



EDITION

PEDIATRICS

ED.08

NORMAL NEWBORN

----- Active space -----

DEFINITIONS :

1. Newborn period : First 4 weeks
- ↳ 1st week : Early.
 - ↳ Next 3 weeks : Late.
2. Birth weight :
- Low birth weight (LBW) : < 2.5 Kg.
 - Very Low Birth Weight (VLBW) : < 1.5 Kg
 - Extremely Low Birth Weight (ELBW) : < 1 Kg

Intrauterine Growth Retardation

00:05:04

SGA — [Constitutional (Normal)
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Pathological (IUGR)

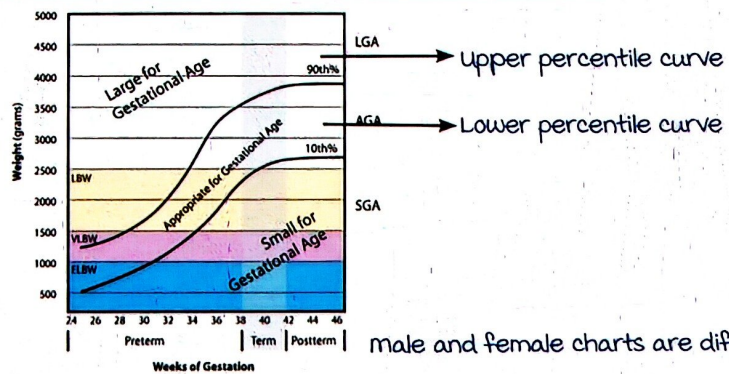
Identification points :

- a. Loose skin folds.
- b. Skin peeling.
- c. Thin umbilical cord.

	Symmetrical IUGR	Asymmetrical IUGR
Etiology	maternal	Fetal
Cause	uteroplacental insufficiency	Genetic defects (Eg : Trisomy), organ anomalies
Onset	2 nd & 3 rd trimester (During placenta-dependent growth of body)	1 st trimester
Effect	Brain sparing effect present ↓ Normal size head, body size small for gestational age	No brain sparing effect ↓ uniformly small baby
Outcome	Good	Poor

Assessment of IUGR :

1. New Allms intrauterine growth curves :



a. Ponderal index (PI) :

$$PI = \frac{\text{Weight of baby (g)}}{[\text{Length of baby (cm)}]^3} \times 100$$

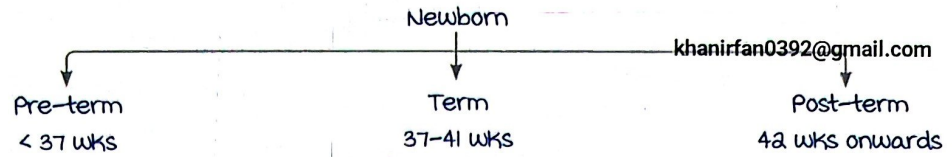
Interpretation :

- > 2 : Symmetrical IUGR.
- < 2 : Asymmetrical IUGR.

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Preterm Baby

00:22:48



ANTENATAL ASSESSMENT :

Based on :

- mother's last menstrual period (Lmp).
- 1st trimester ultrasound scan.

POST NATAL ASSESSMENT :

Expanded New Ballard Score (ENBS) :

- Based on $\left\{ \begin{array}{l} \text{Neuro muscular maturity} \\ \text{Physical maturity} \end{array} \right.$

- Total score range : -10 to +50.
- 10 : 20 weeks.
+50 : 44 weeks.

- Accuracy : ± 1 week.

Neuromuscular Maturity

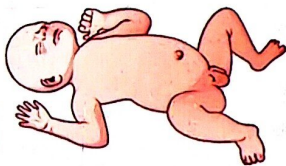
Score	-1	0	1	2	3	4	5
Posture							
Square window (wrist)							
Arm recoil							
Popliteal angle							
Scarf sign							
Heel to ear							

Physical Maturity

	Sticky, friable, transparent	Gelatinous, red, translucent	Smooth, pink; visible veins	Superficial peeling and/or rash; few veins	Cracking, pale areas; rare veins	Parchment, deep cracking; no vessels	Leathery, cracked, wrinkled
Lanugo	None	Sparse	Abundant	Thinning	Bald areas	Mostly bald	Maturity Rating
Plantar surface	Heel-toe 40-50 mm: -1 <40 mm: -2	> 50 mm, no crease	Faint red marks	Anterior transverse crease only	Creases anterior 2/3	Creases over entire sole	Score Weeks
Breast	Imperceptible	Barely perceptible	Flat areola, no bud	Stippled areola, 1-2 mm bud	Raised areola, 3-4 mm bud	Full areola, 5-10 mm bud	-10 20
Eye/Ear	Lids fused loosely: -1 tightly: -2	Lids open; pinna flat; stays folded	Slightly curved pinna; soft; slow recoil	Well curved pinna; soft but ready recoil	Formed and firm; instant recoil	Thick cartilage, ear stiff	-5 22
Genitals (male)	Scrotum flat, smooth	Scrotum empty, faint rugae	Testes in upper canal, rare rugae	Testes descending, few rugae	Testes down, good rugae	Testes pendulous, deep rugae	0 24
Genitals (female)	Clitoris prominent, labia flat	Clitoris prominent, small labia minora	Clitoris prominent, enlarging minora	Majora and minora equally prominent	Majora large, minora small	Majora cover clitoris and minora	5 26
							10 28
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							25 34
							30 36
							35 38
							40 40
							45 42
							50 44



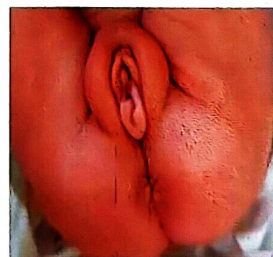
Pre-term baby in extended position



Term baby in flexed position



Scarf sign positive



(a)



(b)

a). Preterm female external genitalia

b). Term female external genitalia

Feedback

Normal Newborn
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DIFFERENCES BETWEEN PRETERM & TERM BABY :

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Features	Preterm baby	Term baby
1. Posture of limbs	extended (↓ tone)	Flexed (Normal tone)
2. Square window test	Fingers do not touch forearm (↓ flexibility)	Finger touches forearm (Flexible wrist)
3. Arm recoil	Absent	Present
4. Scarf sign	Elbow crosses midline (D/t ↓ tone & resistance)	Elbow does not cross midline
5. Popliteal angle (Angle b/w thigh & leg when flexed)	Obtuse	Acute
6. Heel to ear	Possible	Not possible
7. Breast buds	< 5 mm	> 5 mm
8. External genitalia- Female	Both labia majora & labia minora seen	Only labia majora seen (Labia minora hidden)
9. External genitalia-male	Scrotum : Less pigmented Empty scrotum d/t incomplete descent of testis	Scrotum : more pigmented Scrotum contains testis (Fully descended by 36 wks)
10. Lanugo hair	Abundant	Less/absent
11. Ear pinna recoil	Slow (D/t poorly developed elastic cartilage)	Fast

COMPLICATIONS OF PRETERM BIRTH :

Preterm complications

D/t organ immaturity :

Respiratory distress syndrome (RDS) : D/t surfactant deficiency.

