

## Neonatal management of macrosomic baby



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## Macrosomia

*Makros* = Large  
*Soma* = Body  
 “Abnormally large size of the body”



## How big is too big ?



## Definition

- **Macrosomia:** Birth weight > 4000-4500 g
- **Large-for-gestational age:**
  - BW > 90<sup>th</sup> percentile for gestational age
  - BW > 2 SD for gestational age
- A neonate may be LGA without being macrosomic

## Factors associated with macrosomia

- **Maternal diabetes**
  - Maternal obesity
  - Parents of large stature
  - Previous macrosomic baby
  - Racial differences:
    - higher in Hispanic women compared to white, African-American or Asian women
- Multiparity
  - Grand multiparity
  - Male gender
  - Postterm pregnancies
  - Congenital hyperinsulinemic syndromes
    - (Beckwith-Wiedemann S.)

## Neonatal morbidities

- Perinatal asphyxia
- Birth injuries
- Respiratory distress
- Hypoglycemia
- Polycythemia
- Hyperbilirubinemia
- Hypocalcemia & hypomagnesemia
- Infants of diabetic mothers:
  - congenital cardiac, neurologic, skeletal, intestinal, renal system malformations, RVT, cardiomyopathy



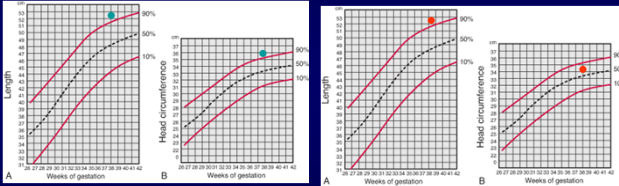
## Initial clinical assessment

- **Maternal history**
- **Focused physical examination:**
  - Plot BW, length, HC on growth chart
  - Birth injuries & asphyxia
  - Respiratory distress
  - Congenital anomalies

## Growth curves: Look for asymmetry



## Two babies, two diagnosis



Baby A, birth weight 4250g

Baby B, birth weight 4250g



Baby A, constitutively large

Baby B, infant of diabetic mother

Ponderal index is ↑ in IDM

## Macrosomic infants of non-diabetic mothers:

Are there any differences in the incidence of neonatal morbidities ?

TABLE 1  
Prevalence of perinatal outcomes in patients without gestational diabetes stratified by presence vs absence of macrosomia

Outcome	Absence of GDM Bwt < 4000 g, % (n)	Absence of GDM Bwt ≥ 4000 g, % (n)	P value
Hyperbilirubinemia	9.1% (2109)	7.6% (243)	.23
Hypoglycemia	1.2% (269) <sup>a</sup>	2.4% (77) <sup>a</sup>	< .001
RDS	1.2% (283) <sup>a</sup>	1.7% (55) <sup>a</sup>	.02
Shoulder dystocia	0.9% (205) <sup>a</sup>	6.0% (190) <sup>a</sup>	< .001
Brachial plexus injury	0.1% (29) <sup>a</sup>	0.7% (21) <sup>a</sup>	< .001

Bwt, birthweight; GDM, gestational diabetes mellitus; RDS, respiratory distress syndrome.  
<sup>a</sup>Results are statistically significant.  
Eschoff, Birthweight 4000 g or greater and perinatal outcomes in GDM. Am J Obstet Gynecol 2009.

TABLE 2  
Prevalence of perinatal outcomes in patients with gestational diabetes stratified by presence vs absence of macrosomia

Outcome	Presence of GDM Bwt < 4000 g, % (n)	Presence of GDM Bwt ≥ 4000 g, % (n)	P value
Hyperbilirubinemia	10.4% (93)	13.2% (20)	.90
Hypoglycemia	2.6% (23) <sup>a</sup>	5.3% (8) <sup>a</sup>	.04
RDS	1.5% (13) <sup>a</sup>	4.0% (6) <sup>a</sup>	.03
Shoulder dystocia	1.6% (14) <sup>a</sup>	10.5% (16) <sup>a</sup>	< .001
Brachial plexus injury	0.2% (2) <sup>a</sup>	2.6% (4) <sup>a</sup>	< .001

Bwt, birthweight; GDM, gestational diabetes mellitus; RDS, respiratory distress syndrome.  
<sup>a</sup>Results are statistically significant.  
Eschoff, Birthweight 4000 g or greater and perinatal outcomes in GDM. Am J Obstet Gynecol 2009.

