

Hypertensive Disorders in Pregnancy

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Objectives

- To differentiate various hypertensive disorders during pregnancy
- To familiarize with antenatal management of such disorders
- To review neonatal outcomes in pregnancies complicated with hypertensive disorders

Task Force on Hypertension in Pregnancy, 2013

- Pre-eclampsia–eclampsia
- Chronic hypertension (of any cause)
- Chronic hypertension with superimposed preeclampsia
- Gestational hypertension

Pre-eclampsia

- Hypertension after 20 weeks
 - a systolic BP ≥ 140 mm Hg or a diastolic BP ≥ 90 mm Hg, or both
 - at least two determinations, 4 hours apart
 - a shorter interval (even minutes) when faced with severe hypertension

Pre-eclampsia

- New-onset proteinuria
 - 24-hour excretion ≥ 300 mg in 24 hours
 - the ratio of measured protein to creatinine in a single voided urine ≥ 3.0 mg/dL
 - qualitative dipstick $\geq 1+$; should be reserved for use when quantitative methods are not available or rapid decisions are required

Pre-eclampsia

- Pre-eclampsia-eclampsia
 - in the absence of proteinuria
 - thrombocytopenia (platelet count $<100,000/\mu\text{L}$)
 - transaminases to twice the normal concentration
 - renal insufficiency (elevated serum creatinine greater than 1.1 mg/dL or a doubling of serum creatinine in the absence of other renal disease)
 - pulmonary edema
 - new-onset cerebral or visual disturbances

Pre-eclampsia with severe features

- Systolic blood pressure ≥ 160 mm Hg , or diastolic blood pressure ≥ 110 mm Hg
- Thrombocytopenia
- Elevated transaminases, severe persistent right upper quadrant or epigastric pain unresponsive to medication
- Progressive renal insufficiency
- Pulmonary edema
- New-onset cerebral or visual disturbances
- Growth restriction or proteinuria $> 5\text{g}/24\text{ h}$ excluded

HELLP

- H = hemolysis
- EL = elevated liver function tests
- LP = low platelets

Chronic hypertension with superimposed pre-eclampsia

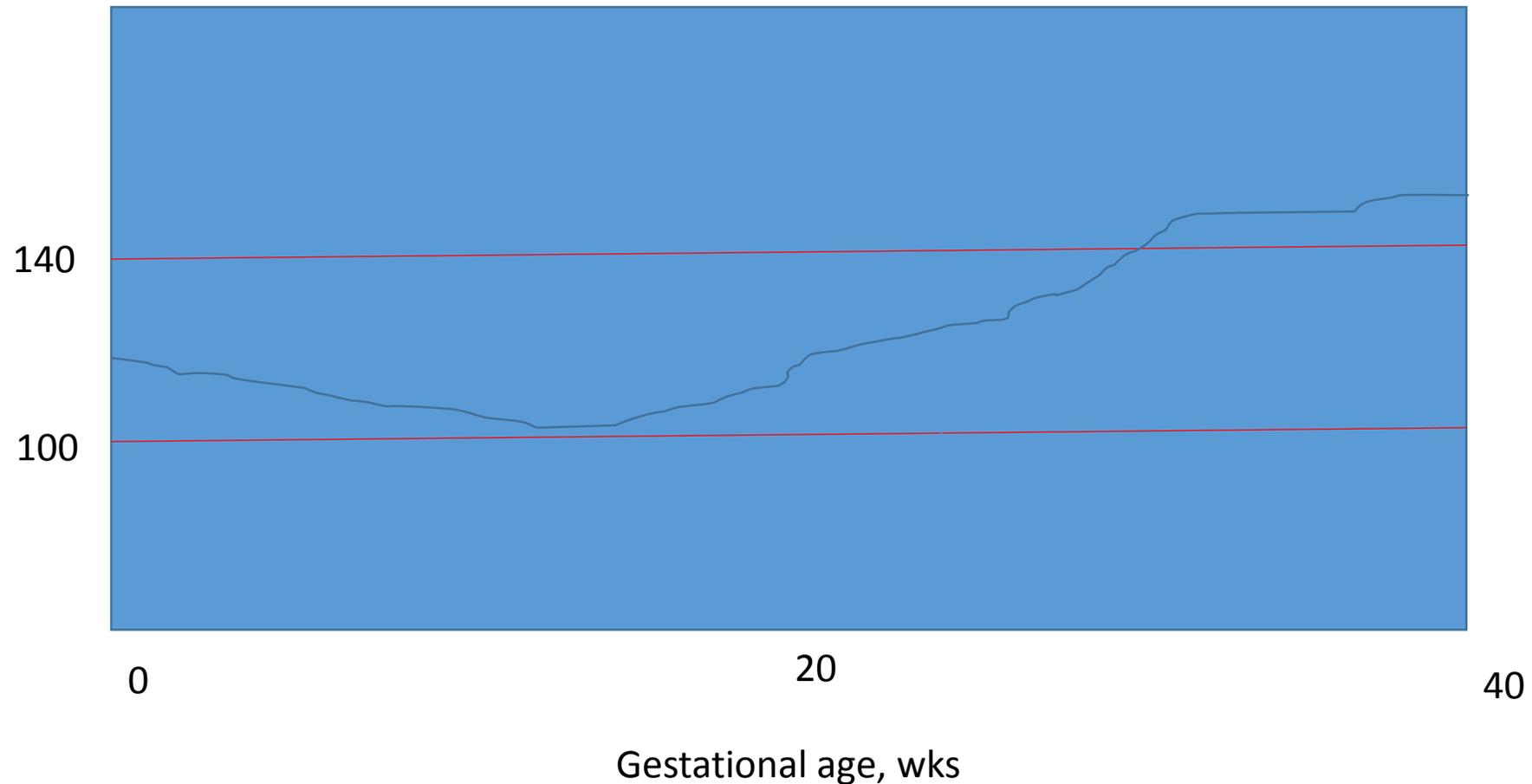
- women with hypertension only in early gestation who
 - develop proteinuria after 20 weeks of gestation
- women with hypertension and proteinuria before 20 weeks of gestation who
 - experience a sudden exacerbation of hypertension, or a need to escalate the antihypertensive drug dose
 - suddenly manifest other signs and symptoms
 - sudden, substantial, and sustained increases in protein excretion

