Bedside Diagnosis for Infectious Diseases

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Outline

- Useful bedside methods
- Basic and advance laboratory tests
- Cases presentation
- Spot diagnosis

Evaluation of Infectious Disease Case

- Define if infection occur
- History
  - Travel and exposure history
  - Social and family history
- Physical examination
- Laboratory investigations
  - Basic
  - Advance

Patients' Evaluation

- **Who**: Which kind of patient has infection?
  - Determine immunosuppressive status
- **When**: Is an environmental factor influence the disease occurrence?
- **Where**: Which part of body?
- **What**: What kind of the organism?

Determining the Result of Positive Test

- **Why** is the test performed?
- **When** is the test done?
- **Where** is the isolated site?
- **What** organism?
- **How** is the organism isolated or identified?
- **Who** is infected?

Acute Febrile Illness

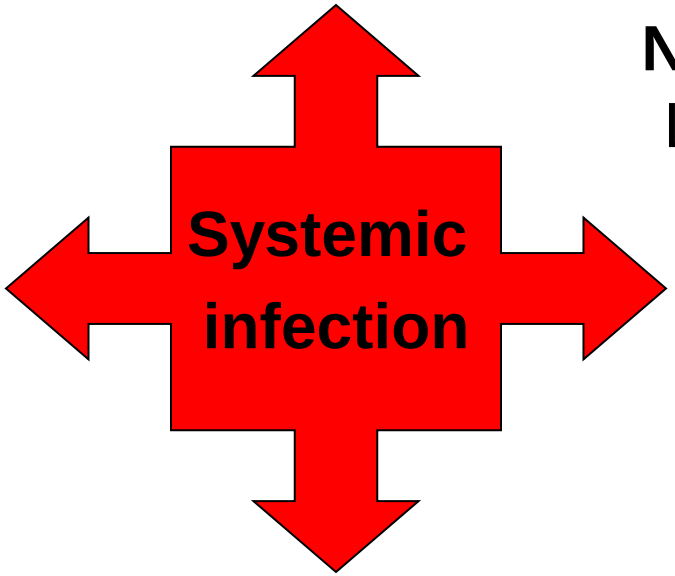
Acute fever

Non-specific symptoms

Myalgia

Nausea/vomiting

…….



Non-specific signs

Lymphadenopathy

Hepatomegaly

Splenomegaly

……

Non-specific lab

CBC, U/A, LFT, CXR,…….

Bacterial Infection by Site

Mouth
Peptococcus
Peptostreptococcus
Actinomyces

Skin/Soft Tissue
S. aureus
S. pyogenes
S. epidermidis
Pasteurella

Bone and Joint
S. aureus
S. epidermidis
Streptococci
N. gonorrhoeae
Gram-negative rods

Abdomen
E. coli, Proteus
Klebsiella
Enterococcus
Bacteroides sp.

Urinary Tract
E. coli, Proteus
Klebsiella
Enterococcus
Staph saprophyticus

Upper Respiratory
S. pneumoniae
H. influenzae
M. catarrhalis
S. pyogenes

Lower Respiratory Community
S. pneumoniae
H. influenzae
K. pneumoniae
Legionella pneumophila
Mycoplasma,
Chlamydia

Lower Respiratory Hospital
K. pneumoniae
P. aeruginosa
Enterobacter sp.
Serratia sp.
S. aureus

Meningitis
S. pneumoniae
N. meningitidis
H. influenza
Group B Strep
E. coli
Listeria

Case Presentation

Case 1

PF: ชายไทยคู่ อายุ 65 ปี อาชีพ ข้าราชการบำนาญ ภูมิลำเนา กรุงเทพมหานคร

CC: ไข้ 3 วันก่อนมารพ. ถูกส่งตัวมาจากรพ. เอกชน

PI: 7 วันก่อนมารพ. อ่อนเพลีย รับประทานอาหารได้น้อย ไม่มีไข้ ไม่ไอ ไม่เจ็บคอ ไม่ปวดท้อง ถ่ายปัสสาวะและอุจจาระปกติ ไปรพ. แห่งหนึ่งได้ยารักษากระเพาะอาหารอักเสบ อาการไม่ดีขึ้น

3 วันก่อนมารพ. มีไข้สูงหนาวสั่น คลื่นไส้ อาเจียน ปวดท้อง บริเวณลิ้นปี่ นอนรักษาที่รพ. นี้ 5 วัน

Past and Personal History

- No contact with person who had flu-liked symptoms
- 2 weeks PTA, he traveled to the orchid garden in Chiang Rai and stayed there for 3-4 days
- Hypertension and hyperlipidemia 15 years
  - Enalapril, simvastatin, gemfibrozil

Investigations

- CBC: Hct 39.7%, WBC 4,700 (N 80, L 12, Atyp L 1, Band 7), Plt 75,000/mm^3
- BUN 45, Cr 2.3 mg/dL
- Liver function test
  - AST 155 , ALT 88 , ALP 270, GGT 265 U/L
  - TB 1.5, DB 0.8 mg/dL, TP 7.3, alb 3.8 g/L

What is the Most Likely Diagnosis?