TABLE 3

The odds of adverse perinatal outcomes in infants weighing  $\geq 4000$  g as compared with infants weighing  $< 4000$  g in women with and without gestational diabetes

Outcome	Absence of GDM/with Bwt $\geq 4000$ g, aOR (95% CI) <sup>a</sup>	Presence of GDM/presence of Bwt $\geq 4000$ g, aOR (95% CI) <sup>b</sup>
Hyperbilirubinemia	0.90 (0.74-1.09)	1.60 (0.93-2.74)
Hypoglycemia	2.04 (1.42-2.92) <sup>c</sup>	2.60 (1.05-6.45) <sup>c</sup>
RDS	1.54 (1.02-2.33) <sup>c</sup>	3.10 (1.11-8.65) <sup>c</sup>
Shoulder dystocia	9.62 (7.38-12.54) <sup>c</sup>	16.45 (6.71-40.33) <sup>c</sup>
Brachial plexus injury	6.65 (2.90-15.27) <sup>c</sup>	41.89 (4.05-433.64) <sup>c</sup>

<sup>a</sup>aOR, adjusted odds ratio; Bwt, birthweight; CI, confidence interval; GDM, gestational diabetes mellitus; RDS, respiratory distress syndrome.  
<sup>b</sup>The reference group is neonates born to women without GDM who weighed  $< 4000$  g; <sup>c</sup>The reference group is neonates born to women with GDM who weighed  $< 4000$  g. <sup>c</sup> Results are statistically significant.  
 Esakoff. Birthweight 4000 g or greater and perinatal outcomes in GDM. *Am J Obstet Gynecol* 2009.



Neonatal outcomes of macrosomic births in diabetic and non-diabetic women

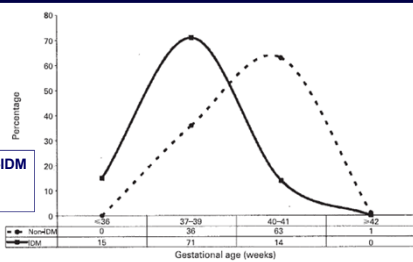
S Das, M Ingoyen, M B Patterson, A Salvador and D L Schutzman  
*Arch. Dis. Child. Fetal Neonatal Ed.* 2009;94:F419-F422; originally published online 15 Jun 2009.

Table 2 Outcomes in all macrosomic infants

Characteristic	Non-IDM (n = 262), n (%)	IDM (n = 41), n (%)	Total (n = 303), n (%)	p Value
Hypoglycaemia	75 (28.6)	23 (56.1)	98 (32.3)	<0.001
Respiratory distress	24 (9.2)	12 (29.2)	36 (11.9)	0.001
Birth injury	21 (8.0)	1 (2.4)	22 (7.3)	0.13
Brachial plexus injury	4 (1.5)	0 (0)	4 (1.3)	0.55
Fracture (clavicle or humerus)	17 (6.5)	1 (2.4)	18 (6.0)	0.20
At least one of the above	130 (49.6)	30 (73.2)	160 (52.8)	0.002
Hospital stay >3 days	35 (13.4)	8 (22.9)	43 (14.2)	0.06
Cephalhaematoma	14 (5.3)	1 (2.4)	15 (5.0)	0.26

IDM, infants of diabetic mothers; non-IDM, infants of non-diabetic mothers.

Figure 1 Gestational age distribution in the IDM and non-IDM groups. IDM, infants of diabetic mothers; non-IDM, infants of non-diabetic mothers.



IDM / non-IDM  
 C/S (%) 66 / 30  
 Mean GA (wks) 38 / 40

*Arch Dis Child Fetal Neonatal Ed* 2009;94:F419-F422.

