L' ENFANT MACROSOME
PRISE EN CHARGE PÉDIATRIQUE

Pratiques reposant sur les faits scientifiques prouvés

44e journées de la SFMP
Lyon 2014



24/10/2014
Didier.pinquier@chu-rouen.fr

AUDIPOG
" Estimation du poids fœtal ou néonatal et pratiques"

Incidence of and risk factors for nodding off at scientific sessions

Kenneth Rockwood, David B. Hogan, Christopher J. Patterson; for the Nodding at Presentations (NAP) Investigators

CMAJ • DEC. 7, 2004; 171 (12)

Table 1: Risk factors for nodding off at lectures

Factor	Odds ratio (and 95% CI)
Environmental	
Dim lighting	1.6 (0.8–2.5)
Warm room temperature	1.4 (0.9–1.6)
Comfortable seating	1.0 (0.7–1.3)
Audiovisual	
Poor slides	1.8 (1.3–2.0)
Failure to speak into microphone	1.7 (1.3–2.1)
Circadian	
Early morning	1.3 (0.9–1.8)
Post prandial	1.7 (0.9–2.3)
Speaker-related	
Monotonous tone	6.8 (5.4–8.0)
Tweed jacket	2.1 (1.7–3.0)
Losing place in lecture	2.0 (1.5–2.6)

Note: CI = confidence interval.

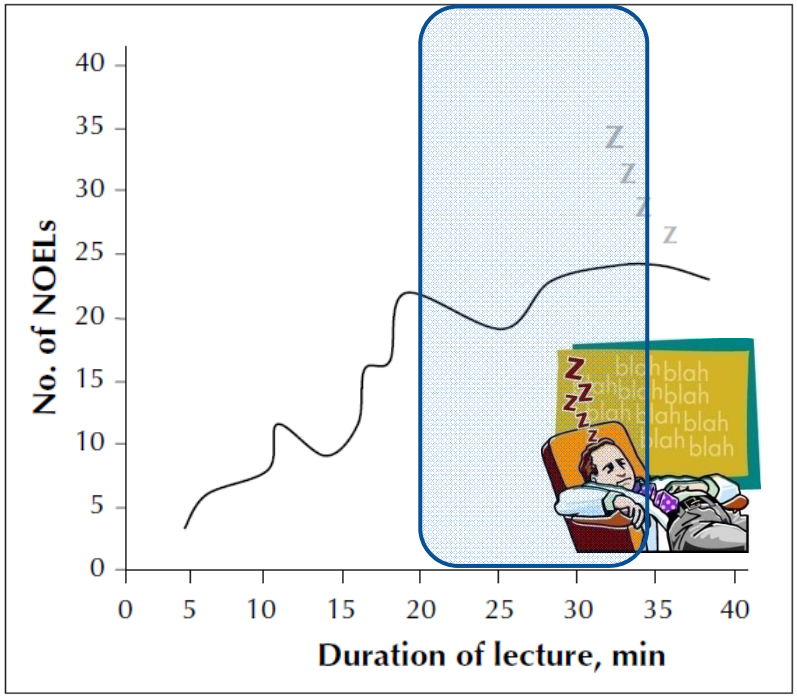


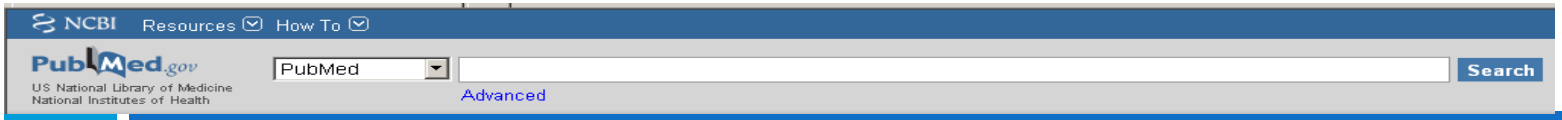
Fig. 1: Special incidence density curve, showing number of nodding-off events per lecture (NOELs) per 100 attendees over length of time of presentation.

Définition

- **La macrosomie est habituellement définie par un poids de naissance supérieur à 4 000 g**
- **La macrosomie peut mais doit également se définir par rapport à la répartition des poids de naissance :**
  - **90e , 95e , 97e percentiles de courbes de référence selon l'âge gestationnel**
    - **Leroy Lefort, Fessard ….**
  - **Intégrée selon le sexe, l'ethnie, parité, mensuration maternelle….**
    - **Audipog**
- **Fréquence**
  - **Courbe de croissance**
  - **10% si définition > 90e percentile**
  - **2,5 % si poids > 4,5 kg**

macrosomie : poids ≥ 90ème percentile (courbes Audipog)							
Terme (SA)	35	36	37	38	39	40	41
Poids (g)	♀ ≥ 3000 ♂ ≥ 3000	♀ ≥ 3220 ♂ ≥ 3250	♀ ≥ 3400 ♂ ≥ 3500	♀ ≥ 3600 ♂ ≥ 3720	♀ ≥ 3780 ♂ ≥ 3920	♀ ≥ 3850 ♂ ≥ 4080	♀ ≥ 3980 ♂ ≥ 4180

Définition



- MEDLINE
  - fetal macrosomia
  - large for gestational age
  - Poids > 4, 4,5, 5 kg
  - Poids > 90^{e} percentile
  - Body index en g/cm^{3}*
  - z-score
- *risk, prevention, prediction, management, labour induction, pregnancy outcome, pregnancy complication, delivery and caesarean.*
- Prévalence
  - Quelles courbes de croissance
  - Quelle définition

Macrosome
La vision obstétricale?