Definition: Gestational Hypertension

- Systolic >140mm Hg, diastolic >90 mm Hg
and
- First detected >20 weeks
and
- No proteinuria

Physiologic blood pressure change during pregnancy

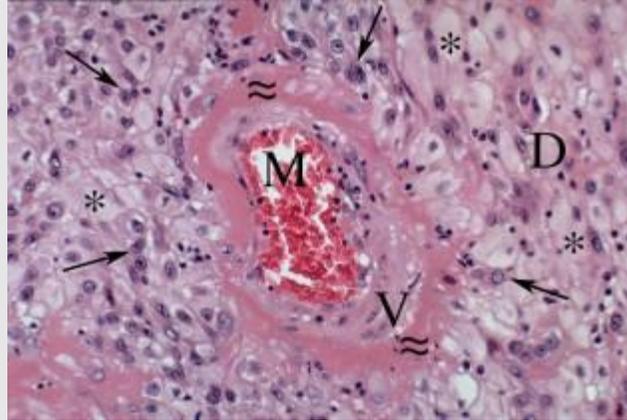
Systolic BP, mm Hg



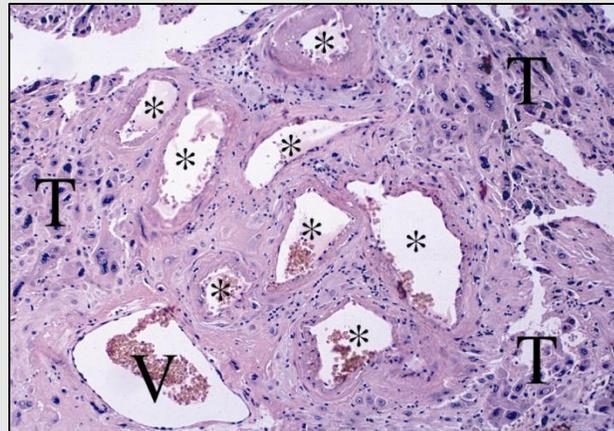
Gestational hypertension includes the following mix of patients

- Women who go on to develop preeclampsia -15 to 25%
- Women with 'transient hypertension of pregnancy'
- Women with previously unrecognized 'chronic hypertension'