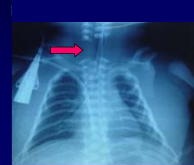
Birth injuries



Brachial plexus paralysis



Clavicular fracture



Cervical dislocation



Facial paralysis



Humerus fracture



Cephalhematoma

## Some injuries and malformations **may not be apparent at birth!**

- Adrenal / Intracranial hemorrhages
- Congenital torticollis
- Congenital heart defects
- Small left colon
- Hydronephrosis

## Brachial plexus injury



Most common scenario:

- Macrosomic baby
- Delivery complicated by shoulder dystocia

## Brachial plexus palsies



- **Upper plexus (Erb's):**
  - most common (73%-86%)
- **Total plexus:**
  - most devastating (20%)
- **Lower plexus (Klumpke's):**
  - least common (0.6%)
- Trauma to other nerves can accompany:
  - Hemidiaphragmatic paralysis, Horner's syndrome



## BPP: Assessment

- **Evidence of other injuries:**
  - Extremity fractures
  - Horner's syndrome
  - Phrenic nerve palsy
  - Facial palsy
  - Cervical spine injury
- **Diagnostic testing:**
  - X-ray: cervical spine, shoulder, clavicle, elbow, hand
  - MRI
  - CT myelography
  - EMG

## BPP: Prognosis

- The majority of the injuries are *transient*
- Resolution depends on the *anatomical injury and its severity*
- *Total / Lower plexus* injuries are more severe with a poorer prognosis
- Therapy is initially *conservative*

## Asymmetric facies: Is it facial palsy?



## Respiratory problems:

“...for some of us are out of breath  
And all of us are fat” Lewis Carroll

- Respiratory distress syndrome
- Transient tachypnea of the newborn
- Persistent pulmonary hypertension



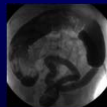
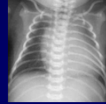
## Elective C/S: Risk of severe respiratory failure

- Suspected macrosomia
  - Increased elective C/S rate
- HOWEVER
- Macrosomia prediction poor !
  - Increased risk of respiratory morbidity:
    - Decreased gestational age
    - Birth without labour



## Look for congenital anomalies

- **Central nervous system:**
  - Neural tube defects
- **Cardiovascular system:**
  - Structural: TGA, VSD, ASD, LS obstructive lesions
  - Functional: Septal hypertrophy, cardiomyopathy
- **Skeletal:**
  - Caudal regression syndrome
  - Spinal anomalies, syringomyelia
- **Intestinal:**
  - Atresias, small left colon
- **Renal:**
  - Hydronephrosis, renal agenesis, cystic kidneys



## R/O congenital hyperinsulinemic syndromes



Beckwith-Wiedemann S.

## Hypoglycemia

- The nadir occurs between 1-3 hrs of life, persists up to 72 hrs, may last up to 1 wk
- Hyperinsulinemic – Hypoketonemic:
  - May require high glucose perfusion rates, additional therapy (glucagon, steroids...)
  - Higher therapeutic goal for serum glucose (60 mg/dL)

## Screening for hypoglycemia

- Check blood glucose within 2-3 hrs (earlier in IDM)
- Repeat before feeds OR any time if Sx (+)
- Early and frequent feedings
- Start i.v glucose perfusion if symptomatic OR asymptomatic but unresponsive to enteral feeds
- Continue monitoring preprandial blood glucose until:
  - Blood glucose normal and stable
  - Tolerating oral feeds
  - Successful breastfeeding established



## Management plan

- Glucose                      Within 2-3 hrs after birth, before feeds, any time if Sx (+)
- Hct/ CBC                    At 4-6 hrs
- Bilirubin                    Based on clinical jaundice
- Radiologic studies        Evidence of respiratory / skeletal problems / birth injuries
- In IDM
  - Calcium                    First 24, repeat if Sx (+)
  - Magnesium                 Check if calcium low
  - Urine analysis             At 24 hrs
  - ECHO                        Hypertrophic cardiomyopathy / cardiac malformation suspected
- Assign to one of 3 levels of care & continue monitoring for possible clinical problems

Modified from Pediatr Clin N Am 2004;51:619-37

## Indications for admission to a special or intensive care unit:

- Infant of diabetic mother
- Infant of non-diabetic mother:
  - Requiring resuscitation / Asphyxia
  - Developing respiratory distress
  - Hypoglycemia resistant to enteral feeds
  - Polycythemia
  - Severe birth injury

## Research agenda

- Accurate prediction of macrosomia
- Optimal timing and mode of delivery
- Prevention of neonatal morbidities
- Perinatal outcomes and management of macrosomic infants of non-diabetic mothers



**“Would he were thinner !”**