Hypertensive Disorders in Pregnancy& Postpartum

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Hypertensive Disorders in Pregnancy-PP

Learning Objectives

- **Describe DX. and management of mild HDP**
- **Describe management of severe HTN-preeclampsia**
- **Discuss prevention and management of Eclampsia**
- **Review management of HELLP and its complications**
- **Describe DX/management of Pulmonary edema**

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Rate HDP is increasing: 12-15%

Change in Obstetric Demographics

- AMA during pregnancy
  - > 35 : 20%
  - ≥ 40 : 5%
  - IVF, multifetal gestation
- Increased prevalence of obesity
  - BMI ≥ 30 : 30-35%
  - BMI ≥ 50 : 5 %
- Increased GDM, pre-gestational DM
- Increased pregnancies with medical disorders
  - Renal disease, lupus
  - CHTN : 5-6%
  - Transplants

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Classic Diagnosis of Preeclampsia was Dependent On Accurate Measurements of BP, Proteinuria, Edema

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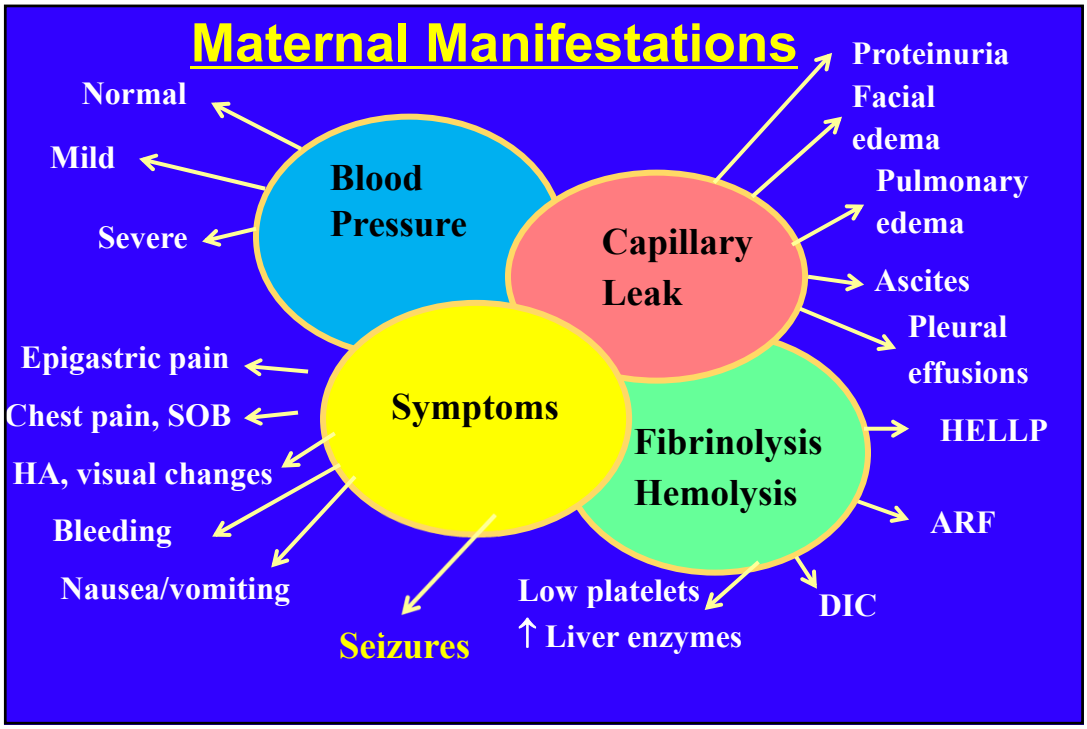
Maternal Manifestations
Normal
Mild
Severe
Blood Pressure
Proteinuria
Facial edema
Pulmonary edema
Capillary Leak
Ascites
Pleural effusions
Epigastric pain
Chest pain, SOB
HA, visual changes
Bleeding
Nausea/vomiting
Symptoms
Fibrinolysis Hemolysis
HELLP
ARF
Seizures
Low platelets
↑ Liver enzymes
DIC

