

# MENINGITIS

DURA MATER

ARACHNOID  
MATER

PIA  
MATER

SEVERE HEADACHE

PHOTOPHOBIA  
(SENSITIVITY TO  
LIGHT)

DIFFICULTY EXTENDING  
THE LEG AT THE  
KNEE

MELISSA IS SITTING UP  
IN BED. SUDDENLY, SHE  
TRIES TO EXTEND HER  
LEG AND NOTICES IT  
FEELS VERY PAINFUL.

NUCHAL  
RIGIDITY  
(NECK  
STIFFNESS)

## MENINGITIS AND ICP MONITORING

A CASE  
STUDY

MELISSA  
HAS A  
DIAGNOSIS  
OF BACTERIAL  
MENINGITIS

# MENINGITIS

SEVERE HEADACHE

MELISSA IS A 25 YEAR OLD FEMALE. SHE WOKE UP IN THE MORNING FEELING A LITTLE CONFUSED. SHE HAS A SEVERE HEADACHE AND IS UNABLE TO TOLERATE LIGHT.

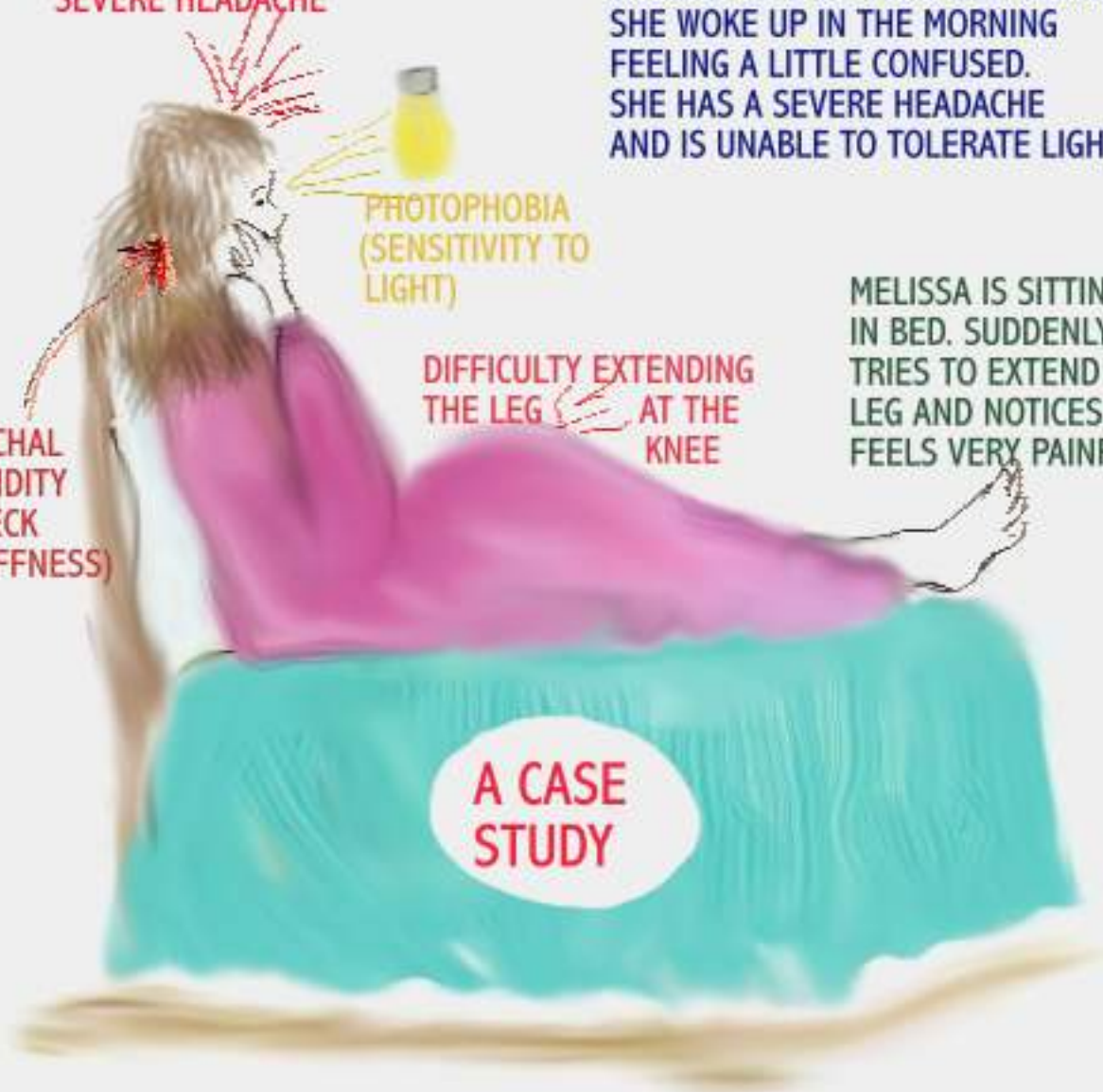
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## RED ALERT



THE CONTENT OF THIS PROGRAM IS INTENDED TO HELP NURSES WHO ARE NEW AND INEXPERIENCED.

