

SURVIE ET QUALITÉ DE VIE DES ENFANTS PORTEURS DE MALFORMATIONS CONGÉNITALES MAJEURES

Fabrice MICHEL

Anesthésie Réanimation Pédiatrique

Marseille – CHU Timone 2

Aix-Marseille-Université

Assistance Publique Hôpitaux de Marseille

ADES | UMR 7268

Aix*Marseille université

MALFORMATION CONGÉNITALE MAJEURE?

ECOSIA

Lancez une recherche pour planter des arbres...

53 290 120

Nombre d'arbres déjà plantés par les utilisateurs d'Ecosia



MALFORMATION CONGÉNITALE MAJEURE?

Santé publique France

MALFORMATION CONGÉNITALE MAJEURE

Anencéphalie	Spina bifida	Coarctation de l'aorte
Transposition des gros vaisseaux	Tétralogie de Fallot	Hypoplasie du ventricule gauche
Fentes labiales et labio-palatines	Fente palatine seule	Atrésie de l'œsophage
Atrésie anorectale	Agénésie rénale bilatérale	Réduction de membre
Hernie diaphragmatique	Omphalocèle	Laparoschisis
Hypospadias	Trisomie 21	Trisomie 18
Trisomie 13	Syndrome de Turner	Syndrome de klinefelter

LIMITES

- ✓ Définitions de la QDV
  - Composantes physique / Sociale / Psychologique
- ✓ Cognition / Développement psychomoteur
- ✓ Outils de mesure
- ✓ Evolution
  - Avec l'âge
  - Avec le temps: labilité selon les traitements
  - Augmentation de la survie…

PREVALENCE

Anomalies	Nouveau-nés vivants + mort-nés + IMG		Nouveau-nés vivants (NV)	
	Fréquence[1]	Nombre	Fréquence[1]	Nombre
TGV	1 / 2 100 N	389	1 / 2 610 NV	310
Tétralogie de Fallot	1 / 2 190 N	373	1 / 2 970 NV	273
Hypoplasie du VG	1 / 2 850 N	287	1 / 10 040 NV	81
Coarctation de l'aorte	1 / 2 730 N	299	1 / 2 970 NV	273
Atrésie de l'œsophage	1 / 2 810 N	291	1 / 3 470 NV	233
Atrésie anorectale	1 / 2 700 N	303	1 / 4 280 NV	189
Hernie diaphragmatique	1 / 2 730 N	299	1 / 4 450 NV	182
Laparoschisis	1 / 5 080 N	161	1 / 6 090 NV	133
Omphalocèle	1 / 2 150 N	380	1 / 6 240 NV	130

HERNIE DIAPHRAGMATIQUE

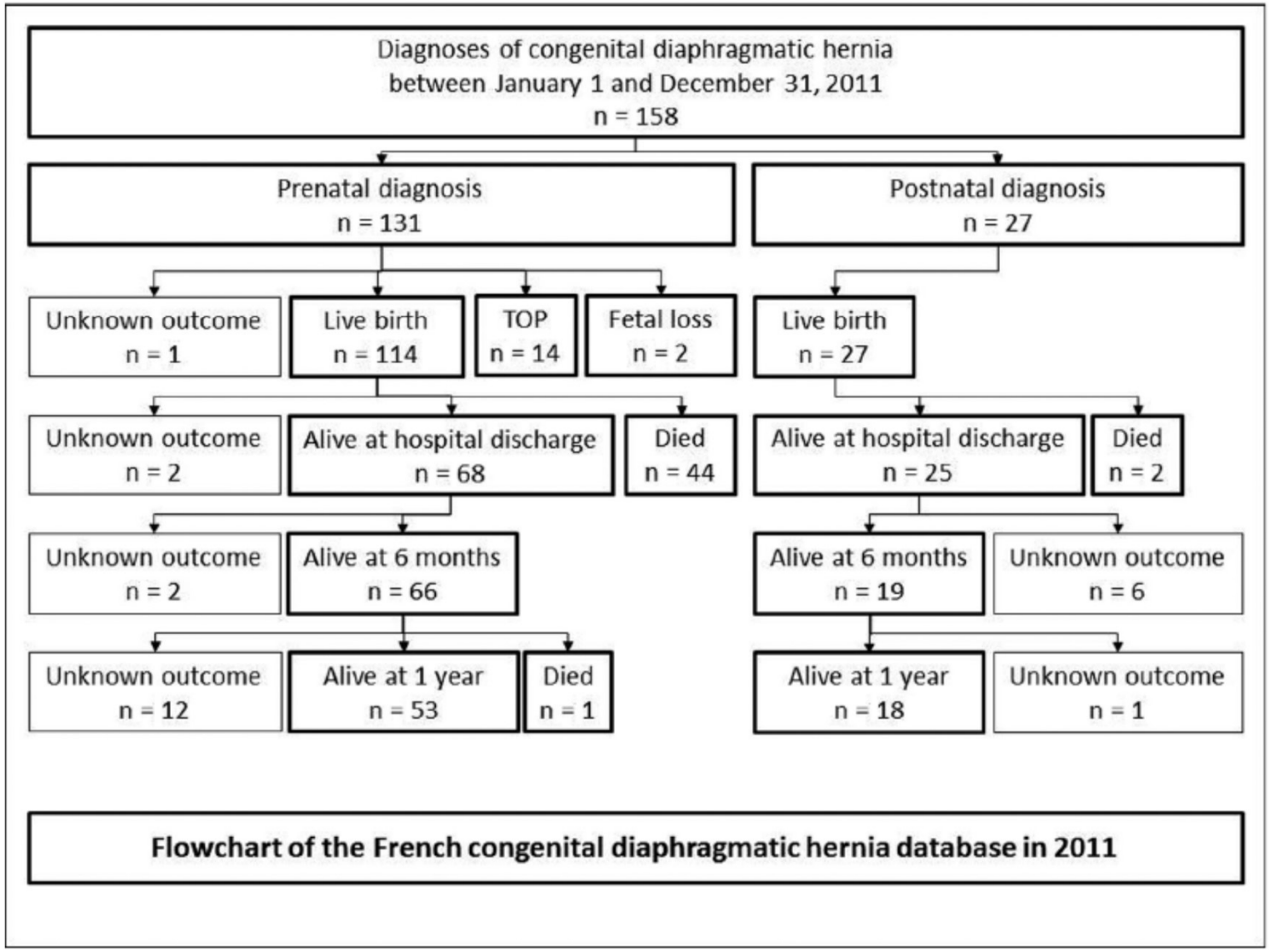
THE JOURNAL OF PEDIATRICS • www.jpeds.com