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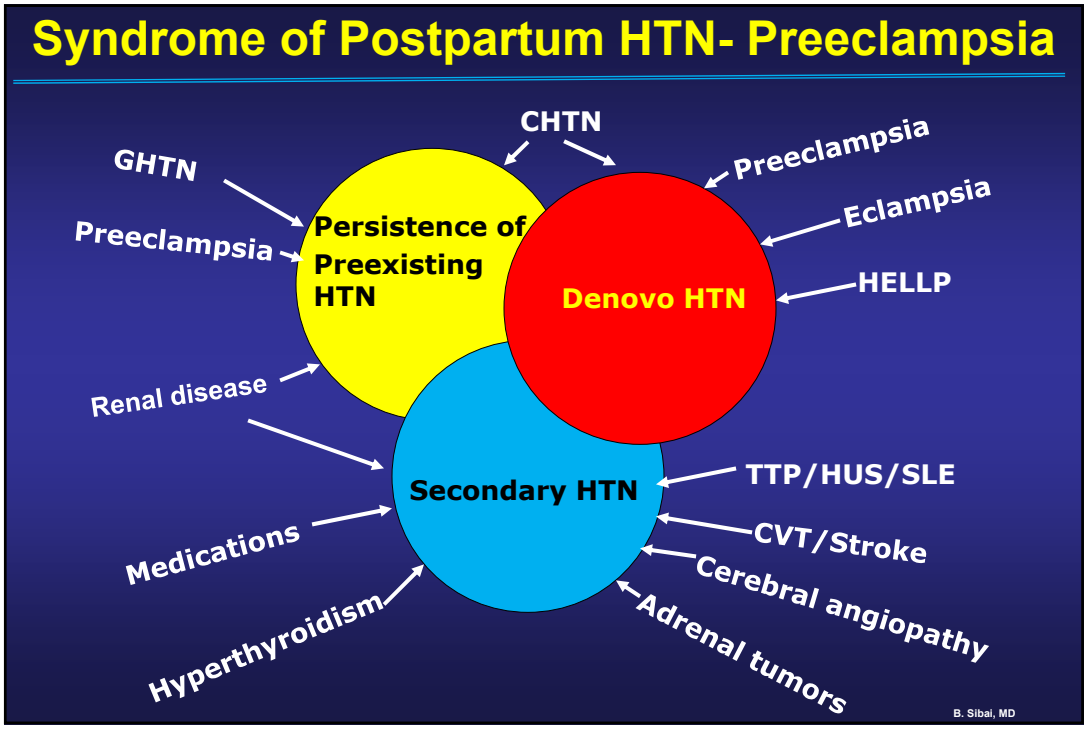
Syndrome of Postpartum HTN- Preeclampsia
CHTN
GHTN
Preeclampsia
Persistence of Preexisting HTN
Preeclampsia
Eclampsia
HELLP
Denovo HTN
Renal disease
Secondary HTN
TTP/HUS/SLE
CVT/Stroke
Cerebral angiopathy
Medications
Hyperthyroidism
Adrenal tumors
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When is the best time for delivery in Mild GTHN/Preeclampsia- HIPITAT-1

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HYPITAT Randomized Trial
Maternal Outcome

	Induction n=377	Expectant n=379	RR (95% C.I.)
Composite adverse outcome	117 (31)	166 (44)	0.71(0.59-0.86)
• HELLP	4 (1)	11 (3)	
• Pulmonary edema	0	2 (1)	
• Abruptio	0	0	
• Eclampsia	0	0	
• Maternal ICU	6 (2)	14 (4)	
• Cesarean section	54 (14)	72 (19)	0.75(0.55-1.04)

Koopmans et al. Lancet 2009

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HYPITAT: Secondary Outcome

	Induction #(%)	Expectant #(%)
Composite Neonatal outcome	24 (6%)	32 (8%)
• Perinatal deaths	0	0
• Apgar <7 at 5′	7 (2)	9 (2)
• Cord PH <7.05	9 (3)	19 (6)
• NICU admission	10 (3)	8 (2)
• RDS	1 (0.25)	1 (0.25)

Koopmans et al. Lancet 2009

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Mild Non-Severe GHTGN or Preeclampsia
Delivery versus waiting at 34-36 6/7 wk

- **Potential Benefits**
  - Lower maternal morbidity
  - Less testing
  - Fewer hospital days
  - Less abruption, FGR
- **Potential Risks**
  - Higher neonatal morbidity
  - More days in NICU
  - Higher C/S
  - Less induction
  - Prolonged hospitaliz

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Expectant Management of Late preterm (34-36 weeks) Preeclampsia

- Multicenter trials
  - Hypitat- 1: 36-41 weeks- Netherlands
  - Hypitat -2: 34-36 weeks - Netherlands
  - Phoenix : 34-36 weeks – UK
- Various diagnostic criteria for preeclampsia
- Included oral antihypertensive medications, FGR
- Outcomes: Less maternal morbidity and increased neonatal complications: Individualized management

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Management of Severe Preeclampsia Remote From Term < 34 wk ?

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Clinical Trial > Am J Obstet Gynecol. 1994 Sep;171(3):818-22.
doi: 10.1016/0002-9378(94)90104-x.

Aggressive versus expectant management of severe preeclampsia at 28 to 32 weeks' gestation: a randomized controlled trial

B M Sibai [1], B M Mercer, E Schiff, S A Friedman

- 95 with severe preeclampsia at 28-32 wk.
- Singleton, EFW > 10th percentile, no co-morbidity
- Remain undelivered after 24 h observation
- Magnesium sulfate
- Control of hypertension with hydralazine, labetalol, or nifedipine
- Glucocorticoids x2 doses
- Randomized :Aggressive or expectant RX.