IT IS IN NO WAY INTENDED TO BE USED AS A SUBSTITUTE FOR YOUR INSTITUTION'S POLICIES AND PROCEDURES OR DOCTOR'S ORDERS. I HOPE YOU ENJOY LEARNING!

## LEARNING OBJECTIVES



1. IDENTIFY MENINGITIS AND ITS SIGNS AND SYMPTOMS.
2. DISCUSS THE DIAGNOSTIC TESTS DONE FOR MENINGITIS.
3. RECOGNIZE THE INDICATIONS FOR ICP MONITORING.
4. DESCRIBE THE VENTRICULAR SYSTEM.
5. DISCUSS THE MANAGEMENT OF A PATIENT WITH MENINGITIS AND THE COMPLICATIONS.
6. IDENTIFY THE NEED FOR FAMILY EDUCATION.

**PLEASE REFER TO CRANIAL NERVE ASSESSMENT AND ACCURATE NEUROLOGICAL ASSESSMENT (VOLUMES 2 AND 3) OF "STROKE SERIES ASSESSMENT IN THE CLINICAL SETTING" AS A HELPFUL TOOL IN ASSESSMENT AND INTERVENTION.**

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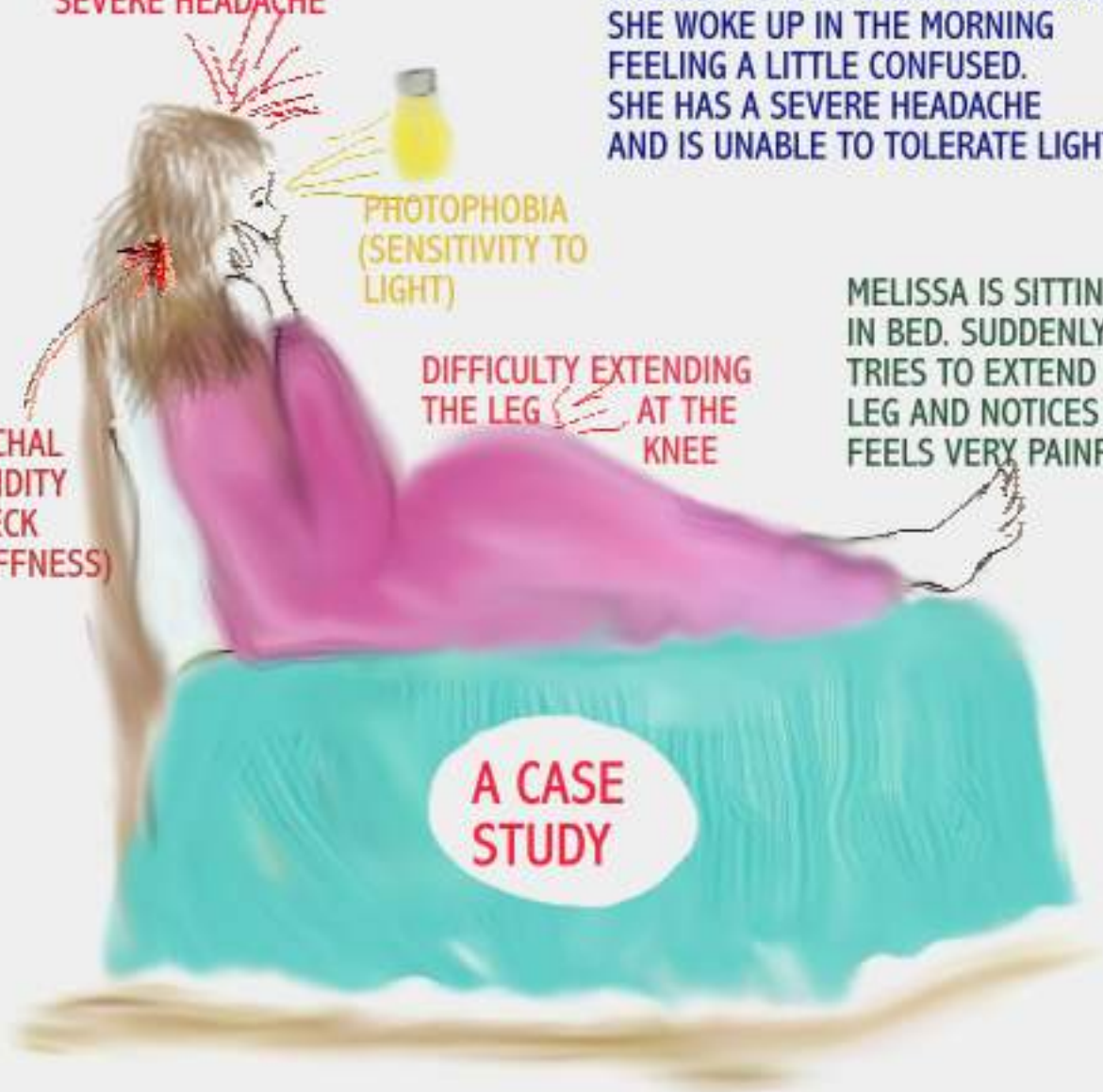
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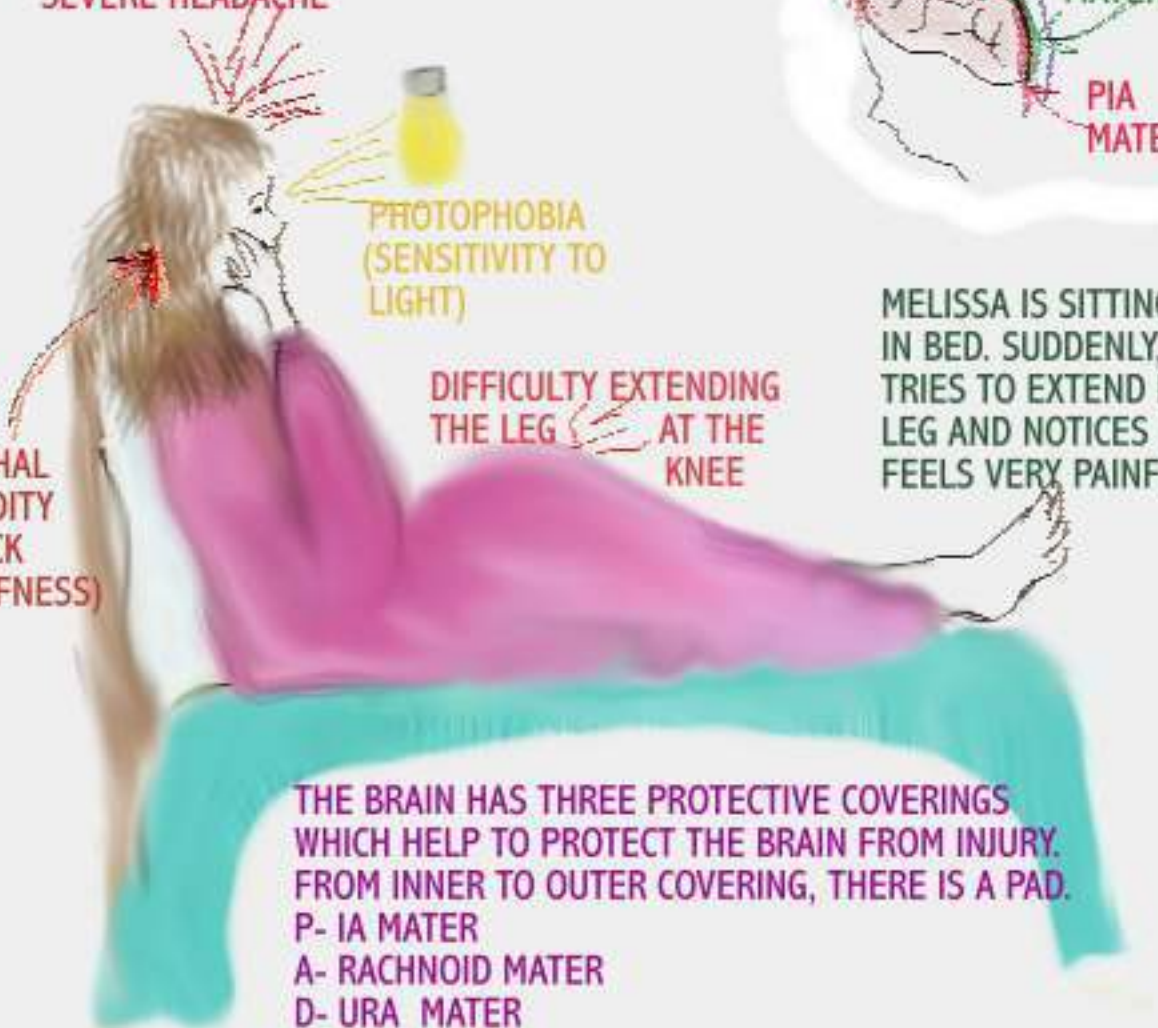
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THE BRAIN HAS THREE PROTECTIVE COVERINGS  
WHICH HELP TO PROTECT THE BRAIN FROM INJURY.  
FROM INNER TO OUTER COVERING, THERE IS A PAD.  
P- IA MATER  
A- RACHNOID MATER  
D- URA MATER

MENINGITIS MAY BE CAUSED BY A VIRUS, BACTERIA, FUNGI, TUMORS OR CHEMICAL IRRITANTS.



