

INTRAPARTUM FETAL SURVEILLANCE IN THE HIGH RISK LABOR

Sanaz Mousavi

Assistant professor of Obstetrics and
Gynecology

Fellowship of maternal fetal medicine

Background and aim:

- ▣ This lecture helps to participants to understand:
- ▣ The strength & weakness of the CTG
- ▣ Fetal defence / compensation against IP hypoxic ischemic insults
- ▣ FHR patterns suggestive of fetal decompensation and injury

What is the point of fetal surveillance:

- to predict significant intrapartum fetal asphyxia &
 - institute timely intervention
 - to prevent fetal hypoxic ischaemic injury****
 - without unnecessary op delivery of non-acidotic babies,**** *which*
-
- increases costs of healthcare without benefit*
 - exposes the mother & baby to iatrogenic harm*
 - perpetuates defensive practice*

CTG MONITORING DURING LABOR

■ Pattern recognition / clinical tests

normal vs abnormal patterns

always present? similar amplitude? always recognisable?

■ Do we even know / recognise all patterns?

e.g. late decelerations + acceleration + good variability

absent variability with no decel with contractions



Is hypoxia the only cause of fetal damage?

FSIRS, IP pyrexia, pPROM, HCA, funisitis, fetal strokes, chromosomes

MOST CTG ABNORMALITIES DON'T CAUSE ACIDOSIS

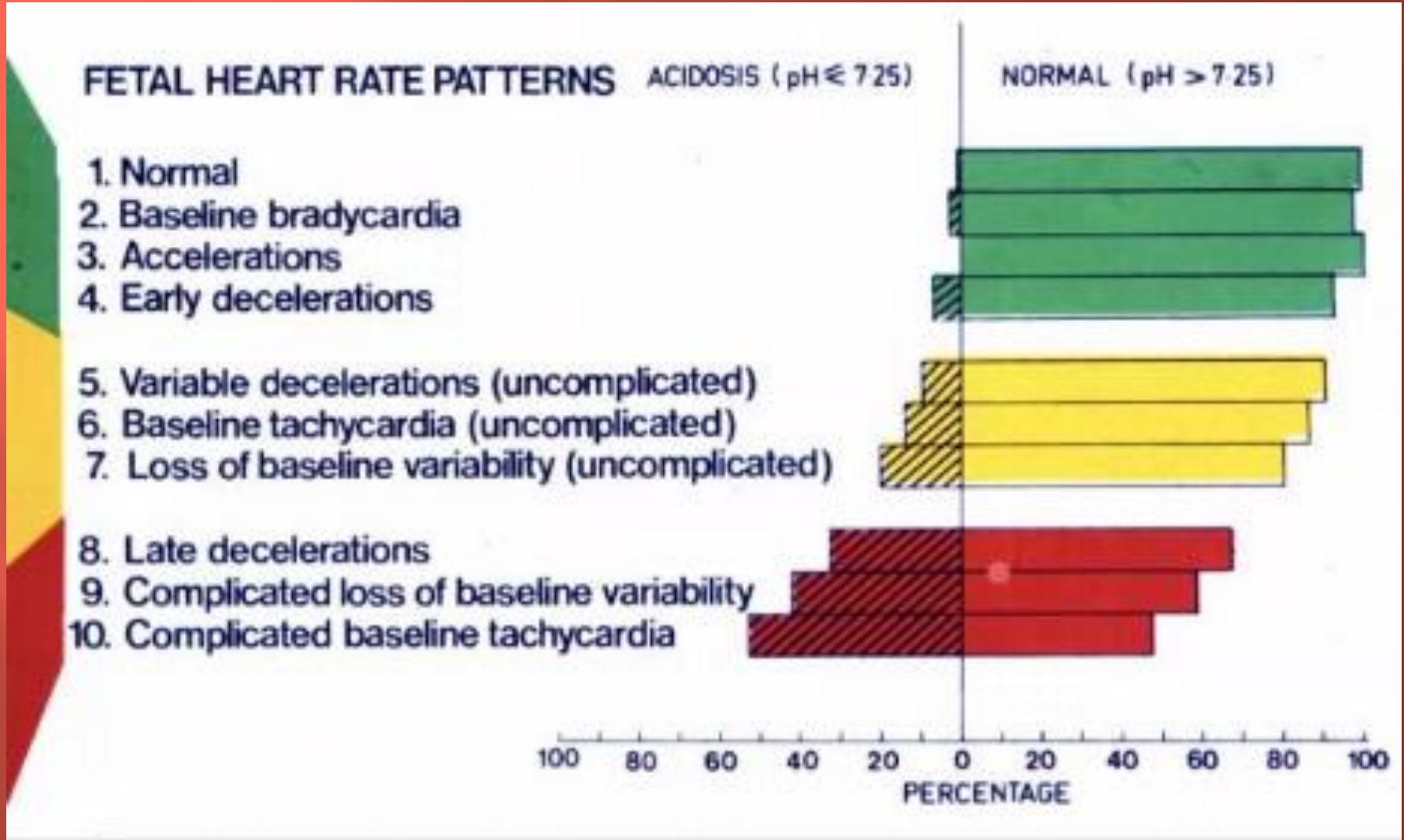
FETAL HEART RATE PATTERNS

ACIDOSIS ($\text{pH} \leq 7.25$)

NORMAL ($\text{pH} > 7.25$)

1. Normal
2. Baseline bradycardia
3. Accelerations
4. Early decelerations
5. Variable decelerations (uncomplicated)
6. Baseline tachycardia (uncomplicated)
7. Loss of baseline variability (uncomplicated)
8. Late decelerations
9. Complicated loss of baseline variability
10. Complicated baseline tachycardia

100 80 60 40 20 0 20 40 60 80 100
PERCENTAGE



Definition of normal suspicious and pathological FHR traces

category	definition
normal	All features are reassuring
suspicious	1 nonreassuring feature & 2 reassuring features
pathologic	1 abnormal feature OR 2 nonreassuring features
Need for urgent intervention	Acute bradycardia, or a single prolonged deceleration for 3 minutes or more