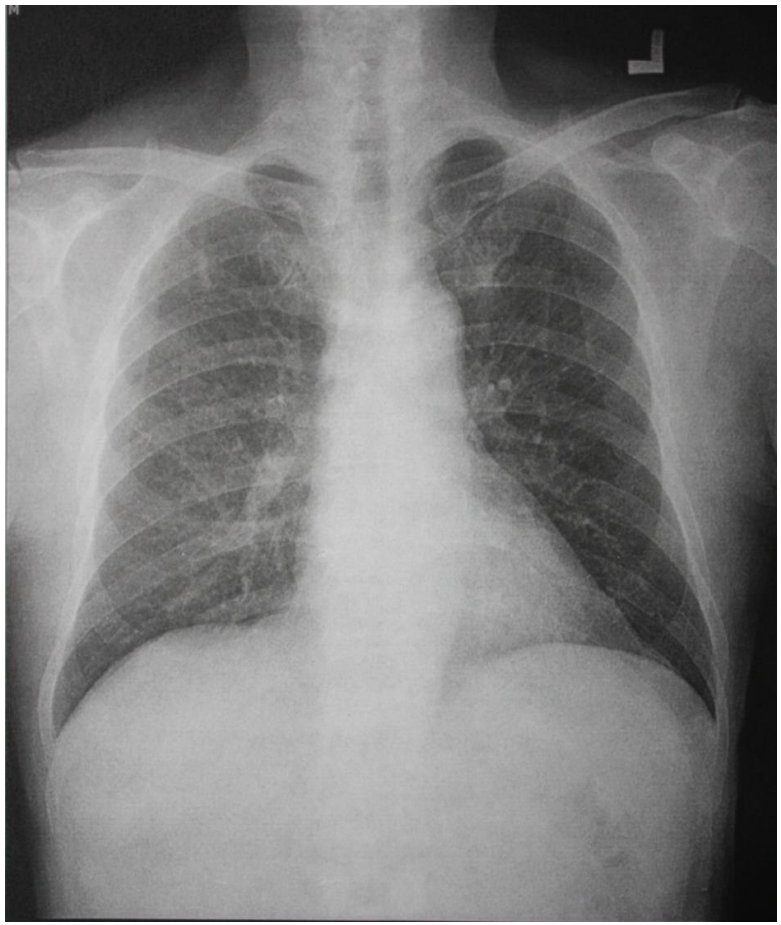
- A. Dengue (hemorrhagic) fever
- B. Rickettsioses
- C. Leptospirosis
- D. Malaria
- E. Bacterial sepsis
  (Gram negative/positive)

65 years, acute fever with systemic symptoms

History travel to Chiang Rai

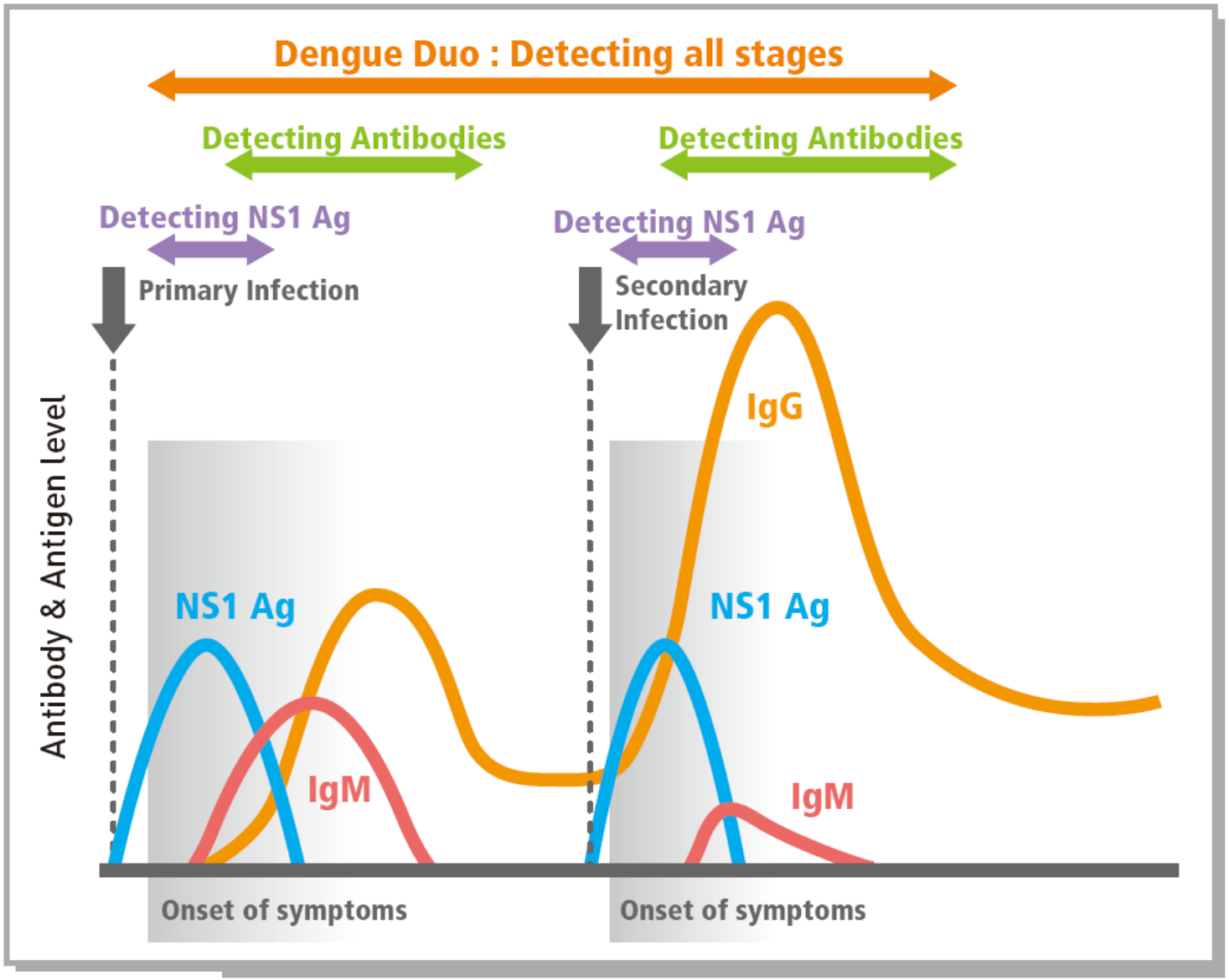
Lab: thrombocytopenia, AKI, abnormal LFT