## CAUSES OF MENINGITIS



MENINGITIS IS CAUSED BY INFLAMMATION OF THE MENINGEAL COVERINGS OF THE BRAIN AND SPINAL CORD. THIS INFLAMMATION MAY BE BROUGHT ON BY BACTERIA, A VIRUS, FUNGI, TUMORS OR CHEMICAL IRRITANTS.

BACTERIAL MENINGITIS IS COMMON IN THE COLDER MONTHS AND IS CAUSED BY THE HAEMOPHILUS INFLUENZAE OR NEISSERIA MENINGITIDES.

VIRAL OR ASEPTIC MENINGITIS IS LESS SEVERE THAN BACTERIAL MENINGITIS AND IS FREQUENTLY SEEN IN THE SUMMER MONTHS. CAUSES INCLUDE MUMPS, MEASLES, AND HERPES ZOSTER.

FUNGAL MENINGITIS MAY BE SEEN IN PATIENTS WITH HIV DISEASE. THE ORGANISM MOST OFTEN RESPONSIBLE IS CRYPTOCOCCUS NEOFORMANS.

MENINGITIS MAY ALSO BE CAUSED BY MYCOBACTERIUM TUBERCULOSIS.

## SIGNS AND SYMPTOMS



- HIGH FEVER, SEVERE HEADACHE, NAUSEA AND VOMITING
- PHOTOPHOBIA (SENSITIVITY TO LIGHTS), IRRITABILITY
- ALTERED LEVEL OF CONSCIOUSNESS
- KERNIG'S AND BRUDZINSKI'S SIGN
- NUCHAL RIGIDITY

## INTERVENTION

THE DOCTOR WILL DETERMINE THE MEDICATIONS TO BE USED, DEPENDING ON THE CAUSE OF MENINGITIS. DRUGS SUCH AS PENICILLIN, CLAFORAN AND ROCEPHIN ARE USED TO TREAT BACTERIAL MENINGITIS. ACYCLOVIR (ZOVIRAX) IS USED TO TREAT VIRAL MENINGITIS.

AMPHOTERICIN B IS USED IN THE TREATMENT OF FUNGAL MENINGITIS. IF THERE IS A TUMOR, SURGICAL INTERVENTION MAY BE NECESSARY.

# SYMPTOMS OF MENINGITIS

BRUDZINSKI'S SIGN - WHEN THE EXAMINER FLEXES THE PATIENT'S NECK, THE KNEES AND HIPS FLEX AT THE SAME TIME.



KERNIG'S SIGN- INABILITY TO STRAIGHTEN THE LEG WHEN THE HIP IS FLEXED AT A 90 DEGREE ANGLE. THE HAMSTRING MUSCLES BECOME VERY STIFF.

## HELPFUL HINT

PATIENTS WHO HAVE SYMPTOMS OF MENINGITIS BECOME IRRITABLE BECAUSE OF THE PAIN AND SENSITIVITY TO LIGHT. TRY TO CREATE A QUIET ENVIROMENT AND ENCOURAGE THE FAMILY MEMBERS TO LET THE PATIENT REST. PAIN MEDS SUCH AS FENTANYL AND DILAUDID ARE ORDERED BY THE MD. HOWEVER, MEDICATE CAUTIOUSLY, AS TOO MUCH MEDICATION MAY MASK THE NEUROLOGICAL STATUS.

# MENINGITIS - ICP MONITORING

MELISSA IS ADMITTED TO ICU

DIAGNOSTICS TESTS ARE DONE IN ICU

THROAT CULTURE IS DONE.