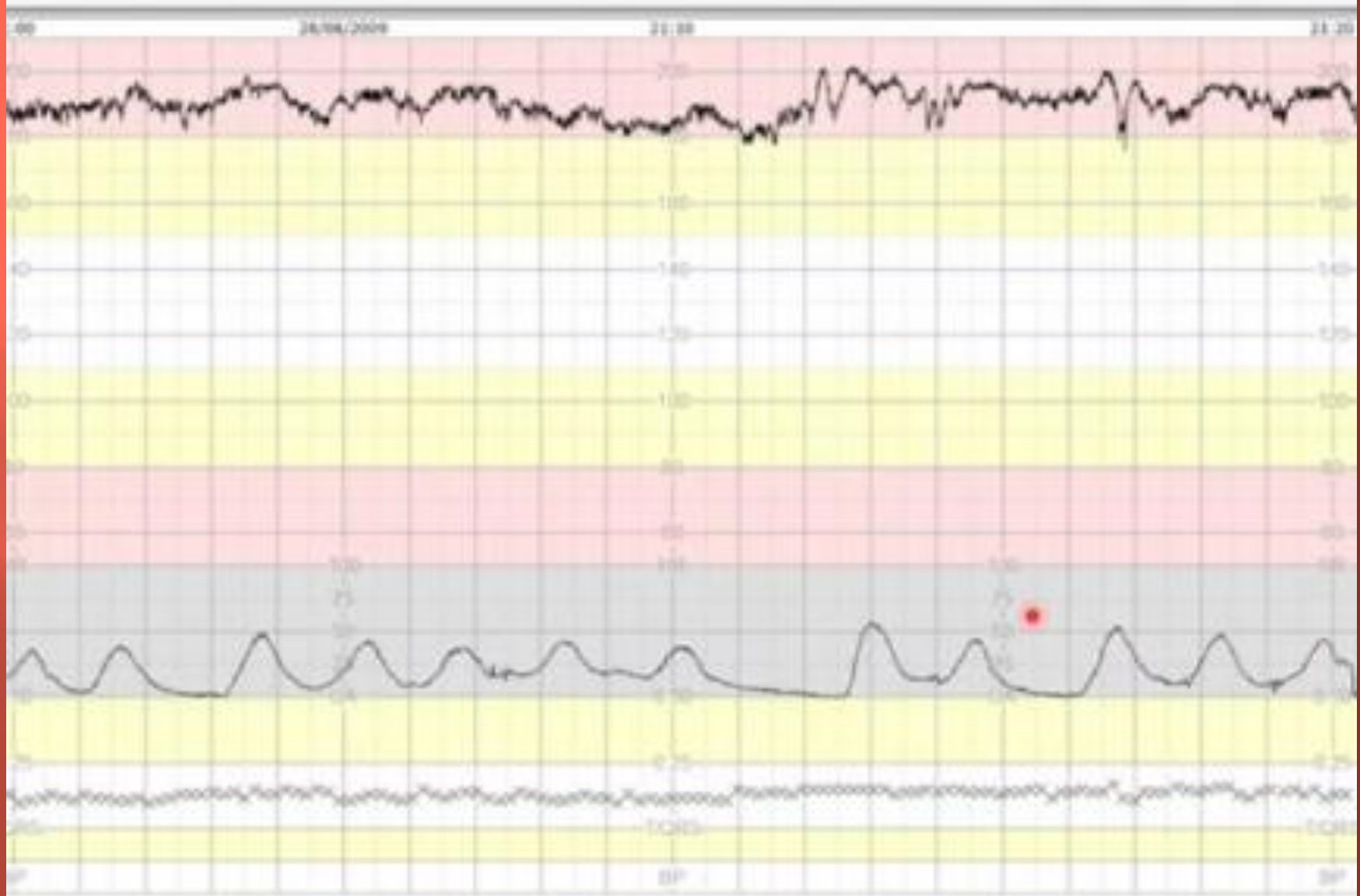
Classification of FHR trace features

Description	Feature		
	Baseline (beats/minute)	Baseline variability (beats/minute)	Decelerations
Reassuring	110 to 160	5 to 25	None or early Variable decelerations with no concerning characteristics* for less than 90 minutes
Non-reassuring	100 to 109† OR 161 to 180	Less than 5 for 30 to 50 minutes OR More than 25 for 15 to 25 minutes	Variable decelerations with no concerning characteristics* for 90 minutes or more OR Variable decelerations with any concerning characteristics* in up to 50% of contractions for 30 minutes or more OR Late decelerations in over 50% of contractions for less than 30 minutes, with no maternal or fetal clinical risk factors such as vaginal bleeding or significant meconium

Clasification of FHR trace features

Abnormal	Below 100 OR Above 180	Less than 5 for more than 50 minutes OR More than 25 for more than 25 minutes OR Sinusoidal	Variable decelerations with any concerning characteristics* in over 50% of contractions for 30 minutes (or less if any maternal or fetal clinical risk factors [see above]) OR Late decelerations for 30 minutes (or less if any maternal or fetal clinical risk factors) OR Acute bradycardia, or a single prolonged deceleration lasting 3 minutes or more