- Necrotizing enterocolitis (NEC).
- Intraventricular hemorrhage : D/t bleeding from germinal matrix into ventricles (Fragile blood vessels).



- Kernicterus :

Bilirubin crosses immature blood brain barrier (BBB).

Brain damage

D/t decreased reserve of nutrients :

- ↑ risk of hypoglycemia
- ↑ risk of anaemia (D/t ↓ iron stores).
- ↑ risk of hypothermia (D/t ↓ defence mechanisms to cold).

Normal Observations in a Newborn

00:43:53

Sign	0	1	2
Activity (muscle tone)	Limp (Absent tone)	Some flexion	Good flexion/ active movements
Pulse (Heart rate)	Nil	<100/min	>100/min
Grimace (Reflex irritability)	No response	Grimace, flaccid response without cry	Cry/cough or sneeze
Appearance (Colour)	Blue or pale	Body pink Extremities blue : Acrocyanosis	Pink all over
Respiratory effort	Nil	Irregular, slow breathing	Good cry

APGAR scoring :

Timing : 1 min after birth
↓ Followed by

Total maximum score : 10.
Total minimum score : 0.
Normal APGAR score : 7 to 10/10.
Low APGAR score : < 7/10.

Feedback

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Note :

- Nasogastric tube is used to irritate nasal mucosa to elicit grimace.
- Normal newborn heart rate : 120-160/min.

VITAL SIGNS :





- Heart rate : > 100/min — { Term : 100-160/min
Preterm : 120-180 min
- Respiratory rate : 40-60/min.
- Capillary refill time (CRT) :

Checked by pressing ball of finger over sternum



- Temperature : 36.5 °C to 37.5 °C.

NORMAL FINDINGS :

Findings	Details
1. Erythema toxicum/erythema neonatorum	 <p>→ Papulosquamous lesions</p> <p>648c85cf68b03674e182fab</p> <ul style="list-style-type: none"> - Histology : Eosinophils present. - Onset : > 24 hr after birth.
2. Pustular melanosis	<ul style="list-style-type: none"> • Pustules + hyperpigmented patches. • Onset : < 24 hr after birth. • Histology : Neutrophils present.
3. Epithelial inclusion cyst	 <p>→ Keratin deposits (milia)</p> <p>Other sites of keratin deposition :</p> <ul style="list-style-type: none"> • Palate : Epstein pearls. • Gum : Bohn's nodules.
4. Mongolian spots	 <p>→ Hyperpigmented macules D/t presence of melanocytes in dermis instead of epidermis</p> <p>Pathogenesis : Arrest in melanocyte migration from neural crest.</p>
5. Salmon patch/stork bite/birth mark	 <p>→ Salmon-colored patch on forehead (Or nape of neck). D/t vascular ectasia (Dilation).</p>

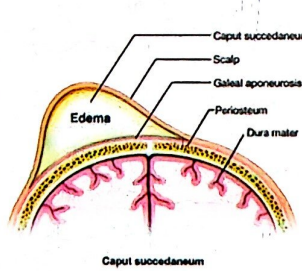
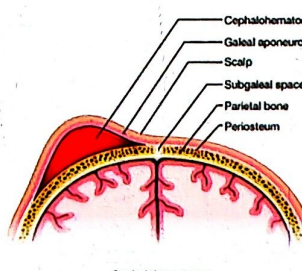
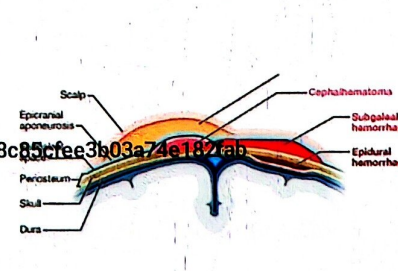
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Findings	Details
6. Breast findings	<ul style="list-style-type: none"> Breast engorgement. Witch's milk: milk-like fluid discharge from nipple.
7. Bleeding per vagina	uterine shedding in female babies → sudden withdrawal of maternal hormones.
8. Small subconjunctival/retinal hemorrhage	• D/t stress of normal delivery
9. Hymenal skin tags	In female baby
10. Physiological phimosis	In male baby

Note: These conditions do not require treatment, only reassurance.

Head Swellings in Newborn

00:57:58

	Caput succedaneum	Cephalhematoma	Sub galeal hemorrhage
Incidence/severity	more common	Less common	more severe
Extent	Diffuse swelling	Localised swelling	Diffuse swelling
Plan	Superficial	Deep	Superficial
Location	Scalp	Sub-pereosteal	Below galea aponeurotica
Reason	<p>D/t prolonged labour</p> <p>↓</p> <p>venous congestion</p> <p>↓</p> <p>Fluid leakage</p>	D/t trauma to skull in instrumental delivery	<p>vaccum extraction</p> <p>↓</p> <p>Traction on layers of scalp</p> <p>↓</p> <p>Separation of scalp layers</p> <p>↓</p> <p>Blood accumulation</p>
Content	Fluid	Blood	Blood (Fluctuant swelling)
Onset	At birth/soon after birth	Slowly increased after 12-24 hr after birth	Appears soon after birth
Recovery	2-3 days after birth	3-8 wks after birth	-
Associations	<p>None</p>  <p>Labels: Caput succedaneum, Edema, Scalp, Galeal aponeurosis, Periosteum, Dura mater.</p>	<ul style="list-style-type: none"> Linear skull fractures. Jaundice (D/t heme breakdown).  <p>Labels: Cephalhematoma, Galeal aponeurosis, Scalp, Subgaleal space, Parietal bone, Periosteum.</p>	<ul style="list-style-type: none"> Shock (D/t ↓ blood volume). Pallor. Jaundice.  <p>Labels: Scalp, Cephalhematoma, Subgaleal hemorrhage, Epicranial aponeurosis, Periosteum, Skull, Dura.</p>

Feedback

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NEONATAL RESUSCITATION

Priority of management in newborn :

1st : **Respiration** (Crying after birth).