RESEARCH

2008
www.AJOG.org

OBSTETRICS

How big is too big? The perinatal consequences of fetal macrosomia

Xun Zhang, PhD, Adriana Decker, MD, Robert W. Platt, PhD, Michael S. Kramer, MD

- 4 kg
- 4,5 kg
- 5 kg

OPEN ACCESS Freely available online

PLOS | ONE

Searching for the Definition of Macrosomia through an Outcome-Based Approach

2014

Conclusions: A birthweight greater than 4500 g in Whites, or 4300 g in Blacks and Hispanics regardless of gestational age is the optimal threshold to define macrosomia. A birthweight greater than the 97th percentile for a given gestational age, irrespective of race is also reasonable to define macrosomia. The former may be more clinically useful and simpler to apply.

- **cut-offs**
  - **4500 g (ACOG)**
  - **> 97^{e} percentile**
    - **Comparaison : MFIU, Apgar < 4, Mortalité néonatale, césarienne**

Optimal birth weight percentile cut-offs in defining small- or large-for-gestational-age

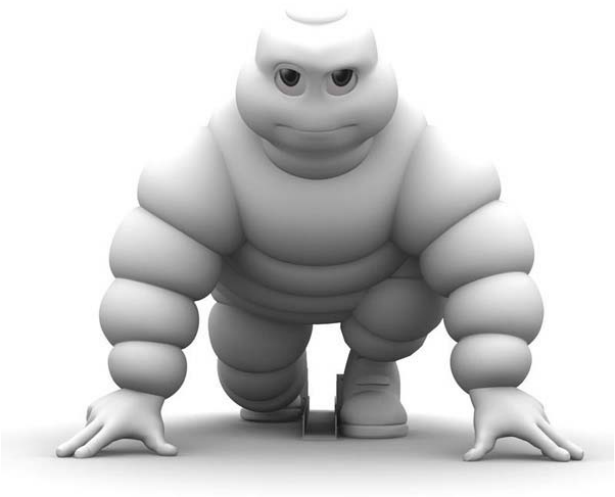
Acta Pædiatrica/*Acta Pædiatrica* 2010 **99**, pp. 550–555

Conclusion: The commonly used 10th and 90th birth weight percentile cut-offs for defining SGA and LGA respectively seem largely arbitrary. The 15th and 97th percentiles may be the optimal cut-offs to define SGA and LGA respectively.

Macrosomie

Versant pédiatrique :
Période néonatale /suivi

- **Quelle est la cause?**
  - Peu d'influence sur la prise en charge obstétricale
  - Diabète maternel +++ : complication de l'hyperinsulinisme ?
- **Quelles complications?**
- **Qui surveiller ?**
  - Quelle surveillance?
  - Qui transférer?
- **Évolution à long terme**



Macrosomie

Cause

- Diabète++
  - Pré-existant, gestationnel
- Constitutionnelle
  - Courbe intégrée : parité, âge, taille, poids…..
- Syndromique exceptionnel
  - Génétique
    - ***Syndrome de Wiedemann-Beckwith (WBS)***
    - ***Syndrome de Sotos ou gigantisme cérébral***
    - ***Syndrome de Weaver***
    - ***Syndrome de Marschall-Smith***
    - ***Syndrome de Banayan***

2007 OBSTETRICS, GYNAECOLOGY AND REPRODUCTIVE MEDICINE 17:2

OBSTETRICS

How big is too big? The perinatal consequences of fetal macrosomia

> 4,5 ?

TABLE 1

Sociodemographic and clinical characteristics by birthweight (g)

	2500-3499	3500-4499	4500-4999	5000 or greater
Gestational age in completed weeks (mean ± SD)	39.2 ± 1.5	39.7 ± 1.4	39.9 ± 1.4	39.9 ± 1.4
Infant sex (% male)	45.6	56.8	68.4	70.7
Multiparous (%)	55.3	61.8	68.6	71.2
Mother's age 35 years or older (%)	13.9	16.1	19.8	22.7
Mother's education 13 years or more (%)	53.8	61.6	63.0	61.6
Marital status (% legally married)	75.3	81.9	85.4	84.9
Smoking (%)	19.5	9.9	5.9	5.7
Maternal diabetes (%)	2.4	2.8	5.4	11.5

All *P* values < .001.