Further Investigations



- Dengue Rapid Test
  - IgM: positive
  - IgG: negative
  - NS1: negative
- U/S upper abdomen
  - Normal thin wall GB with gall stones
  - Small pericholecystic fluid

Diagnosis:
Severe dengue infection



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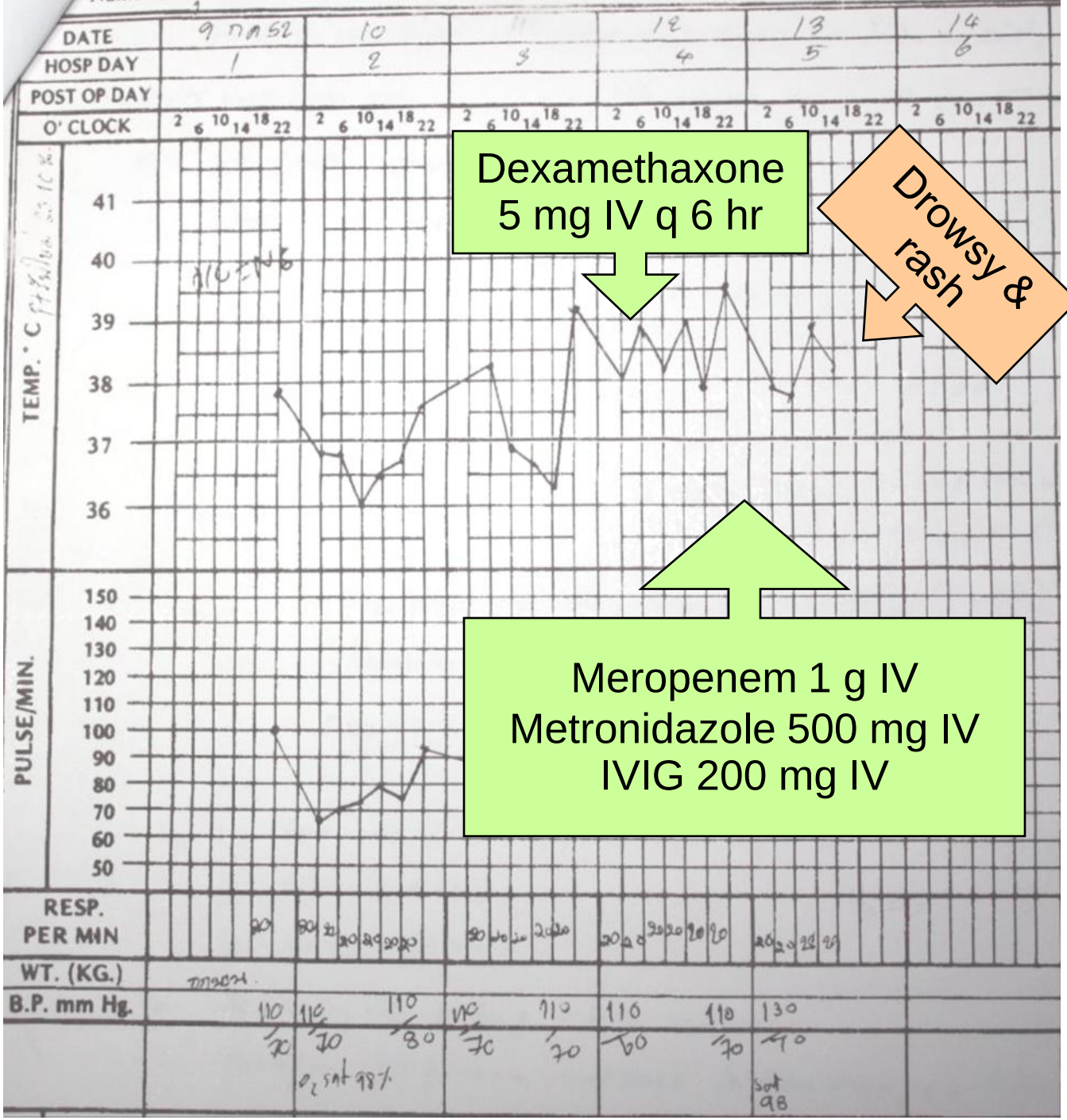

DATE
HOSP DAY
POST OP DAY
O' CLOCK
TEMP. °C
PULSE/MIN.
RESP. PER MIN
WT. (KG.)
B.P. mm Hg.
Dexamethaxone 5 mg IV q 6 hr
Drowsy & rash
Meropenem 1 g IV
Metronidazole 500 mg IV
IVIG 200 mg IV

Physical Examination at Rama

- VS: T 37.8ºC , BP 150/90 mmHg, PR 89/min, RR 20/min
- GA: drowsy, not pale, mild jaundice, mild puffy eyelids, no injected conjunctiva
- LN: not palpable
- Abdomen: mild tenderness at epigastrium, liver 2 FB below RCM
- Neurology: drowsy, no stiffness of neck

Investigations

- CBC: Hb 14.1 g/dL, Hct 42%, WBC 12,600/mm^3 (N 74, L 11, M 14, Baso 1), Plt 95,000/mm^3
- BUN 48, Cr 2.5 mg/dL
- Na 132, K 5.06, HCO_3 18.7, Cl 101 mmol/L
- LFT: AST 663, ALT 178, ALP 466, GGT 415 U/L, TB 3.3, DB 3.0 g/L ,
- UA: sp gr. 1.020, pH 5.0, prot 3+, blood mark positive, WBC 2-3, RBC 10-15/HPF

