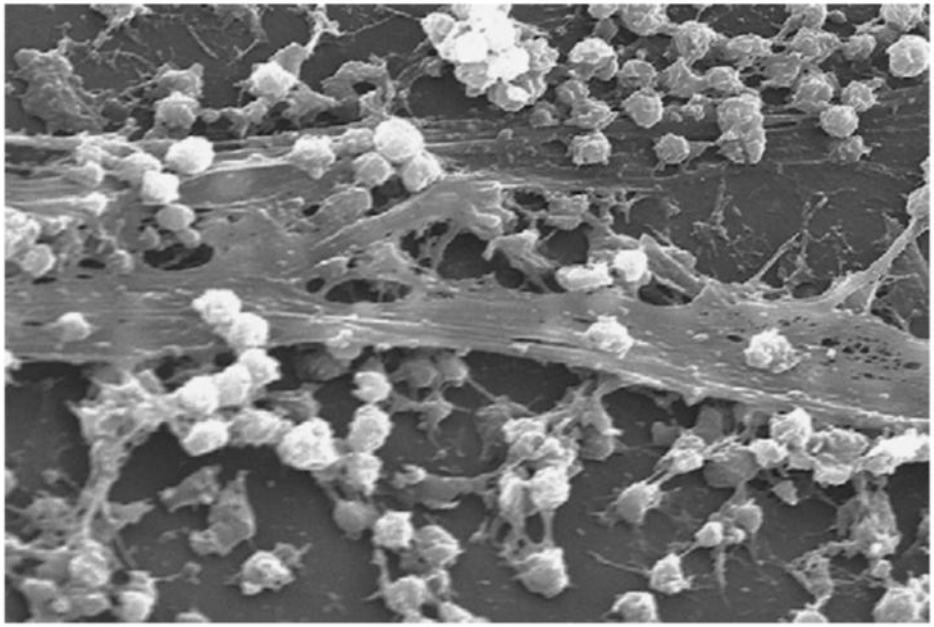


Fig. 1. Electron micrograph of *Staphylococcus aureus* biofilm. (*Courtesy of* CDC/Rodney M. Donlan, PhD, Janice Carr.)

Treatment

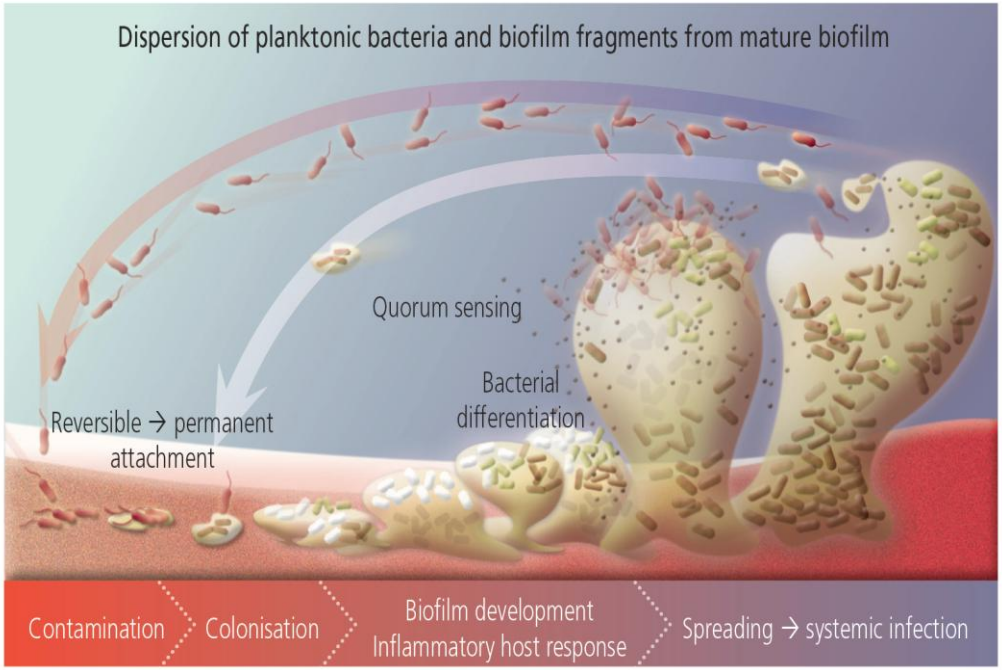
- Source control
- Antimicrobial treatment
- Anticoagulation ?
- Surgery: indications ?