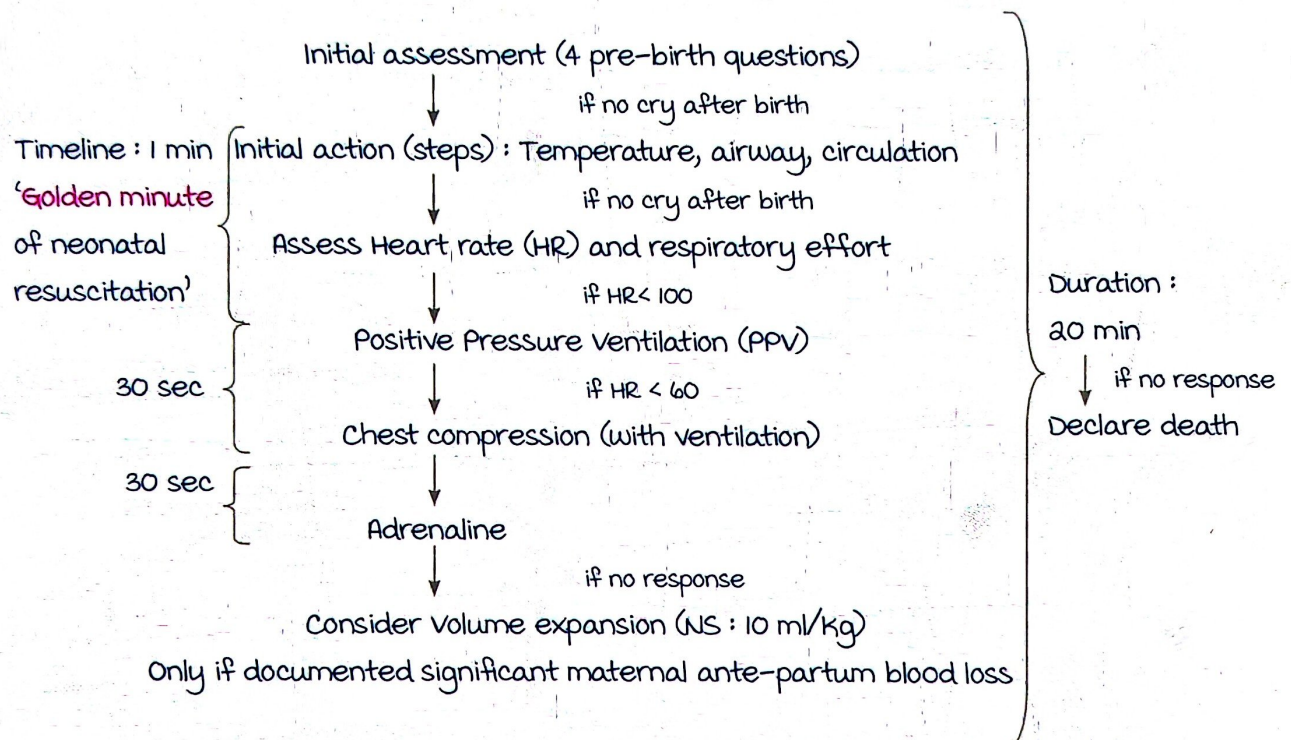
2nd : Temperature.

khanirfan0392@gmail.com

3rd : Circulation.

Management Algorithm

00:31:09



INITIAL ASSESSMENT :

4 pre-birth questions : To predict and plan for outcome of delivery.

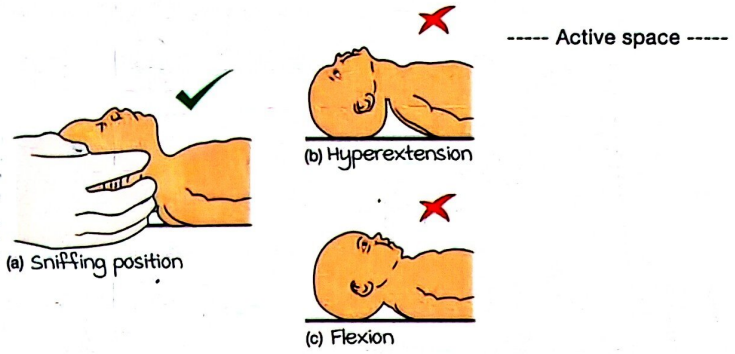
1. Term gestation ?
2. Clear amniotic fluid ?
3. Risk factors present ? (maternal or fetal).
4. Umbilical cord management plan :
 - Delay cord clamping for 30-60s after birth ? (Only if baby cried after birth).
 - Cord blood for newborn screening token ?

INITIAL STEPS :

1. Temperature : Keep baby under warmer.

2. Breathing : Gentle tactile stimulation

- methods :
 - Rubbing over back (with cotton towel)/
 - Flicking soles.



3. Airway :

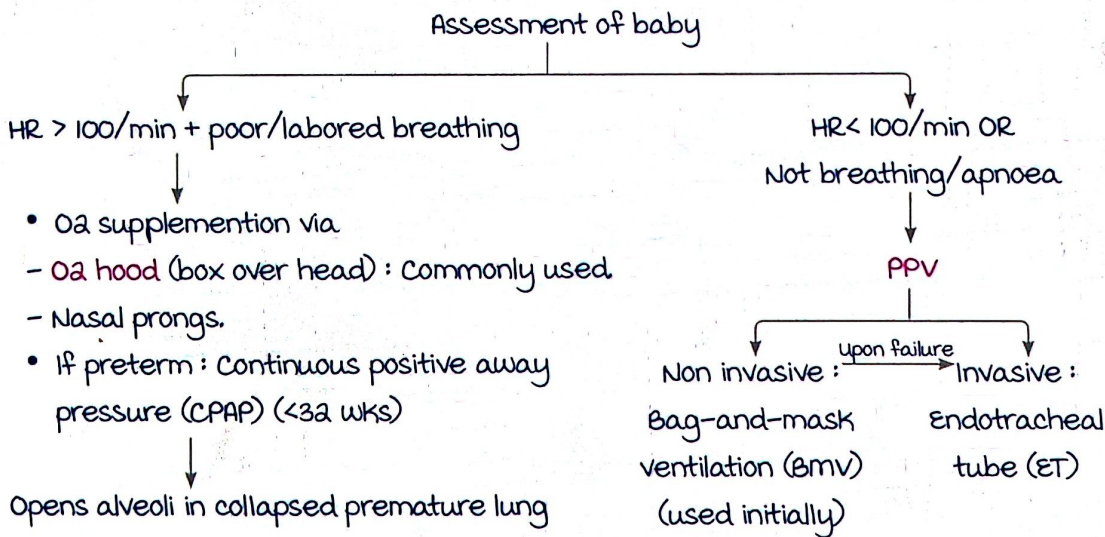
- Positioning : Slight extension of neck (Sniffing position) using towel under shoulder.
- Suctioning : Only if visible secretions.
 Order : **mouth** → **Nose**.
 (Suctioning nose first → blocking of nose → mouth breathing → Secretions aspirated).