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21:15hrs VE: Fully dilated



Clinical importance of an abnormal CTG

BFHR >160bpm, \pm decelerate, \pm loss/reduced/normal FHRV

- Consider fetoplacental infection
- Meconium aspiration syndrome
- Chronic hypoxia
- Intracranial haemorrhage
- Hypoglycaemia
- Antecedent brain injury
- Placental disorders ~ FVM, MVM, cord incidents...
- Recreational drugs
- Maternal systemic disease
- Chromosomal disorders
- Cardiac arrhythmias

Selected high-risk situations

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- Meconium~stained amniotic fluid
 - Maternal fever
 - Chorioamnionitis
 - Syntocinon infusion
 - Combinations
-
- Preterm / Post term
 - Diabetes
 - IUGR fetus

MECONIUM



The Effect of Meconium Staining of Amniotic Fluid on the Growth of *Escherichia coli* and Group B *Streptococcus*

Arthur I. Eidelman, MD

Ayelet Nevet, MD

Bernard Rudensky, PhD

Ron Rabinowitz, MD

Cathy Hammerman, MD

David Raveh, MD

Michael S. Schimmel, MD

OBJECTIVE:

To compare the effect of meconium staining on the growth rate of *Escherichia coli* and group B streptococci (GBS) in amniotic fluid.

(12 mg/ml), during the first 6 hours of incubation, the growth rates of GBS and *E. coli* were nearly similar.