Treatment – source control

- Catheter management
- Drainage of abscesses

Treatment – source control

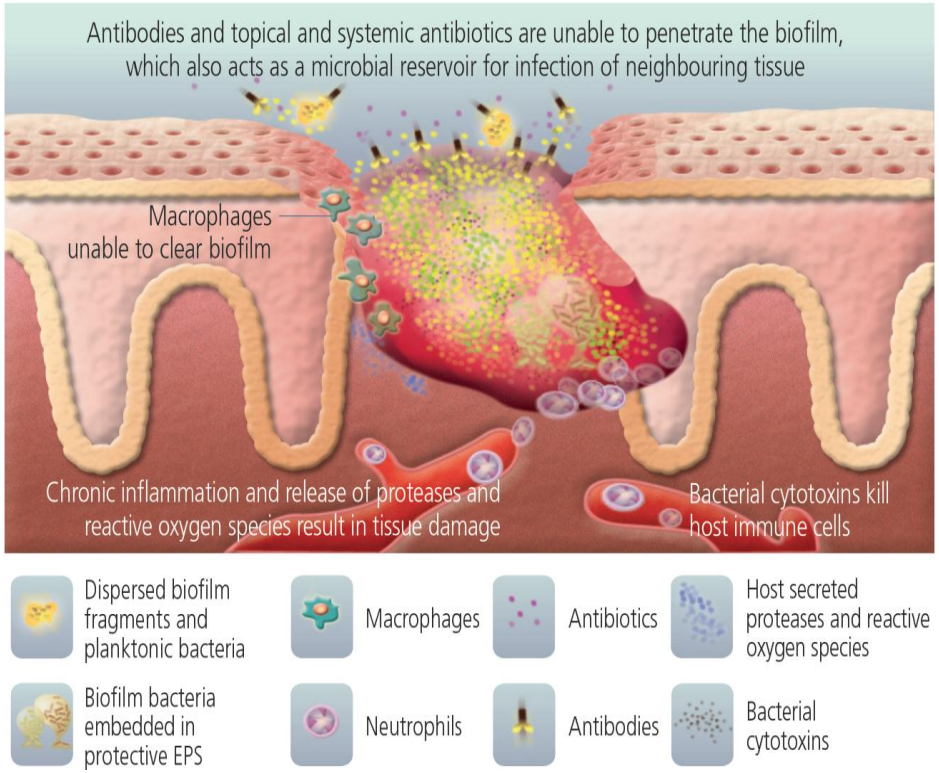
- Treatment of long-term CVC-related infections
  - Difficult ∵ micro-organisms adhere to the CVC and embedded in biofilm
  - 24% to 66% cannot be salvaged, and require replacement



AFlynn 2000; Fratino 2005; Mermel 2009; Rubin 1999; Wiener 1992).antibiotic and other lock treatments for tunnelled central venous catheter-related infections in children with cancer (Review) .**2013** The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

Treatment – source control

- To achieve therapeutic concentrations of antibiotics needed to kill microbes growing in a biofilm, concentrations 100 to 1000 times higher are required than for the killing of freely floating (planktonic) bacteria



AFlynn 2000; Fratino 2005; Mermel 2009; Rubin 1999; Wiener 1992).antibiotic and other lock treatments for tunnelled central venous catheter-related infections in children with cancer (Review) .**2013** The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

Treatment – source control

- **For adults** the IDSA recommends systemic antibiotic treatment and **removal** of the catheter in case of a complicated CVC-related infection.
- **Remove for adults** patient with complicated infection, includes:
  - Severe sepsis
  - Suppurative thrombophlebitis
  - Endocarditis
  - Persistent bloodstream infection despite > 72 hours of antimicrobial therapy
  - Infections due to Staphylococcus aureus, Pseudomonas aeruginosa, fungi or mycobacteria

AFlynn 2000; Fratino 2005; Mermel 2009; Rubin 1999; Wiener 1992).antibiotic and other lock treatments for tunnelled central venous catheter-related infections in children with cancer (Review) .**2013** The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

Treatment – source control

- In all other cases, **catheter salvage** can be considered, if necessary.
- **For children**
  - Same recommendations apply
  - Must also balance benefits of catheter removal against the difficulty of obtaining alternate venous access
  - Provided the clinical situation of the child permits salvage, treatment consists of systemic and antibiotic lock treatment simultaneously

AFlynn 2000; Fratino 2005; Mermel 2009; Rubin 1999; Wiener 1992).antibiotic and other lock treatments for tunnelled central venous catheter-related infections in children with cancer (Review) .**2013** The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

Treatment – source control

- **Catheter salvage:**
  - **Methods being studied:**
    - Antibiotic lock
    - Alternative lock solutions such as ethanol and taurolidine
    - Urokinase and ethanol lock
  - **Considerations:**
    - Theoretically less systemic side-effect
    - Potentially causes microbial resistance
    - May cause catheter malfunction

Treatment - source control

- Antibiotic lock
  - According to the IDSA guideline, antibiotic lock canbe used for salvage of catheter for long-term catheter with CRBSI, and without exit site or tunnel infection
  - Has to be given together with systemic antibiotic

Treatment

- Systemic antibiotics
  - Duration, depends on
    - Metastatic infection involved
    - At least 4 weeks for suppurative thrombophlebitis
    - Requires at least 6 weeks if complicated with osteomyelitis

Clinical Practice Guidelines for the Diagnosis and Management of Intravascular Catheter-Related Infection: 2009 Update by the Infectious Diseases Society of America *Clin Infect Dis. 2009 July 1; 49(1): 1–45.doi:10.1086/599376*