Increased Trophoblastic Apoptosis



Trophoblastic invasion of a maternal vessel



Failed trophoblastic invasion

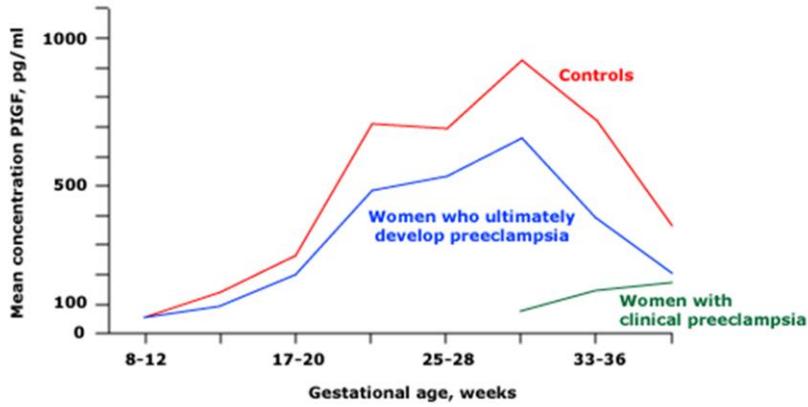
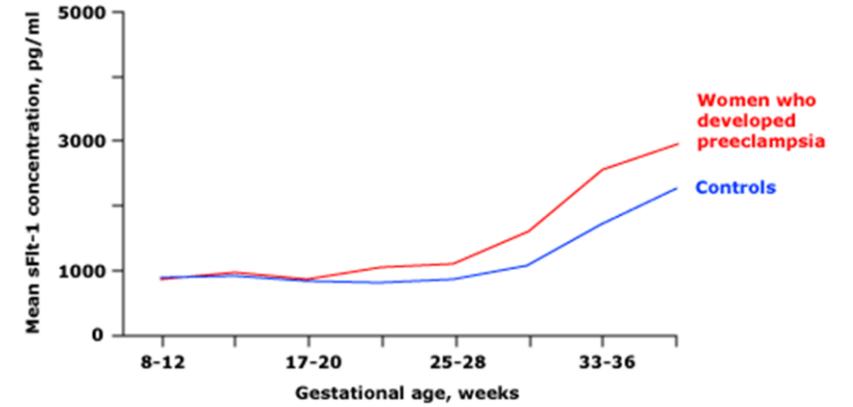
Altered Global Gene Expression in First Trimester Placentas of Women Destined to Develop Preeclampsia

Sandra A. Founds¹, Yvette P. Conley^{1,2}, James F. Lyons-Weiler³, Arun Jeyabalan⁴, W. Allen Hogge⁴, and Kirk P. Conrad⁵

