

Paediatrics

Edition 8.5

Marrow

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Instructions

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Childhood Infections

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NORMAL NEWBORN

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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)
Pathological (IUGR)

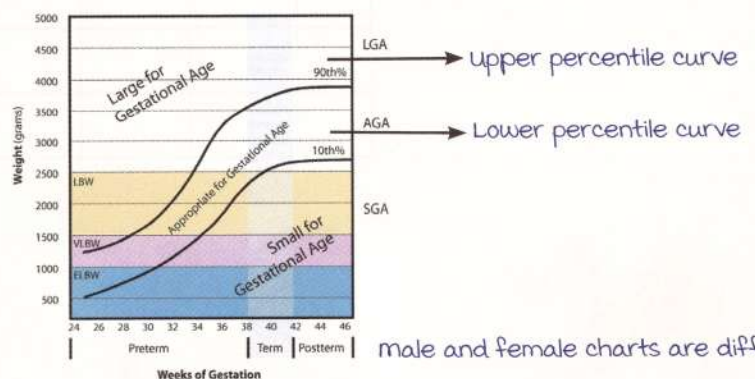
Identification points :

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

	Asymmetrical IUGR (m/c)	Symmetrical IUGR
Etiology	maternal	Fetal
Cause	uteroplacental insufficiency	Genetic defects (Eg : Trisomy), organ anomalies
Onset	2nd & 3rd trimester (During placenta-dependent growth of body)	1st 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 :



2. Ponderal index (PI) :

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

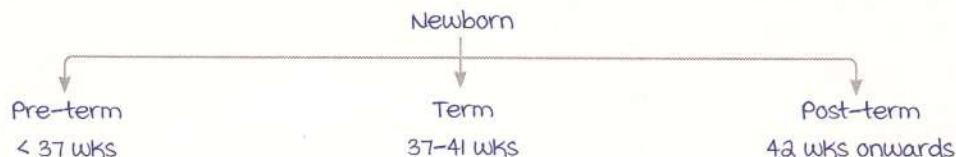
Interpretation :

- > 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 Neuro muscular maturity
Physical maturity
- 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

Skin	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
							15 30
							20 32
							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)

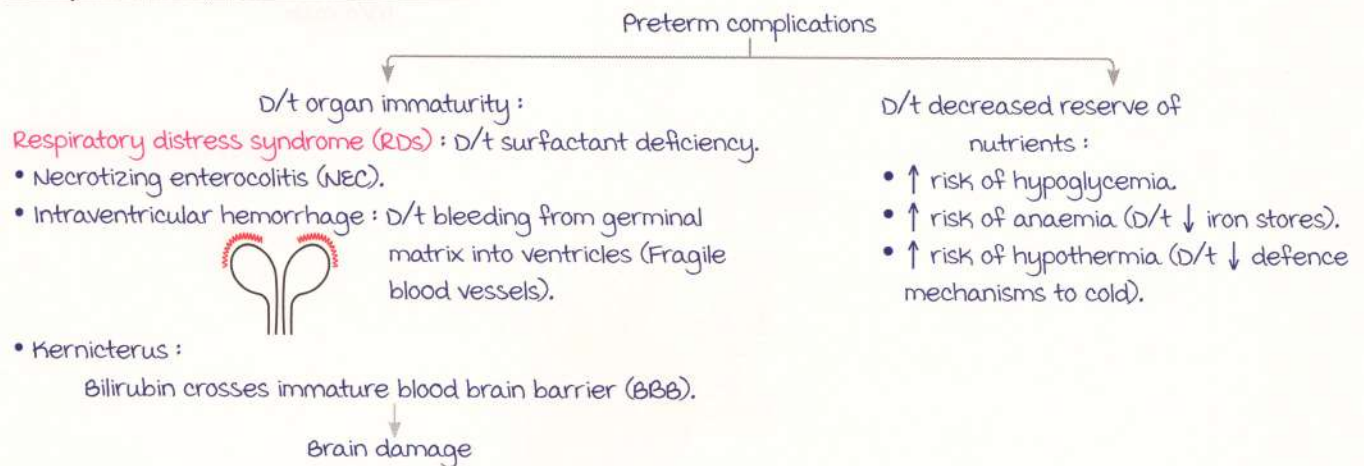
- a). Preterm female external genitalia
b). Term female external genitalia

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	Positive, 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 :



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, Facial 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 5 mins after birth

Total maximum score : 10.

