



Case 5: meningitis



❖ Learning issues:

- 1- Structures and functions of meninges.
- 2-Cerebrospinal circulation and blood-brain barrier.
- 3-Microbiology, pathology and pathogenesis of meningitis.
- 4-Interpretation of patient's clinical symptoms and signs.
- 5-Use of biochemical and microbiological tests in the diagnosis of meningitis.
- 6-Pharmacology of drugs used in the treatment of meningitis.



❖ Key information and Presenting problems:

- Male, 10 years old, primary school student
- Severe headache
- Fever (40c)
- vomiting



History:

- Faiz was well until last night.
- He had some headache and was unwell and irritable.
- Did not eat his dinner and went to bed early.
- School nurse called his father because of his fever.
- He vomited twice on the way to the ER.
- He did **not** hit his head anywhere
- Bowel habits are **normal**
- **NO** trouble with vision or teeth
- **NO** history of prolonged exposure to sun.
- **NO** history of hospital admission or surgery.
- **NO** Medication and Allergy
- **Normal** vaginal delivery, **full term** gestation, **normal** growth and development.
- He had **all vaccinations in time.**



New terms	
Irritable	Excessive response to stimuli
Bowel habits	Time, size, amount, consistency and frequency of bowel (intestines) movements throughout the day
Full term gestation	Special time period of pregnancy
papilledema	Optic disc swelling that is caused by increased intracranial pressure

Vital Signs	Faiz's result	Normal range
temperature	40° C	36.6-37.2 ° C
Pulse rate	120/min	70-100/ min
Respiratory rate	25/min	15-25/ min
Blood pressure	100/60	90/50 – 110-70 mmHg

❖ Neurological Examination:

- * cranial nerves are **normal**.
- * **No** focal neurological signs (no sensory or motor loss).
- * Fundus examination shows **no**

papilloedema.

* **Neck stiffness**.

* Kernig's sign is **positive**.

* Brudzinki's sign is **positive**.

❖ Cardiovascular an Respiratory Examination:

Normal

❖ Abdominal Examination:

Normal

Kernig's sign:

The patient is lying in supine position in bed and his hip and knee are flexed, Extension of his knee joint causes pain and resist the doctor.(normally no pain resistant)

<http://www.youtube.com/watch?v=Evx48zcKFDA>

Brudzinki's sign :

The patient is lying in supine position in bed and the doctor flexes his neck, the patient will suddenly flexes his hip and knee joints.(normally no flexion)

<http://www.youtube.com/watch?v=rN-R7-hh5x4>

❖ Investigations:

- Because Faiz has **meningeal irritation** (positive Kernig's sign and Brudzink's sign) the doctor asked for further assessment of CSF via a lumbar puncture.
- The doctor **examines Faiz's fundi** by the ophthalmoscope to see if there is "papilloedema" which is usually associated with increase ICP. The examination reveals that there is no papilloedema.

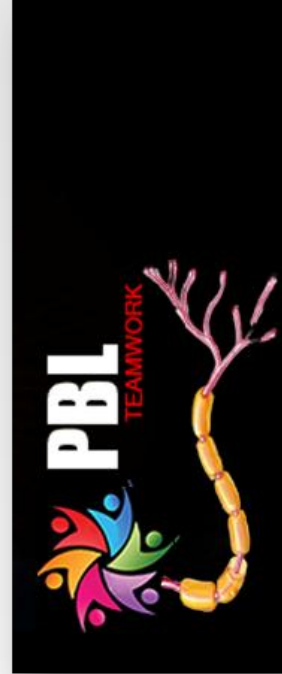
NB: If there is an increase in intra cranial pressure , lumbar puncture is contraindicated.

- The doctor used a wide caliber needle to withdraw blood from Faiz's **median cubital vein** and arrange for urgent blood tests, blood cloture tests, and CSF samples to biochemical and microbiological and culture tests.