ORIGINAL ARTICLES

One-Year Outcome for Congenital Diaphragmatic Hernia: Results From the French National Register

François Barrière, MD[1], Fabrice Michel, MD, PhD[1], Anderson D. Loundou, PhD[2], Virginie Fouquet, MD[3], Elsa Kermorvant, MD[4], Sébastien Blanc, MD[5], Elisabeth Carricaburu, MD[6], Amélie Desrumaux, MD[7], Odile Pidoux, MD[8], Alexis Arnaud, MD[9], Nicolas Berte, MD[10], Thierry Blanc, MD[11], Frederic Lavrand, MD[12], Guillaume Levard, MD[13], Isabelle Rayet, MD[14], Sylvain Samperiz, MD[15], Anne Schneider, MD[16], Marie-Odile Marcoux, MD[17], Norbert Winer, MD[18], Yann Chaussy, MD[19], Valérie Datin-Dorriere, MD[20], Quentin Ballouhey, MD[21], Aurélien Binet, MD[22], Charles Muszynski, MD[23], Jean Breaud, MD[24], Armelle Garenne, MD[25], Laurent Storme, MD, PhD[26], and Julia Boubnova, MD[27], on behalf of the Center for Rare Diseases for Congenital Diaphragmatic Hernia





Barrière et al. J Pediatr 2017

FACTEURS PRONOSTIQUES PRÉNATALS

	n (%)	Survivors	Nonsurvivors	OR	*P* value
LHR					
≤1	26 (25)	3	14	16.12 [3.91-66.43]	<.001
1-1.3	25 (24)	14	8	1.91 [0.66-5.92]	.225
>1.3	54 (51)	38	11	1 [Ref]	
o/e LHR					
≤25%	15 (15)	0	10	NA	NA
25%-45%	53 (52)	26	18	4.67 [1.39-15.67]	.013
>45%	34 (33)	27	4	1 [Ref]	
Liver position					
Up	48 (42)	14	25	6.70 [2.69-16.69]	<.001
Down	67 (58)	45	12	1 [Ref]	
o/e TLV					
≤25%	19 (44)	3	12	24 [4.13-139.38]	<.001
>25%	24 (56)	18	3	1 [Ref]	
1 prenatal marker	29 (22)	14	13	3.38 [1.30-8.83]	.013
≥2 prenatal markers	29 (22)	3*	17	20.64 [5.29-80.62]	<.001
No prenatal markers	73 (56)	51	14	1 [Ref]	

FACTEURS PRONOSTIQUES POSTNATALS

General characteristics	n (%)	Survivors	Nonsurvivors	*P* value
Sex				
Male	70 (51)	50	20	.276
Female	67 (49)	42	25	
Side of hernia				
Left	111 (88)	78	33	.001
Nonleft	16 (12)	4	12	
Diagnosis				
Prenatal	112 (81)	68	44	.002
Postnatal	27 (19)	25	2	
Hospital of birth				
Inborn	106 (80)	69	37	.208
Outborn	27 (20)	21	6	
Gestational age				
<37 wk	38 (27)	16	22	<.001
≥37 wk	101 (73)	77	24	
Delivery mode				
Cesarean	50 (37)	26	24	.006
Vaginal	84 (63)	63	21	
5-min Apgar score				
≥7	22 (19)	21	1	.001
<7 or no Apgar	92 (81)	55	37	

FACTEURS PRONOSTIQUES POSTNATALS

General characteristics	n (%)	Survivors	Nonsurvivors	*P* value
Cardiorespiratory status				
O_2 dependency at 28 d	31 (33)	23	8	.002
No O_2 at 28 d	62 (67)	60	2	
PPHN (48 h)	63 (55)	35	28	<.001
No PPHN (48 h)	51 (45)	45	6	
HFOV	66 (56)	34	32	<.001
No HFOV	52 (44)	47	5	
ECMO	7 (6)	4	3	.429
No ECMO	109 (94)	77	32	
Surgical management				
Surgery	114 (82)	93	21	<.001
No surgery	25 (18)	0	25	
Surgery <48 h	56 (63)	51	5	.001
Surgery ≥48 h	33 (37)	20	13	
Patch repair	28 (31)	18	10	.006
No patch	62 (69)	55	7	
Defect C/D	32 (48)	19	13	<.001
Defect A/B	34 (52)	33	1	

SÉQUELLES DES HDC

To cite: Tan JK, Banton G, Minutillo C, *et al*. *Arch Dis Child* Epub ahead of print: [*please include* Day Month Year]. doi:10.1136/archdischild-2018-316091

Table 5 Comparison of chest CT scan findings between groups

Measure	Cases (n=26)	Controls (n=26)	P value
Pulmonary changes			
Subpleural triangles	17 (65)	3 (12)	0.001
Architectural distortion	23 (89)	0	<0.001
Linear opacities	22 (85)	1 (4)	<0.001
Gas trapping	16 (62)	17 (65)	1.00
Atelectasis	6 (23)	4 (15)	0.69
Bronchial wall thickening	9 (35)	6 (23)	0.51
Bronchiectasis	2 (8)	2 (8)	1.00
Chest wall deformities			
Scoliosis	12 (46)	0	<0.001
Pectus excavatum	6 (23)	0	0.03
Pectus carinatum	3 (12)	0	0.25

Data summarised as number (%).