Zhang. How big is too big? The perinatal consequences of fetal macrosomia. Am J Obstet Gynecol 2008.

20

Tumour surveillance in Beckwith–Wiedemann syndrome and hemihyperplasia: A critical review of the evidence and suggested guidelines for local practice

Journal of Paediatrics and Child Health **42** (2006) 486–490

Tumour surveillance	Frequency	Until age
Abdominal ultrasound	3 monthly	8 years
Serum alpha-fetoprotein	3 monthly	4 years
Complete physical examination including abdominal palpation by physician	6 monthly†	Indefinite

EPIGENOTYPING AS A TOOL FOR THE PREDICTION OF TUMOR RISK AND TUMOR TYPE IN PATIENTS WITH BECKWITH-WIEDEMANN SYNDROME (BWS)

The Journal of Pediatrics 2004

	Group I (UPD)	Group II (IC1)	Group III (IC2)	Group IV
Methylation pattern	KCNQ1OT1↓ H19↑	H19↑	KCNQ1OT1↓	Normal
Total: tumor frequency in sample 16% (63/287)				
Percentage within group (%)	20/56 (36)	15/29 (52)	8/124 (6)	17/78 (22)
P value*	.010	.0003	<.0001	.848
Wilms' tumor/total number of tumors	10/18	11/11	0/7	9/13
P value†	.624	.0010	.0003	.547

Macrosome
La vision obstétricale?

> 4,5 ?

RESEARCH

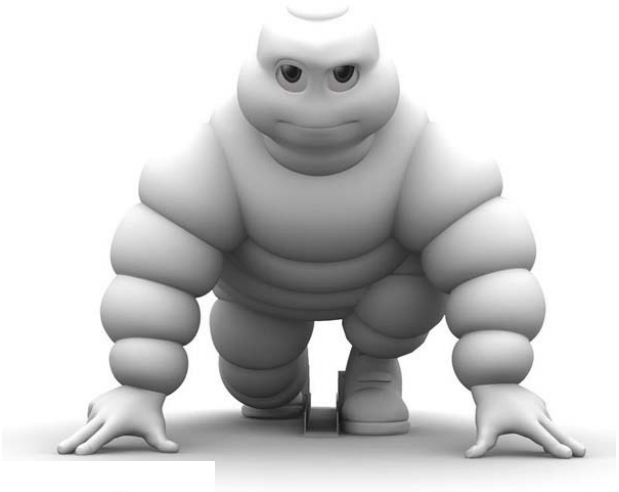
2008
www.AJOG.org

OBSTETRICS

How big is too big? The perinatal consequences of fetal macrosomia

Xun Zhang, PhD, Adriana Decker, MD, Robert W. Platt, PhD, Michael S. Kramer, MD

517.e1



CONCLUSION: Birthweight greater than 4500 g, and especially greater than 5000 g, is associated with increased risks of perinatal and infant mortality and morbidity.

Key words: birth asphyxia, birth injury, macrosomia, stillbirth, sudden infant death syndrome

Macrosomie

Les causes de décès

> 4,5 ?

TABLE 3

Major causes of infant deaths by birthweight

Birthweight (g)	Asphyxia	Congenital anomalies	Infection	Postneonatal SIDS
2500-3499				
n (%)	353 (0.01)	1422 (0.05)	142 (0.00)	2230 (0.07)
OR (95% CI)	1.1 (0.9 to 1.3)	2.8 (2.5 to 3.2)	1.5 (1.1 to 2.1)	1.4 (1.3 to 1.6)
3500-4499				
n (%)	295 (0.01)	448 (0.02)	70 (0.00)	1100 (0.04)
OR (95% CI)	1.0	1.0	1.0	1.0
4500-4999				
n (%)	26 (0.02)	12 (0.01)	4 (0.00)	32 (0.03)
OR (95% CI)	2.3 (1.5 to 3.5)	0.6 (0.3 to 1.2)	1.8 (0.7 to 5.0)	0.9 (0.6 to 1.3)
5000 or greater				
n (%)	12 (0.11)	4 (0.04)	2 (0.02)	8 (0.07)
OR (95% CI)	10.5 (5.7 to 19.2)	2.3 (0.9 to 6.3)	8.9 (2.2 to 36.6)	2.3 (1.1 to 4.6)

ORs estimated from multiple logistic regression models adjusted for gestational age, sex, parity, maternal age, maternal education, maternal marital status, maternal diabetes, and smoking.

Zhang. How big is too big? The perinatal consequences of fetal macrosomia. Am J Obstet Gynecol 2008.

Macrosomie et Adaptation

: Apgar, DR, Cn, traumatisme obstétrical…

> 4,5 ?