CONCLUSIONS:

GBS (type II and III) growth, in contrast to *E. coli*, was less inhibited by amniotic fluid, occurred at a more rapid rate, and was enhanced at lower concentrations of meconium. As such, the presence of even light meconium staining in cases of rupture of membranes of even less than 6 hours in a mother who is a GBS carrier should be considered as a risk factor for the development of perinatal GBS infection.

Journal of Perinatology (2002) 22, 467–471 doi:10.1098/jp.721074

OBSTETRICS

Meconium aspiration syndrome: a role for fetal systemic inflammation

JoonHo Lee, MD, PhD; Roberto Romero, MD, DMedSci; Kyung A Lee, MD, PhD; Eun Na Kim, MD; Steven J. Korzeniewski, PhD; Piya Chaemsaihong, MD; Bo Hyun Yoon, MD, PhD

question. Patients with MSAF have a higher frequency of intraamniotic inflammation/infection than those with clear fluid. We propose that fetal systemic inflammation is a risk factor for the development of MAS in patients with MSAF.

OBJECTIVE: We sought to investigate whether intraamniotic inflammation and funisitis, the histopathologic landmark of a fetal inflammatory response, predispose to MAS.

Cite this article as: Lee J, Romero R, Lee KA, et al. Meconium aspiration syndrome: a role for fetal systemic



MATERNAL FEVER

~ WITHOUT INFECTION



MATERNAL FEVER

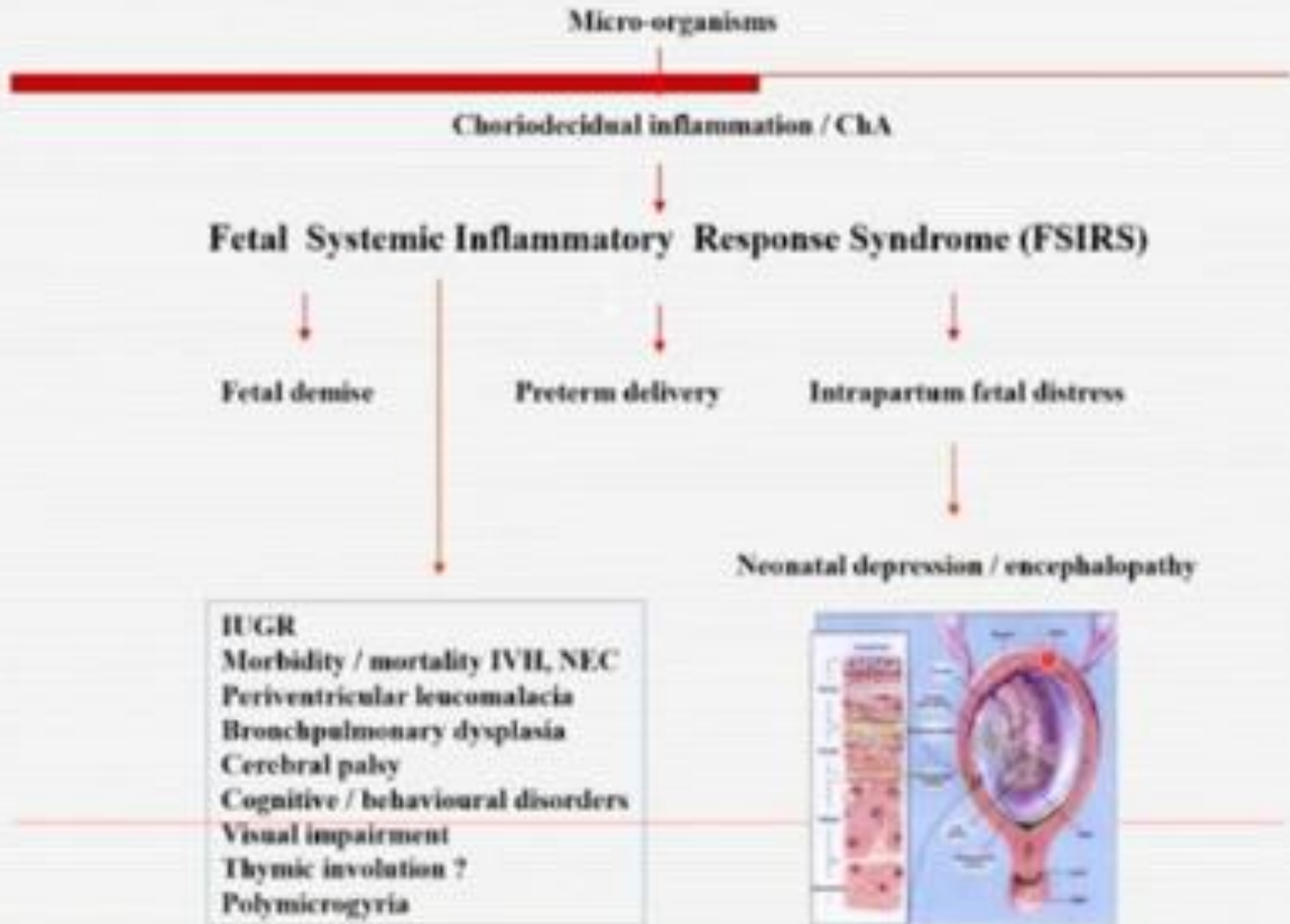
- **Loss of feto-maternal temperature gradient**
- **Does not necessarily cause FHR tachycardia**
- **Increases fetal tissue metabolic demands**
- **Increases susceptibility to hypoxia**
- **Epidural, dehydration ~ common causes**
- **Increases risk of unexplained neonatal seizures**
- **Independent risk factor for NNE**
- **Independent risk factor for HIE, hypotonia, resus**