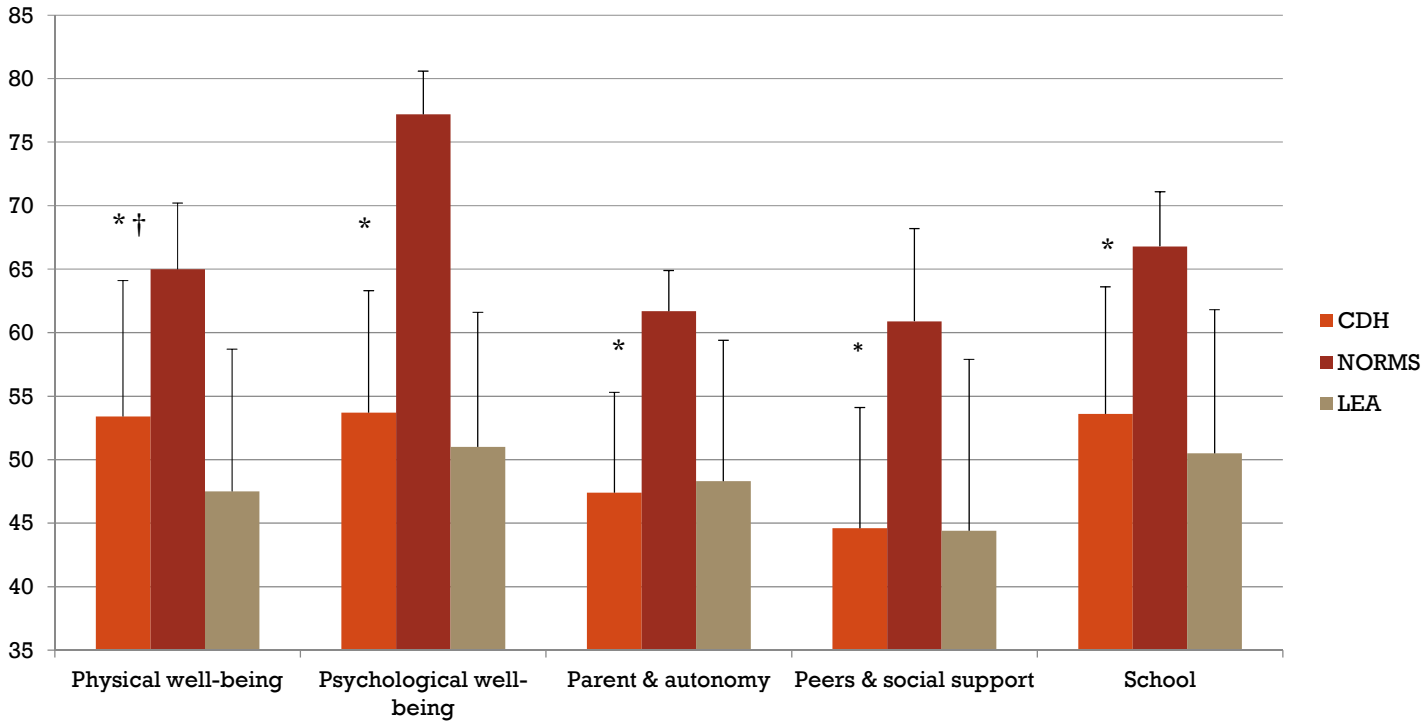
SEQUELLES DES HDC

Symptomes	% patients
Troubles digestifs	34%
Troubles respiratoires	22%
Troubles neuropsychologiques	27%
Troubles orthopédiques	13%
Au moins un symptôme	**66%**

Michel et al. Orphanet J Rare Dis. 2013

QUALITÉ DE VIE DES HDC

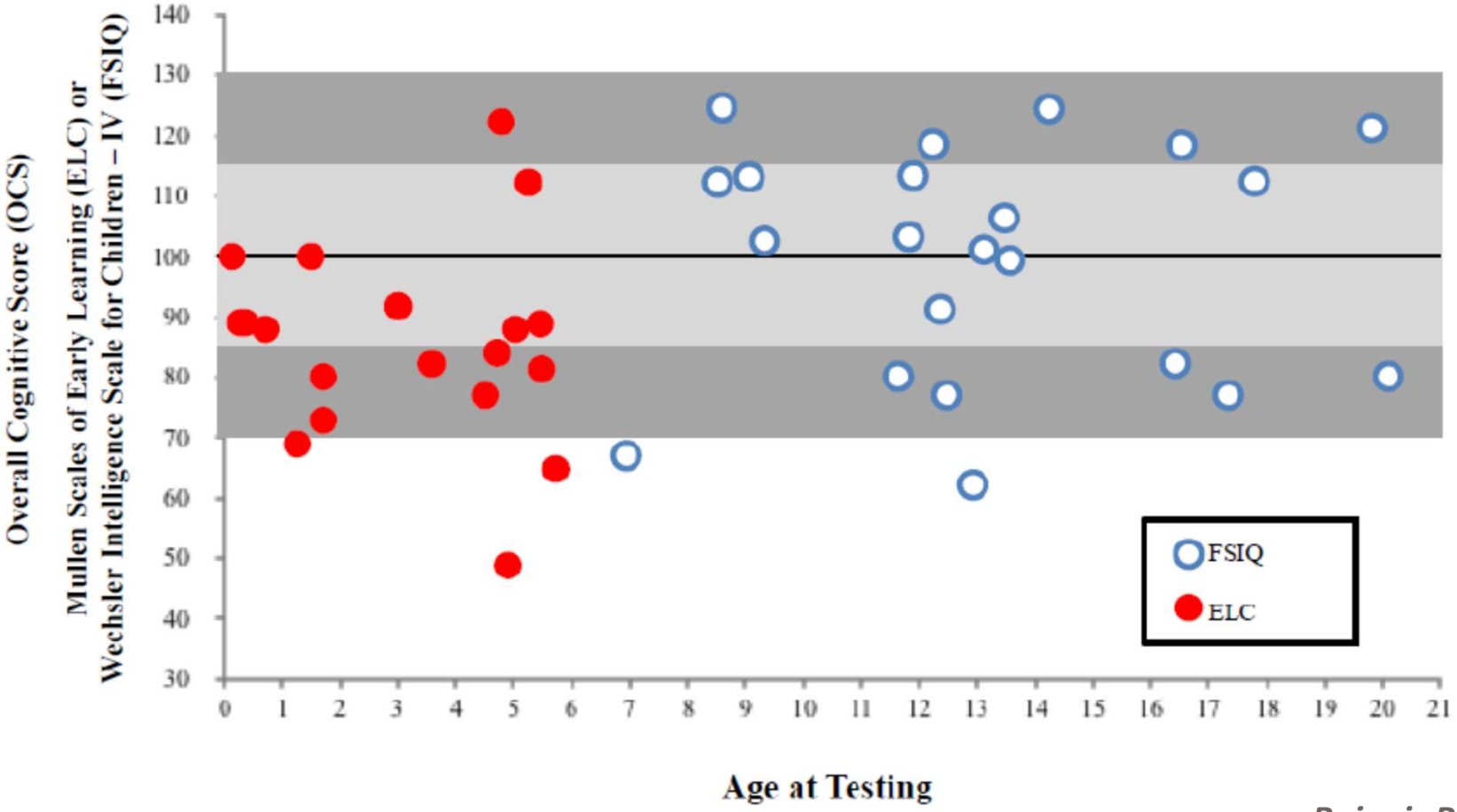
Comparaison of Kidscreen 27 dimensions scores of CDH survivors with long term leucemia survivors (LEA), and norms