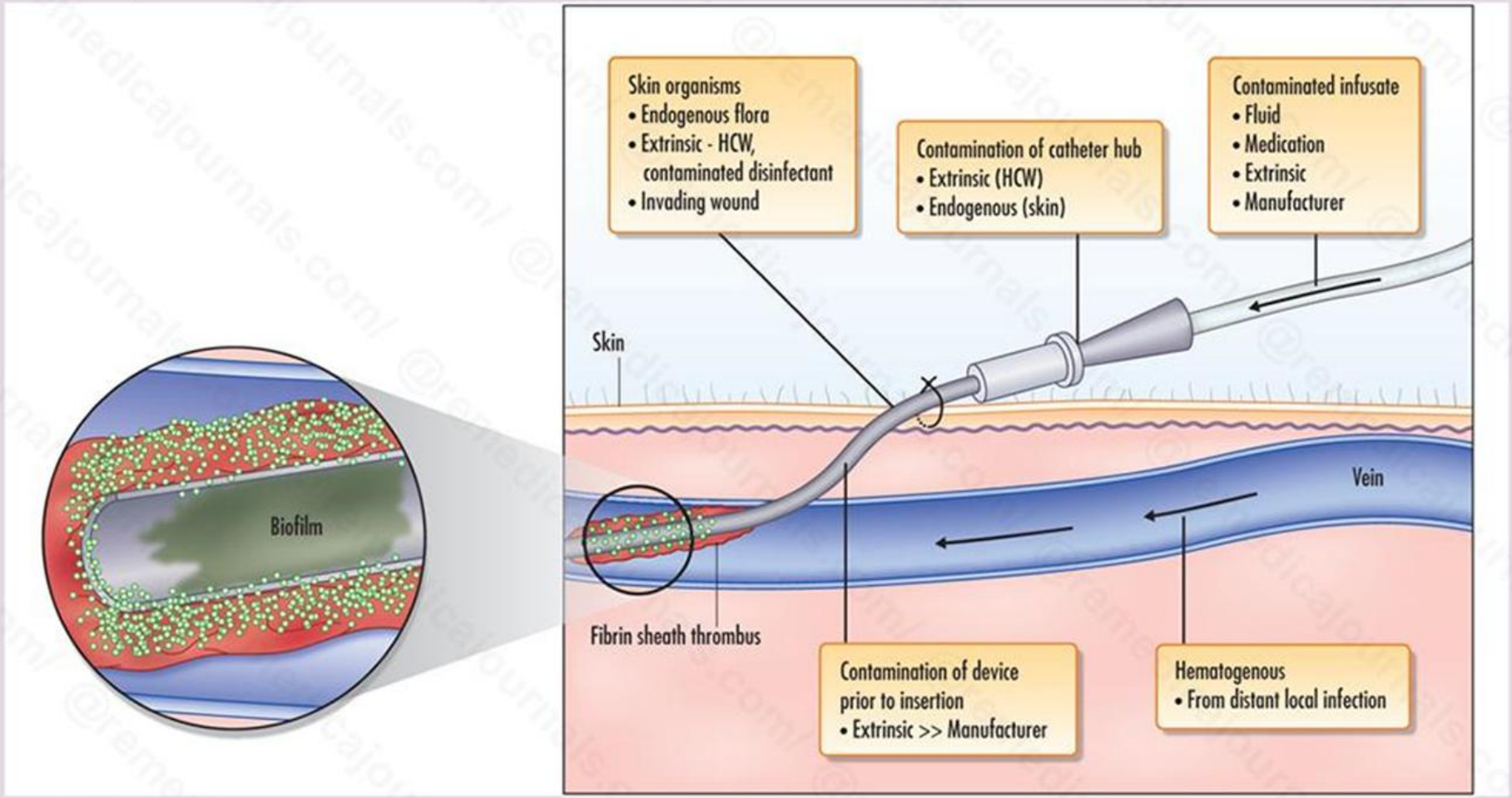
Pathogen & choice of antibiotic

- Most CVC-related infections occur within 100 days after placement.
- In the first 45 days early CVC-related infections are often caused by skin pathogens colonising the catheter. Colonisation of the external surface of the CVC occurs through insertion.
- After 45 days luminal colonisation, originating from the hub, is more frequently the source of infection, or a disseminating infection elsewhere in the body

Antibiotic and other lock treatments for tunnelled central venous catheter-related infections in children with cancer (Review) .**2013** The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

Pathogen & choice of antibiotic

Figure 2. Diagram of an intravenous catheter with biofilm growth.



HCW: healthcare worker.

Image courtesy of Remedica Journals
http://www.remedicajournals.com/The-Journal-of-Invasive-Fungal-Infections/BrowseIssues/Volume-5-Issue-2/Article-The-Story-of-Biofilms

TABLE I.
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1	56/female	Dental extraction	Unknown	AMC, MTZ	12	–	0	3
2	20/female	Tonsillitis	Fusobacterium necrophorum	CLR, FEP, NET, MTZ, CLI, TZP, PEN	31	–	1	26
3	38/male	Tonsillitis	Fusobacterium necrophorum	CLR, AMC, CLI	66	+*	0.15	40
4	32/female	Peritonsillar abscess	Bacteroides species, Pseudomonas aeruginosa	AMC, TZP CLI, CIP	30	+*	3.5	24
5	57/female	Peritonsillar abscess	Streptococcus milleri, Peptostreptococcus species	TZP, RIF, AMC	45	+	7	32
6	42/female	Pharyngitis	Group A beta-hemolytic streptococcus	AMC, VAN	37	+	3	21
7	18/male	Pharyngitis	Streptococcus milleri, Fusobacterium necrophorum	CRO, MTZ	No follow-up	–	No follow-up	min. 6
8	29/female	Pharyngitis	Fusobacterium necrophorum	CRO, MTZ, AMC, CLI	43	–	0	15
9	68/female	Retropharyngeal abscess	Group C beta-hemolytic streptococcus	FEP, PEN, AMC	No follow-up	+	No follow-up	min. 25
10	79/male	Sinusitis	Streptococcus milleri	AMC, MTZ	42	+	6	16
11	13/male	Sinusitis	Group A beta-hemolytic streptococcus, Staphylococcus aureus	MEM, CLI, CRO, AMX	14	–	6	15
12	66/female	Periorbital abscess	Mixed anaerobic flora, coagulase-negative staphylococci	AMC, CRO	22	+	3	31
13	71/male	Necrotizing external otitis	Pseudomonas aeruginosa	FEP, CIP	59	+	Lifelong	37
14	7/female	Otitis media	Group A beta-hemolytic streptococcus	MEM, AMX	17	+	2.5	17
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16	40/male	Mastoiditis	Streptococcus milleri	CRO, AMX, VAN, MEM	29	+	24	18
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22	63/male	Mastoiditis	Fusobacterium nucleatum, coagulase-negative staphylococci	MEM, AMC, CIP, CAZ, FEP	42	+*	No follow-up	63
23	7/male	Gradenigo Syndrome	Group A beta-hemolytic streptococcus, Staphylococcus aureus	AMC	21	+	0.15	15