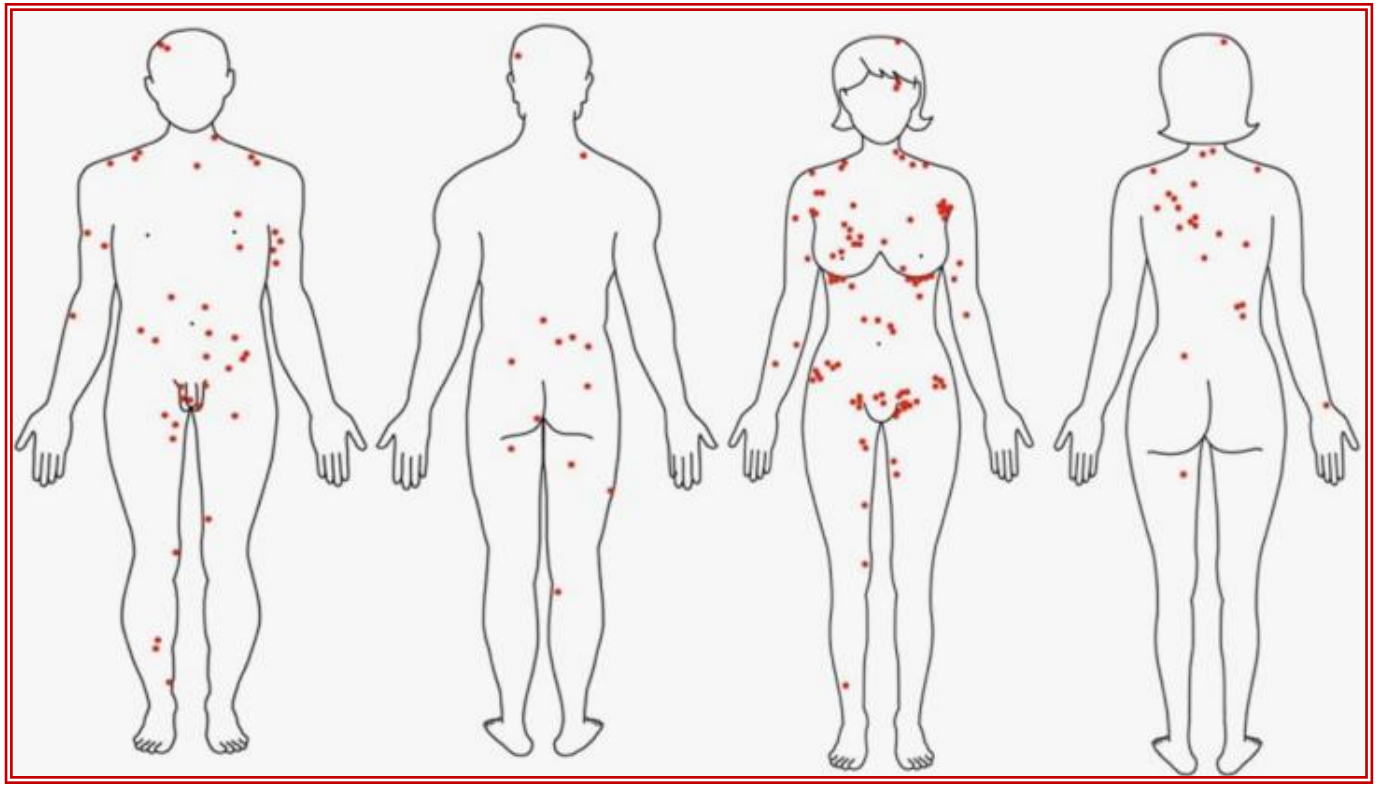
Which Investigations for Confirmation?

- A. Weil-Felix Test
- B. Widal Test
- C. Dengue titer ELISA
- D. IFA for rickettsioses
- E. Leptospira titer
- F. Hemo culture
- G. Malarial film
- H. None of the above

Eschar Lesions

- Scrub typhus
- Rickettsialpox
- Other mite- or tick-borne rickettsiosis
- Ecthyma: pseudomonas infection
- Anthrax
- Skin infection/pyoderma
- Ecthyma/ulcerating impetigo
- Vasculitis
- Warfarin induced subcutaneous necrosis

Eschar Lesions



Case 2: 56 Years Old Male

- Government officer, Nakornprathom
- CC: fever and jaundice 4 days
- PI: 10 days low-grade fever, myalgia, low back pain
  - 4 days high-grade fever, increased pain, and jaundice
- PH: alcoholic drinking, smoking

Physical Examination

- VS: T 39^{o}C, RR 28/min, PR 120/min, BP 90/60 mmHg
- HEENT: not pale, mild jaundice
- Abdomen: soft, not tender, liver 3 FB below RCM, span 15 cm, spleen just palpable, no ascitis
  - Stigmata of chronic liver disease
- Ext: Rt. shoulder marked tender if passive movement
- Rt. lower back: tender ~L5–S1

Investigations

- CBC: Hct 35%, WBC 10,100/mm^3 (N 87%, L 7%, M 5%, B 1%), plt 331,000/mm^3
- UA: pH 6.0, prot 3+, glu 3+, ketone slightly positive, WBC 0-1, RBC 3-5/HPF
- BUN/Cr: 14/1 mg/dl
- LFT: AST 107, ALT 115, ALP 1418 u/L, alb 22.0 G/L, TB 3.4, DB 2.9 mg/dl

Provisional Diagnosis?

- A. Cholangitis
- B. Cholycystitis
- C. Liver abscess
- D. Psoas abscess
- E. Acute pyelonephritis

56 years, fever and jaundice 4 days

PE: stigmata of chronic liver disease, hepatosplenomegaly, shoulder and back pain

Lab: abnormal UA and LFT

Which Organism?