* p<0.001 between sample and Kidscreen norms (sex- and gender- matched)
† p<0.01 between sample and Kidscreen scores of LEA cohort

Michel et al. Orphanet J Rare Dis. 2013

DEVELOPPEMENT NEUROPSYCHO HDC



Bojanic Ped Int Surg 2016

ATRESIE DE L'OESOPHAGE

Schneider *et al. Orphanet Journal of Rare Diseases* 2014, 9:206
http://www.ojrd.com/content/9/1/206

ORPHANET JOURNAL OF RARE DISEASES

RESEARCH Open Access

Results from the French National Esophageal Atresia register: one-year outcome

Anne Schneider[1,12*], Sébastien Blanc[2], Arnaud Bonnard[3], Naziha Khen-Dunlop[4], Frédéric Auber[5], Anne Breton[6], Guillaume Podevin[7], Rony Sfeir[1], Virginie Fouquet[8], Catherine Jacquier[9], Jean-Louis Lemelle[10], Frédéric Lavrand[11], François Becmeur[12], Thierry Petit[13], Marie-Laurence Poli-Merol[14], Frédéric Elbaz[15], Thierry Merrot[16], Jean-Luc Michel[17], Allal Hossein[18], Manuel Lopez[19], Edouard Habonimana[20], Cécile Pelatan[21], Pascal De Lagausie[22], Philippe Buisson[23], Philine de Vries[24], Jean Gaudin[25], Hubert Lardy[26], Corine Borderon[27], Joséphine Borgnon[28], Olivier Jaby[29], Dominique Weil[30], Didier Aubert[31], Stephan Geiss[32], Jean Breaud[33], Anis Echaieb[34], Jane Languepin[35], Christophe Laplace[36], Myriam Pouzac[37], François Lefebvre[38], Frédéric Gottrand[1†] and Laurent Michaud[1†]

ATRÉSIE DE L'OESOPHAGE

- ✓ Cas entre 2008 et 2009
- ✓ Mortalité basse
- ✓ 307 patients – 16 décès



Table 2 Ages and causes of death

	Age at death (days)	Term (weeks)	Birth weight (g)	EA type (LADD)	Cause of death
1	?	39	2300	III	Multivisceral failure (trisomy 18)
2	1	37	2770	III	
3	1	31	1750	III	
4	2	34	1760	I	
5	2	39	1840	III	disease)
6	3	36	2100	III	
7	6	36	1985	III	?
8	6	34	1815	III	Enterocolitis
9	13	28	600	III	
10	20	35	2380	I	
11	53	30	1295	I	
12	102	32	1300	III	
13	151	34	1101	III	
14	182	38	2190	III	
15	192	36	2920	I	Mediastinitis
16	284	37	2800	III	Sudden infant death (negative autopsy)

Syndromes polymalformatifs

Sepsis

Table 3 Comparison between children presenting with and without complications during the first year of life

	Complications (n = 91)	No complications (n = 180)	p	Multivariate analysis
Sex (%)	Male (31)	Male (69)	.8	NS
	Female (29)	Female (71)		
Term (weeks)	36.5 ± 3.3	37.6 ± 2.9	.005	NS
Birth weight (g)	2419 ± 710	2672 ± 677	.003	NS
Associated malformations (%)	57/141 (40)	84/141 (60)	.01	NS
EA type (%)	LADD I (64)	LADD I (36)	.01	NS
	LADD III (29)	LADD III (71)		
Defect length	1.6 ± 4.8	1.5 ± 1.2	.0002	NS
Primary anastomosis (%)	70/235 (30)	165/235 (70)	.003	NS
Delayed primary anastomosis (%)	22/32 (69)	10/32 (31)	$1.4\ 10^{-5}$	NS
Anastomotic tension (%)	48/86 (56)	38/86 (44)	$1.2\ 10^{-7}$	**OR, 3.0 [1.6–5.6] p = .0009**
Difficult anastomosis (%)	16/28 (57)	12/28 (43)	.01	NS
Gastrostomy (%)	40/56 (71)	16/56 (29)	$4.9\ 10^{-11}$	**OR, 4.8 [2.1–11.1] p = .0002**
Complementary enteral nutrition at discharge (%)	28/40 (70)	12/40 (30)	$2.9\ 10^{-7}$	**NS**
Exclusive oral feeding at discharge (%)	57/219 (26)	162/219 (74)	$3.1\ 10^{-6}$	**OR, 4.5 [1.5-14.2] p = .007**

NS, not significant.
OR, odds-ratio.