CHORIOAMNIONITIS



Sequalae of chorioamnionitis



SYNERGISTIC INJURY – hypoxia + inflammation

- inflammation sensitises fetal neurologic tissue to hypoxic damage**
 - lowers the threshold at which hypoxia induces apoptosis in neural tissue**
 - magnitude of injury much much greater than the summation of injury from hypoxia or inflammation alone**
 - molecular mechanisms not completely understood**
 - the timing of injury is unknown**
 - is there a safe interval?**
 - is it a gestation dependent phenomenon?**
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Intrapartum Asphyxia in Pregnancies Complicated by Intra-Amniotic Infection

Table 2. Results of Umbilical Artery pH Determinations

	Intra-amniotic infection (N = 123)	Controls (N = 6769)	Comparison
Umbilical artery pH			
Mean	7.28	7.28	NS
≥7.20	105 (85%)	6068 (90%)	NS
<7.20	18 (15%)	701 (10%)	NS
<7.15	4 (3%)	242 (4%)	NS
<7.00	0	6 (0.1%)	NS
Metabolic acidemia			
For pH <7.20	1 (0.8%)	9 (0.1%)	NS
For pH <7.15	0	4 (0.06%)	NS

Table 3. Frequency of Low 1- and 5-Minute Apgar Scores

Apgar scores	Intra-amniotic infection (N = 123)	Controls (N = 6769)
1 min		
≤6	25 (20%)	316 (5%)*
≤3	7 (6%)	109 (2%)*
5 min		
≤6	4 (3%)	52 (1%)*
≤3	1 (1%)	9 (0.1%)*

* $P < .05$.

Maberry et al. Obstet Gynecol 76:351, 1990.



The American College of
Obstetricians and Gynecologists
WOMEN'S HEALTH CARE PHYSICIANS

ACOG COMMITTEE OPINION

Number 712 • August 2017

Committee on Obstetric Practice

The Society for Maternal-Fetal Medicine endorses this document. This Committee Opinion was developed by the American College of Obstetricians and Gynecologists' Committee on Obstetric Practice in collaboration with R. Phillips Hains, MD; American Academy of Pediatrics member Karen M. Puopolo, MD, PhD; Richard Beigi, MD; Neil S. Silverman, MD; and Tamer Y. El-Sayed, MD.