- A. *E. coli*
- B. *K. pneumoniae*
- C. *B. pseudomallei*
- D. *P. aeruginosa*
- E. *Acinetobacter* spp.

Gram-Negative Aerobes

COCCI

- *M. catarrhalis*
- *N. gonorrhoeae*
- *N. meningitidis*
- *H. influenzae*

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- *E. coli*, *Klebsiella* spp.
- *Enterobacter* spp., *Citrobacter* spp.
- *Proteus* spp., *Serratia* spp.
- *Salmonella* spp., *Shigella* spp.
- *Acinetobacter* spp.
- *Helicobacter* spp.
- *Pseudomonas* spp.

Case 3: 30 Years, Physician, Bangkok

- CC: high-grade fever 1 day
- PI: 3 days, high-grade fever with chill
  - Headache, myalgia and dry cough
- 1 day, high-grade fever
  - Mark pain on her thighs and both ankles
  - Frequent vomiting
- No known underlying disease
- 6 weeks ago, went back to Chiang Rai
- 3 weeks ago, got H1N1 2009 vaccination

Physical Examinations

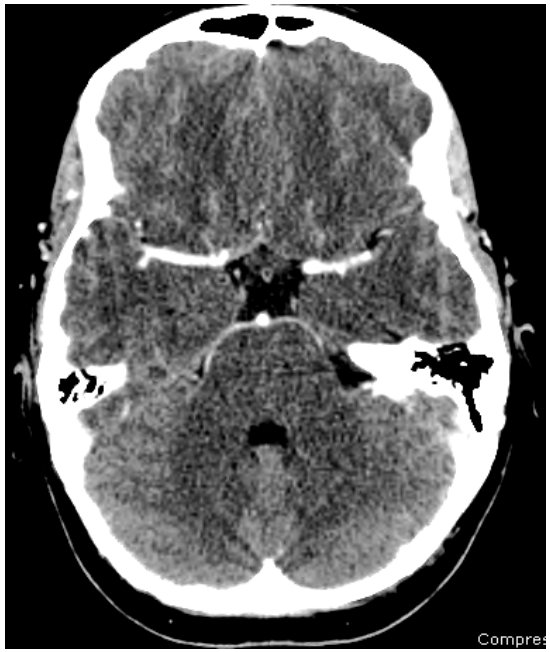
- V/S: T 39.2ºC, BP 100/60 mmHg
- GA: looked sick but good consciousness, not pale, no jaundice
- Extremities: mild tenderness at both thighs
- Skin: no rash, no eschar
- Neuro: alert, good orientation
  - Sharp optic disc, both
  - Pupil Rt 4 mm RTL, Lt 3 mm RTL
  - Mild limit ROM (80%) of Rt MR, SR & IR
  - Terminal stiffness of neck: positive

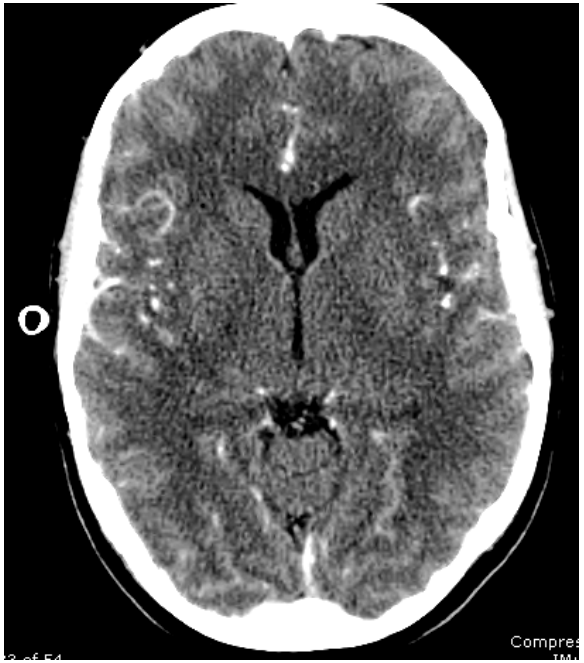
Investigations

- CBC
  - WBC 9,970 cells/mm³ (N 88%, L 7%, M 5%)
  - Hb 12.7 g/dL, Hct 36.9%, plt: adequate
- Blood chemistry: normal
- Urinalysis
  - Prot 3+, WBC 3-5, RBC >100 cells/HPF

CT Brain

- Diffuse brain swelling causing downward transtentorial and impending tonsillar herniation
- Diffuse leptomenigeal enhancement
- No focal enhacing mass, ICH, extraaxial collection, hydrocephalus or midline shift





Investigations

- CBC
  - WBC 9,970 cells/mm³ (N 88%, L 7%, M 5%)
  - Hb 12.7 g/dL, Hct 36.9%, plt: adequate
- Lumber puncture
  - OP/CP 37/37 cmH_2O
  - Slightly turbid CSF
  - WBC 390 cells/mm^3
  - PMN 87%, monocyte 13%
  - Protein 315, glucose 9 mg/dL
  - G/S: numerous PMN, no organism seen

What is the Causative Agent?