34%

Fuite anastomotique

Refistulisation

Sténose anastomotique

COMPLICATIONS AOE

- ✓Réintervention 15%
- ✓Alimentation entérale la première année 30%
- ✓Reflux gastro oesophagien 50%
- ✓Dilatations oesophagienne 40%
- ✓Troubles respiratoires 35%
- ✓Dysphagie jusqu’à l’age adulte

QUALITÉ DE VIE DES AOE

- ✓ Peu de travaux focalisant sur la QDV
- ✓ Discordance
  - Hölscher et al. 2013
    - 8% altération sévère 42% altération modérée
  - Amin et al. 2018
    - Altération des composantes physiques de la QDV à l'age de 10 ans

DEVELOPPEMENT NEUROPSYCHO AOE

Neurodevelopmental outcomes of infants with esophageal atresia and tracheoesophageal fistula



Wegdan Mawlana [a], Paul Zamiara [b], Hilary Lane [b], Margaret Marcon [c], Eveline Lapidus-Krol [b], Priscilla PL Chiu [b], Aideen M Moore [d,*]

Age at time of assessment, months, mean ± SD	24 ± 9
Neurodevelopment within normal	138 (76%)
Cognitive delay	32 (17.6%)
Severe	1
Language delay	44 (24.2%)
Severe	1
Motor delay	40 (21.9%)
Severe	3

DEVELOPPEMENT NEUROPSYCHO AOE

Long-term morbidity in adolescents and young adults with surgically treated esophageal atresia

Hiroomi Okuyama[1] · Yuko Tazuke[1] · Takehisa Uenoa[1] · Hiroaki Yamanaka[1] · Yuichi Takama[1] · Ryuta Saka[1] · Keigo Nara[2] · Noriaki Usui[2]

Long-term morbidities	Total ($n = 69$)
Neurodevelopmental abnormalities	13% (8/62)
Mental retardation	7
Cerebral palsy	1

LAPAROSCHISIS

- ✓ Mortalité basse
  - Cas simples proche de 0%
  - Cas compliqués 0 à 10% dans les publications européennes récentes

Malformation	Hessian neonatal registry, 2010–2015	Mortality according to previous publications
Duodenal atresia and stenosis	3.6%	3%[23] 6%[24] 4%[25] 46% (one year)[1]
Gastroschisis	1.8%	4%[26] 4%[27] 3%[17] 6.3% (1 y)[1] 3.8%[28]
Omphalocele	24%	6.8%,[17] 16%[29] 12.8% (1 y)[1]
CDH	27.5%	28%,[30] 34.4%,[17] 53%[31] 62% (1 y)[1] 48% (1 y)[32] 40% (2 y)[33]
Esophageal atresia	11.1%	5.4%[19] 9%[21] 5%[20] 12.2%[17] 4.8% (1 y)[1]

Wittekindt . Eur J Pediatr Surg 2017

DEVENIR DES LAPAROSCHISIS

Neurodevelopment and Health-Related Quality of Life in Infants Born with Gastroschisis: A 6-Year Retrospective French Study

Barthelemy Tosello[1] Meriem Zahed[1] Floriane Guimond[1] Karine Baumstarck[2] Alice Faure[3]
Fabrice Michel[4] Olivier Claris[5] Jerome Massardier[6] Catherine Gire[1] Thierry Merrot[3]

- ✓33 laparoschisis
- ✓Séquelles
- ✓ASQ
- ✓KIDSCREEN

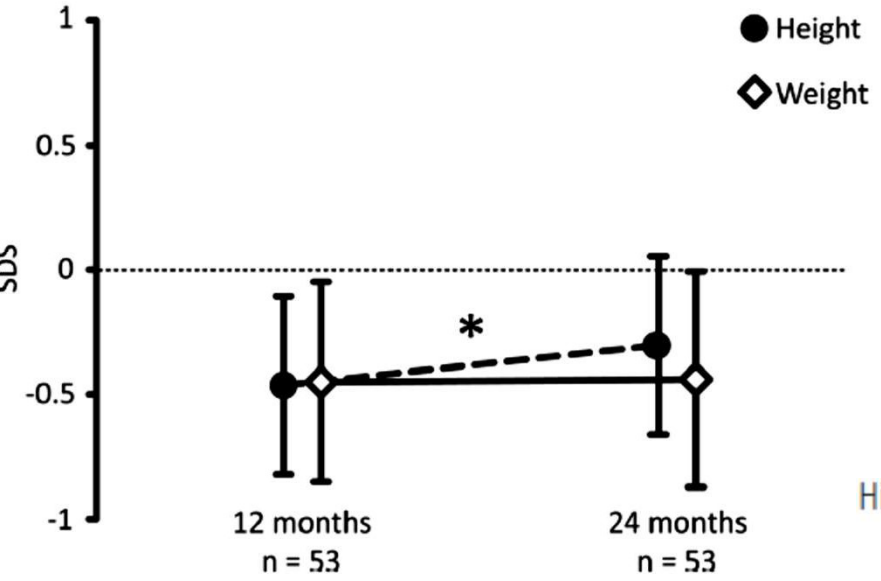
COMPLICATIONS DES LAPAROSCHISIS

Complications	
New surgery after first discharge, *n* (%)	6 (18.1)
Constipation, *n* (%)	8 (24.2)
Chronic abdominal pain, *n* (%)	13 (39.3)
Respiratory troubles, *n* (%)	4 (12.1)
Neurosensory impairments, *n* (%)	2 (6)