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Primary Outcome : Neonatal Outcome*

Management	Aggressive Group n=46	Expectant Group n=49	p value
Admitted to NICU	46 (100)	37 (76)	0.002
Days in NICU (mean)	36.6±17.4	20.2 ±14.0	0.0001
SGA	5 (10.9)	15 (30.1)	0.04
RDS	23 (50)	11 (22.4)	0.002
NEC	5 (10.9)	0 (0)	0.02

**Sibai et al (Am J Obstet Gynecol 1994)*

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Secondary Outcomes: Maternal Complications

	Aggressive n=46	Expectant n=49
Postpartum stay (d)	5.3 ± 1.9	5.1 + 2.3
Thrombocytopenia only # (%)	1 (2.1)	3 (6.1)
HELLP syndrome # (%)	1 (2.1)	2(4.1)
Abruptio placentae # (%)	2 (4.3)	2 (4.1)

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ACOG Task Force and SMFM Guidelines

Preeclampsia/ superimposed with severe features

< 23 or ≥ 34 wk.

Stabilize M/F status
Magnesium sulfate
Antihypertensives
Delivery

23-33 5/7 wk.

- Corticosteroids
- Magnesium sulfate
- Anti-hypertensives

Expectant management with delivery for:
- Maternal reasons
- Fetal reasons
- 34 weeks

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"You got to know when to hold' em,
Know when to fold 'em,
Know when to walk away,
Know when to run."

From Kenny Rogers' "The Gambler"

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Severe preeclampsia<34wk : Know when to hold ?
And when to deliver them?

There are patients where you CAN expectantly manage after corticosteroids!

"You got to know when to hold 'em"

There are patients where you should not expectantly manage after corticosteroids!

" Know when to fold 'em"

There are also patients that should not be expectantly managed period.

"Know when to walk 'away" Sibai, 2024

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SUMMARY regarding expectant RX.
Decision to deliver is not straight forward

- Fetal factors to consider
  - Gestational age
  - Fetal growth & AFI
  - UA Doppler results: Absent or reverse EDF
  - Fetal heart rate tracing
- Maternal factors to consider
  - Co-morbidities: renal disease, DM, asthma, ECHO
  - Persistent symptoms : Type & severity
  - Blood tests: Changes in platelets, AST, Cr
  - Number and dose of antihypertensives
  - Maternal wishes

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When to Initiate Acute therapy for Sustained Severe Hypertension?

- **Threshold of blood pressure**
  - **SBP > 160 mmHg**
  - **DBP > 110 mmHg**
  - **MAP > 127 mmHg**
- **Duration of sustained HTN**
  - **15-30 min**
  - **30-60 min**
- **Medications, dose to use , and how frequent?**
- **What if no IV access ?**

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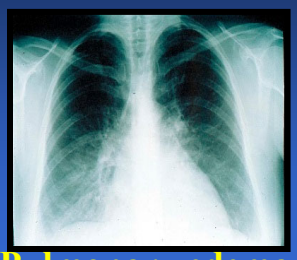
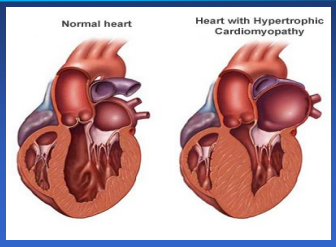
Target Organ Damage of untreated severe HTN

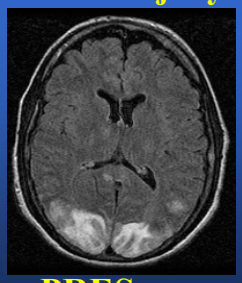
Retinal injury



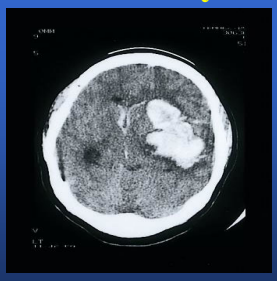
Pulmonary edema



Cardiomyopathy



PRES



ICH

Death from ICH

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Protocols for Acute Rx of Severe HTN

SBP ≥ 160 or DBP ≥ 110 after 15-30 minutes

Antepartum, in Labor, Postpartum

Time Min	LABETALOL IV (mg)	HYDRALAZINE IV (mg)	NIFEDIPINE Oral (mg)
0	20	5-10	10
10	SBP ≥ 160 or DBP ≥ 110 40	Check BP	Check BP
20	SBP ≥ 160 or DBP ≥ 110 80	SBP ≥ 160 or DBP ≥ 110 10	SBP ≥ 160 or DBP ≥ 110 20
30	SBP ≥ 160 or DBP ≥ 110 10, Hydralazine	Check BP	Check BP
40	Check BP	SBP ≥ 160 or DBP ≥ 110 40, Labetalol	SBP ≥ 160 or DBP ≥ 110 20
50	SBP ≥ 160 or DBP ≥ 110 Consult*	SBP ≥ 160 or DBP ≥ 110 Consult*	SBP ≥ 160 or DBP ≥ 110 20, Labetalol Consult*