(faiz's results are shown in next page)

❖ management:

- 1- (IV) Antibiotics, **Ceftriaxone** , twice daily
- 2- (IV) Fluids . "**normal saline and glucose drip**"
- 3- **Admitting** faiz to the hospital



Full Blood Count

Blood Test	Patient	Normal range
Haemoglobin	12.5	11.5-13.5 g/100ml
White blood cell count	18000 ↑	5,000 -10,000 mm ³
Differential count		
- Segmented neutrophils	83% ↑	50-70%
- Band neutrophils	5% ↑	1-3%
- Eosinophils	1	0-4%
- Basophils	1	0.5-1%
- Lymphocytes	8 ↓	12-46%
- Monocytes	2	2-10%
Platelet count	280,000	160,000-500,000 mm ³

Blood Biochemistry

Blood Test	Patient	Normal Range
Serum Sodium	139	135-145 mmol/L
Serum Potassium	3.5	3.5-5.0 mmol/L
Blood urea	4.5	2.5-8.3 mmol/L
Blood creatinine	0.09	0.05-0.11 mmol/L
Blood glucose	3.9	3.6-5.3 mmol/L

CSF Examination

CSF	Patient	Normal Range
Appearance	Turbid	Clear
Cells	960 (predominantly neutrophils) ↑	0-5 cells per mm ³
Proteins	1.7 ↑	0.15-0.35 g/L
Glucose	1.6 ↓	2.8-4.4 mmol/L
Pressure	17	10-18 cm H ₂ O (patient is lying on his side)

❖ Prognosis:

- ✓ Over the next **12 hours**, faiz's temperature drops to **38-38.5C**.
 - ✓ Over the next **5 days**, faiz shows significant improvement and his temperature **was back to normal**.
 - ✓ He is **not** irritable or drowsy and his appetite is back to **normal**.
 - ✓ He is **discharged from hospital on day 10** and all his blood tests are back to **normal** and had been afebrile for the last **three days before discharge**.
 - ✓ Asked to review the outpatient clinic **in two weeks**.
(the later follow-up shows that he did not develop any complication such as deafness or impairment of the cranial nerves)
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❖ Diagnosis: acute pyogenic Meningitis

- ✓ **Caused by: *Streptococcus pneumoniae***

S.pneumoniae grow in **chocolate agar**. This strain of *S.pneumoniae* appears **mucoïd when grown in blood agar**. (mucoïd appearance is related to the capsule production)

❖ Pathology :

1- MENINGITIS:

An inflammation of the leptomeninges*and CSF within the subarachnoid space.
(Leptomeninges= pia matter + arachnoid matter)

*meningitis may leads to brain abscess also brain abscess may leads to meningitis

2-Aseptic meningitis (viral meningitis):

It is less dangerous than pyogenic meningitis (bacterial meningitis) because it is usually self-limiting.

❖ Signs and Symptoms of Acute Meningitis

Fever, Headache, Stiff neck “Pain, itchy nick”, Nausea & vomiting, Sensitivity to light, Confusion., bruises under skin & spread rapidly in advanced cases.

❖ In infants:

Inactivity, Irritability, Vomiting, Poor feeding

❖ Biochemical and microbiological tests in the diagnosis of meningitis

1. Blood biochemical of CSF
2. microbiological test of CSF
3. CSF and blood culture
(CSF from Spinal tap “lumbar puncture”)

CSF properties/The disease	Pyogenic meningitis	T.B meningitis	Aseptic meningitis
Appearance	Cloudy	Cloudy less than pyogenic	clear
Protein level	increased	increased	Little increased
Glucose level	Decreased	Decreased	normal
Cells differential	neutrophils	Lymphocytes	Lymphocytes

Questions



Q1	What is Meningitis?	Q3	Gram stain showed a Gram positive diplococci ,What is the most likely the causative organism?
Is the inflammation of the protective membranes covering the brain and spinal cord known as the meninges		S.Pneumoniae	
Q2	What are the symptoms associated with pyogenic meningitis?	Q4	What are the investigations of meningitis?
<ul style="list-style-type: none">○Fever○Headache○Vomiting○Neck stiffness○Photophobia		<ul style="list-style-type: none">○Head CT scan: should be performed if there is any suspicion of an intracranial mass lesion such as <u>papilloedema</u>○Lumbar puncture (LP): urgent CSF microscopy, white cell count and differential, and analysis for protein and glucose concentration.○ blood biochemistry and microbiology of CSF	



Q5 What are the CSF findings in pyogenic meningitis?