TABLE 4
Neonatal morbidity by birthweight

Birthweight (g)	5-minute Apgar score less than 4	Neonatal seizures	Ventilation less than 30 min	Ventilation 30 minutes or more	Birth injury	Meconium aspiration syndrome
2500-3499						
%	0.12	0.06	2.01	0.41	0.24	0.15
OR (95% CI)	1.3 (1.2 to 1.3)	1.1 (1.0 to 1.2)	0.9 (0.9 to 0.9)	1.2 (1.1 to 1.2)	0.6 (0.5 to 0.6)	0.9 (0.8 to 0.9)
3500-4499						
%	0.09	0.05	2.13	0.34	0.40	0.18
OR (95% CI)	1.0	1.0	1.0	1.0	1.0	1.0
4500-4999						
%	0.17	0.08	2.87	0.57	0.91	0.26
OR (95% CI)	1.8 (1.5 to 2.1)	1.6 (1.3 to 2.0)	1.4 (1.3 to 1.4)	1.7 (1.5 to 1.8)	2.4 (2.2 to 2.5)	1.5 (1.3 to 1.7)
5000 or greater						
%	0.60	0.17	4.20	1.31	1.38	0.37
OR (95% CI)	6.4 (4.9 to 8.4)	3.3 (2.1 to 5.3)	2.0 (1.8 to 2.2)	3.7 (3.1 to 4.5)	3.5 (3.0 to 4.2)	2.1 (1.5 to 2.9)

22%

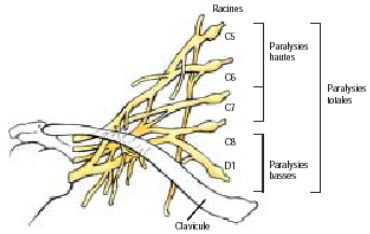
36%

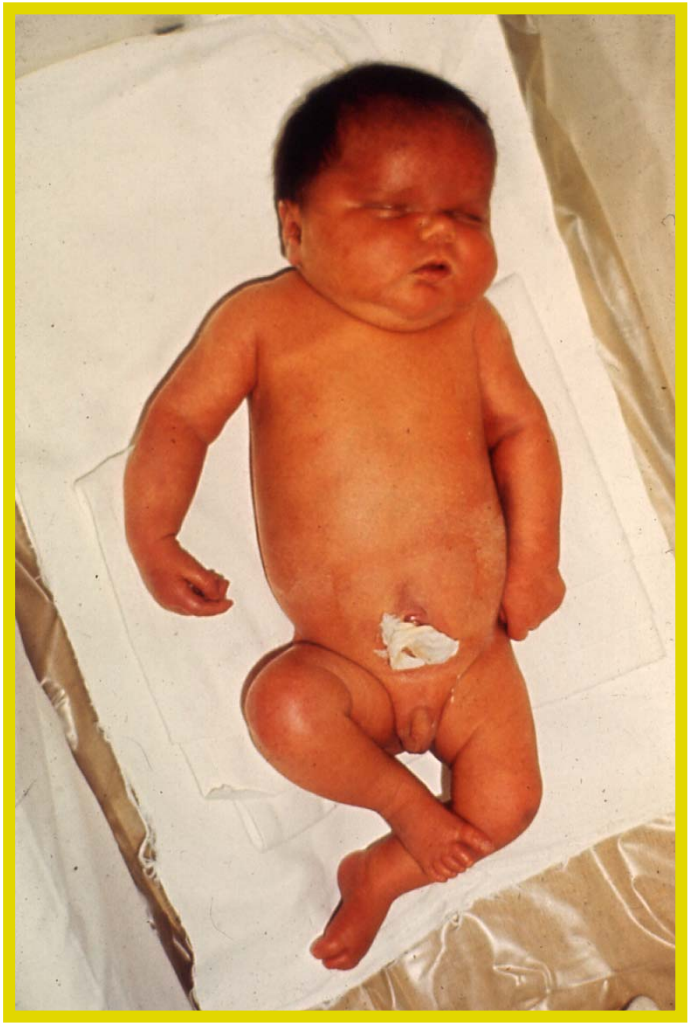
51%

ORs estimated from multiple logistic regression models adjusted for gestational age, sex, parity, maternal age, maternal education, maternal marital status, maternal diabetes, and smoking.

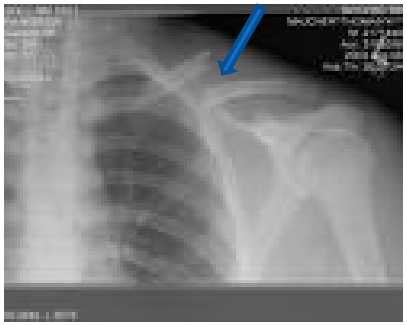
Zhang. How big is too big? The perinatal consequences of fetal macrosomia. Am J Obstet Gynecol 2008.