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Comparative Trial of Labetalol V. Hydralazine

	Labetalol	Hydralazine
Mean dose **Responded to ≤ 60 mg** **Required > 220 mg**	140 mg **45%** **32%**	14 mg
Mean # of injections (range) Mean reduction in MAP(mm Hg)	3.2 (1-5) 25.5±11	2.9 (1-6) 33.3±13
Time to Max decrease BP	**55 min**	**76 min**
Duration of action < 3hr	**70%**	**40%**
Late decelerations	**0**	**33%**

Mabie et al, Obstet Gynecol,1987

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Drugs to Use & Maximum Dose in Severe HTN

- **Labetalol**
  - Avoid in asthma
  - Avoid if HR< 65 bpm
  - Maximum dose of 300 mg/ hour with IV
  - 2400 mg / day with oral
  - **Labetalol : 1-2 mg / min continuous infusion**
- **Hydralazine**
  - Avoid if HR > 110 bpm
  - Avoid if severe headaches
  - Maximum dose of 25-30 mg / hour with IV
  - No continuous IV drip
  - 200 mg/ day with oral

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Drugs to Use & Maximum Dose in Severe HTN

- **Nifedipine**
  - Ideal if no IV access
  - Drug of choice postpartum
  - Maximum dose of 50 mg / hour with Immediate Release
  - Maximum dose 180 mg / day with Extended Release
- **Nicardipine**
  - Continuous IV infusion : 3 mg /h , increase 1mg /h, max 10 mg /h
  - Maximum oral dose :120 mg /day with immediate release

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Magnesium Sulfate Prophylaxis Candidates ? When, How long?

- All patients with preeclampsia
- Severe preeclampsia-eclampsia only
- Severe GHTN ?
- When in relation to delivery ? How long?
- Late onset severe preeclampsia?
- Dose in those with renal insufficiency?
- Pulmonary edema?

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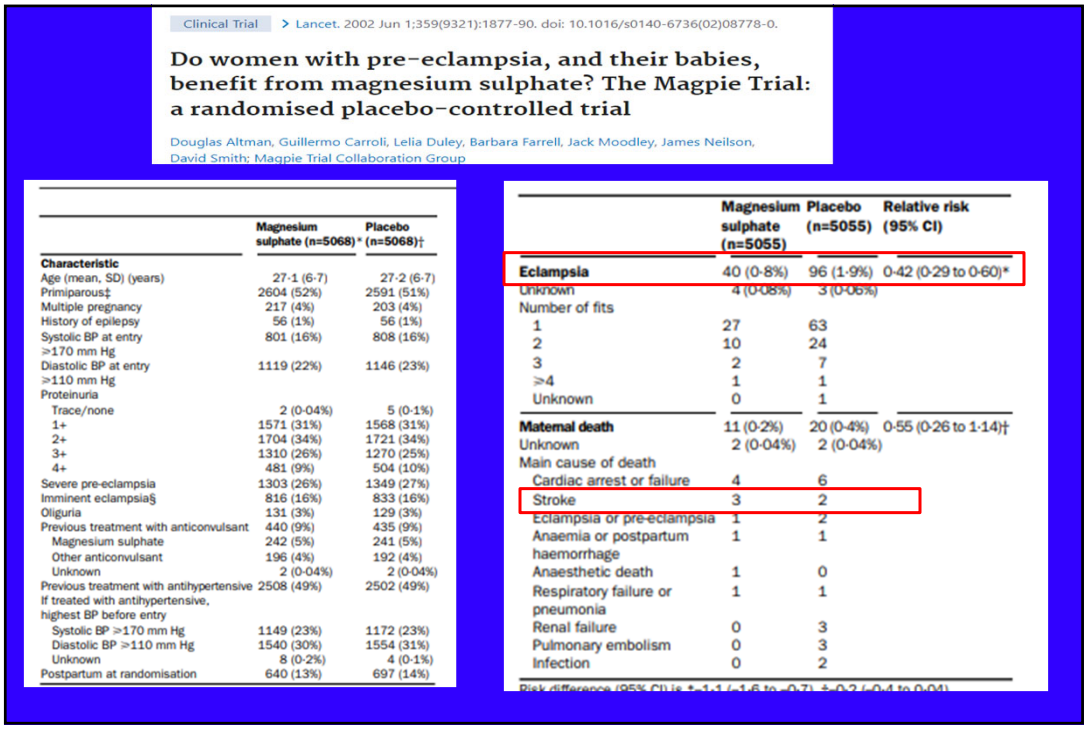

Clinical Trial > Lancet. 2002 Jun 1;359(9321):1877-90. doi: 10.1016/s0140-6736(02)08778-0.