ASSESSMENT OF HR AND RESPIRATORY EFFORT :

Purpose of HR assessment :

No cry after birth (No breathing) → **significant hypoxia** → ↓ HR (< 100/min).

Note : Normal newborn HR : > 100/min.



BAG AND MASK VENTILATION :

Volume : 240 to 750 ml.

Rate : 40-60/min.

Response monitoring : HR > 100/min.

Pressure — { 1st pressure : 30-40 cm of H₂O (Higher to open stiff airway).
 Subsequent : 15-20 cm of H₂O (Lower to prevent hyper inflation/rupture of alveoli).

Feedback

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FIO₂ : (Based on gestational age).

- ≥ 35 weeks room air (21% O₂).
- < 35 weeks start with 21-30% O₂ → Titrate to target SpO₂ (measured at right hand).

mins after birth	Targeted SpO ₂
1 min	60-65%
2 min	65-70%
3 min	70-75%
4 min	75-80%
5 min	80-85%
10 min	85-95%

Need for matching targeted SpO₂:Excess O₂, (Preterm)

Hyperoxia damage :

Retinopathy of prematurity (ROP) :



Blindness

Ventilation correction steps if response inadequate : In order undertaken :

mnemonic : **MRSOPA**.1. **mask** repositioning :

- Incorrect position : m/c cause of inadequate response.



Correct



Incorrect closure



Too small



Too large

2. Readjust head position.

3. Suction : Remove all secretions.

6. Alternate airway : If all steps fail.

(ET tube)

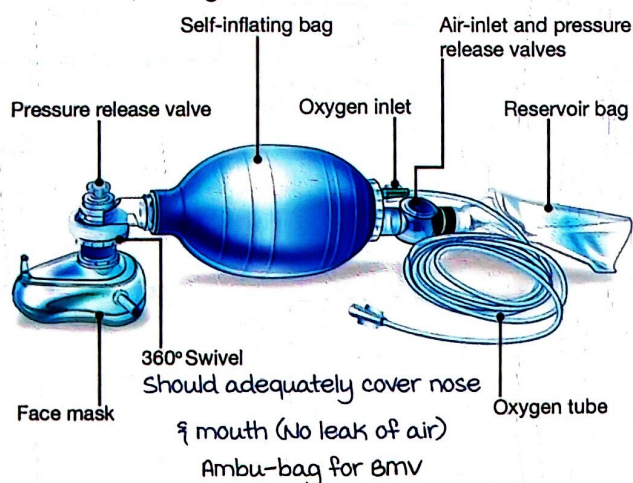
4. Open mouth.

5. Pressure increase over bag.

Absolute C/I : Congenital diaphragmatic hernia.

Air enters via esophagus → Inflates intrathoracic viscera → Compression of lungs (↑ respiratory distress).

Goal : Respiratory rate 40 to 60 breaths/min



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Endotracheal intubation :

visualization of airway : via straight blade laryngoscope

{	Size 0 : Preterm	} On back of blade
	Size 1 : Term.	

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Type of ET : Uncuffed.

- To prevent **pressure tracheal necrosis** (D/t cuff pressure on narrow sub-glottic area).

Inner diameter of tube :

- Based on weight of body :
 - < 1 kg : 2.5 mm.
 - 1 to 2 kg : 3 mm.
 - > 2.5 kg : 3.5 mm.

End tidal CO₂ estimation (EtCO₂) : **Best method** to determine if placement is correct done using capnography

Insertion depth : Naso-tragal length (in cm) + 1 cm.

CHEST COMPRESSION :

Done alongside ventilation (2 person).

Ratio : 3 : 1 (90 compressions : 30 ventilation in 1 min).

Response monitoring : Using cardiac monitor.

- HR > 60.

ADRENALINE :

Route :

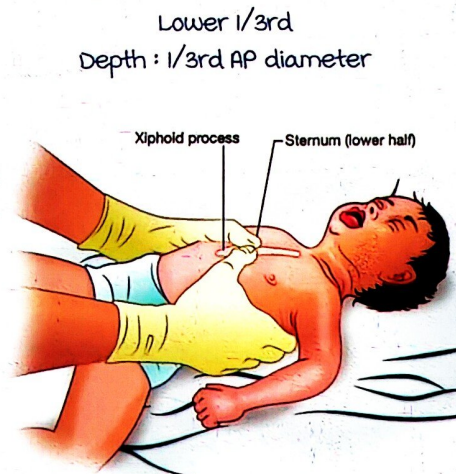
- Preferred : IV (Through umbilical vein).

↓ if inaccessible

Intraosseous route

Dose : 0.2 ml/kg.

Strength : 1 : 10,000.



2-thumb technique
performed from head end usually

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NECROTIZING ENTEROCOLITIS AND NEONATAL SEPSIS

m/c and devastating surgical emergency in neonates.

Etiopathogenesis

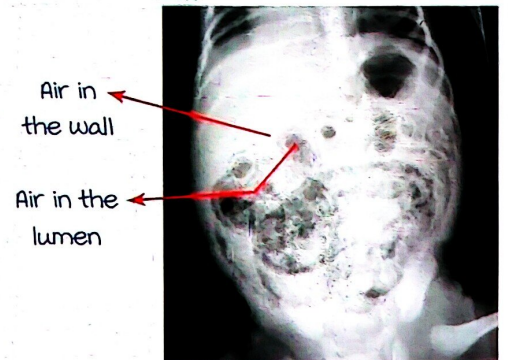
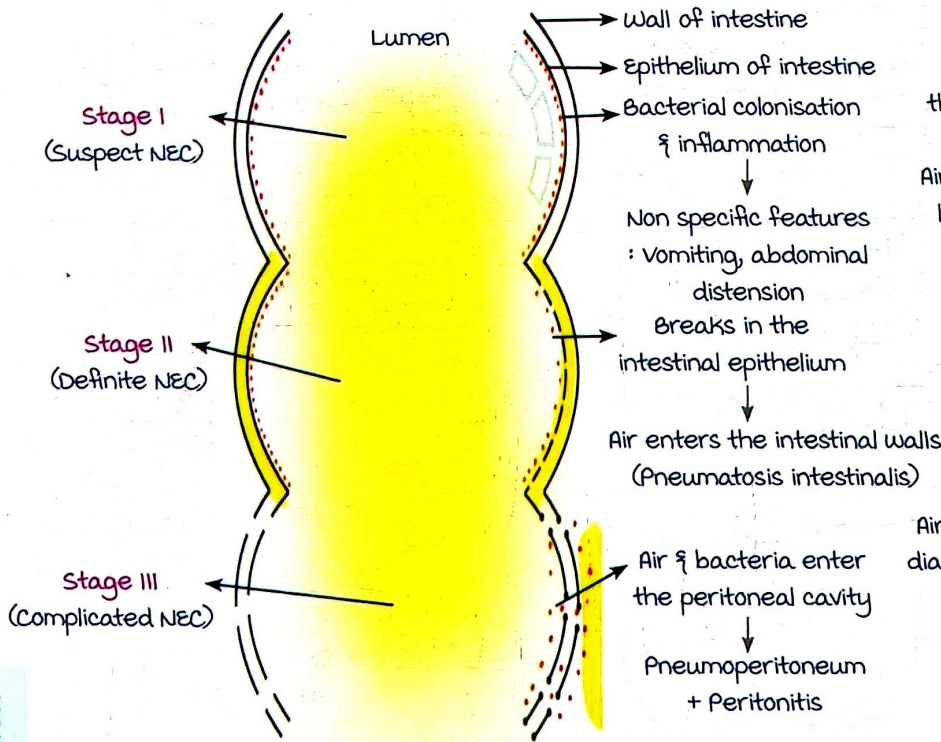
00:00:30