SINUS TACHYCRDIA  
-DUE TO  
FEVER CAUSED  
BY INFECTION



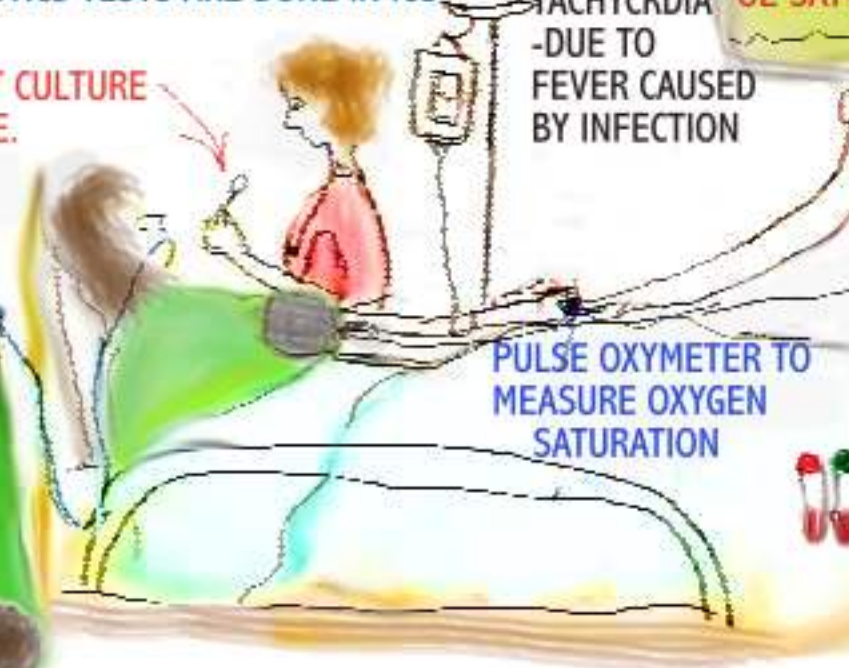
BLOOD PRESSURE

PULSE OXYMETER TO  
MEASURE OXYGEN  
SATURATION

BLOOD SAMPLES  
ARE DRAWN TO  
EVALUATE ANY  
ABNORMAL LAB  
VALUES. WBCs  
ARE INCREASED  
DURING  
INFECTION.



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CT SCAN SHOWS  
SWELLING OF  
THE VENTRICLES.  
THIS IS AN  
INDICATION  
FOR ICP  
MONITORING.



PATIENT POSITIONED  
FOR  
LUMBAR PUNCTURE (SPINAL TAP).  
THIS IS A DIAGNOSTIC TEST FOR  
MENINGITIS.



# MENINGITIS - ICP MONITORING

IV FLUIDS AS ORDERED BY THE DOCTOR

SINUS RHYTHM ON MONITOR



ANTIBIOTIC GIVEN IV FOR INFECTION

TEMP= 99.6

DRESSING TO HEAD



EXTERNAL VENTRICULAR DEVICE (EVD) IS PLACED IN THE VENTRICLE TO REMOVE THE EXTRA FLUID WHICH WOULD MAKE ICP HIGH.

SHAVING AND CLEANSING THE AREA OF THE HEAD FOR EVD INSERTION IS DONE BY THE NEUROSURGEON. A DEVICE SIMILAR TO A WALL DRILL IS USED TO TUNNEL INTO THE VENTRICLE.

STOPCOCK IS OPENED TO ALLOW CSF DRAINAGE

A CATHETER IS THEN PLACED IN THE VENTRICLE AND A DRAINAGE SYSTEM IS ATTACHED. THIS IS CALLED AN EVD (EXTERNAL VENTRICULAR DEVICE) THE PURPOSE OF THIS SYSTEM IS TO RELIEVE THE PRESSURE ON THE BRAIN CAUSED BY EXCESSIVE FLUID IN THE VENTRICLES.

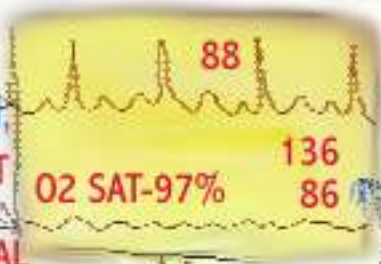


BLOODY DRAINAGE IN CHAMBER

# MENINGITIS - ICP MONITORING

MELISSA'S CARE IN ICU WILL BE PROLONGED, BUT GOOD NURSING CARE IS BEGINNING TO PAY OFF.

HR = SINUS RHYTHM, AS FEVER IS DOWN, 99.6



O2 SAT IS NORMAL

BP

DRESSING TO HEAD

EVD

ICP WAVE

CHAMBER FOR DRAINAGE FROM VENTRICLE

EXTERNAL VENTRICULAR DEVICE (EVD) IS PLACED IN THE VENTRICLE TO REMOVE THE EXTRA FLUID WHICH WOULD MAKE ICP HIGH.

A SAMPLE OF MD ORDERS BELOW:

- NEUROLOGICAL ASSESSMENT AND REPORT CHANGES
- RECORD ICP Q 1HR AND TREAT IF > 20 FOR 5 MINUTES
- IV FLUIDS AND ANTIBIOTICS AS ORDERED BY MD
- PAIN MEDS AND SEDATION
- ANTIPIRETICS TO REDUCE FEVER
- I/O
- MANNITOL, DIURETICS TO DECREASE ICP.
- LAB VALUES

DOCUMENT THE QUANTITY AND COLOR OF DRAINAGE Q 1 HR OR AS ORDERED.