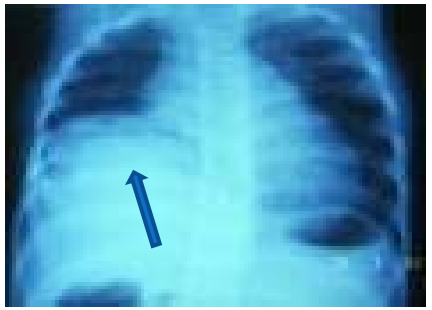
Macrosomie
et Paralysie du Plexus brachial





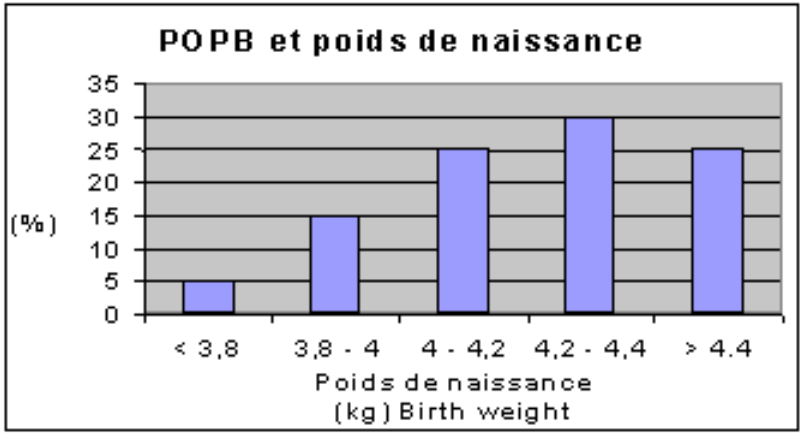
> 4,5 kg





2%

6 % vs 1.5‰



Macrosomie et Plexus Brachial

- Information des parents +++
- Description initiale +++
  - Bilan initial
    - Mobilité des doigts, extension, opposition du pouce
    - ROT (Bicipital C5-6)
  - Recherche de lésions associées
    - Fracture de clavicule
      - Autres fractures
    - Paralysie diaphragmatique
    - Claude Bernard horner
- Surveillance quotidienne
  - Signes de récupération
  - Testing musculaire
- Nursing, Kiné, orthopédie

Macrosomie
et troubles métaboliques

- Surtout macrosome pour l'âge gestationnel
  - **> 90e percentile**
  - **En cas de diabète maternel préexistant ou gestationnel**
- Moins fréquent
  - **chez le nouveau-né de mère diabétique à terme eutrophe**
  - **En cas de diabète gestationnel traité par régime seul**
- Hypoglycémie
  - Apport / poids
  - Capacité d'ingestion /oralité
- Hypocalcémie

Neonatal outcome of macrosomic infants: an analysis of a two-year period

Zita Gyurkovits [a,*], Karola Kálló [b], Judit Bakki [a], Márta Katona [c], Tamás Bitó [a], Attila Pál [a], Hajnalka Orvos [a]

Outcome measures of the macrosomic neonates of diabetic and non-diabetic mothers.

	Diabetic $n=43$	Non-diabetic $n=367$	p
Caesarean section	23 (53%)	179 (49%)	0.56
Males	24 (56%)	256 (70%)	0.06
Umbilical cord pH < 7.2	2 (4.7%)	68 (19%)	0.02*
Apgar score < 7 at 5 min	0 (0%)	4 (1.1%)	0.49
Congenital anomalies	4 (9.3%)	14 (3.8%)	0.10
Hypoglycaemia	11 (26%)	14 (3.8%)	<0.001*
Polycythaemia	4 (9.3%)	15 (4.1%)	0.06
Hyperbilirubinaemia	13 (30%)	63 (17%)	0.04*
Clavicle fracture	0 (0%)	7 (1.9%)	0.36
Cephalhaematoma	3 (7%)	12 (3.3%)	0.22
Adrenal haemorrhage	1 (2.3%)	3 (0.8%)	0.34
Respiratory disorder	4 (9.3%)	17 (4.6%)	0.19
NICU admission	4 (9.3%)	17 (4.6%)	0.19
Mechanical ventilation	1 (2.3%)	1 (0.3%)	0.07
Cardiomyopathy	2 (4.7%)	1 (0.3%)	0.01*
Neurological disorder	1 (2.3%)	8 (2.2%)	0.96

* Significance at $p < 0.05$.