- A. *S. pneumoniae*
- B. *M. tuberculosis*
- C. *E. coli*
- D. *N. meningitidis*
- E. *H. influenzae*
- F. Not all of the above

OP/CP 37/37 cmH_2O
Slightly turbid CSF
WBC 390 cells/mm^3 (N 87%, monocyte 13%)
Protein 315, glucose 9 mg/dL

Acute Meningitis: Causative Agents

Characteristic	Dexa	Placebo
Pathogen cultured from CSF — no./total no. (%)	108/216 (50.0)	114/218 (52.3)
Streptococcus suis	60/216 (27.7)	56/218 (25.7)
S. pneumoniae	26/216 (12.0)	29/218 (13.3)
Streptococcus species§	6/216 (2.8)	12/218 (5.5)
Staphylococcus aureus	3/216 (1.4)	6/218 (2.8)
Coagulase-negative staphylococcus	0	1/218 (0.5)
Neisseria meningitidis	9/216 (4.1)	10/218 (4.6)
Haemophilus influenzae	1/216 (0.5)	6/218 (2.8)
Klebsiella species	7/216 (3.2)	3/218 (1.4)
Escherichia coli	6/216 (2.8)	3/218 (1.4)
Other gram-negative bacteria¶	2/216 (0.9)	2/218 (0.9)
Bacteria seen in CSF but not cultured — no./total no. (%)		
Acridine orange stain only	11/217 (5.1)	13/218 (6.0)
Gram's stain or acridine orange stain‖	12/217 (5.5)	16/218 (7.3)

S. pneumoniae (30-50%), *H. influenzae* (1-3%), *N. meningitidis* (10-35%), gram-negative bacilli (1-10%), staphylococci (5-15%), streptococci (5%), *and Listeria* spp. (5%)*

Nguyen TH et al. N Engl J Med 2007;357:2431-40. http://emedicine.medscape.com/article/784389-overview*

Spot Diagnosis

QUIZ 1

- Yeast-like organism, intracellular, pleomorphic, round to ovoid, “sausage” cells, binary fission
- *Penicillium marneffei*

Penicillosis: Clinical Manifestations

Symptoms	No. (%)
Fever	74 (92.5)
Skin lesions	53 (67.5)
Cough	39 (48.7)
Diarrhea	25 (31.2)
Signs	
Elevated temperature	76 (95.0)
Anemic	62 (77.5)
Marked weight loss	61 (76.2)
Skin lesions	57 (71.2)
Lymphadenopathy	46 (57.5)
Hepatomegaly	41 (51.2)
Splenomegaly	13 (16.2)
Jaundice	6 (7.5)

Supparatpinyo K et al. Lancet 1994;344:110-3.

Subacute-Prolonged Fever and Skin Lesions

- Papulonecrotic lesion
  - Cryptococcosis
  - Penicillosis
  - Histoplasmosis
- Mollusgum contagiosum
- Eosinophilic pustular folliculitis
- Prurigo nodularis

Common Etiology of CAP

Patient Type	Etiology	
Outpatient	*S. pneumoniae* *H. influenzae*	*M. pneumoniae* *C. pneumoniae*
		Respiratory viruses
Inpatient (non-ICU)	*S. pneumoniae*	Legionella species
	H. influenzae	Aspiration
	M. pneumoniae	Respiratory viruses
	C. pneumoniae	
Inpatient (ICU)	*S. pneumoniae*	Gram-negative bacilli
	S. aureus	*H. influenzae*

Mandell LA et al. Clin Infect Dis 2007;44:S27-72.

Pneumonia: Specific Etiology by Host

Condition	Commonly pathogen
Alcoholism	*S. pneumoniae*, oral anaerobes, *K. pneumoniae*, *Acinetobacter* spp, *M. tuberculosis*
COPD and/or smoking	*H. influenzae*, *P. aeruginosa*, *S. pneumoniae*, *M. cararrhalis*
Aspiration	Gram-negative enteric pathogens, oral anaerobes (included *S. pneumoniae*)
IVDU	*S. aureus*, anaerobes, *M. tuberculosis*, *S. pneumoniae*
Endobronchial obstruction	Anaerobes, *S. pneumoniae*, *H. influenzae*, *S. aureus*
Post-influenza	*S. aureus*, *S. pneumoniae*

Mandell LA et al. Clin Infect Dis 2007;44:S27-72.

QUIZ 3

- 18-year-old man
- High-graded fever and headache for 2 days
- Stiffness of neck
- Lumbar puncture was preformed and sent for Gram Stain

QUIZ 3

- Gram-positive, lancet-shaped cocci with capsule
- Acute bacterial meningitis
  - *S. pneumoniae*

Gram-Positive Aerobes

COCCI

- Clusters: staphylococci
- Pairs: *S. pneumoniae*
- Chains: group and *viridans streptococci*
- Pairs and chains: *Enterococcus* spp.