*Ligation of the internal jugular vein.
AMC = amoxicillin/clavulanate; AMX = amoxicillin; CIP = ciprofloxacin; CLR = clarithromycin; CRO = cef
MTZ = metronidazole, RIF = rifampicin; TZP = piperacillin/tazobactam; VAN = vancomycin; min. = minimum.

Laryngoscope, 125:863–868, 2015

Treatment - anticoagulation

Cons-

- Internal jugular vein thrombosis
  - Inherent nature: thrombosis resolve without anticoagulation

Pros+

- Anticoagulation
  - Enhances penetration of antibiotics to septic thrombi
  - Prevents extension of thrombosis

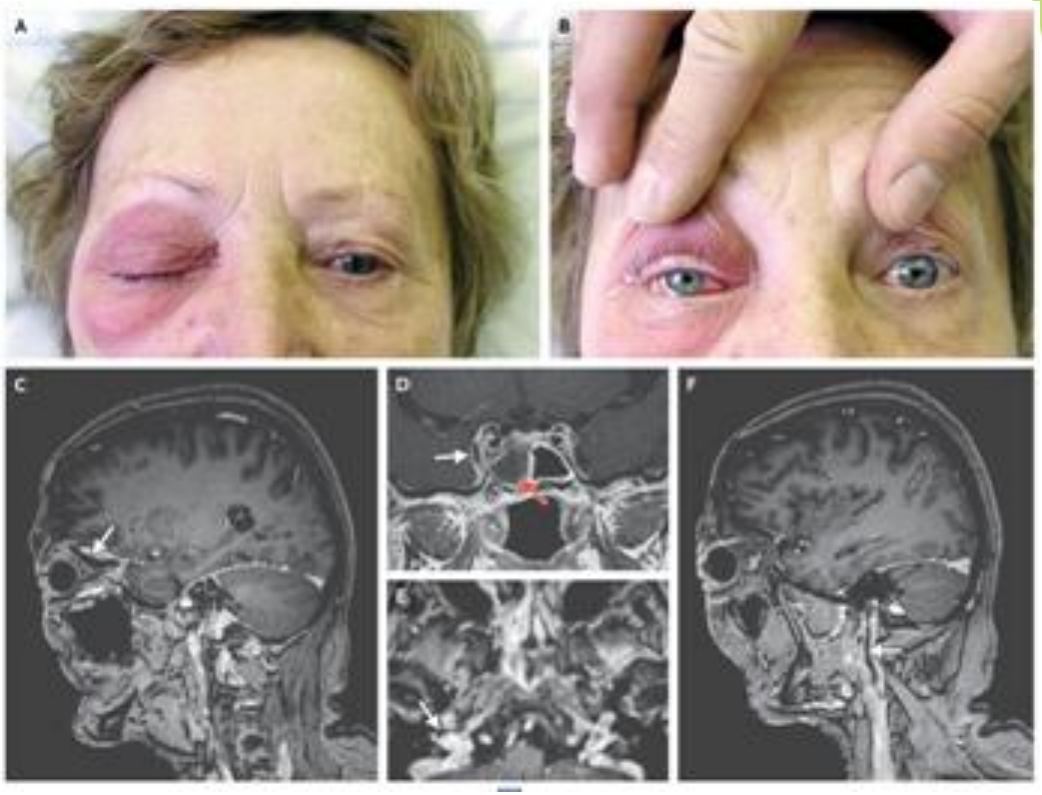
Treatment

- Anticoagulation therapy
  - Give vs Nil
  - Duration if given

Treatment - anticoagulation

- Considered especially when:
  - Extension of thrombosis despite antibiotics

    Especially to intracranial venous system
  - Patient with predisposing thrombophilia



NEJM 2015

Eur J Neurol 2010;17:1229-1235

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Laryngoscope, 125:863–868, 2015

Treatment – surgical modalities

- Indications:
  - Persistent bacteremia or septic emboli despite medical treatment

- Modalities:
  - Internal jugular vein ligation
  - Embolectomy

M. Kim .Eur J Vasc Endovasc Surg (2015) 49, 670e675

Treatment - Embolectomy

Means:

- Surgical
- Combined mechanical thrombectomy with local thrombolytics

  - Thrombolytics may interfere microthrombus formation and biofilm integrity, enhance antimicrobial activity

  - Risk of distal embolization could be reduced by insertion of temporary filter

Eur J Vasc Endovasc Surg (2015) 49, 670e675

Long-term Central Venous Access

- Inserted in >60% adults and children with cancer
- Very important for oncology patients
  - Allow administration of cytotoxic drugs, antibiotics
  - Blood taking