- Cloudy , purulent CSF
- As many as 90,000 neutrophils /mm
- Raised protein level
- Markedly reduced glucose content

Q7 What is the management for pyogenic meningitis?

Treatment of bacterial meningitis includes the following:

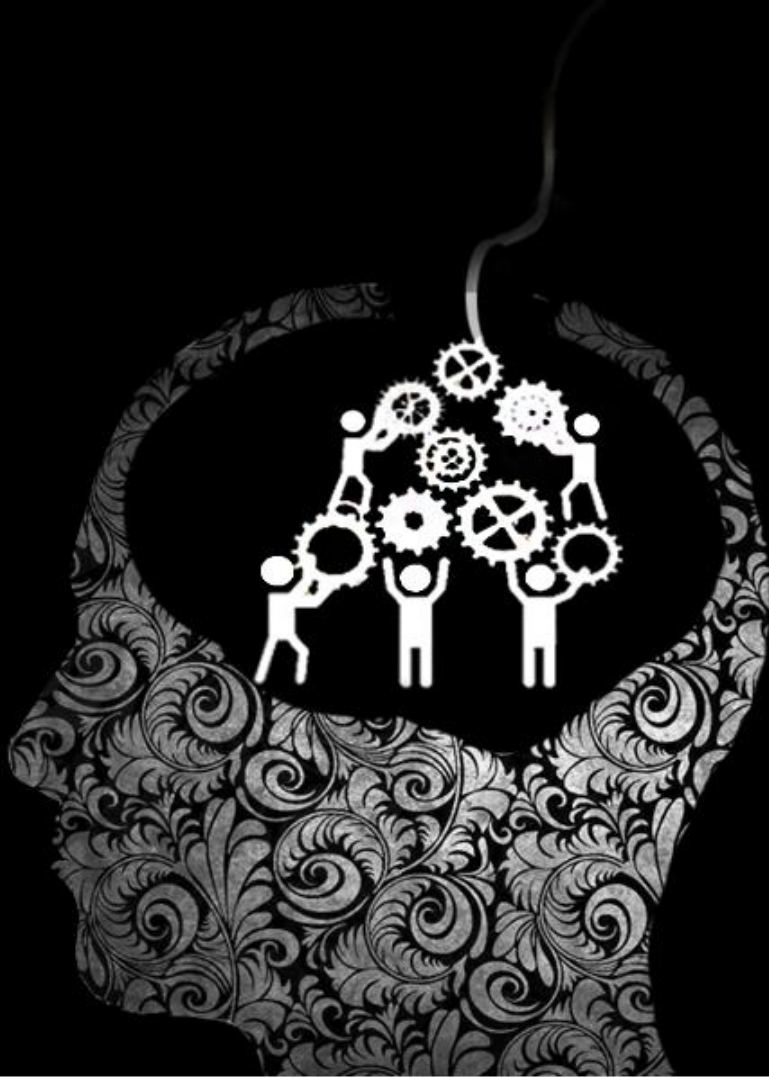
- Prompt initiation of empiric antibacterial therapy as appropriate for patient age and condition
- After identification of the pathogen and determination of susceptibilities, targeted antibiotic therapy as appropriate for patient age and condition
- May includes Steroid therapy

Q6 What are the complications of meningitis?

- Phlebitis
- Focal cerebritis & seizures
- Cerebral abscess
- Cognitive deficit
- Deafness

Q8 Describe brudzinki's test ?

The patient is lying in supine position in bed and the doctor flexes his neck, the patient will suddenly flexes his hip and knee joints.(normally no flexion)



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