Total minimum score : 0.

Normal APGAR score : 7 to 10/10.

Low APGAR score : < 7/10.

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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

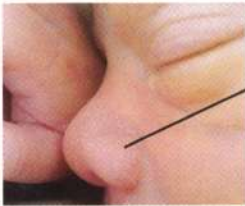
↓
Blanching of skin

↓
Skin becomes pink

} CRT ≤ 3 sec

Temperature : 36.5 °C to 37.5 °C.

Normal Findings :

Findings	Details
1. Erythema toxicum/erythema neonatorum	 Red papulo-pustular lesions - m/c rash - Histology : Eosinophils present. - Onset : > 24 hr after birth
2. Pustular melanosis	- Pustules + hyperpigmented patches. - Onset : < 24 hr after birth. - Histology : Neutrophils present.
3. Epithelial inclusion cyst	 Keratin deposits (milia) Other sites of keratin deposition : - Palate : Epstein pearls. - Gum : Bohn's nodules.
4. Mongolian spots	 Hyperpigmented macules D/t presence of melanocytes in dermis instead of epidermis Pathogenesis : Arrest in melanocyte migration from neural crest.
5. Salmon patch/stork bite/birth mark	 Salmon-colored patch on forehead (Or nape of neck). D/t vascular ectasia (Dilatation).

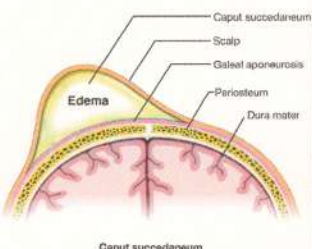
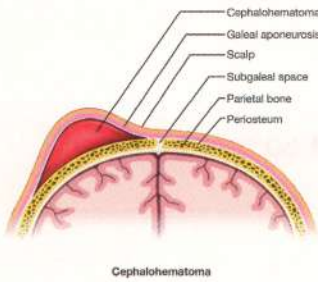
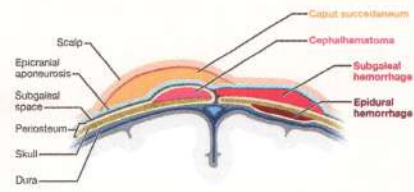
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Findings	Details
6. Breast findings	- Breast engorgement (D/t maternal estrogen). Witch's milk: milk-like fluid discharge from nipple (2-3 days).
7. Bleeding per vagina	uterine shedding in female babies → sudden withdrawal of maternal hormones.
8. 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	Cephalohematoma	Sub galeal hemorrhage
Incidence/severity	more common	Less common	more severe
Extent	Diffuse swelling	Localised swelling (D/t limitation by sutures)	Diffuse swelling
Plane	Superficial	Deep	Superficial
Location	Scalp	Sub-periosteal	Below galea aponeurotica
Reason	D/t prolonged labour ↓ Venous congestion ↓ Fluid leakage	D/t trauma to skull in instrumental delivery	Vacuum extraction ↓ Traction on layers of scalp ↓ Separation of scalp layers ↓ Blood accumulation
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	None 	- Linear skull fractures. - Jaundice (D/t heme breakdown). 	- Shock (D/t ↓ blood volume). - Pallor. - Jaundice. 

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NEONATAL RESUSCITATION

Priority of management in newborn :