Contents lists available at SciVerse ScienceDirect

European Journal of Obstetrics & Gynecology and Reproductive Biology

Nouveau-né de mère diabétique :
Hyperinsulinisme / Morphologie

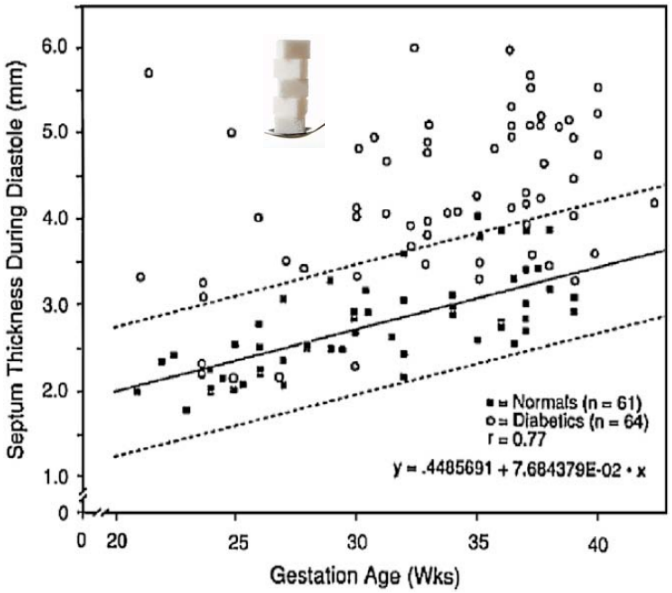
- Macrosomie
  - accroissement du panicule adipeux
  - Répartition facio-tronculaire
  - Pilosité, oreilles
  - Césarienne

- Retard de résorption du liquide pulmonaire
- Hypertrohie myocardique : 15-30%
  - SIV > +2DS

- Cytostéatonécrose (rare)
  - Lipolyse, inflammation sous cutanée, hypercalcémie tardive

Complications cardio-pulmonaires

Corrélation SIV/ AG



- HSV 75%
- Linéaire
- 12 vs 8%
  - P<0.05
- Symptomatique : 12%

- DRT
  - Césarienne
  - Hyperinsulinisme
- Polyglobulie
  - HTAP

Tachypnée T

Obstet Gynecol. 1992. 79(1):51-4.

Images Paediatr Cardiol. 2000.;2(2): 17–23.

Nouveau-né de mère diabétique Métabolisme

- **Hypoglycémie : <2.2 mmoles /l**
  - 30-50%
  - **Signes cliniques d'hypoglycémie**
    - asymptomatique
    - Trémulation , Hyperexcitabilité
    - Accès de cyanose (apnées, sueurs, convulsions…)
    - hypotonie , Cn
  - **Dextro *et confirmer l,hypo par glycémie sg***
- **Hypoparathyroidisme transitoire**
  - **Hypocalcemie : 30% (Mg)**
  - **Un-alpha**
- **Polyglobulie (30%)**
  - HTAP, Ictère, Thrombose

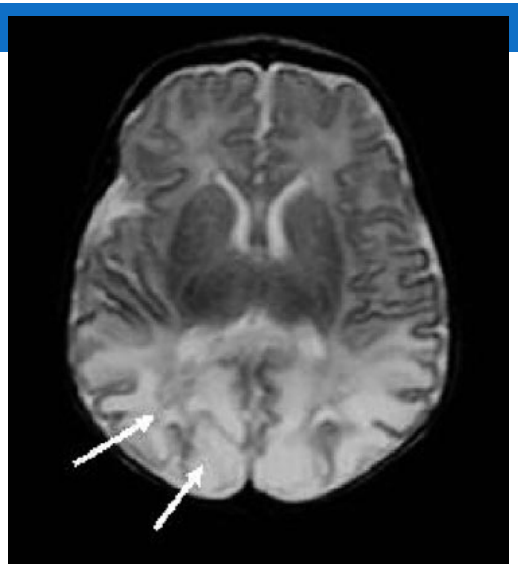
Pediatr Clin N Am. 2004

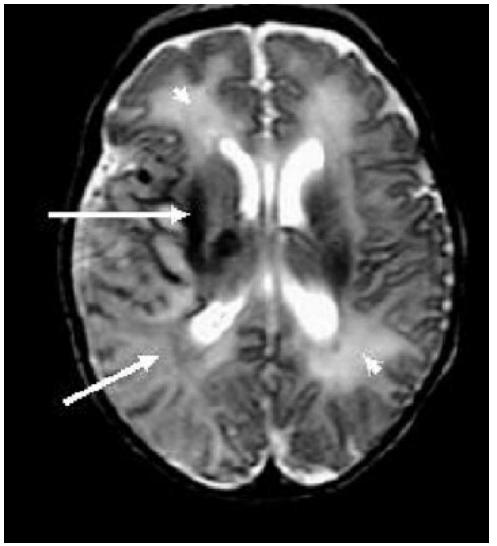
PEDIATRICS
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Burns. 2008. p 65

Hypoglycémie
Tableau clinique variable : grande simulatrice
Parfois gravissime même après 1 seul épisode

- **Hypoglycémies symptomatiques**
  - **< 1,5 mmol/l**
  - **2/3 transitoires**
  - **80% H0-H48 (57% 0 J1)**
- **Convulsion (83%)**
- **IRM avant J10**
- **Lésions de la substance blanche**
  - 94%
    - Severe 43%
    - Posterieure 29%
    - Hémorragie 30%
    - Noyaux gris 51%





Macrosome en maternité

Alimentation précoce ou tétée précoce < 30'

- Dextro 1h après
  - Dextro avant le départ de la salle de naissance
  - Dextro > 2, 2 mmoles/l
- Alimentation/3h
- Lait Pré/ liquigen