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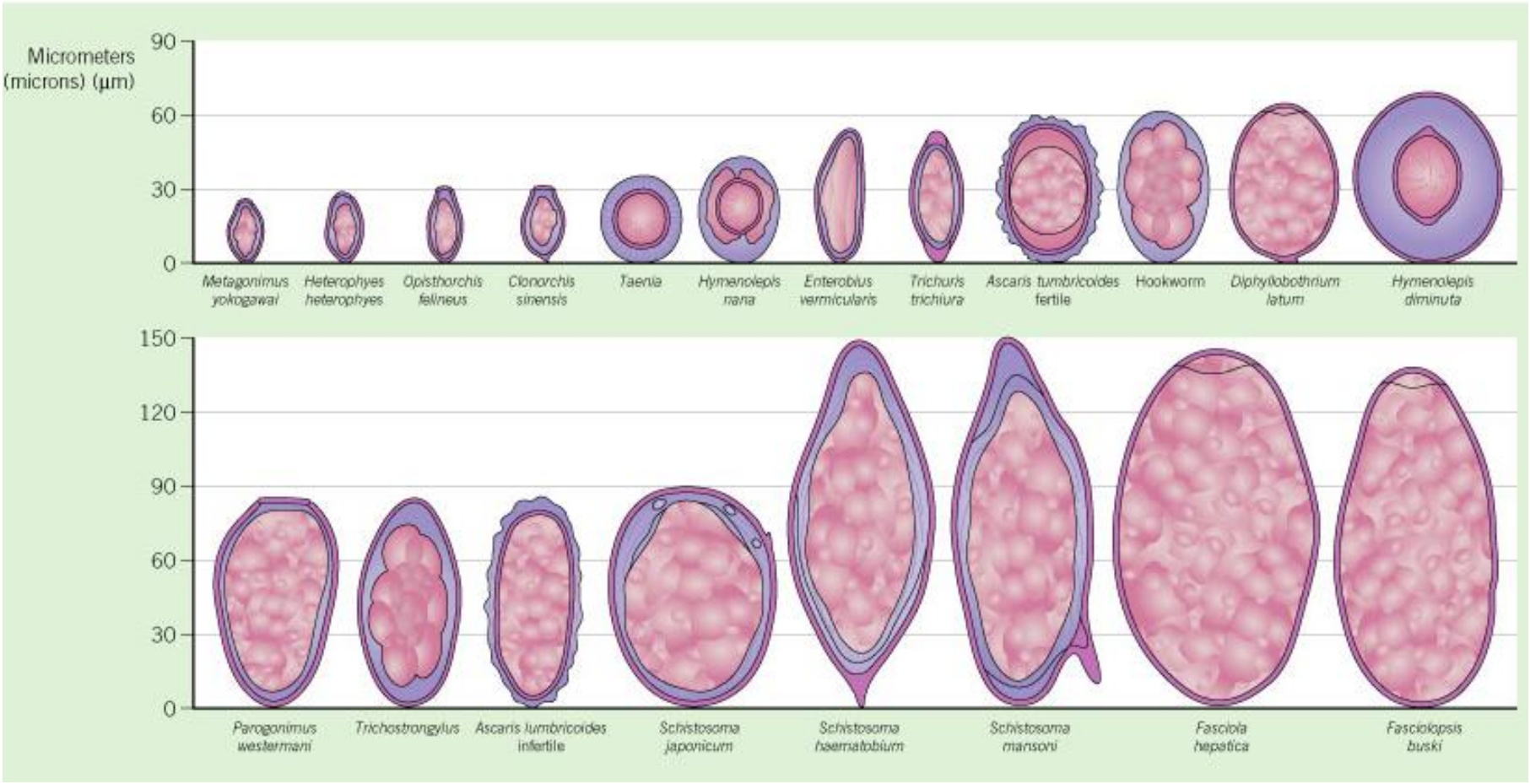
- *Bacillus* spp.
- *Corynebacterium* spp.
- *Listeria monocytogenes*
- *Nocardia* spp.

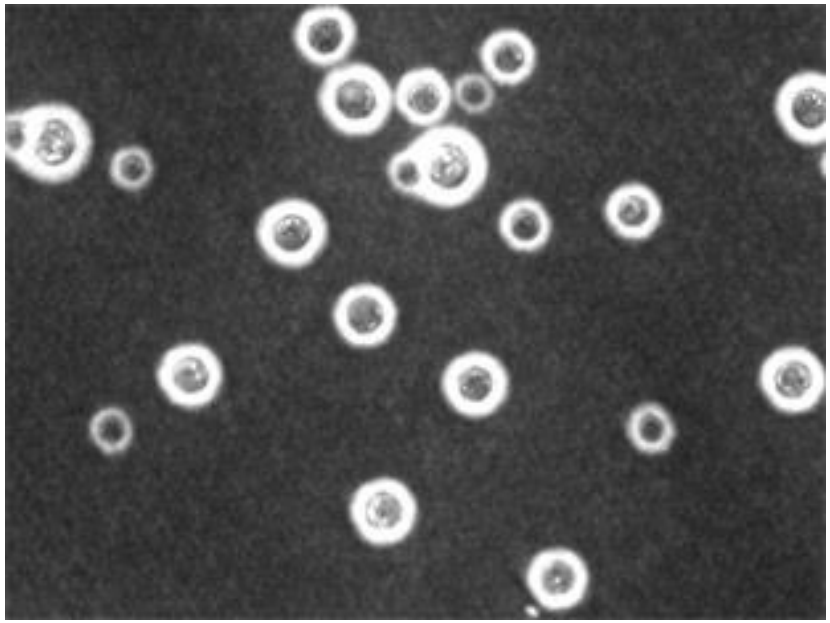
Sizes of Helminth Eggs



BAL Cytology

- Large round encapsulated yeasts
- Budding yeast with negatively stained halos and narrow necked buds

Cryptococcus spp.