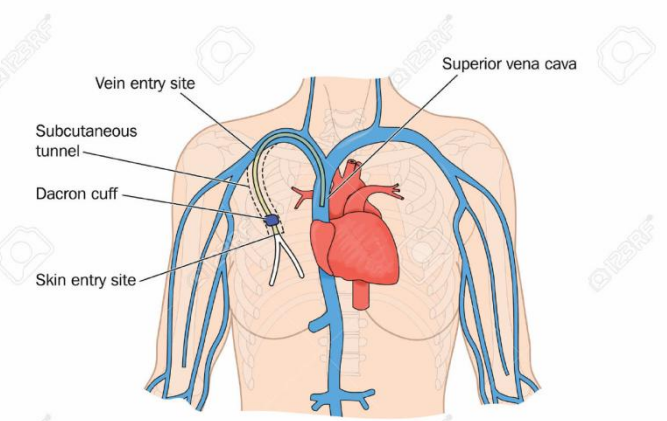
- Tunneled
  - ↓ catheter related infection, compared with non-tunneled catheter

Antibiotic and other lock treatments for tunnelled central venous catheter-related infections in children with cancer (Review) .**2013** The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

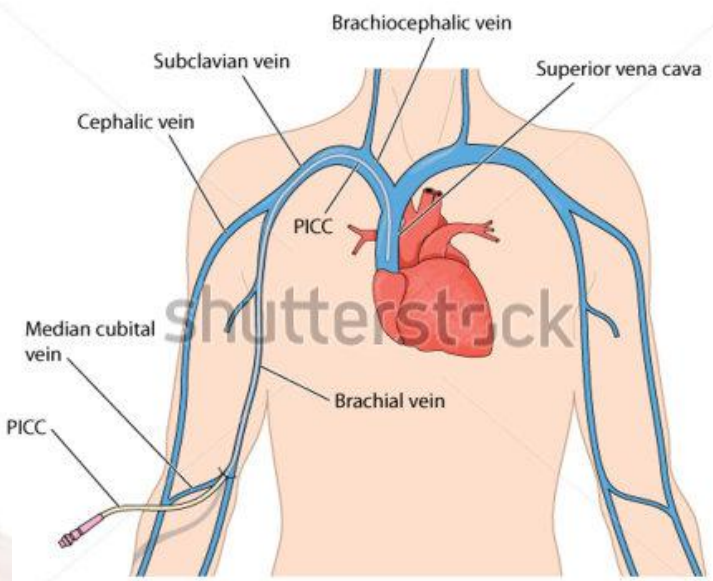
Types of Central Venous Access

Nontunneled	Temporary CVC	
	PICC	
Implanted (Semipermanent)	Tunneled catheters	1. eg.Hickman, Broviac 2. PICC devices can also be attached to subcutaneous port (eg,Passport).
	Totally Implantable Venous Access Devices (TIVAD)	1. e.g., Port-a-Cath, Bard Port, Power Port, Infuse-a-Port, Medi-port 2. The port or reservoir is accessed through the skin by needle puncture into the port's self-sealing septum.
Specialized venous devices	1. Vena cava filters 2. Pulmonary artery catheters 3. Pacemakers/Defibrillators	