Do women with pre-eclampsia, and their babies, benefit from magnesium sulphate? The Magpie Trial: a randomised placebo-controlled trial

Douglas Altman, Guillermo Carroli, Lelia Duley, Barbara Farrell, Jack Moodley, James Neilson, David Smith; Magpie Trial Collaboration Group

	Magnesium sulphate (n=5068)*	Placebo (n=5068)†
Characteristic		
Age (mean, SD) (years)	27·1 (6·7)	27·2 (6·7)
Primiparous‡	2604 (52%)	2591 (51%)
Multiple pregnancy	217 (4%)	203 (4%)
History of epilepsy	56 (1%)	56 (1%)
Systolic BP at entry ⩾170 mm Hg	801 (16%)	808 (16%)
Diastolic BP at entry ⩾110 mm Hg	1119 (22%)	1146 (23%)
Proteinuria		
Trace/none	2 (0·04%)	5 (0·1%)
1+	1571 (31%)	1568 (31%)
2+	1704 (34%)	1721 (34%)
3+	1310 (26%)	1270 (25%)
4+	481 (9%)	504 (10%)
Severe pre-eclampsia	1303 (26%)	1349 (27%)
Imminent eclampsia§	816 (16%)	833 (16%)
Oliguria	131 (3%)	129 (3%)
Previous treatment with anticonvulsant	440 (9%)	435 (9%)
Magnesium sulphate	242 (5%)	241 (5%)
Other anticonvulsant	196 (4%)	192 (4%)
Unknown	2 (0·04%)	2 (0·04%)
Previous treatment with antihypertensive	2508 (49%)	2502 (49%)
If treated with antihypertensive, highest BP before entry		
Systolic BP ⩾170 mm Hg	1149 (23%)	1172 (23%)
Diastolic BP ⩾110 mm Hg	1540 (30%)	1554 (31%)
Unknown	8 (0·2%)	4 (0·1%)
Postpartum at randomisation	640 (13%)	697 (14%)

	Magnesium sulphate (n=5055)	Placebo (n=5055)	Relative risk (95% CI)
Eclampsia	40 (0·8%)	96 (1·9%)	0·42 (0·29 to 0·60)*
Unknown	4 (0·08%)	3 (0·06%)	
Number of fits			
1	27	63	
2	10	24	
3	2	7	
⩾4	1	1	
Unknown	0	1	
Maternal death	11 (0·2%)	20 (0·4%)	0·55 (0·26 to 1·14)†
Unknown	2 (0·04%)	2 (0·04%)	
Main cause of death			
Cardiac arrest or failure	4	6	
Stroke	3	2	
Eclampsia or pre-eclampsia	1	2	
Anaemia or postpartum haemorrhage	1	1	
Anaesthetic death	1	0	
Respiratory failure or pneumonia	1	1	
Renal failure	0	3	
Pulmonary embolism	0	3	
Infection	0	2	

Risk difference (95% CI) is * -1·1 (-1·6 to -0·7) † -0·2 (-0·4 to 0·04)

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Eclampsia Rate by Subgroup in Magpie Trial

	$Mgso_4$	Placebo	RR (95% C.I.)
Imminent eclampsia	**8/810 (1.0)**	**31/829 (3.1)**	**0.26 (0.12-0.57)**
No imminent eclampsia	**32/4245 (0.7)**	**65/4226(1.5)**	**0.49 (0.32-0.75)**
Low PMR country	**4/778 (0.5)**	**6/782 (0.8)**	**0.67 (0.19-2.37)**

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Who Should Receive Magnesium Sulfate ? When? , How long?

- **All patients with severe preeclampsia or eclampsia**
  - Total duration for 24 hr.
  - In labor / delivery plus 12-24 hours PP
  - **Continue for > 24 hours PP** : NO
  - Adjust dose if serum Cr > 1.2 mg/dl : **Yes**
- Severe GHTN with no symptoms : ACOG-yes, Sibai-No
- Pulmonary edema: **Yes**
- How far postpartum : up to 7 days maximum - Sibai
- Given before, then comes back PP . **No repeat**

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Steps in Managing an Eclamptic Seizure

Step 1: Prevent hypoxia: Support maternal respiratory cardiovascular functions

↓

Step 2: Prevent maternal injury & aspiration

↓

Step 3: Do not try to arrest the first seizure

↓

Step 4: Prevent convulsions from recurring (chiefly with magnesium sulfate)