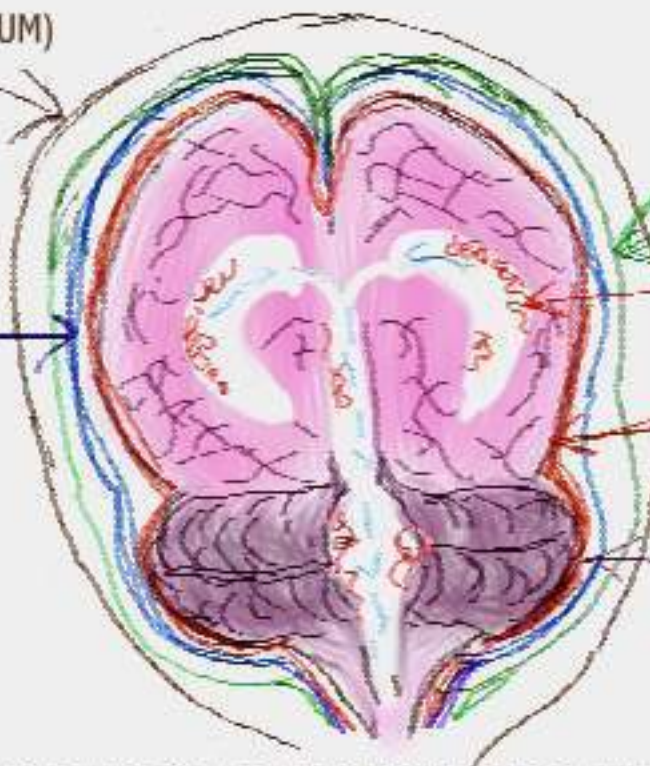


FOLEY WITH URINE. IF MANNITOL OR DIURETICS SUCH AS LASIX IS USED TO DECREASE ICP, EXPECT A LARGE VOLUME OF URINE STRICT I/O SHOULD BE DONE. \*KEEP SBP 130 - 150 (A SAMPLE). BLOOD PRESSURE PARAMETERS ARE SPECIFIED BY THE DOCTOR. THE BRAIN WILL NEED GOOD BLOOD FLOW TO FUNCTION NORMALLY.

## THE VENTRICULAR SYSTEM AND CSF PRODUCTION

THE SKULL (CRANIUM)  
IS A BONY  
STRUCTURE  
WHICH PROTECTS  
THE BRAIN.