- Anti-HIV
- Serum cryptococcal antigen
- Culture for fungus
- Lumbar puncture

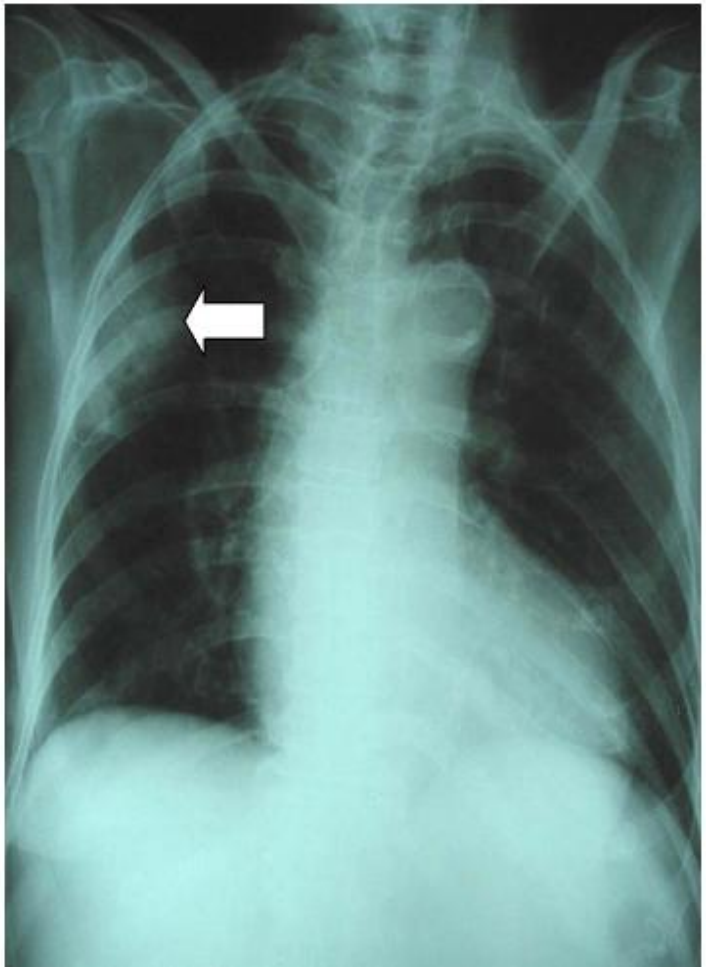
Data in Thailand: Ramathibodi Hosp.

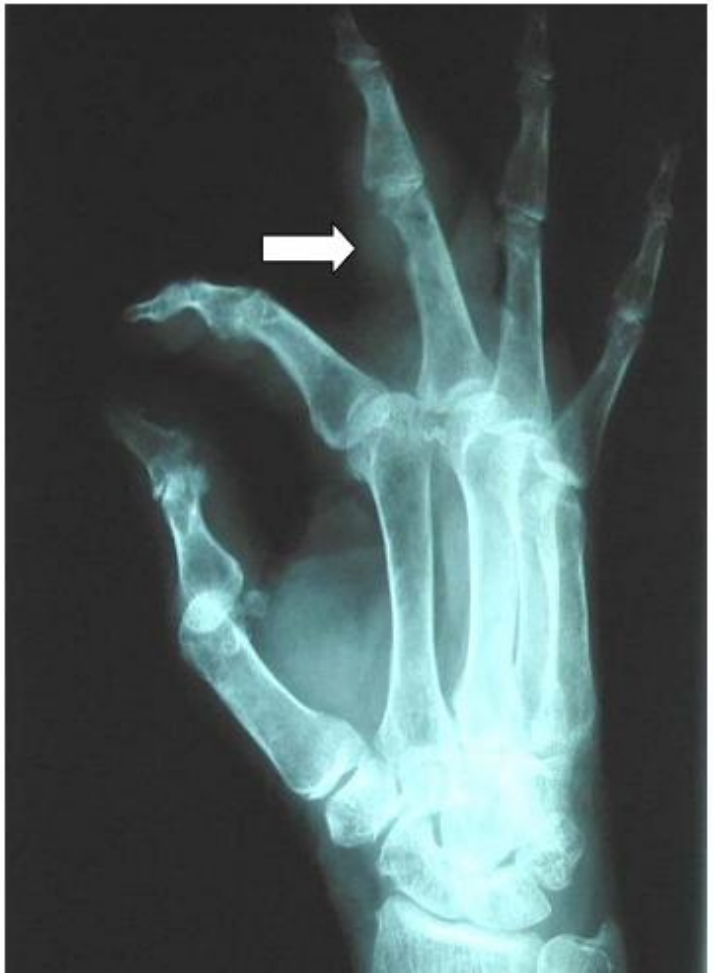
- 40 cases of HIV negative, 1987-2003
- Mean age: 49 (range 16-83) years
- 73% female
- 65% had associated underlying conditions

Underlying conditions[a]	*N* (%)
Receiving immunosuppressive drugs[b]	15 (41)
Systemic lupus erythematosus	6 (16)
Malignancies	6 (16)
Diabetes mellitus	5 (14)
Chronic inflammatory demyelinating disease	2 (5)
Cirrhosis	2 (5)
Others[c]	8 (22)

Kiertiburanakul S et al. Int J Infect Dis 2006;10:72-8.

Radiological Findings





Kiertiburanakul S et al. Int J Infect Dis 2006;10:72-8.

Nonmeningeal Cryptococcosis

Patient group	Initial antifungal regimen	Duration	Evidence
Immunosuppressed patients and immunocompetent patients with mild-to-moderate pulmonary cryptococcosis	Fluconazole (400 mg per day)	6–12 months	B-III
Immunosuppressed patients[a] and immunocompetent patients with severe pulmonary cryptococcosis	Same as CNS disease	12 months	B-III
Patients with nonmeningeal, nonpulmonary cryptococcosis			
Patients with cryptococcemia	Same as CNS disease	12 months	B-III
Patients for whom CNS disease has been ruled out with no fungemia, with a single site of infection, and with no immunosuppressive risk factors *	Fluconazole 400 mg per day	6–12 months	B-III

- Meningitis should be ruled out
- Itraconazole, voriconazole, posaconazole*
  - Persistence, progressive disease, drug toxicity
- Corticosteriod if ARDS
- Surgery

Perfect JR et al. Clin Infect Dis 2010;50:291-322. *Perfect JR et al. Clin Infect Dis 2003;36:1122-31. Raad, II et al. Clin Infect Dis 2006;42:1726-34.

Summary

- Evaluation of patient who presents with infection required
  - Detailed history and physical examination
  - Recognition of abnormal symptoms and signs
- Diagnosis of infection and organism required
  - Experience bedside staining
  - Knowledge of basic laboratory interpretation
  - If any, high-tech or advanced tests may be needed