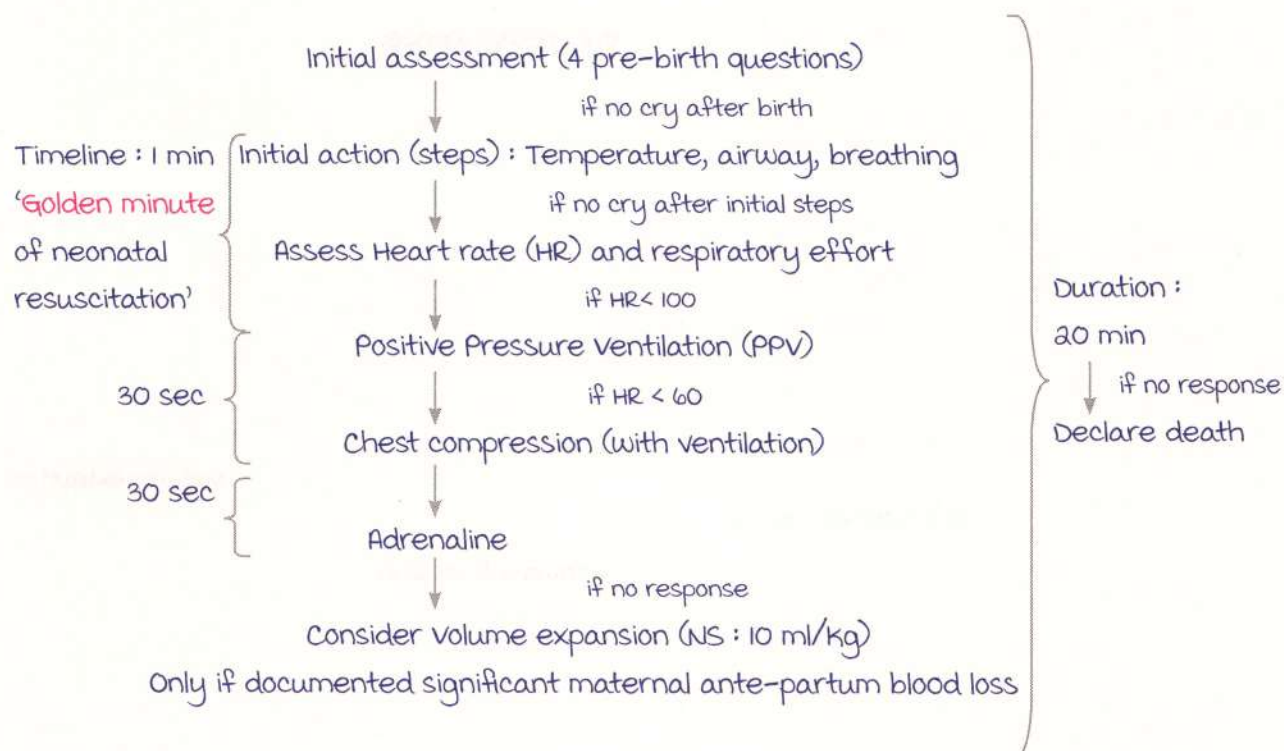
1st : **Respiration** (Crying after birth).

2nd : Temperature.

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 :

- Delayed cord clamping (Only if baby cries after birth) :

At least 60 seconds after birth : Improves iron stores

Improve Hb : ↓ Incidence of anemia.

- Cord blood for newborn screening taken.

Initial Steps :

1. Temperature : Keep baby under warmer.

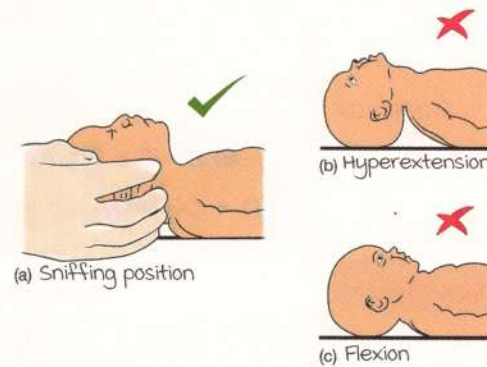
2. Airway :

- 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).



3. Breathing : Gentle tactile stimulation

- methods :

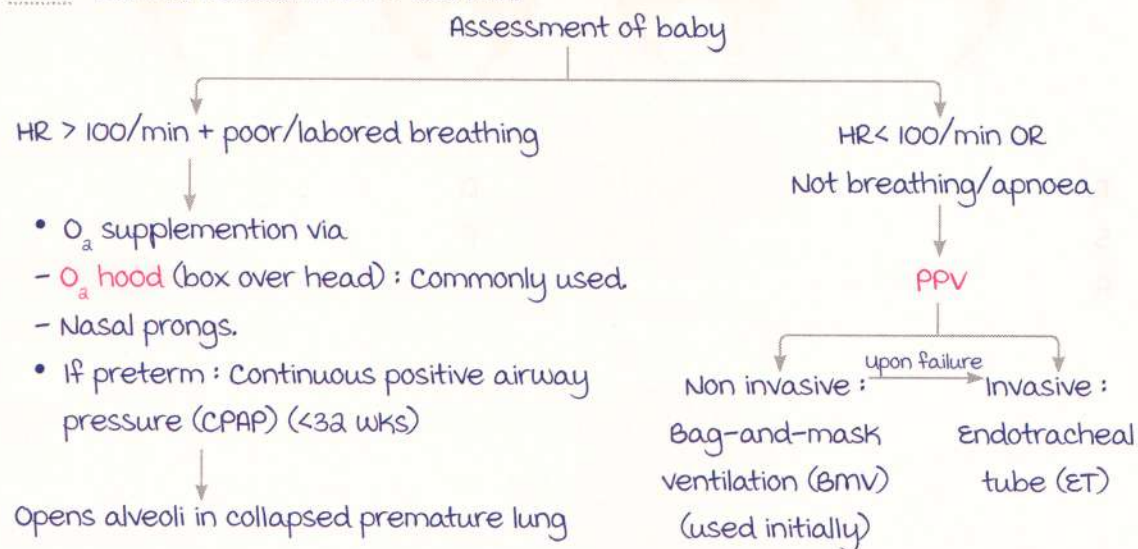
- Rubbing over back (with cotton towel)/
- Flicking soles.