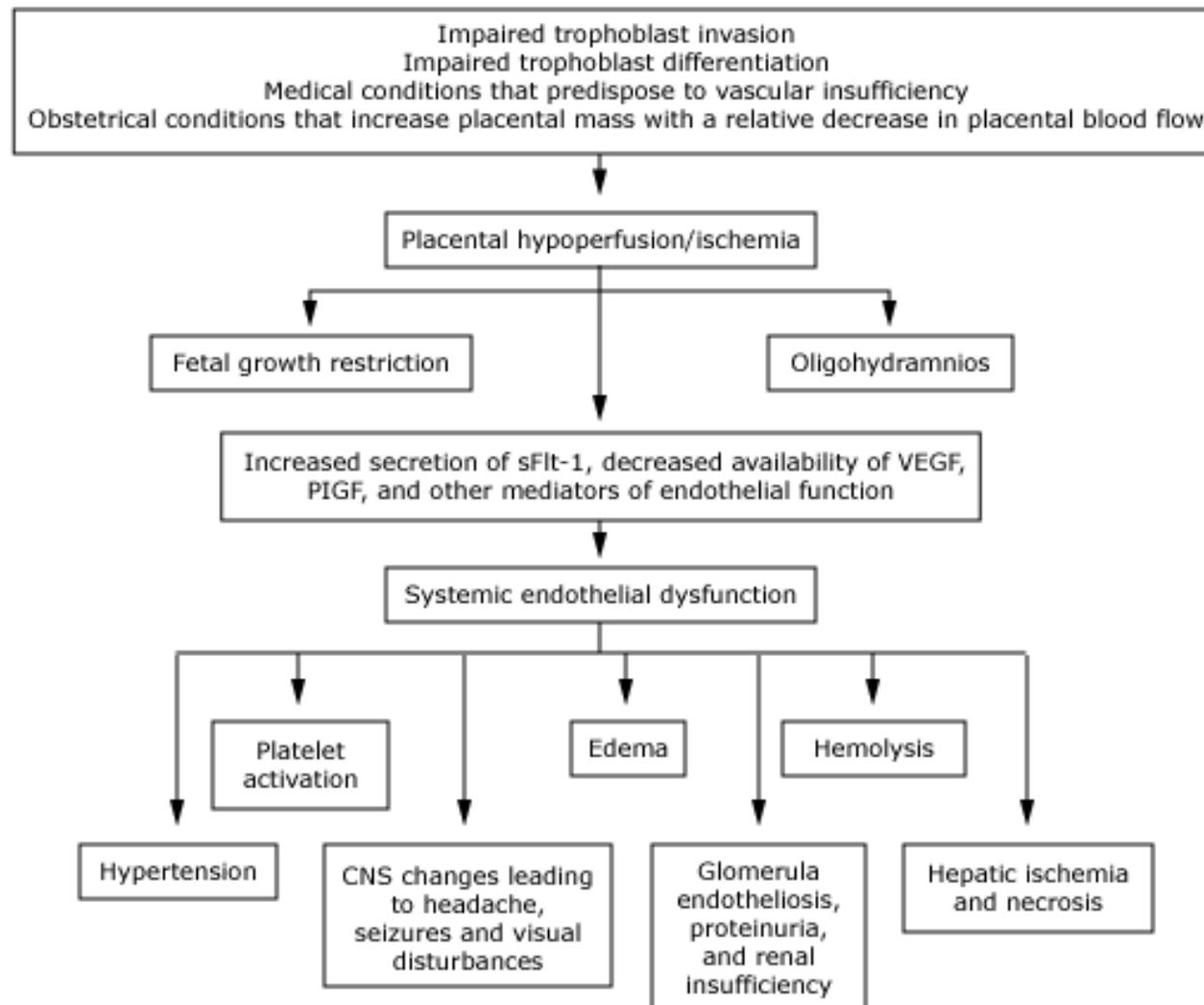
Placenta. 2009 January ; 30(1): 15–24.

What causes systemic endothelial damage?

Proangiogenic factors
Vascular endothelial growth factor (VEGF)
Placental growth factor [PlGF]



Anti-angiogenic
Soluble fms-like tyrosine
[sFlt-1]
Endoglin

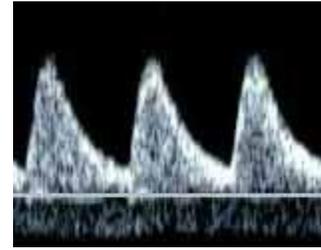


GOALS OF THE INITIAL EVALUATION

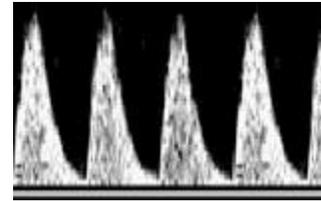
- Exclude other disorders characterized by hypertension and proteinuria
- Assess the severity of disease
- Assess fetal well-being

Fetal Assessment

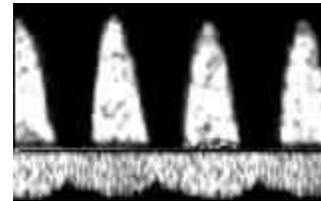
- Fetal heart rate monitoring
- Fetal growth
- Amniotic fluid volume
- Umbilical artery Doppler studies