- Vitamine D précoce : double dose
  - Calcémie à J3
- Surveillance clinique, T° , dextro /48h
  - Arret si 4 dextros consécutifs normaux
    - **En l'absence de difficultés alimentaires et de troubles du comportement**
- Surveillance ictère : polyglobulie : Biliflash

Outcome

Seminars in Fetal & Neonatal Medicine 14 (2009) 119–124
Curr Diab Rep (2014) 14:489

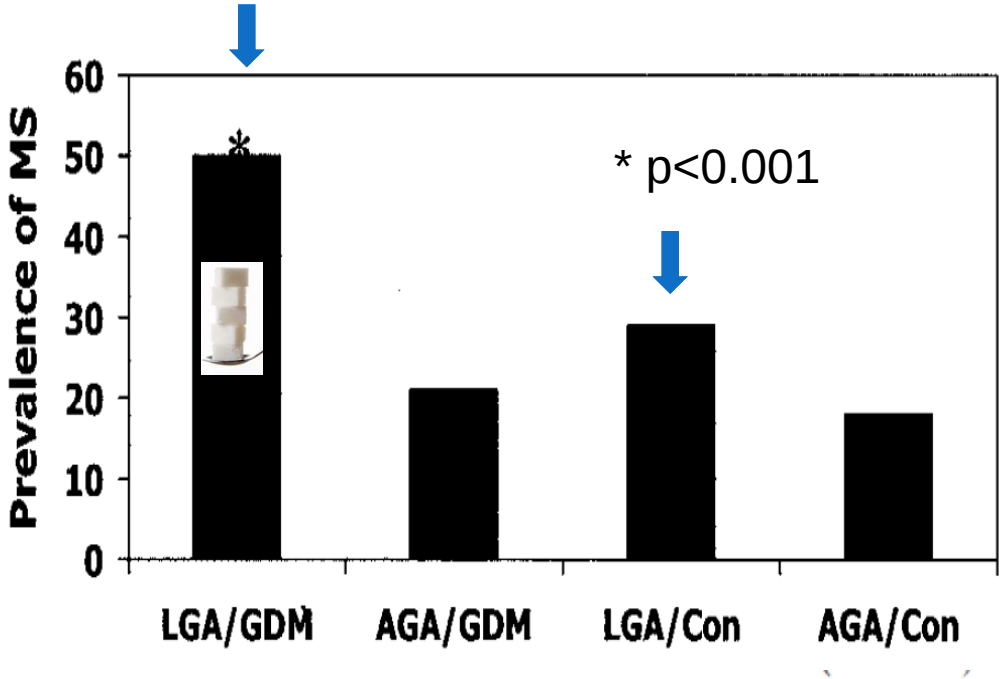
Offspring of diabetic pregnancy: Long-term outcomes

- **Diabète**
- **Obésité**
- **Syndrome métabolique : HTA…**
- **Troubles attentionnels, motricité fine…**

Le risque d'obésité et de diabète non insulino-dépendant est augmenté chez ces enfants. Une surveillance régulière des enfants et une éducation nutritionnelle de la mère et de l'enfant sont donc nécessaires. L'efficacité de ces mesures sur la prévention du diabète non insulino-dépendant doit faire l'objet d'études cliniques tout comme l'évaluation des difficultés neuro-cognitives.

Outcome : Sd metabolique
Follow up : 11 ans

Pediatrics 2005;115;e290



Variables	Hazard Ratio	*P* Value	95% CI for Hazard Ratio
LGA versus AGA	2.19	.006	1.25–3.82
Maternal obesity* versus nonobese	1.81	.039	1.03–3.19
GDM versus control	1.44	.191	0.83–2.50
Male versus female	1.52	.133	0.88–2.61

- BMI > 85e p
- HTA> 90e p
- TG/HDL
- Equilibre gly

- Facteur aggravant
  - Obésité maternelle

Take home messages

Surveillance des enfants de plus de 4 kg

- Macrosome
  - Colosse aux pieds d'argile
- Out come
  - Mortalité périnatale
  - Morbidité obstétricale : traumatisme obstétricale, asphyxie périnatale
  - Infection, détresse respiratoire, transfert, durée d'hospitalisation
  - Trouble métabolique
- Nouveau-nés de mère diabétique
  - Homéostasie glucidique
  - Malformation
  - Ictère, Hypertrophie myocardique

- Quelques rares syndromes
- Suivi à long terme : Sd métabolique, difficultés cognitives

Indications de transfert

- Pas d'hospitalisation systématique
  - Ni en cas de PPB ou de fracture de la clavicule
- La macrosomie chez un enfant de mère diabétique signe le plus souvent un mauvais équilibre maternel et justifie une surveillance attentive de l'alimentation et de l'équilibre glycémique
- Les difficultés d'adaptation à la vie extra utérine en cas d'asphyxie périnatales majorent le risque d'hypoglycémie
- Hypoglycémies rebelles
  - ➔transfert en UK/neonatalogie
    - En cas d'hyperinsulinisme: Diazoxide PROGLYCEM 5-20 mg/kg/j