1. Prematurity (<32 weeks) → Immaturity of GI tract
 2. Top feeds without breastmilk (Eg: Formula, cow milk) → Pathogenic bacterial colonisation
 3. Other factors:
 - Asphyxia
 - maternal cocaine use
 } vasoconstriction of splanchnic circulation → Necrosis.
- Inflammatory necrosis d/t infection.*

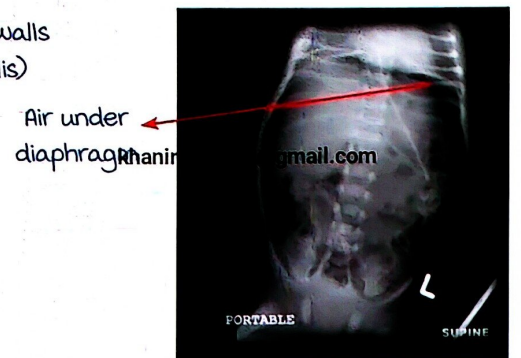
Clinical Features

00:03:00

MODIFIED BELL'S STAGING :



III a : Pneumatosis intestinalis



III b : Pneumoperitoneum



----- Active space -----

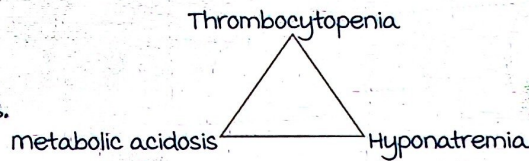
	Features	Imaging
I A	Occult blood in stools	Normal
I B	Gross blood in stools	
II a	Absent bowel sounds	Pneumatosis intestinalis (Characteristic of NEC)
III b	Absent bowel sounds + abdominal wall edema. khanirfan0392@gmail.com	Air in the intestinal wall ↓ Enters venous drainage system ↓ Superior mesenteric vein ↓ Portal vein : Pneumatosis portalis
III a	Induration } Redness/erythema } Of abdominal wall Tenderness }	-
III b	Intestinal perforation	Pneumoperitoneum

Management

00:15:28

Triad of lab findings :

- Seen only **after stage II b.**
- Do not have great relevance in diagnosis.



Until stage III a :

medical management :

- Nil per oral (NPO).
- Total parenteral nutrition (TPN).
- IV antibiotics :
 - Penicillin (Gram +ve) + Aminoglycosides (Gram -ve) + metronidazole (Anaerobes).

Duration of antibiotics :

- Stage I a : 3 days.
- Stage I b : 7-10 days.
- Stage II, III a : 14 days.

Stage III b :

Hemodynamically unstable : 1^o peritoneal drainage (Emergency procedure)

↓
After stabilization

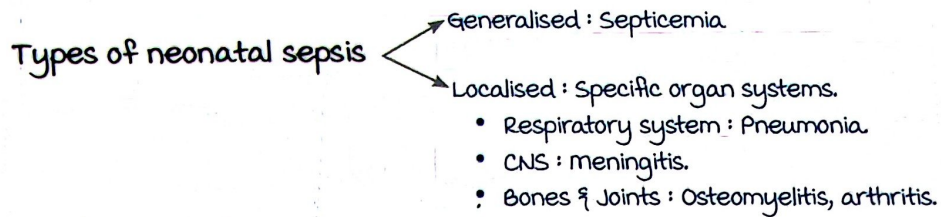
Hemodynamically stable : Laparotomy → Resection & anastomosis.

Untreated : m/c cause of neonatal mortality.

Feedback



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Spectrum of neonatal sepsis

	Early onset sepsis	Late onset sepsis
Onset	First 72 hrs of life	> 72 hrs
Source of infection	maternal	Hospital acquired infection
Risk Factors	<ul style="list-style-type: none"> • Chorioamnionitis. • Infection of maternal genitalia (Foul smelling liquor). • Rupture of membranes over > 72 hrs. 	<ul style="list-style-type: none"> • unclean hands of health professionals & caregivers. • Low birth weight (LBW) → ↓ Immunity. • Lack of breastfeeding.
Type of infection	Pneumonia >> Sepsis	Equal incidence of Sepsis, Pneumonia & meningitis

Etiology & Clinical Features

00:25:17

ORGANISMS IMPLICATED :**India :**

1. *Klebsiella* (m/c).
2. *Acinetobacter*.
3. *S. aureus*.

Worldwide :

1. Group B *Streptococcus* (GBS).
2. *E. Coli*.
3. *Listeria*.

SYMPTOMS :

Weak immune response → **Non specific symptoms** → Suspect sepsis in any sick baby.

Recognised symptoms :**Early symptoms :**

- Change in feeding pattern.
- Lethargy.
- Hypothermia >> Fever.

Pneumonia :

- Respiratory distress.

Signs specific to organ system :**meningitis :**

- Fever and irritability (Non specific).
- Seizures.

Management

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INVESTIGATIONS :

Blood culture : **Gold standard.**

Disadvantage : Time-consuming.

Sepsis screen : Presence of > 2 findings → The sepsis screen.