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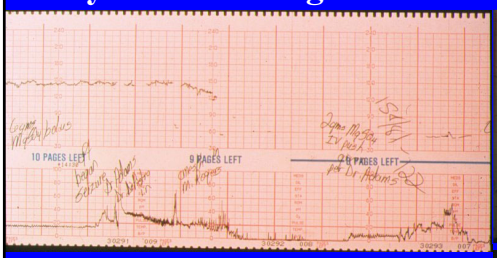
FHR Changes During Convulsions & after Correction of Hypoxemia

Bradycardia during convulsion



Recovery after bradycardia

Reassuring FHR after correction of hypoxia

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Contractions/ FHR Changes in eclampsia

During or After Convulsions

- **Uterine contractions**
  - **Increased frequency**
  - **Increased tone**
- **FHR changes**
  - **Bradycardia : 3-10'**
  - **Variable/late decelerations :10-15'**
  - **Compensatory tachycardia :15'**

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Prevention of Recurrent Convulsions

- **Magnesium sulfate**
  - Loading dose: 6g IV over 20 min
  - Maintenance: 2g IV per hour
- **If convulsions persist**
  - 2g dose of magnesium sulfate
  - Lorazepam (Ativan IV)
- **If recurrent seizures**
  - Intubation
  - Check for aspiration, hypoxia
  - Consider other etiology

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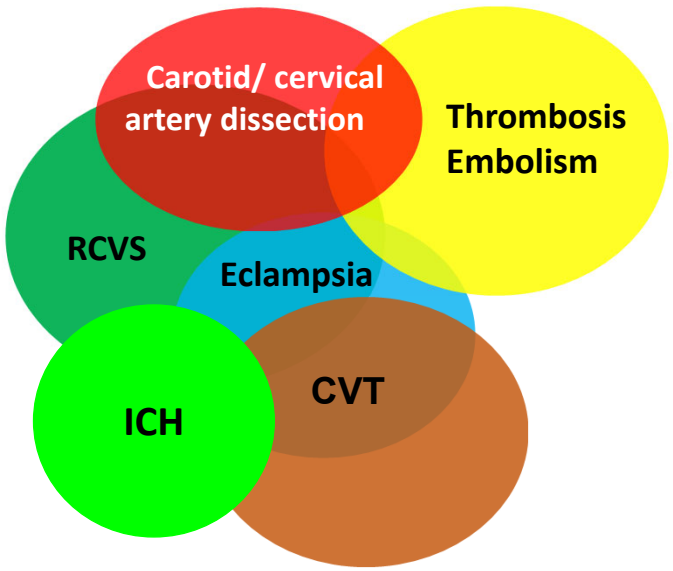
Overlapping syndromes



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Indications for Cerebral Imaging

CT- Angio , MRI , MRA , MRV

- Presence of focal neurologic deficits
- Presence of blindness
- Coma
- Repeat seizures despite adequate magnesium levels
- Onset < 20 wks' gestation
- Onset > 48 hr. postpartum

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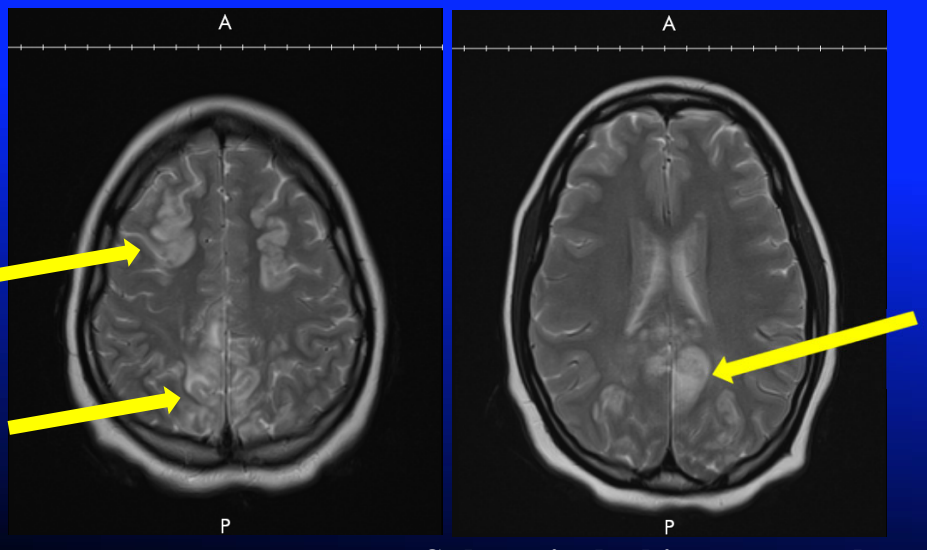
Diffuse PRES in Eclampsia



Bilateral vasogenic edema Subcortical white matter edema

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HELLP Syndrome ?

LP ?

EL ?

ELLP ?

HEL ?