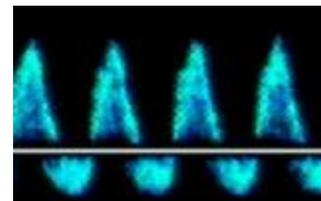
Diminished



Diminished



Absent

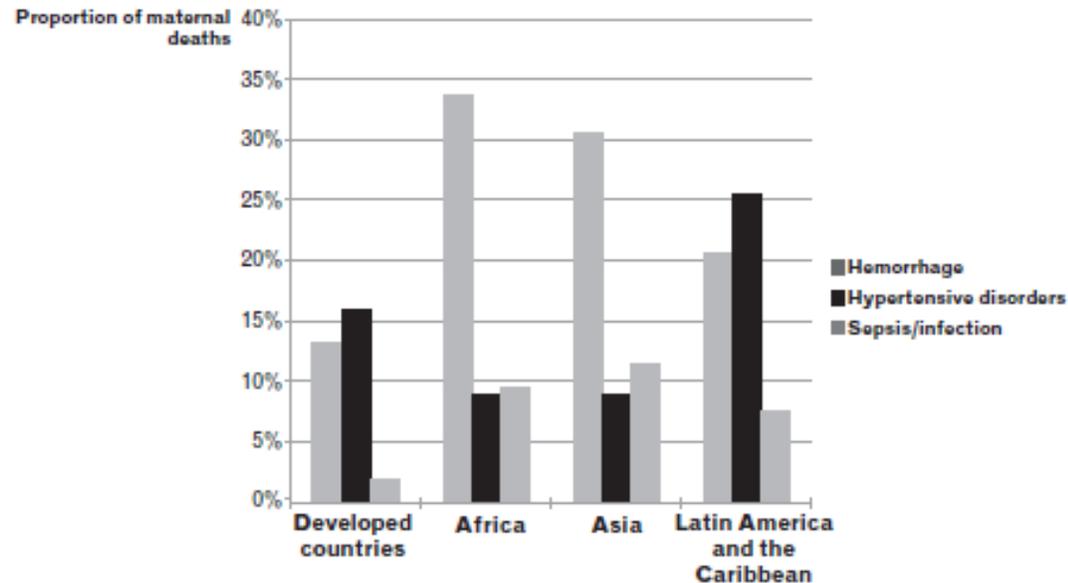


Reversed

Key Points in Management

- Definitive treatment is delivery
- There is no advantage for the mother to remain pregnant after pre-eclampsia is diagnosed
- Expectant management is for the baby's sake