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 : **30 - 60/min** (Previously 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).

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 FiO_a : (Based on gestational age).

- Term infants ≥ 35 weeks (AKA late preterm) :
Room air (21% O_a).
- 32 to 34 + 6 weeks : 21 - 30 % O_a .
- <32 weeks : 30 - 100 % O_a .

Concentration of O_a is titrated
based on targeted SpO_a

mins after birth	Targeted SpO_a measured in Rt. hand
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 SpO_a :
Excess O_a , (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. **R**eadjust head position.

3. **S**uction : Remove all secretions.

6. **A**lternate airway : If all steps fail. (ET tube)

Absolute C/I : Congenital diaphragmatic hernia.

Air enters via esophagus $\rightarrow$ Inflates intrathoracic viscera $\rightarrow$ Compression of lungs
($\uparrow$ respiratory distress).

4. **O**pen mouth.

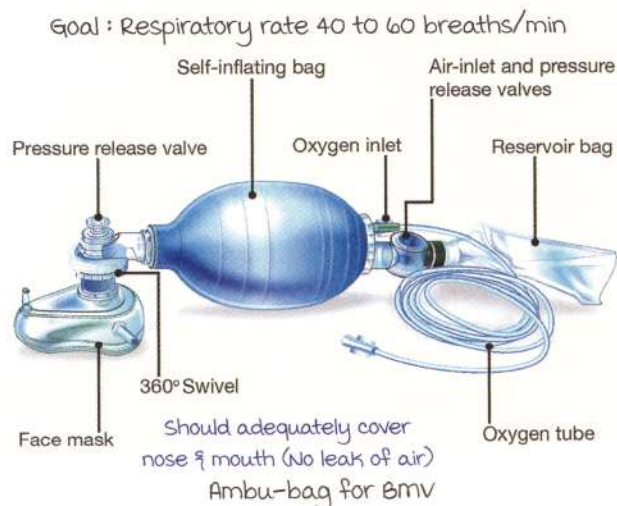
5. **P**ressure increase over bag.

Note :

In case of :

Chest compression +
ventilation

Endotracheal intubation &
ventilation with 100% O_a .



Supraglottic Airway :

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

- Laryngeal mask airway.
- Indications for earlier use :
 - No response to PPV :
 - Bag and mask.
 - Endotracheal intubation.
 - Difficult endotracheal intubation.

Endotracheal intubation :

Visualization of airway : via straight blade laryngoscope

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

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 :
 - a. < 1 kg : 2.5 mm.
 - b. 1 to 2 kg : 3 mm.
 - c. > 2 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).

ECG monitoring : **most reliable**

- HR < 60/min → Indication for chest compression.

Adrenaline :

Route :

- Preferred : IV (Through umbilical vein).

↓ if inaccessible

Intraosseous route

Dose : **0.2 ml/kg**.

Strength : **1 : 10,000**.



NECROTIZING ENTEROCOLITIS AND NEONATAL SEPSIS

m/c and devastating surgical emergency in neonates.