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Laboratory Findings in HELLP Syndrome
Sibai criteria

- **Hemolysis**
  - Peripheral smear : Schistocytes, burr cells
  - Serum bilirubin: ≥ 1.2 mg/dl
  - Low serum haptoglobin
  - Severe Anemia, unrelated to blood loss
- **Elevated liver enzymes**
  - AST or ALT ≥ 2x upper normal
  - LDH ≥ 2x upper normal
- **Low platelets :<100,000/mm3**

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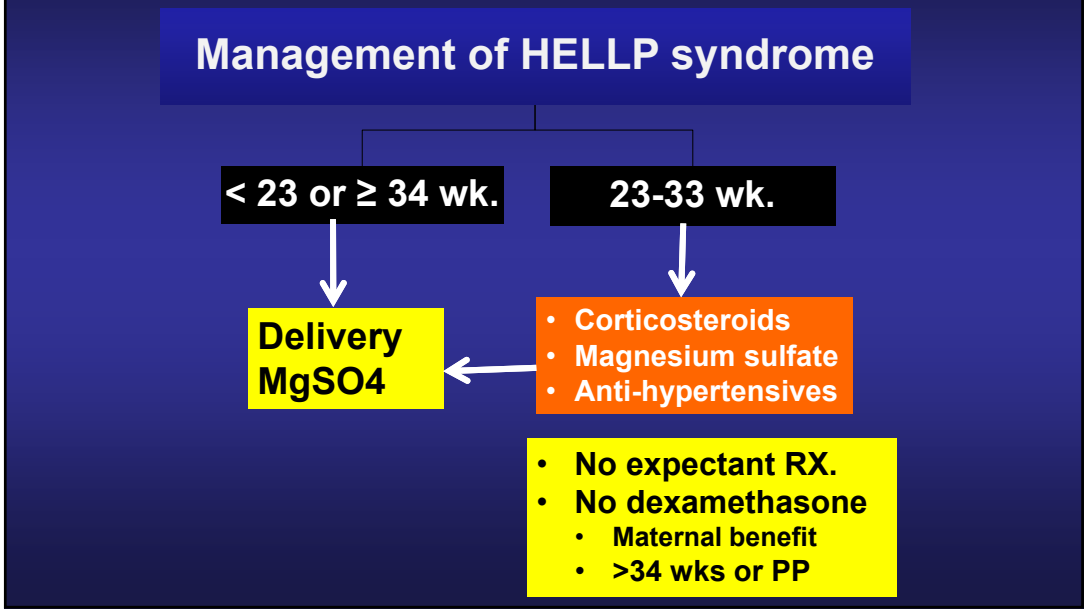
ACOG /SMFM Guidelines For HELLP syndrome



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Management of HELLP Syndrome

- **Analgesia – anesthesia to use?**
  - Usually general
  - Epidural if platelet count > 75,000
  - Check airway for edema and swelling
  - Beware of failed intubation
- **What is the proper mode of delivery?**
  - Vaginal if in labor, PROM, or > 30 wk.
  - Cesarean for fetal reasons or < 30 wk. ?, low Bishop score
- **When to administer platelets?**
  - In case of abnormal bleeding
  - If platelet count < 40, 000 in case of C/S
  - If platelet count < 20, 000
- **Beware of liver hematoma, imitators**
  - Exacerbation of SLE, APAS
  - AFLP, TTP/HUS

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HELLP Versus AFLP : Skin color

HELLP with ascites

AFLP with ascites

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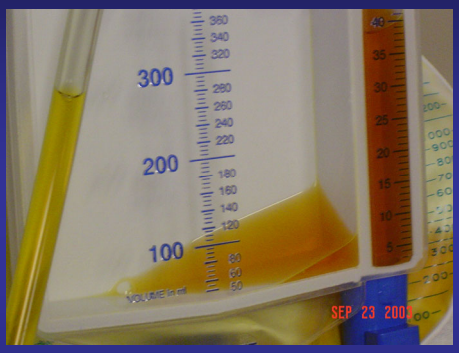
Color of Urine



AFLP

HELLP
TTP
HUS

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Ecchymosis in HELLP Versus TTP

HELLP

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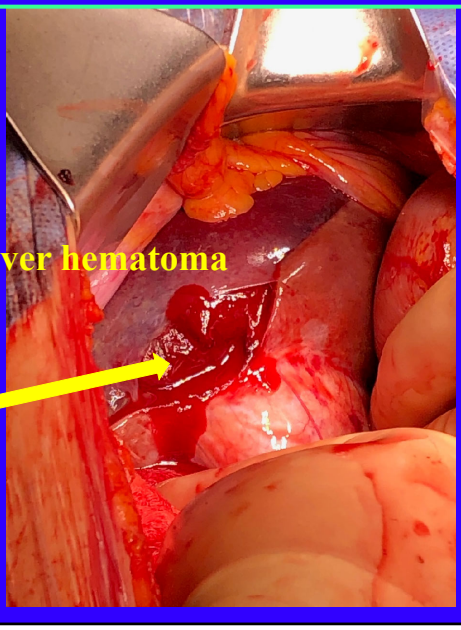
Ruptured Liver Hematoma