Tosello et al. Eur J Pediatr Surg 2017

CROISSANCE

Characteristics	Followed patients ($N = 33$)
Growth	
Weight < 10th percentile, *n* (%)	4 (12.5)
Weight > 90th percentile, *n* (%)	3 (9)
BMI < 10th percentile, *n* (%)	5 (15.1)
BMI > 90th percentile, *n* (%)	5 (15.1)



Tosello et al. Eur J Pediatr Surg 2017

Hijkoop A, *et al. Arch Dis Child Fetal Neonatal Ed* 2017

DÉVELOPPEMENT PSYCHOMOTEUR

ASQ	
Communication: normal score, *n* (%)	29 (87.8)
Global motor function: normal score, *n* (%)	33 (100)
Fine motor function: normal score, *n* (%)	31 (93.9)
Problem solving: normal score, *n* (%)	29 (87.8)
Individual and social abilities: normal score, *n* (%)	32 (96.9)
5/5 normal subscales, *n* (%)	26 (78.7)
Total score (up to 300), mean (±SD)	253 (47)

Tosello et al. Eur J Pediatr Surg 2017

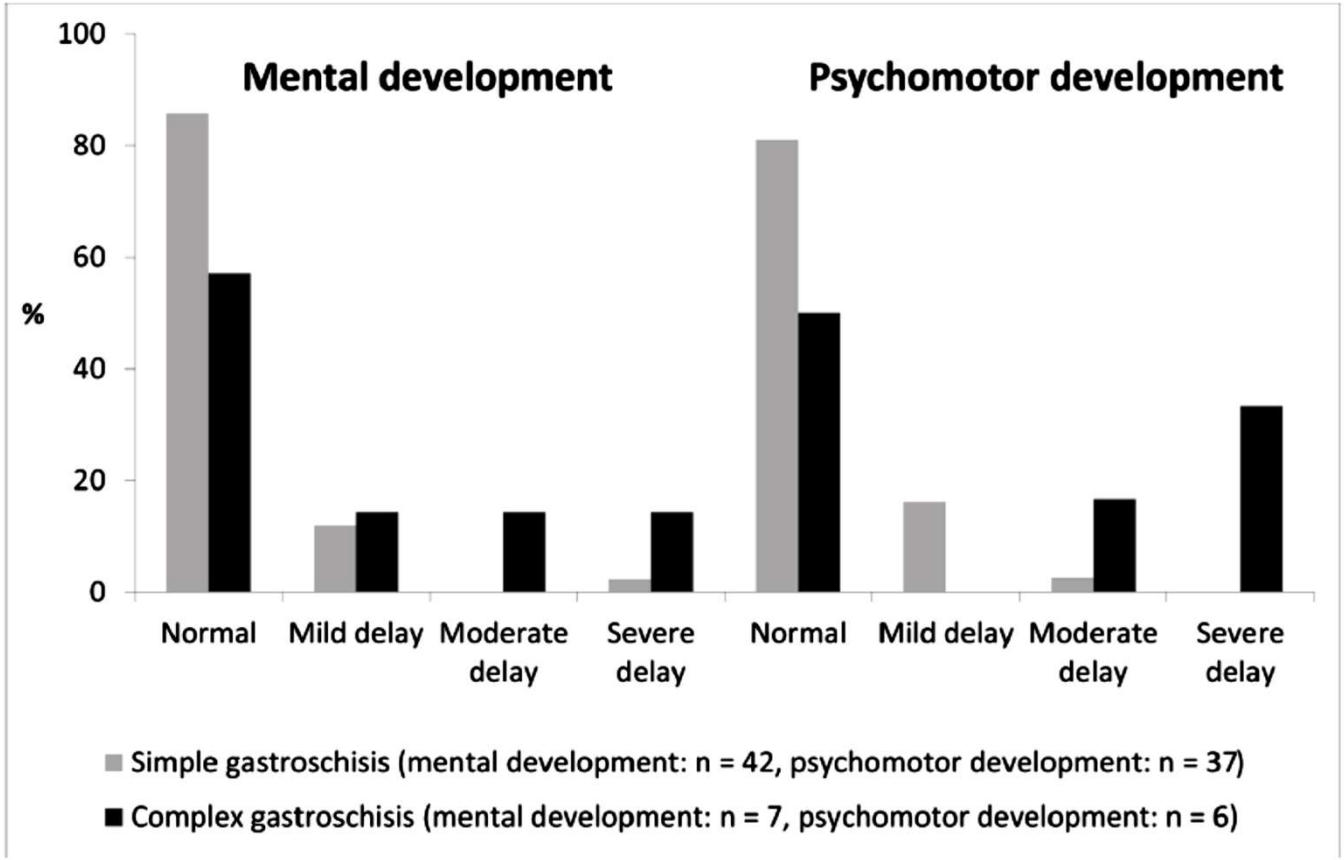


Figure 3 Proportions of children with simple or complex gastroschisis with normal or delayed mental (left panel) and motor (right panel) development at 24 months of follow-up. Mild delay: developmental index 70–84; moderate delay: 55–69; severe delay:<55.