Etiopathogenesis

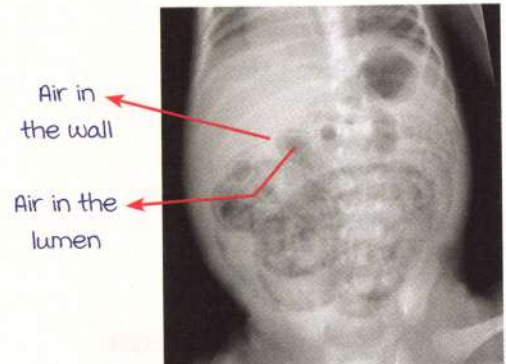
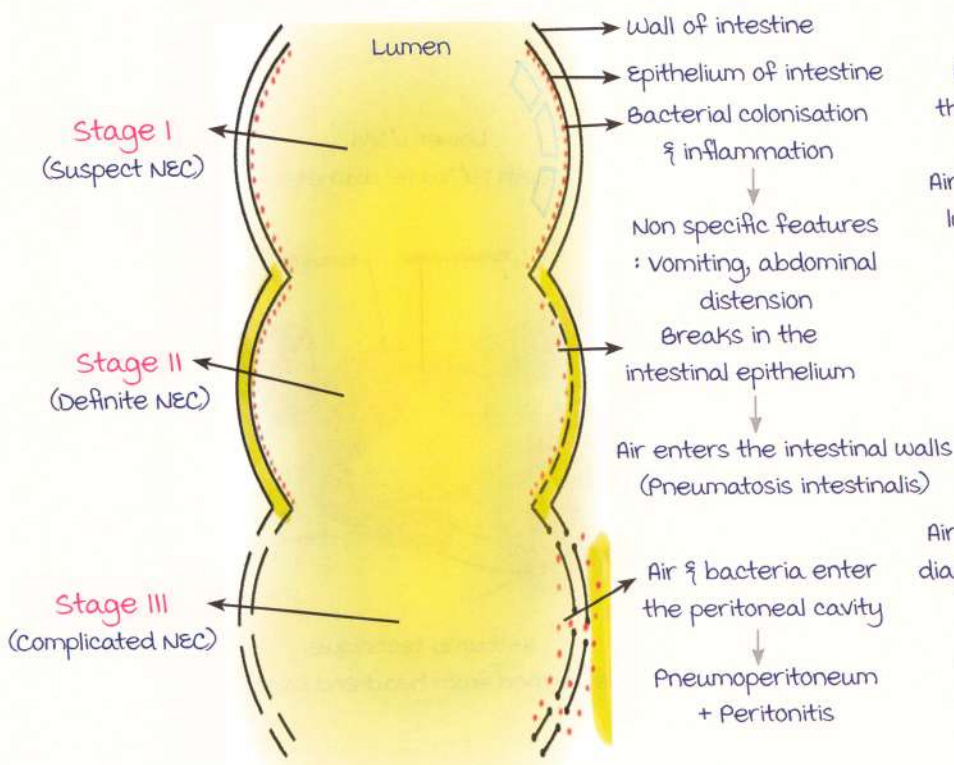
00:00:30

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

Clinical Features

00:03:00

modified Bell's Staging :



II a : Pneumatosis intestinalis



III b : Pneumoperitoneum

	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)
II b	Absent bowel sounds + abdominal wall edema	Air in the intestinal wall ↓ Enters venous drainage system ↓ Superior mesenteric vein ↓ Portal vein : Pneumatosis portalis
III a	Induration Redness/erythema Tenderness } Of abdominal wall	-
III b	Intestinal perforation	Pneumoperitoneum

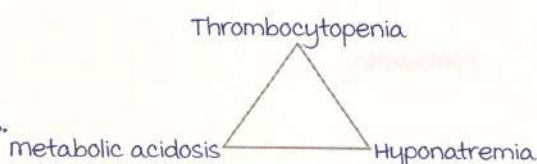
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Management

00:15:28

Triad of Lab Findings :

- Seen from 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 + Aminoglycosides + metronidazole.
 - (Gram +ve) (Gram -ve) (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.

If untreated : m/c cause of neonatal mortality.

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

Spectrum of Neonatal Sepsis

00:20:28

- Types of neonatal sepsis
- Generalised : Septicemia
 - Localised : Specific organ systems.
 - Respiratory system : Pneumonia.
 - CNS : meningitis.
 - Bones & Joints : Osteomyelitis, arthritis.

	Early onset sepsis	Late onset sepsis
Onset	First 72 hrs of life	> 72 hrs
Source of infection	maternal	Hospital acquired infection
Risk Factors	• Chorioamnionitis. • Infection of maternal genitalia (Foul smelling liquor). • Rupture of membranes over > 18 hrs.	• 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

Organism 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.

Signs specific to organ system :

meningitis :

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

Pneumonia :

- Respiratory distress.