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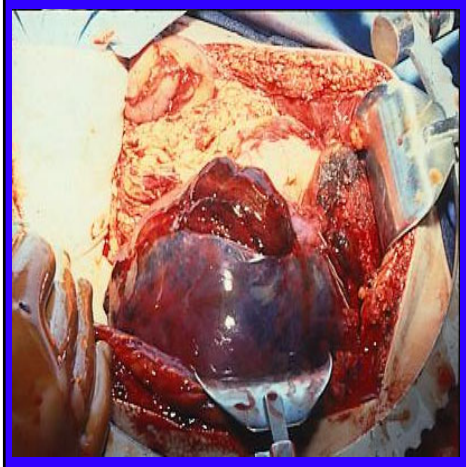
Color of liver: HELLP Versus AFLP



HELLP with subcapsular Hematoma

AFLP with sub-capsular Hematoma

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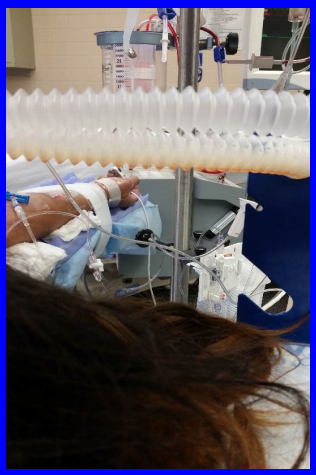
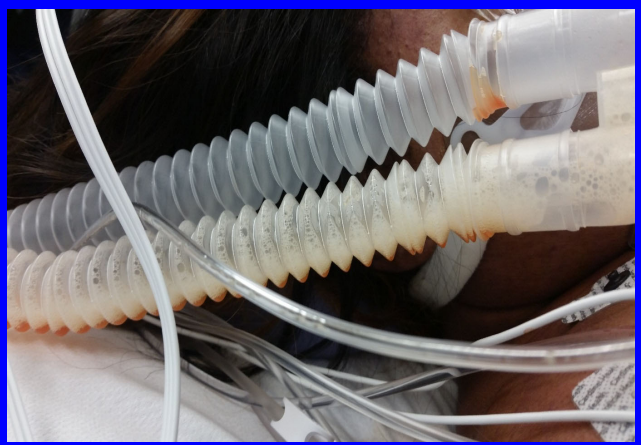
Acute pulmonary Edema

Frothy fluid from trachea





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Postpartum period is a major risk factor
Pulmonary Edema

- **Increased Venous Return**
  - **Removal of pressure off IVC and iliac veins**
  - **Auto-transfusion from uterus- placenta**
- **Reduced oncotic pressure**
  - **Bleeding, fluid administration**
- **Mobilization of fluid from extravascular to intravascular space**
- **Lack of attention to**
  - **BP control**
  - **Intake – output : Net positive > 2 L**

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Management of pulmonary edema in HDP

- Reduce after load: control severe HTN
- **Control heart rate: prolongs filling during diastole**
- Supportive care : oxygen , morphine ,limit fluids
- Reduce preload
  - **Furosemide 40-80 mg IV**
  - **Nitroglycerine IV: veno-dilator**
- Sodium nitroprusside drug of choice
  - **Reduces preload: venous return**
  - **Reduces afterload: arterio-dilator**
- **ECHO to establish etiology**
- **CPAP/Intubation if needed**

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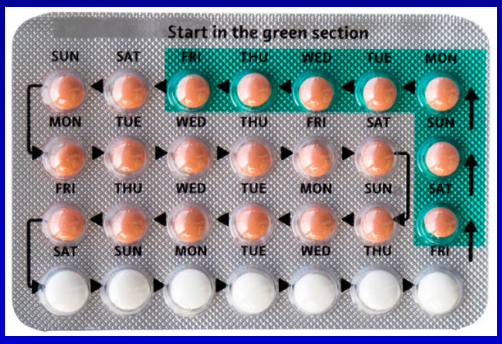
Practical Suggestions For Preeclampsia Prevention

1. Don't have sex with wrong man on the first date.
2. Use one of the methods below.



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Universal use of LDA (81 mg/d) in pregnancy

- Give to all women at first prenatal visit
- 10-15% reduction in rates
  - Preeclampsia
  - Preterm birth: Spontaneous & indicated
  - SGA infants
  - Perinatal death
- More cost-effective than prenatal vitamins
  - $5-10 for 300 tablets
  - Safe

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University of Texas
McGovern Medical School
Memorial Hermann
Hospital-TMC
Hermann Hospital
Memorial City
University of Texas
Professional Building
Memorial Hermann
Hospital Southwest
Lyndon B. Johnson
General Hospital
Life
Dan Wolterman

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