Maternal Mortality and Morbidity due to Hypertension in Pregnancy

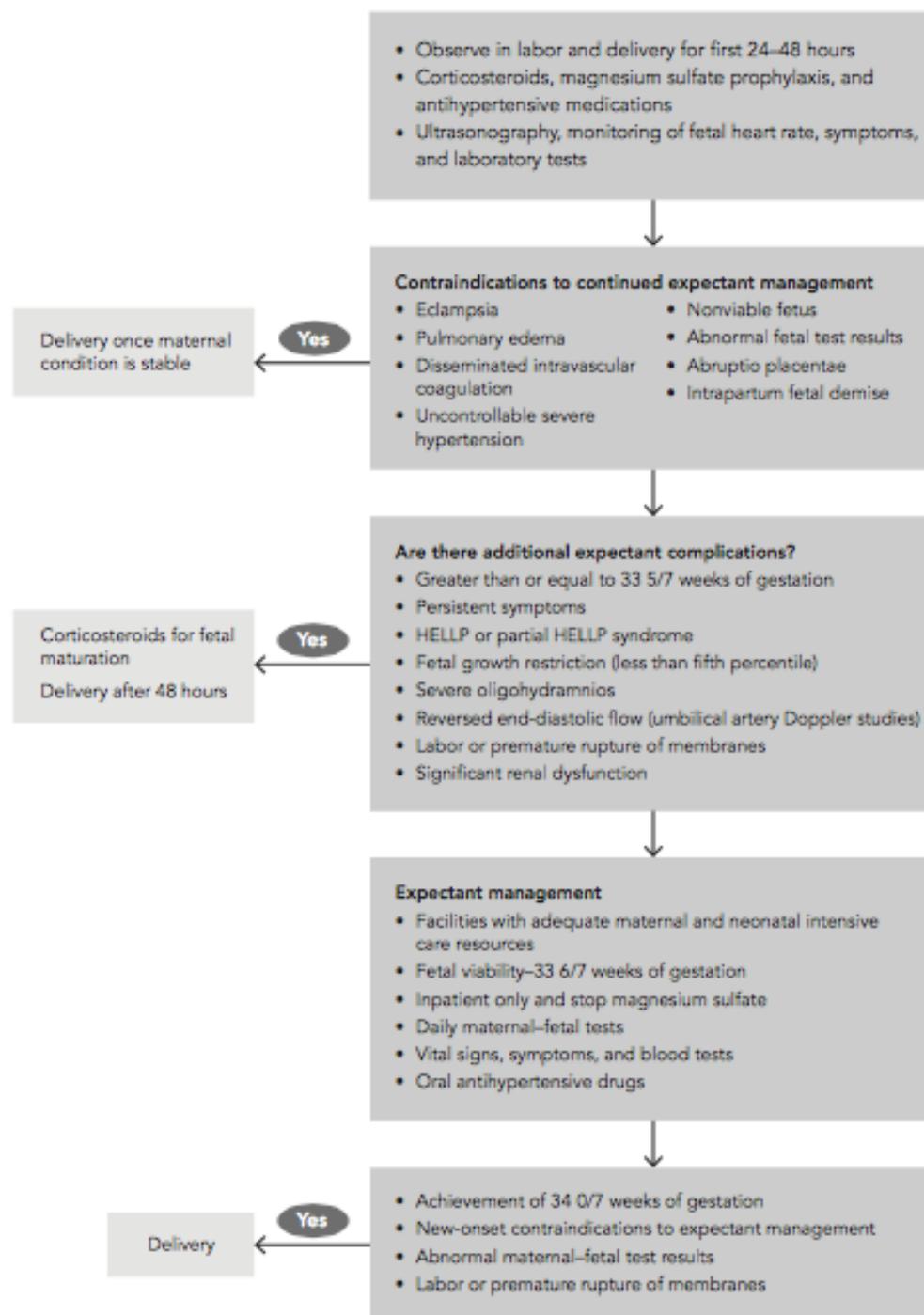


Causes of significant maternal mortality and morbidity

- Stroke
- Posterior reversible encephalopathy syndrome
- Placental abruption
- DIC
- Renal failure
- Hepatic rupture
- Pulmonary edema

Why do we need to control severe hypertension?

- 2/3 maternal deaths in the UK between 2003-2005 resulted from cerebral hemorrhage or infarction
- 27/28 who had severe preeclampsia and stroke had BP \geq 160 mmHg just before a hemorrhagic stroke



Expectant Management of Severe
Preeclampsia at 27⁰/₇ to 33⁶/₇ Weeks'
Gestation: Maternal and Perinatal Outcomes
According to Gestational Age by Weeks at
Onset of Expectant Management

Annette E. Bombrys, D.O.,¹ John R. Barton, M.D.,² Mounira Habli, M.D.,¹
and Baha M. Sibai, M.D.¹

AMERICAN JOURNAL OF PERINATOLOGY/VOLUME 26, NUMBER 6 2009

Table 1 Neonatal and Pregnancy Outcomes Stratified by Gestational Age at Onset of Expectant Management

GA at Admission (wk)	Number of Fetuses	Median Days Gained (Range)	Median Delivery GA (wk)	Mild RDS, n (%)	BPD, n (%)	NEC, n (%)
27-27 ^h	9	4 (4-32)	28.3	5/8 (63)	2/8 (25)	1/8 (13)
28-28 ^h	8	9 (3-35)	31.1	6 (76)	0 (0)	1 (13)
29-29 ^h	14	6 (3-26)	30.4	8 (57)	0 (0)	1 (7)
30-30 ^h	13	4 (3-15)	30.9	6 (47)	0 (0)	1 (8)
31-31 ^h	16	5 (3-12)	32.3	4 (25)	0 (0)	1 (6)
32-32 ^h	5	7 (4-7)	33.1	0 (0)	0 (0)	0 (0)
33-33 ^h	6	4 (3-10)	33.9	2 (33)	0 (0)	0 (0)
Total	71	5 (3-35)	31.4	31/70 (44)	2 (3)	5 (7)

GA, gestational age; RDS, respiratory distress syndrome; BPD, bronchopulmonary dysplasia; NEC, necrotizing enterocolitis.

Table 2 Maternal Outcome Stratified by Gestational Age at Onset of Expectant Management

GA at Admission (wk)	Number of Patients	HELLP, n (%)	Abruptio Placentae, n (%)	Pulmonary Edema, n (%)	Renal Insufficiency, n (%)	Composite Outcome, n (%)
27-27 ^h	9	0 (0)	2 (22)	1 (11)	2 (22)	5 (56)
28-28 ^h	7	1 (14)	2 (29)	0 (0)	0 (0)	3 (43)
29-29 ^h	12	0 (0)	1 (8)	1 (8)	0 (0)	1 (8)
30-30 ^h	12	1 (8)	1 (8)	1 (8)	0 (0)	3 (25)
31-31 ^h	15	2 (13)	0 (0)	0 (0)	0 (0)	2 (15)
32-32 ^h	5	1 (20)	1 (20)	1 (20)	0 (0)	2 (40)
33-33 ^h	6	0 (0)	0 (0)	2 (33)	0 (0)	2 (33)
Total	66	5 (8)	7 (11)	6 (9)	2 (3)	18 (27)

These complications developed during expectant management and were the maternal indications for delivery. GA, Gestational age; HELLP, hemolytic anemia, elevated liver enzymes, and low platelet count.