(débuter à 10 mg/kg) ou Glucagon (GLUCAGEN en IVC 1mg/j)

24/10/2014

SFMP Lyon 2014

AUDIPOG

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Back up

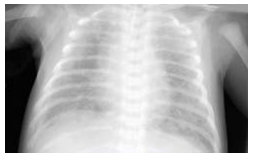
la dystocie des épaules

Risk of shoulder dystocia (adapted from Rouse, 1996)

Birth weight (g)	Maternal diabetes: incidence of shoulder dystocia (95% CI)		No maternal diabetes: incidence of shoulder dystocia (95% CI)
<4000	2.2% (0.6–3.7%)	>	0.7% (0.3–1.0%)
4000–4499	13.9% (4.7–23%)		6.7(3.4–9.0%)
>4500	52.5% (37.5–83.3%)		14.5(9.8–22.0%)

Outcome	Adjusted odds ratio, 95% CI birthweight 4000–4499 g	Adjusted odds ratio, 95% CI birthweight 4500–4999 g	Adjusted odds ratio, 95% CI birthweight ≥5000 g
Cesarean birth	1.69 (1.62–1.76)	2.99 (2.76–3.24)	5.46 (4.40–6.78)
Shoulder dystocia	6.29 (5.83–6.77)	13.05 (11.70–14.56)	17.52 (13.54–22.68)

Cesarean birth	%	13.9	21.1*	32.6*	49.2*
Shoulder dystocia	%	1.5	8.8*	17.4*	23.3*
		Birthweight 2500–3999 g (%)	Birthweight 4000–4499 g (%)	Birthweight 4500–4999 g (%)	Birthweight ≥5000 g (%)



Stotland N. 2004. p 220-26.

Importance du contrôle du diabète maternel pendant la grossesse

Comparison of complications for babies delivered after strict peri-conceptional glycaemic control and normal glycaemic control in women with pre-gestational diabetes mellitus (adapted from Merlob and HOD[52]).

Complication	Prevalence when strict pre-conceptional glycaemic control (%)[52]	Prevalence in other studies of infants of mothers with pre-gestational diabetes
Macrosomia	13.7%	21% [1,54]
Hypoglycaemia	26.3%	27–47% [12,55,56]
Hypocalcaemia	7.5%	4–50% [5,12,57,58]
Polycythaemia	7.5%	5–29% [12,59,60]
Hyperbilirubinaemia	19.4%	20–25% [12,52]
Respiratory distress syndrome	3.7%	17–92% [25]
Ventricular septal hypertrophy	7.5% overall (8.3% in macrosomic infants, 1.8% in normally grown infants)	75% [38]

- **Surveillance glycémique +++**

Seminars in Fetal & Neonatal Medicine 14 (2009) 111–118

Outcome Macrosome ?

- **Nouveau-nés de mères diabétiques**
  - Trouble de l'attention
  - Trouble de la motricité fine
  - QI similaires si diabète maternel équilibré
    - Pediatr endocrinol rev 2005 p 104 Ornoy A 2
  - Nouveau-nés de mère diabétique
    - Co-morbidité frequente
      - Curr Diab Rep 2014. p 489. Fraser A
      - Diabet. Med. 2011. p838–844. Clausen TD
- **Des études sont nécessaires**

Long-Term Health Outcomes in Offspring Born to Women with Diabetes in Pregnancy Curr Diab Rep (2014) 14:489

Neonatal outcome of macrosomic infants: an analysis of a two-year period

Zita Gyurkovits [a,*], Karola Kálló [b], Judit Bakki [a], Márta Katona [c], Tamás Bitó [a], Attila Pál [a], Hajnalka Orvos [a]

Outcome measures of control group and macrosomic neonates.

	Control	Macrosomic	p
Total	4757	410	
Caesarean section	1898 (39.9%)	202 (49.3%)	<0.001*
Males	2322 (48.8%)	280 (68.3%)	<0.001*
Umbilical cord pH < 7.2	705 (14.8%)	70 (17.0%)	0.22
Apgar score < 7 at 5 min	87 (1.8%)	4 (0.9%)	0.22
Congenital anomalies	185 (3.8%)	18 (4.3%)	0.68
Hypoglycaemia	138 (2.9%)	25 (6.1%)	<0.001*
Polycythaemia	161 (3.4%)	19 (4.6%)	0.19
Hyperbilirubinaemia	1446 (30.4%)	76 (18.5%)	<0.001*
Clavicle fracture	43 (0.9%)	7 (1.7%)	0.11
Cephalhaematoma	135 (2.8%)	15 (3.6%)	0.34
Adrenal haemorrhage	7 (0.15%)	4 (0.98%)	<0.001*
Respiratory disorder	305 (6.4%)	21 (5.1%)	0.26
NICU admission	210 (4.4%)	21 (5.1%)	0.58

* Significance at $p < 0.05$.

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