Components	Value in Sepsis
Total leukocyte count	↓ (< 5000/mm ³)
Absolute neutrophil count	↓ (< 1800/mm ³)
Immature/total neutrophil ratio	↑ (> 0.2)
micro-ESR	↑ (> 15 mm/hr)
CRP	↑ (> 1mg/dL)

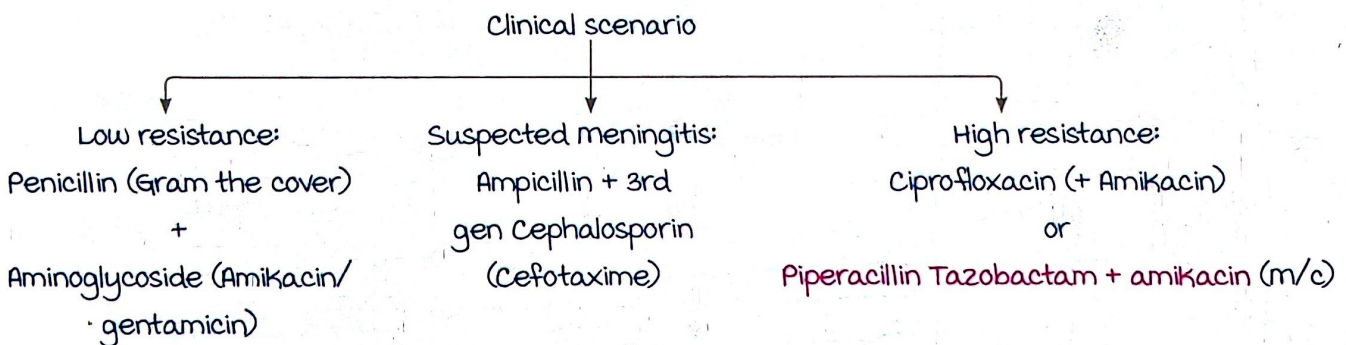
Newest marker for neonatal screening : ↑ **procalcitonin.**

Lumbar puncture :

- Indication : Suspicion of meningitis in all **symptomatic** babies.
- C/I : Asymptomatic babies (Even with risk factors).

TREATMENT :

Empirical antibiotics (While awaiting culture reports):



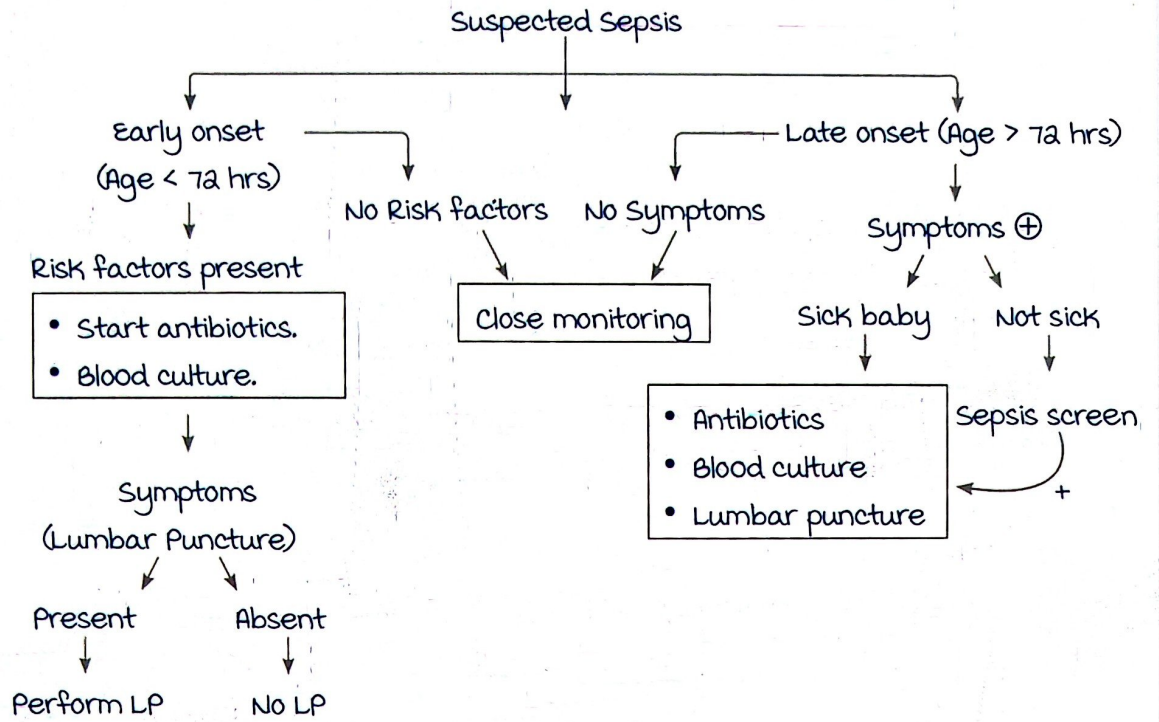
Duration of treatment :

1. Culture negative : 5-7 days (1 week).

2. Culture positive :
 → meningitis : 3 weeks
 → Others : 2 weeks



Sepsis Algorithm



RESPIRATORY DISTRESS IN NEWBORN

----- Active space -----

CLINICAL FEATURES :

1. Respiratory rate : Increased (>60 breaths/min).
 - Normal newborn respiratory rate : 40-60 breaths/min.
2. Chest retraction : D/t involvement of accessory respiratory muscles.
3. Severe hypoxia : Seen in severe cases.
 - manifest as :
 - Central cyanosis : Involves mucosa as well.
 - Grunting : Expiration against a partially closed glottis → Prevents airway/alveolar collapse.

Monitoring of Respiratory Distress

00:02:53

SCORING SYSTEMS :

1. Silverman Anderson score :

used for **preterm babies**.

	0	1	2
1. Upper chest retraction	Synchronized respiration b/w chest & abdomen	Lag : Chest lags behind abdomen during inspiration	See-saw respiration : Chest retracts, abdomen expands during expiration
2. Lower chest retraction	Not seen	mild	Severe
3. Nasal flaring	Not seen	mild	Severe
4. Xiphoid retractions	Not seen	mild	Severe
5. Grunting	Not present	Audible with stethoscope	Audible without stethoscope

Interpretation :

- <5 : mild
- 5-7 : moderate
- >7 : Severe

2. Downe's score :

- used for **term & preterm babies**.
- mnemonic for criteria : **CRARG**.

	0	1	2
Cyanosis	Not present	Present in room air	Present even with O ₂ support, FiO ₂ ≥ 40%
Respiratory rate	<60/min	60-80/min	>80/min
Air entry	B/L equal & normal	Decreased	Severely decreased
Retractions	Not present	mild	Severe
Grunting	Not heard	Audible with stethoscope	Audible without stethoscope

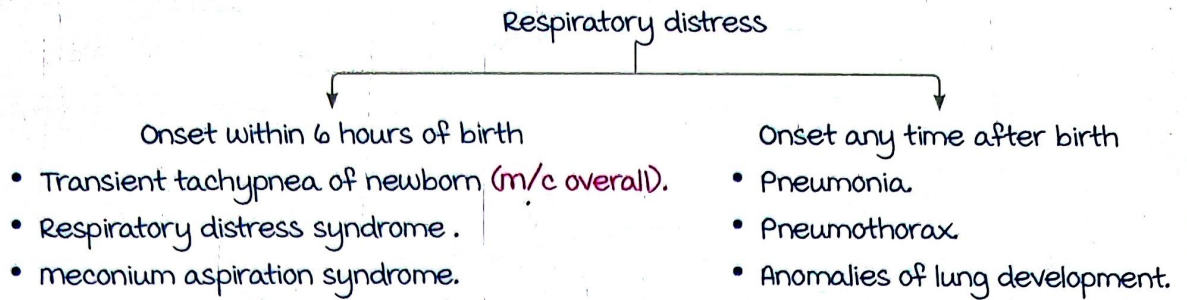
Interpretation :