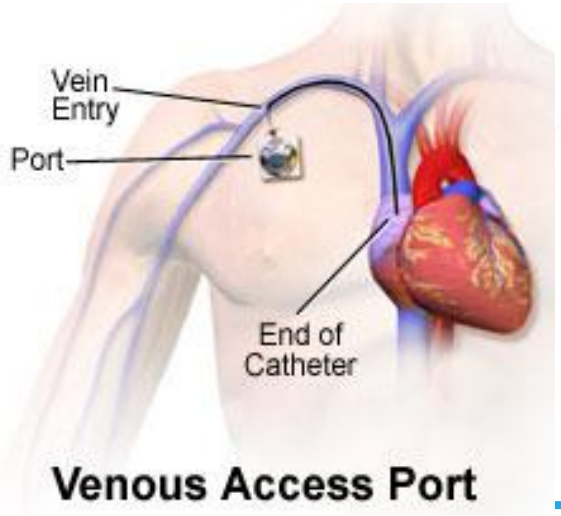
Types of long-term CVC



Hickman catheter



PICC catheter



Venous Access Port

Long-term CVC for oncology patient

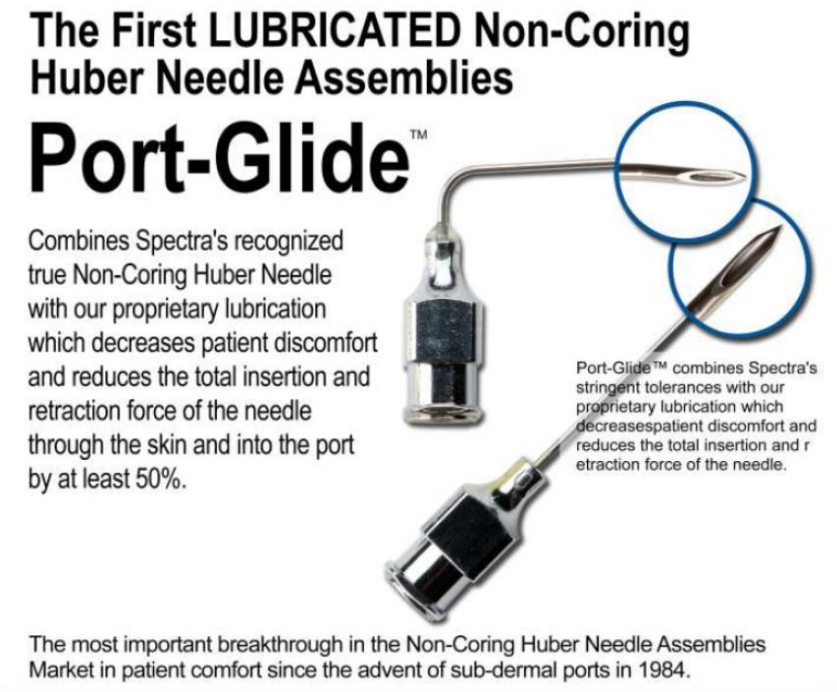
- **Hickman catheter**
  - Modified from Broviac catheter by Dr Hickman in 1979
- **Totally implantable venous access device (TIVAD)**
  - First placement in 1982 in MD Anderson Cancer Center in Houston, via cephalic vein
  - Inserted under radiological guidance in 1992
  - Revolutionalise care of cancer patients, also used in chronic illness

Ahmad Zaghal .Surgical Oncology 21 (2012) 207e215

Totally Implantable Venous Access Device TIVAD

Advantage	Disadvantage
More cosmetically acceptable, requires less nursing care	the need to **puncture** the port through the skin to access the device and the small caliber of the catheter, and thus, limited infusion rate.
allow more normal activities , such as showering or swimming	Port devices are not appropriate for patients who require frequent dosing or continuous infusion of larger fluid volumes such as with total parenteral nutrition.
Allows chemotherapy infusion, antibiotic administration and blood sampling	
Better for intermittent infusion therapy (e.g., chemotherapy).	

Puncture of TIVAD

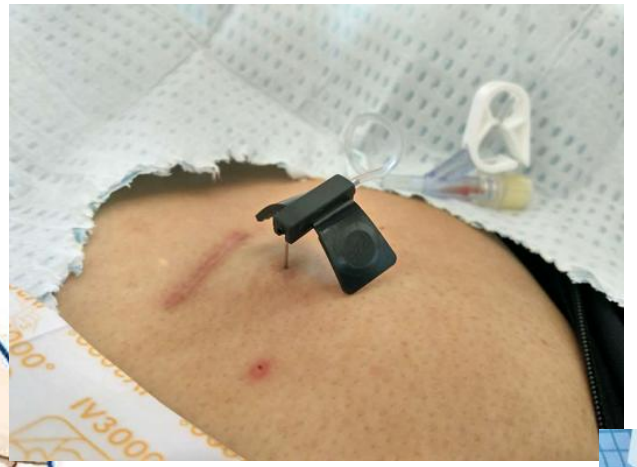


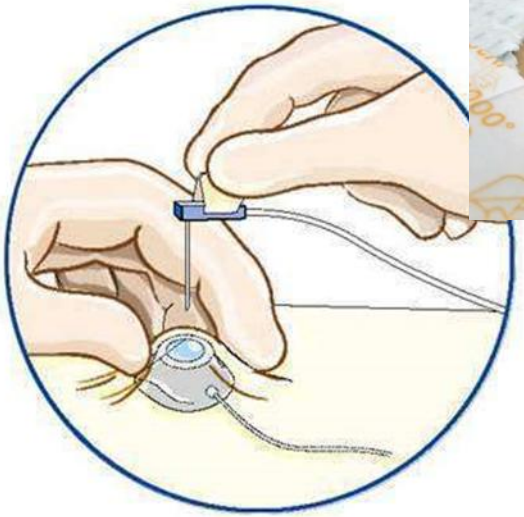
- With Huber needle:
  - Its **special shape** slices rather than punctures the septum
  - reducing the chance of leakage through the opening
  - preventing possible dislodging of silicone slivers or cores, which could lead to serious adverse events if gain access to the circulation.

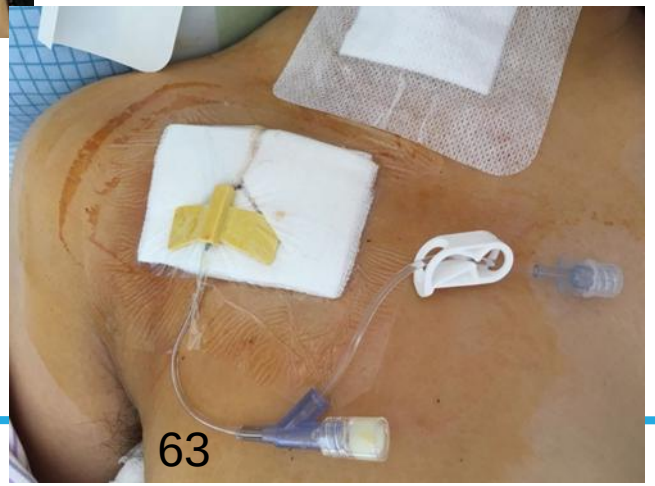
Ahmad Zaghal .Surgical Oncology 21 (2012) 207e215

Puncture of TIVAD

The port or reservoir is accessed through the skin by needle puncture into the port's self-sealing septum.