Hijkoop A, *et al*. *Arch Dis Child Fetal Neonatal Ed* 2017

OMPHALOCELE

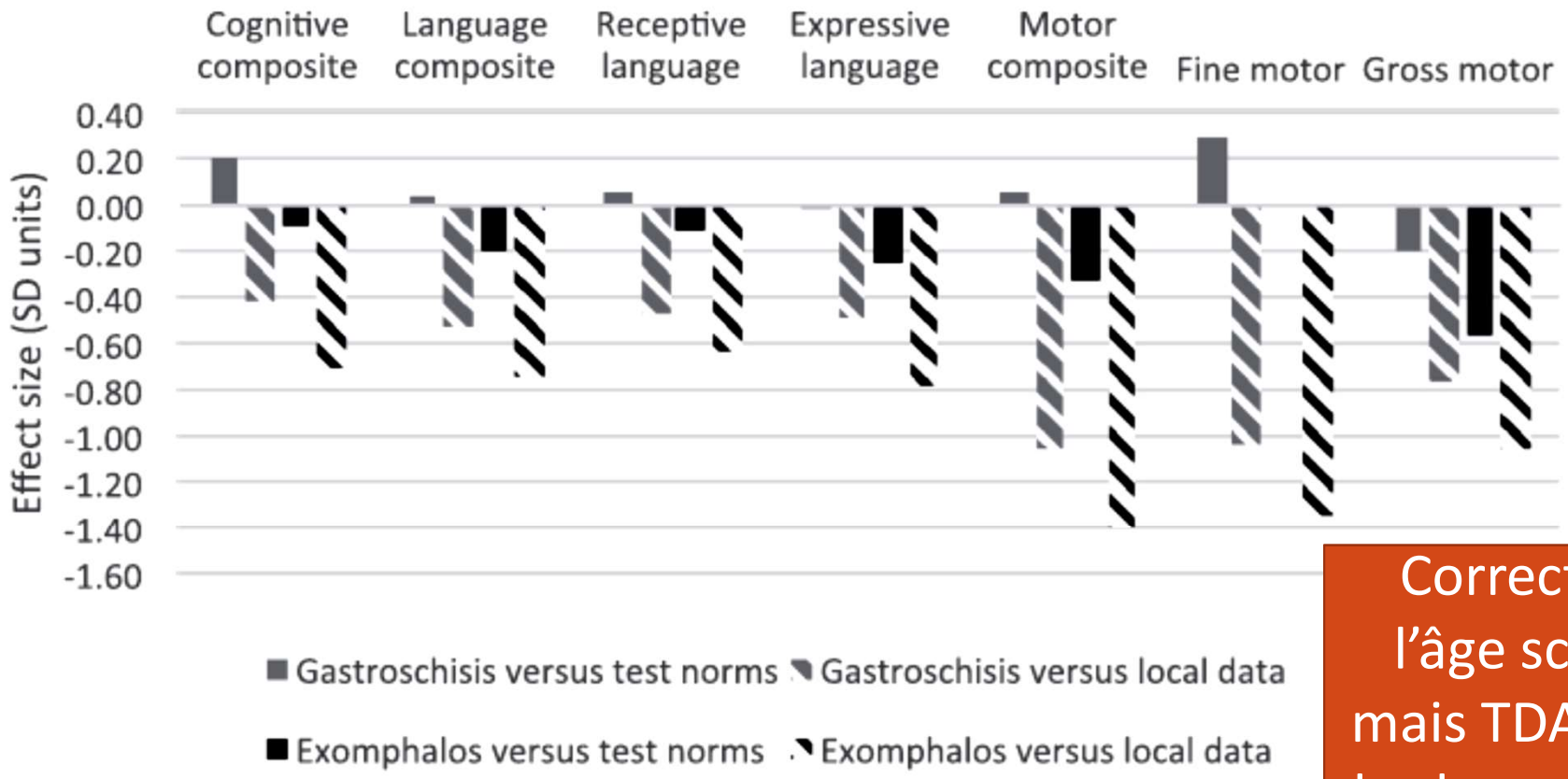
- ✓ Mortalité plus élevée
- ✓ Association à d'autres malformations (syndrome chromosomiques)
- ✓ Si isolé, mortalité proche de 0
- ✓ Faible morbidité
- ✓ QDV peu étudiée. Considérée « bonne »

Wittekindt . Eur J Pediatr Surg 2017

Malformation	Hessian neonatal registry, 2010–2015	Mortality according to previous publications
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Esophageal atresia	11.1%	5.4%[19] 9%[21] 5%[20] 12.2%[17] 4.8% (1 y)[1]