- <3 : mild
- 4-6 : moderate
- >6 : Severe (impending respiratory failure)

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Causes of Respiratory Distress



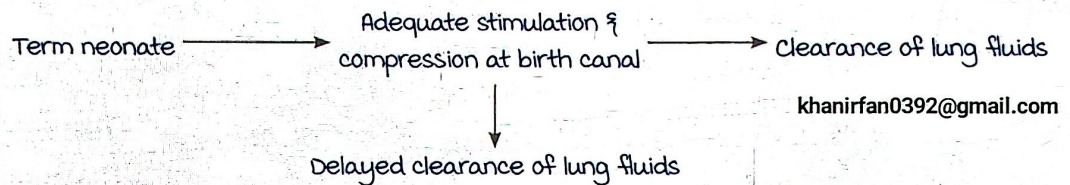
TRANSIENT TACHYPNOEA OF NEWBORN (TTNB) :

AKA *wet lung syndrome*.

m/c seen in :

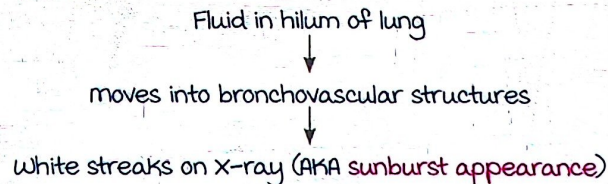
- Term neonates.
- Neonates delivered by lower segment caesarean section (LSCS).

Pathogenesis :



Chest X-ray findings :

- Perihilar radio-opaque streaks.



- Fluid in interlobar fissure.

management :

- Supportive management (O₂ inhalation) is sufficient as it is a transient condition.
- Improvement seen in 48-72 hours.

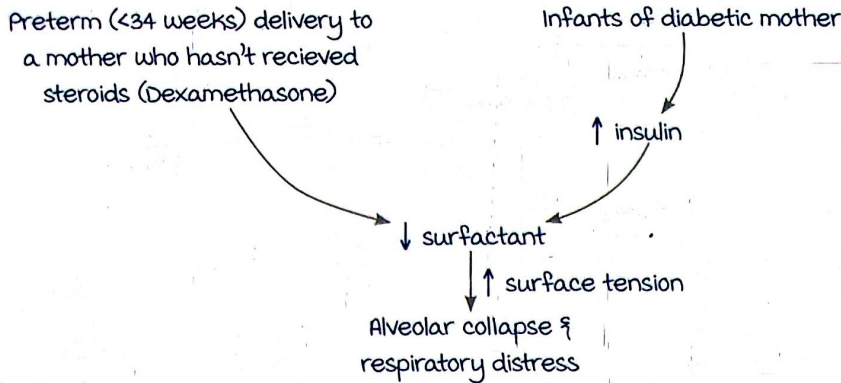
RESPIRATORY DISTRESS SYNDROME :

AKA *hyaline membrane disease (HMD)*.

m/c seen in :

- Preterm babies (<34 weeks) born to mothers who haven't received antenatal steroids (m/c : *Dexamethasone*).
- Infants of diabetic mothers (IDM).

Pathogenesis :



----- Active space -----

Note : Surfactant keeps alveoli open by decreasing surface tension on its lining.

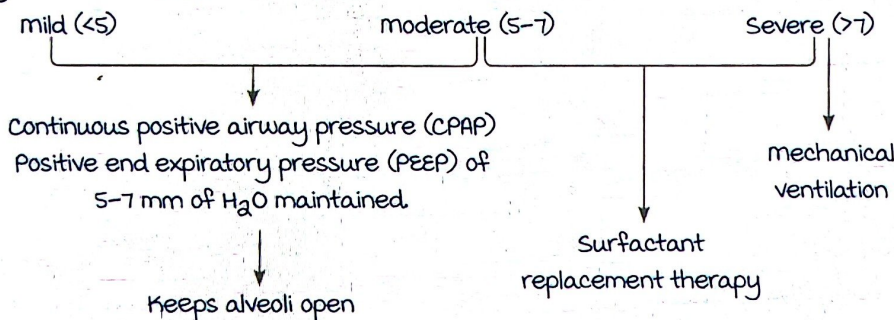
Histology : **Eosinophilic substances** in lung tissue (Resembles hyaline).

Chest X-ray findings :

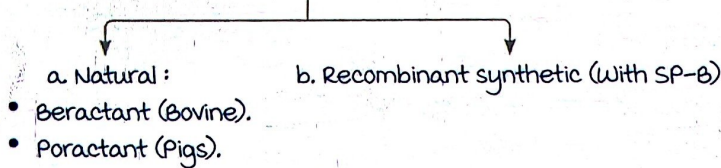
- **White out appearance**/ground glass appearance : D/t collapsed alveoli → No air entry.
- **Air bronchogram sign** : D/t open airway tract.

Management :

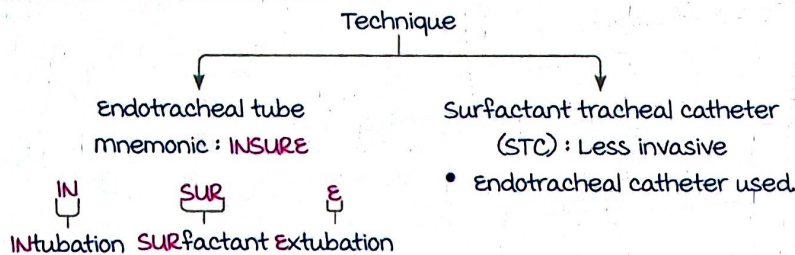
Severity assessed based on **Silverman score** :



Types of surfactant for SRT :



Administration of SRT : Endotracheal.



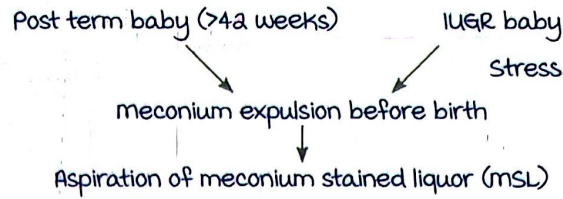
Note : Earlier synthetic surfactants leaked SP-B → ↓ efficacy.