Hickman vs TIVAD

	Hickman	TIVAD	p-value
Bloodstream infection (per 1000 catheter days)	4.66	1.45	
Time to first infection (Days)	52.3	108.8	<0.001
Duration of catheter use (Days)	140.8	277.3	<0.001

A. Adlera .Journal of Hospital Infection (2006) 62, 358–365

Hickman vs TIVAD – catheter infection

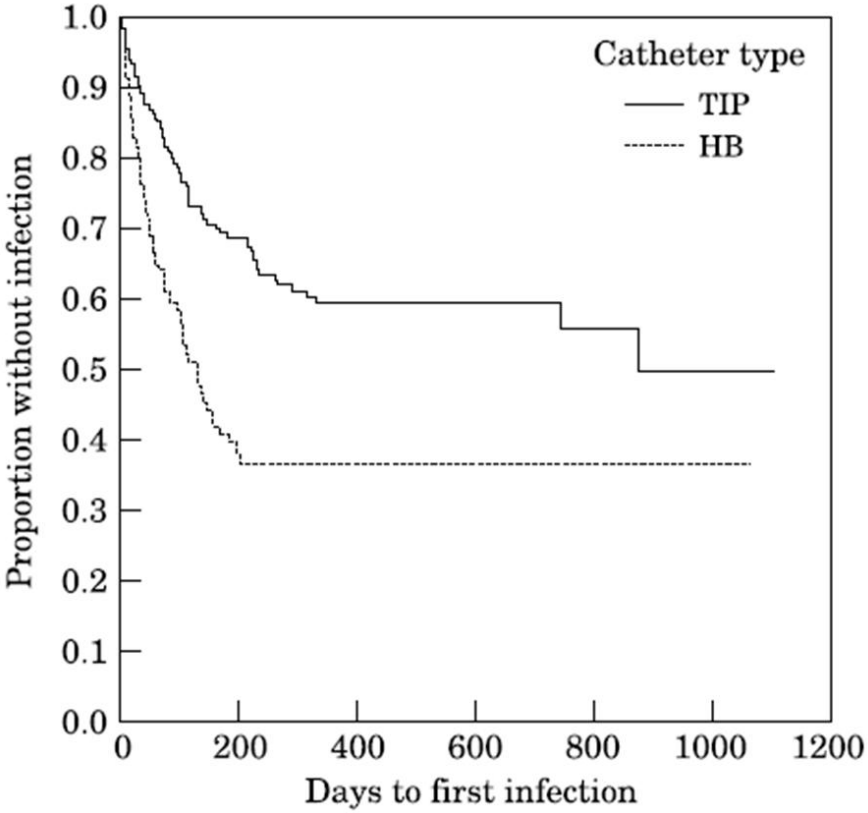


Figure 1 Infection-free survival according to catheter type. TIP, totally implantable ports; HB, Hickman catheters; $P<0.001$.

A. Adlera .Journal of Hospital Infection (2006) 62, 358–365

TIVAD-related bloodstream infection

- Risk factors:
  - Cancer type
    - Described include lung cancer, hematological cancer, head-and-neck cancer
    - Inconclusive
  - Neutropenia
    - Related to Severity and duration
  - Concomitant disease

Lee G. A case–control study to identify risk factors for totally implantable central venous port related bloodstream infection. Cancer Res Treat. 2014;46:250–60

Rebek Pediatr Blood Cancer 2008;51:53–58

Hsiang-Fong Kao .Support Care Cancer (**2014**) 22:1189–1197

IVAD-related bloodstream infection

- Risk factors:
  - Catheter material
    - Silicone vs polyurethane.
    - Polyurethane: slightly higher colonization/infection rates

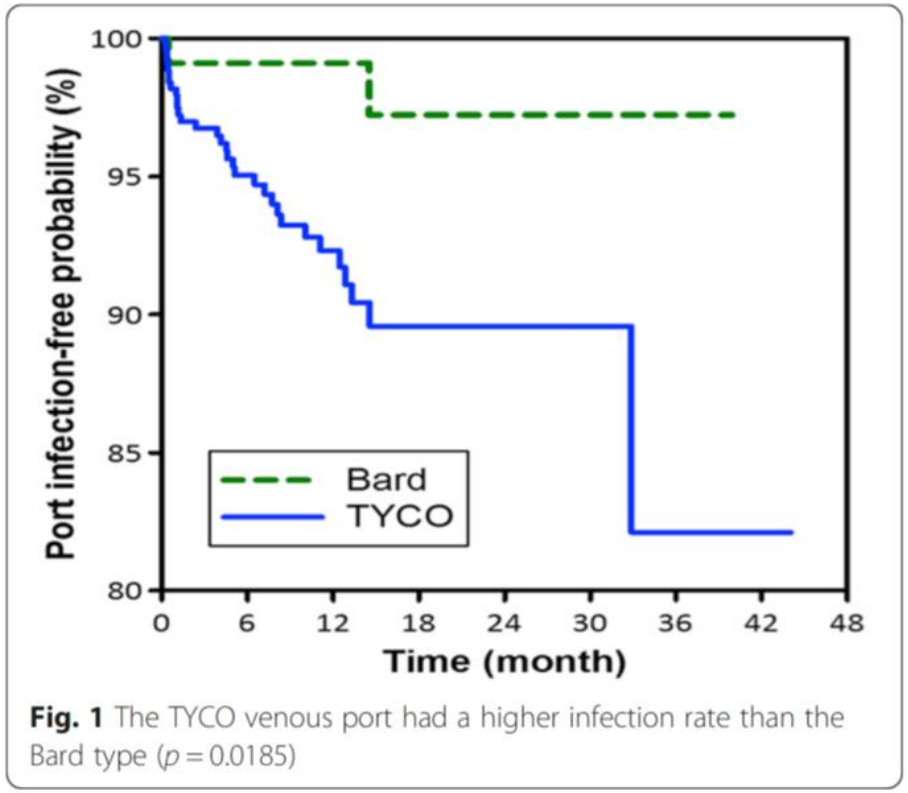


Fig. 1 The TYCO venous port had a higher infection rate than the Bard type ($p = 0.0185$)