ARACHNOID  
MATER



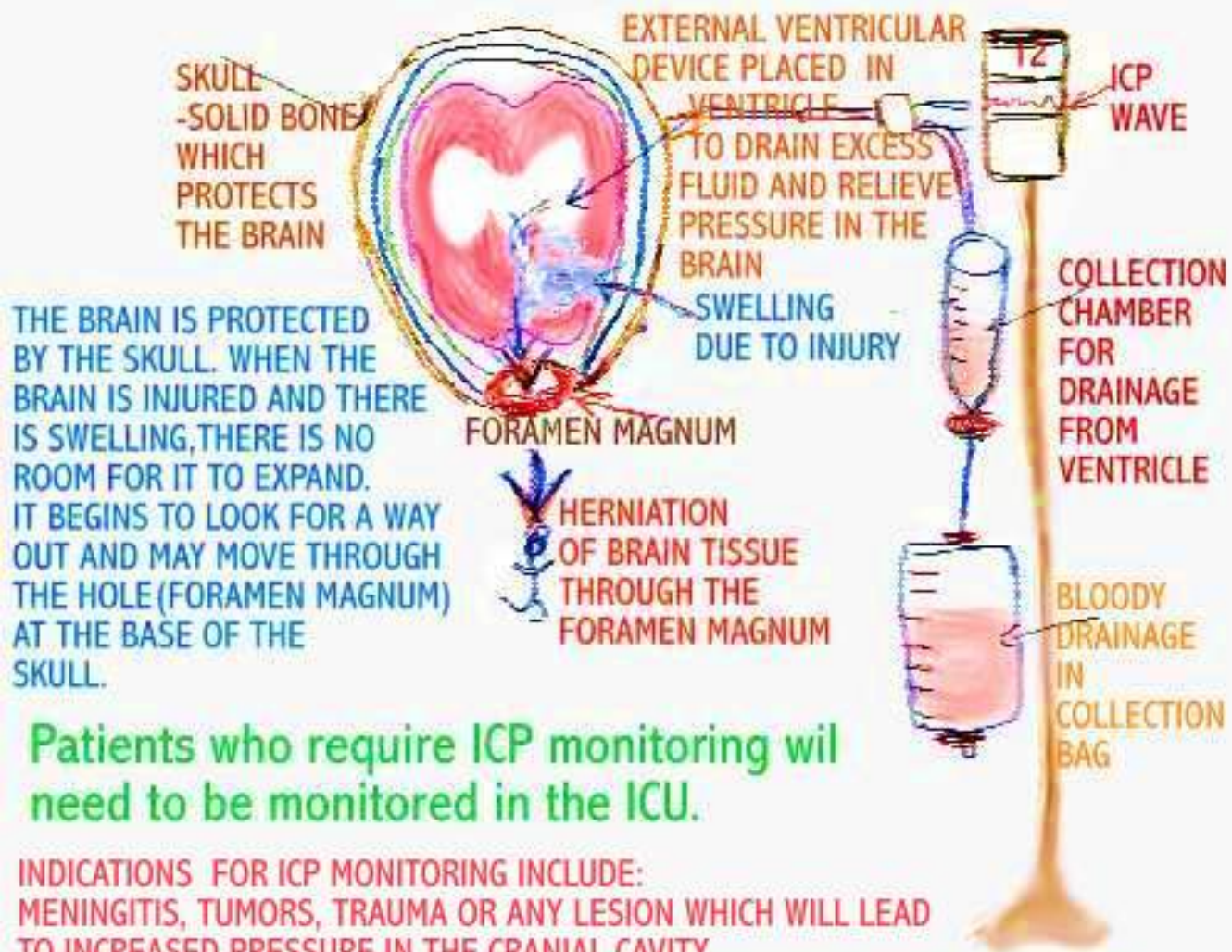
DURA MATER

CHOROID PLEXUS-  
CSF IS PRODUCED IN  
THE CHOROID PLEXUS

PIA MATER

CEREBELLUM

THE BRAIN IS PROTECTED BY A BONY STRUCTURE ( CRANIUM) . THERE ARE THREE PROTECTIVE COVERINGS UNDER THE CRANIUM :- DURA MATER, ARACHNOID MATER AND PIA MATER. BENEATH THE ARACHNOID MATER IS A SPACE CALLED THE SUB-ARACHNOID SPACE. THERE ARE HOLLOW SPACES INSIDE THE BRAIN CALLED VENTRICLES. A TOTAL OF 4 VENTRICLES ARE USUALLY FOUND IN EACH BRAIN. CEREBROSPINAL FLUID ( CSF) IS PRODUCED IN THE VENTRICLES BY VASCULAR CELLS CALLED CHOROID PLEXUS. CSF FLOWS WITHOUT OBSTRUCTION AROUND THE BRAIN AND SPINAL CORD. TYPICALLY, 150MLS. OF CSF FLOWS AT ANY TIME AND APPROX. 500MLS. IS PRODUCED DAILY. CSF IS CLEAR AND ACTS AS A BUFFER.



THE BRAIN IS PROTECTED BY THE SKULL. WHEN THE BRAIN IS INJURED AND THERE IS SWELLING, THERE IS NO ROOM FOR IT TO EXPAND. IT BEGINS TO LOOK FOR A WAY OUT AND MAY MOVE THROUGH THE HOLE (FORAMEN MAGNUM) AT THE BASE OF THE SKULL.

Patients who require ICP monitoring will need to be monitored in the ICU.

INDICATIONS FOR ICP MONITORING INCLUDE:

MENINGITIS, TUMORS, TRAUMA OR ANY LESION WHICH WILL LEAD TO INCREASED PRESSURE IN THE CRANIAL CAVITY.

ALTHOUGH THE NORMAL ICP IS 0 -15, A RISE IN PRESSURE MAY BE CAUSED BY COUGHING, SNEEZING, SUCTIONING, PATIENT CARE AND MORE. REMEMBER TO AVOID TOO MANY ACTIVITIES AT THE SAME TIME, THAT WILL OVEREXHAUST THE PATIENT AND DEplete OXYGEN SUPPLY TO THE BRAIN.

# ACCURATE PATIENT ASSESSMENT



- 2.If your patient continues not to respond, assess the airway for patency.
3. Check vital signs and oxygen saturation.
4. Document findings and notify MD. Your patient may need a work-up and a higher level of care if not in a monitored area.

1.If your patient does not respond when spoken to ( following commands) Try some simple form of stimulation for example, shaking the shoulder or a gentle tap.  
Be sure to document your assessment .

**THE GLASGOW COMA SCALE IS THE COMMONLY USED NEUROLOGICAL ASSESSMENT SCALE**

## TREATMENT OF MENINGITIS

DEPENDING ON THE PATIENT'S CONDITION VENTILATORY SUPPORT MAY BE NEEDED. HOWEVER, IT IS IMPORTANT TO REMEMBER TO BE VIGILANT AND EXPLAIN TO THE FAMILY THE NEED FOR REST TO PREVENT SECONDARY INJURY TO THE BRAIN.

THE DOCTOR USUALLY ORDERS ANTIBIOTICS, ANTIFUNGAL OR ANTIVIRAL MEDS , PAIN MEDS AND SEDATION.

IF THE ICP IS DIFFICULT TO CONTROL, DRUGS SUCH AS MANNITOL ARE USED TO HELP DECREASE ICP AND SERUM OSMOLALITY IS CHECKED PRIOR TO GIVING MANNITOL. THIS LAB VALUE IS DONE TO CHECK FOR SIGNS OF DEHYDRATION.

### NURSING INTERVENTION

1. FOLLOW MD ORDERS.
2. HOB UP 30 DEGREES OR AS ORDERED.
3. PAIN MEDS AS ORDERS.
4. KEEP THE HEAD IN NEUTRAL ALIGNMENT, TO PROMOTE GOOD DRAINAGE OF THE VENTRICLES.
5. IF THE PATIENT IS ON A VENTILATOR, HYPER-OXYGENATION IS NECESSARY PRIOR TO SUCTIONING.



ROLLED TOWELS ON EITHER SIDE OF THE HEAD, TO KEEP THE HEAD IN GOOD ALIGNMENT.