Intrapartum Management of Intraamniotic Infection

ABSTRACT: Intraamniotic infection, also known as chorioamnionitis, is an infection with resultant inflammation of any combination of the amniotic fluid, placenta, fetus, fetal membranes, or decidua. Intraamniotic infection is a common condition noted among preterm and term parturients. However, most cases of intraamniotic infection detected and managed by obstetrician-gynecologists or other obstetric care providers will be noted among term patients in labor. Intraamniotic infection can be associated with acute neonatal morbidity, including neonatal pneumonia, meningitis, sepsis, and death. Maternal morbidity from intraamniotic infection also can be significant, and may include dysfunctional labor requiring increased intervention, postpartum uterine atony with hemorrhage, endometritis, peritonitis, sepsis, adult respiratory distress syndrome and, rarely, death. Recognition of intrapartum intraamniotic infection and implementation of treatment recommendations are essential steps that effectively can minimize morbidity and mortality for women and newborns. Timely maternal management together with notification of the neonatal health care providers will facilitate appropriate evaluation and empiric antibiotic treatment when indicated. **Intraamniotic infection alone is rarely, if ever, an indication for cesarean delivery.**

OXYTOCIN INFUSION

- TACCHYSYSTOLE**
- HYPERTONUS**
- HYPERSTIMULATION**



OXYTOCIN (Syntocinon)

- **Approved by FDA 1962**
 - **Uterine response dependent on stage of pregnancy**
 - **Increases force & frequency of existing contractions**
 - **Impedes uterine blood flow**
 - **Large doses reduce SBP & DBP**
 - **Some ADH effect – may cause water retention**
 - **Plasma half life 1 – 6 minutes**
 - **Effect on uterus lasts – 1hr / 2hr following iv/im**
-

Oxytocin and medico - legal issues

- ❑ Inadequate uterine contraction monitoring
 - ❑ Poor technical quality FHR trace
 - ❑ Cessation of monitoring the FHR or uterine contractions much earlier than the time of delivery
 - ❑ Commencement of oxytocin when there are major risk factors e.g. thick meconium stained scanty fluid, evidence of chorioamnionitis and suspicious or pathological FHR trace
-

INCIDENCE OF METABOLIC ACIDOSIS pH <7.05 BE >-12 IN 65 CASES OF NNE

Umbilical artery (UA)		Neonatal Encephalopathy					Total
pH	Base excess (BE)	Unclassified	HIE I	HIE II	HIE III	NND	
<7.05	≤-12	11	9	3	1	3	27
	>-12		1				1
	Unknown	2		1			3
≥7.05	≤-12	1	2	3	1		7
	>-12	4	6	8		1	19
	Unknown	1	1	1			3
Unknown	Unknown	2	2	1			5

1.10.21 If there is a bradycardia or a single prolonged deceleration with the fetal heart rate below 100 beats/minute for 3 minutes or more:

- start conservative measures
- urgently seek obstetric help
- make preparations for urgent birth
- expedite the birth () if the bradycardia persists for 9 minutes.

If the fetal heart rate recovers at any time up to 9 minutes, reassess any decision to expedite the birth, in discussion with the woman. **[new 2014]**

(3) Acute hypoxia (prolonged deceleration, brady)

- prolonged decelerations, brady ~ FHR < 80 for >3 or >10min if associated with loss of variability – *consider delivery*
- if baseline 80 – 100bpm with good BLV & there is no abruptio, cord prolapse, scar rupture, bolus syntocinon
- 90% will recover within 6 minutes
- 95% will show signs of recovery within 9 minutes
- plan delivery if no recovery by 12 minutes
- deliver by IVD or CS by 15min

In Summary

Prolonged decelerations arising from a previously normal or near-normal CTG are only occasionally associated with acidosis if the nadir stabilises ≥ 80 bpm and baseline FHR variability is maintained....!!

SUMMARY & THE APPROACH AT ST. GEORGE'S....

Clinical chorioamnionitis diagnosed
Temp ≥ 37.8 + any 2 of:
Raised CRP (>30% baseline)
WCC >15,000
Tender / irritable uterus
Maternal or fetal tachycardia
Foul smelling / purulent discharge

- Chase any outstanding microbiology specimens
- Obtain blood cultures if pyrexial
- Give gentamicin 5mg /kg body weight stat
- Amoxicillin 1gm 6 hourly i.v. until delivery.
- Paracetamol, tepid sponge and cooling fan.
- Expedite delivery
- Inform O/C consultant / SR
- Inform neonatologists / paediatricians



Emergency CS if:
CTG abnormal
ECG abnormal / STAN event
MSL + FTP
FBS is dubious
Syntocinon - D/W Consultant



Aim for vaginal delivery if:
CTG is normal
MSL and labour progressing well.
No STAN event
Role of FBS is dubious
Use syntocinon only if CTG normal
Avoid difficult instrumental delivery