Jui-Feng Hsu1 Hsu et al. World Journal of Surgical Oncology (2015) 13:288

Pathogens: TIVAD & Hickman

- An important finding in the present study was the tendency for different pathogens to cause CABSI in different types of catheters
- **Staphylococcus** was the dominant organism in implantable **port group**
- Higher proportion of **Gram-negative**, **polymicrobial** and **M. chelonei** CABSI in the **Hickman group**

A. Adlera .Journal of Hospital Infection (2006) 62, 358–365

TIVAD-related bloodstream infection

- Vigilant catheter care
  - In-hospital care associates with infection risk
- Antibiotic before inserting a tunnelled CVC did not prevent Gram positive catheter-related infections.
- Further studies required:
  - Impregnated catheter
  - Antibiotic and heparin lock / flush

Hickman vs TIVAD – catheter infection

- Author conclusion: Implantable ports may be considered the preferred device for most pediatric oncology and stem cell transplantation patients.

- PICC vs TIVAD

A. Adlera .Journal of Hospital Infection (2006) 62, 358–365

Long-term catheter

- Use a **tunnelled or implanted central venous access device with a subcutaneous port** for patients in whom long-term vascular access is required. (*Class A).*

- Additionally, most studies concluded that **totally implantable devices** had **the lowest reported rates** of CR-BSI compared with either tunnelled or non-tunnelled CVCs.

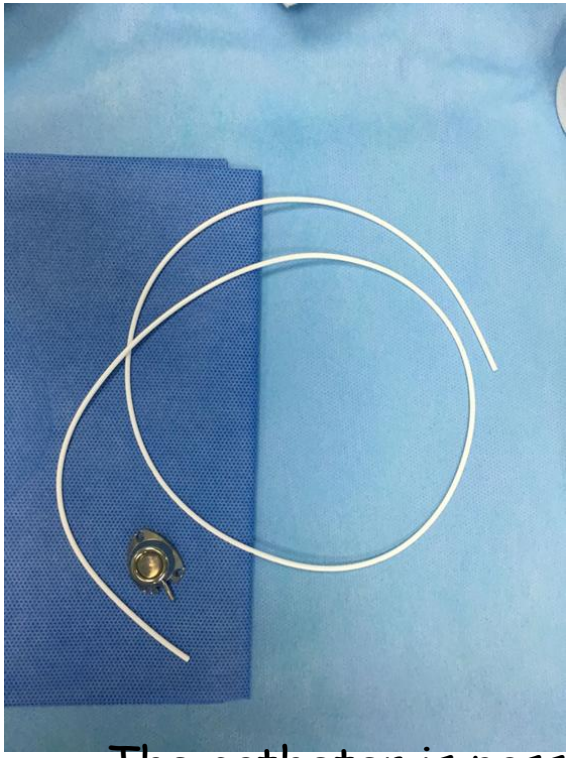
National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England

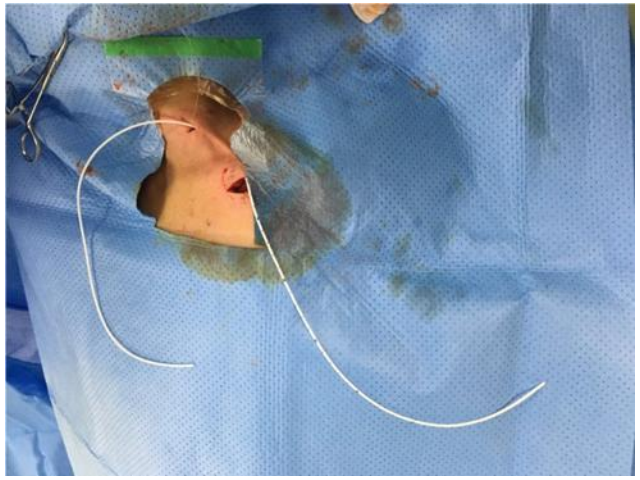
H.P. Lovedaya*, J.A. Wilsona, R.J. Pratta, M. Golsorkhia, A. Tinglea, A. Baka,J. Brownea, J. Prietob, M. Wilcoxc

a Richard

Journal of Hospital Infection 86S1 (2014) S1–S70

Placement of TIVAD





The catheter is passed from the cannulated vein and tunneled beneath the skin, attached to a subcutaneous infusion port or reservoir placed into a subcutaneous pocket. The procedure is done in strict aseptic environment.

Prevention of long-term catheter infection

- Should follow the same principle as for short-term CVC
- Start from the time of insertion
  - strict aseptic technique
- Vigilant catheter care
- Proper education and specific training of the staff is universally recommended as one of the most important and evidence-based strategies for reducing the risk of catheter-related infections.

Summary

- Share a patient with MSSA port-related bloodstream infection, complicated with suppurative thrombophlebitis and metastatic infection
- Discussed management of patient with suppurative thrombophlebitis
- Discussed infection risk of different long-term catheter

Thank you!