Feedback

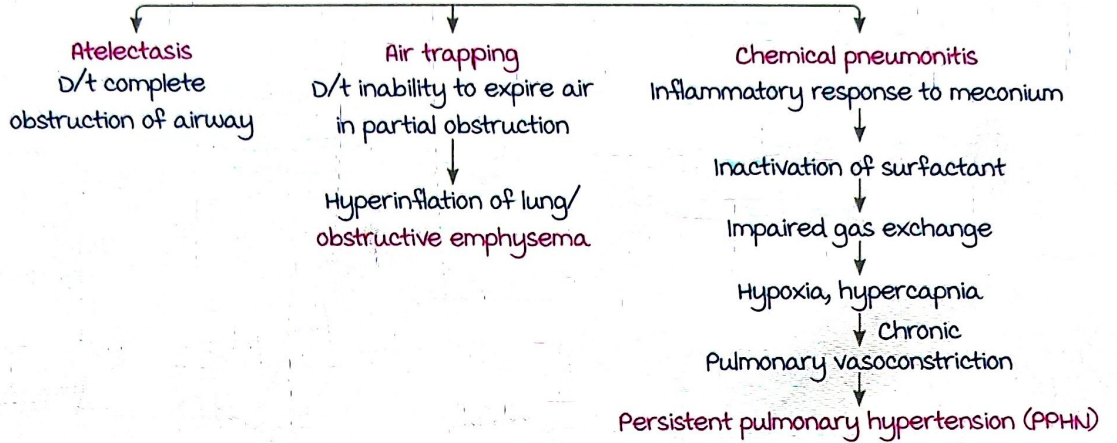
----- Active space -----

MECONIUM ASPIRATION SYNDROME (MAS):

Pathogenesis:



Consequences of MAS:



Chest X-ray findings:

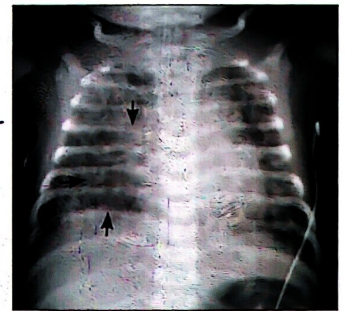
- Infiltrates in lung field: Seen in chemical pneumonitis.

Diagnosis:

- MAS: Diagnosed by exclusion and with h/o meconium-stained liquor.

Management:

- Supportive management is done:
 - O₂ inhalation.
 - CPAP.
 - mechanical ventilation (Severe cases).
- Inhaled nitric oxide (iNO): Pulmonary vasodilator to treat PPHN.



multiple small lung infiltrates

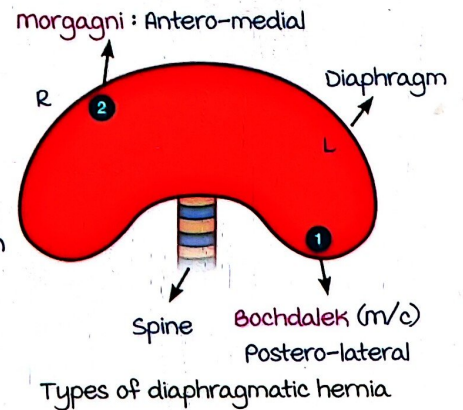
CONGENITAL DIAPHRAGMATIC HERNIA (CDH):

Pathogenesis: Anatomical defect in diaphragm.

Clinical features:

- Respiratory distress: Compression of lung in utero d/t movement of intestines into mediastinum

Pulmonary hypoplasia

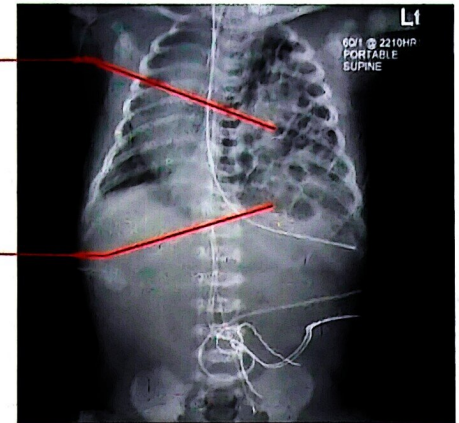


Types of diaphragmatic hernia

- mediastinal shift → Heart sound heard on right side.
- Sunken/scaphoid abdomen.

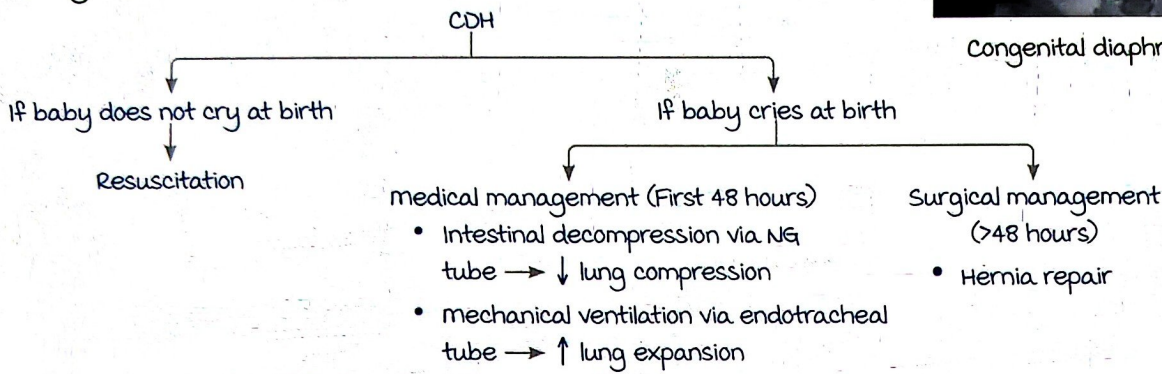
Investigations :

- USG : Antenatal.
- Chest X-ray : Post natal
 - Intestinal air shadows : Air-filled bubble shaped shadows d/t bowel.
 - Absent diaphragm shadows on affected side.



Congenital diaphragmatic hernia

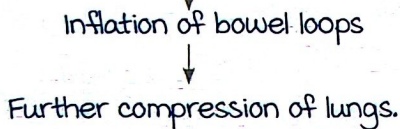
Management :



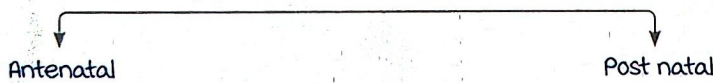
Contraindications :

CDH is an absolute contraindication for bag & mask ventilation.

Cause : Forceful entry of air into esophagus.



Prognostic factors of CDH :



USG :

1. Lung-head ratio (LHR) :

- <1 : Bad prognosis.
- Unaffected lung to be considered.

2. Presence of liver in thorax : Bad prognosis.

1. PPNH (most important) : Bad prognosis.

2. Onset of respiratory distress <24hours : Bad prognosis.

Feedback