Neonatal outcomes in severe preeclampsia between 24-36 weeks: does HELLP syndrome matter?

- HELLP syndrome, n=68
- Partial HELLP, n= 65
- Severe preeclampsia, n=139
- Comparisons stratified by gestational age: ≤ 28 , 29-32, 33-36 weeks
- No difference
 - Neonatal death
 - RDS
 - IVH grade 3 and 4
 - NEC
 - BPD
 - Mechanical ventilation
 - Latency
 - Gestational age at delivery
 - Birth weight
 - IUGR rate

Neonatal outcomes following expectant management of severe pre-eclampsia presenting before 26 weeks

Paris, France, 2000-2008

Admission GA, wks	n	Fetal death, n (%)	Neonatal death, n (%)	Discharged alive from ICU, n (%)	Severe IVH, n (%)	NEC, n (%)	CLD, n (%)
<23	5	5 (100)	0	0
23-23 ^{6/7}	7	6 (86)	1 (14)	0	1 (100)
24-24 ^{6/7}	18	8 (44)	1 (6)	9 (50)	1/10 (10)	3/10 (30)	4/9 (44)
25-25 ^{6/7}	23	8 (35)	2 (9)	13 (57)	1/15 (7)	0	3/13 (23)
Total	53	27 (51)	4 (7)	22 (42)	3/26 (12)	3/23 (13)	7/22 (32)

Admission GA, wks	Authors	No. of fetuses	Perinatal mortality %	Severe FGR		
				n	Perinatal mortality %	Maternal morbidity %
<25	Bombrys et al ⁹	24	71	4	100	55
	Budden et al ⁸	31	71	NR		42
	Current study (2010)	29 ^a	69 ^a	7	100	41
23-23 ^{6/7}	Bombrys et al ⁹	10	80	0		63
	Budden et al ⁸	4	75	NR		25
	Gaugler-Senden ⁷	26	69	NR		65
	Current study (2010)	7	100	3	100	71
24-24 ^{6/7}	Bombrys et al ⁹	7	29	2	100	33
	Budden et al ⁸	13	39	NR		31
	Haddad et al ²	6	67	NR		50
	Current study (2010)	17 ^a	47 ^a	3	100	33

Maternal outcomes stratified by gestational age at admission in patients managed expectantly for severe pre-eclampsia

Admission GA, wks	n	Composite morbidity, n (%)
<23	4	1 (25)
23-23 ^{6/7}	7	7 (71)
24-24 ^{6/7}	18	6 (33)
25-25 ^{6/7}	21	10 (46)
Total	51	22 (43)

Composite morbidity: death, HELLP syndrome, placental abruption, eclampsia, pulmonary, edema, renal insufficiency, isolated thrombocytopenia, or DIC.

Prediction and Prevention

- Early, severe pre-eclampsia: risk of recurrence, 25-65%
- Mild pre-eclampsia: risk of recurrence, 5-7%
- First pregnancy normal; risk of pre-eclampsia in subsequent pregnancy: 1%
- No reliable predictive tests
- No effective prophylaxis

Chronic hypertension

- Superimposed preeclampsia — 10 to 25 percent
- Abruptio placentae — 0.7 to 1.5 percent
- Preterm birth <37 weeks — 12 to 34 percent
- Fetal growth restriction — 8 to 16 percent
- These risks were even higher in women with severe chronic hypertension

Chronic hypertension

- Acceptable blood pressures: (systolic <160 /100 mmHg)
- Secondary or complicated hypertension: maintain BP within 120 to 140/80 to 90 mmHg
 - End-organ damage (e.g., ventricular dysfunction, retinopathy)
 - Dyslipidemia
 - Maternal age over 40 years old
 - Microvascular disease
 - History of stroke
 - Previous perinatal loss
 - Diabetes
 - Renal disease

Gestational hypertension

- Distinguish from preeclampsia
- Determine whether hypertension is mild or severe
- Mild
 - outcomes are generally favorable
 - frequent prenatal visits and fetal assessment and delivering at term
- Severe
 - Control blood pressure
 - severe gestational hypertension are at increased risk for maternal and perinatal morbidity, similar to the rates reported for women with severe preeclampsia
 - Consider treatment like severe pre-eclampsia