CLOSELY MONITOR PATIENT FOR SEIZURE ACTIVITY. INFLAMMATION OF THE MENINGES HIGH FEVER AND ELECTROLYTE IMBALANCE SUCH AS HYPONATREMIA ( LOW SODIUM) MAY LEAD TO SEIZURES.

SEIZURES WILL BE DISCUSSED IN A LATER CHAPTER.

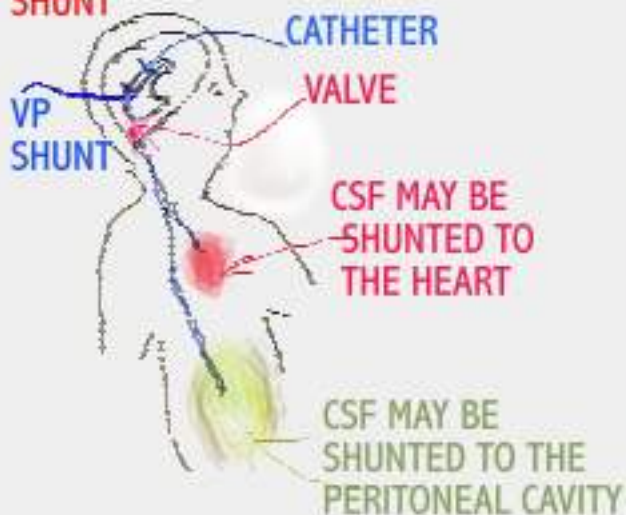
## COMPLICATIONS OF MENINGITIS

THE TREATMENT AND RECOVERY OF MENINGITIS MAY BE VERY PROLONGED. COMPLICATIONS INCLUDE , BUT ARE NOT LIMITED TO:

- NEUROLOGICAL DEFICITS
- SPEECH IMPEDIMENTS
- SEIZURES
- HEARING LOSS
- VISUAL DEFICITS
- HYDROCEPHALUS

DURING THE ACUTE PHASE, EVERY ATTEMPT SHOULD BE MADE TO ADMINISTER GOOD PATIENT CARE, AS WELL AS PATIENT AND FAMILY EDUCATION, TO AVOID THESE COMPLICATIONS.

### VENTRICULOPERITONEAL SHUNT HYDROCEPHALUS



AN ABNORMAL ACCUMULATION OF CSF MAY COMPLICATE MENINGITIS. TUMORS AND BLEEDING INTO THE BRAIN MAY ALSO HAVE THE SAME EFFECT.

IF LONG TERM INTERVENTION IS NEEDED TO RELIEVE THE PRESSURE, A MECHANICAL DEVICE CALLED A VP SHUNT IS INSERTED IN THE VENTRICLE FOR THIS PURPOSE. THIS DEVICE CONSISTS OF A CATHETER, A VALVE AND A RESERVOIR.

# REMEMBER TO EDUCATE THE FAMILY ABOUT THE NEED FOR REST!

patient



headache

visitors



MORE ACTION  
MEANS MORE  
OXYGEN NEEDS  
FOR THE BRAIN.

**AVOID**  
secondary injury  
to the brain from  
over-exhaustion!

ALLOW PATIENTS  
TO REST BETWEEN  
ACTIVITIES,  
TO AVOID SEVERE  
HEADACHES.



visitors

pain  
medication

Too much pain medication may mask the real neurological status of the patient.

Q- WHAT IS THE NORMAL DISTANCE FOR TESTING VISUAL ACUITY?

A- 14 - 20 FEET AWAY



**WORD SALAD**  
A COLLECTION OF SPOKEN WORDS THAT HAVE NO REAL MEANING.

Q- WHAT IS STEREOGNOSIS?

A - THE NORMAL ABILITY TO IDENTIFY OBJECTS BY TOUCHING.



Q- WHAT PART OF THE BRAIN IS RESPONSIBLE FOR BALANCE AND COORDINATION?

A- THE CEREBELLUM, WHICH BELOW THE CEREBRUM.



cerebellum

SLURRED SPEECH,  
"WOBBLY" WALK.



**ANISOCORIA-**  
UNEQUAL PUPILS,  
OCCURS NATURALLY IN ABOUT 20% OF THE POPULATION.  
CONDITIONS SUCH AS HEAD INJURY, MENINGITIS, TUMORS AND GLAUCOMA MAY ALSO CAUSE THIS CONDITION.

DEAR NURSES,

HOPE YOU HAVE BENEFITED  
FROM THIS MENINGITIS/ICP  
CASE STUDY.

PLEASE VISIT VOLUMES 2 AND 3  
OF "STROKE SERIES ASSESSMENT  
IN THE CLINICAL SETTING".

THIS WILL BE OF HELP TO YOU IN DOING  
AN ACCURATE NEUROLOGICAL ASSESSMENT.

STAY POSTED FOR A CASE STUDY ON  
SUBARACHNOID HEMORRHAGE.

MARGARET