DÉVELOPPEMENT PSYCHOMOTEUR OMPHALOCÈLE

A.C. Burnett et al. *Early Human Development 116 (2018) 47–52*



Correction à l'âge scolaire mais TDAH pour les laparoschisis

DÉVELOPPEMENT PSYCHOMOTEUR OMPHALOCÈLE

✓ 31 enfants avec omphalocèle géante

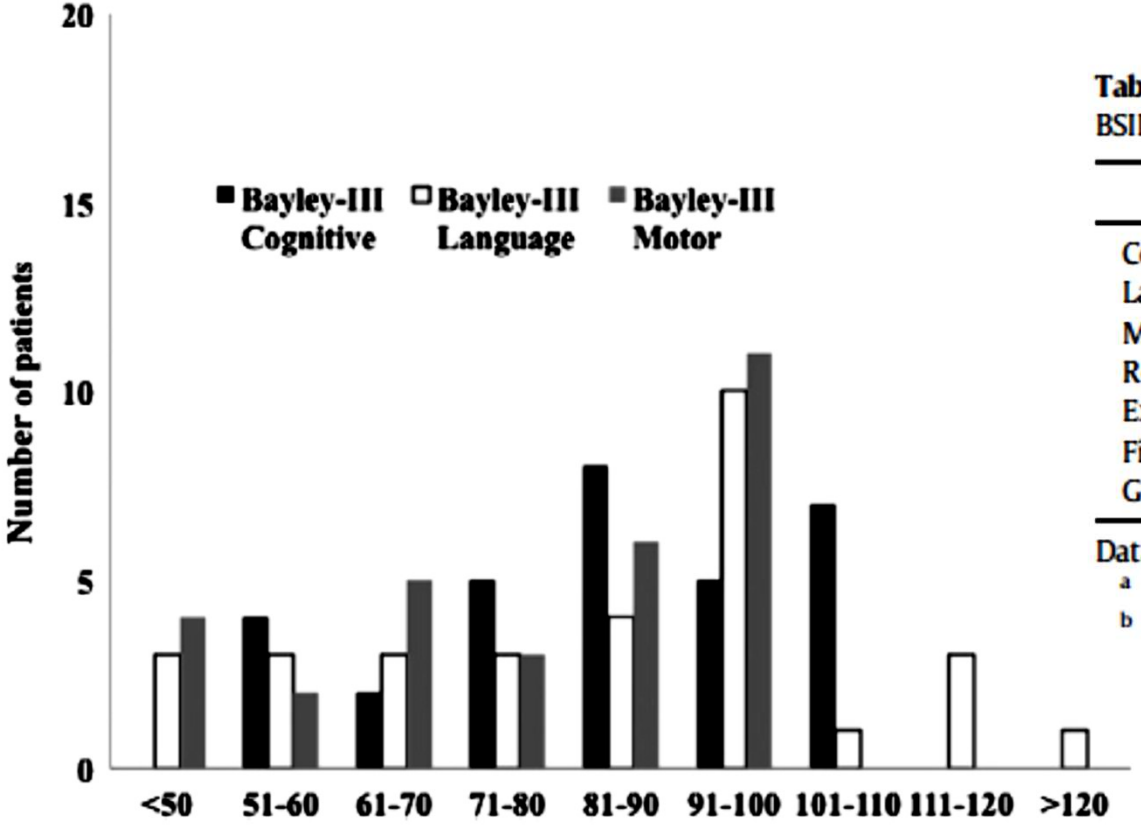


Table 3
BSID-III (n = 31) outcomes as compared to population norms.[10]

	BSID-III score	P-value
Cognitive composite score[a]	86.8 ± 16.8 (55–110)	**0.0001**
Language composite score[a]	83.2 ± 21.1 (47–124)	**0.0001**
Motor composite score[a]	81.5 ± 16.2 (49–100)	**0.0001**
Receptive language score[b]	7.6 ± 4.2 (1–16)	**0.0001**
Expressive language score[b]	6.8 ± 3.5 (1–12)	**0.003**
Fine motor score[b]	8.5 ± 2.9 (1–13)	**<0.01**
Gross motor score[b]	5.5 ± 3.3 (1–10)	**0.0001**

Data presented as mean ± SD (range).
[a] Mean ± SD of expected normal score of reference population is 100 ± 15.
[b] Mean ± SD of expected normal score of reference population is 10 ± 3.

Table 5
OLS regression modeling the relationship between the Bayley scores and predictors of adverse neurodevelopmental and functional outcomes in GO children during infancy.

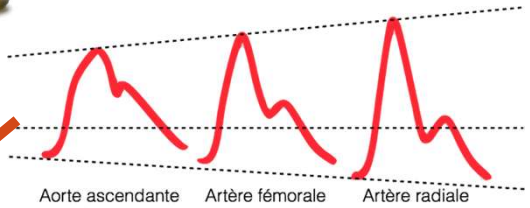
	Bayley cognitive score		Bayley language score		Bayley motor score	
	b (95% CI)	P value	b (95% CI)	P value	b (95% CI)	P value
Age at first surgery	−1.54 (−3.27 to 0.18)	0.08	−1.92 (−4.10 to 0.26)	0.08	−2.28 (−3.87 to −0.71)	**0.007**
Age at final closure	−0.39 (−0.97 to 0.19)	0.174	−0.66 (−1.36 to 0.04)	0.06	−0.63 (−1.17 to −0.08)	**0.03**
Age enteral feed	−0.24 (−0.51 to 0.02)	0.07	−0.32 (−0.63 to −0.01)	**0.04**	−0.52 (−0.83 to −0.21)	**0.002**
Age at dc	−0.15 (−0.23 to −0.08)	<**0.0001**	−0.18 (−0.27 to −0.09)	<**0.0001**	−0.16 (−0.23 to −0.09)	<**0.0001**
Failure to thrive (low wt.)	−0.40 (−0.57 to −0.22)	<**0.0001**	−0.45 (−0.68 to −0.22)	<**0.0001**	−0.38 (−0.57 to −0.18)	<**0.0001**
Autism	−22.26 (−41.47 to −2.77)	**−0.03**	−35.61 (−58.54 to −12.67)	**0.004**	−10.73 (−35.27 to 13.80)	0.37
HFOV	−20.87 (−33.36 to −8.38)	**0.002**	−25.51 (−41.91 to −9.11)	**0.004**	−19.11 (−33.90 to −4.33)	**0.01**
Pulmonary hypertension	−15.80 (−27.22 to −4.40)	**0.008**	−17.39 (−32.15 to −2.64)	**0.02**	−18.88 (−29.6 to −8.17)	**0.001**
GERD	−13.61 (−27.00 to −0.22)	**0.05**	−14.95 (−32.01 to 2.13)	**0.08**	−20.18 (−31.81 to −8.53)	**0.001**
Need for supplemental O_2 at DOL 30	−14.86 (−27.61 to −3.01)	**0.02**	−21.73 (−35.97 to −7.50)	**0.004**	−17.95 (−28.92 to −6.99)	**0.002**
Abnormal BEARs	−27.25 (−41.49 to −13.00)	**0.001**	−31.05 (−49.73 to −12.36)	**0.002**	−23.38 (−39.47 to −7.29)	**0.006**
Need for g-tube or j-tube for nutritional support	−25.95 (−39.78 to −12.10)	<**0.0001**	−37.57 (−54.51 to −18.62)	<**.0001**	−25.06 (−41.40 to −8.72)	**−0.004**
Tracheostomy	−28.13 (−38.68 to −17.56)	<**0.0001**	−29.73 (−44.79 to −14.67)	<**0.0001**	−25.41 (−37.22 to −13.79)	<**0.0001**
Ventilator dependence at f/u	−27.15 (−40.76 to −13.54)	<**0.0001**	−27.62 (−46.27 to −8.96)	**0.005**	−21.25 (−37.46 to −5.04)	**0.01**
Need for physical therapy	−13.46 (−34.78 to 3.25)	**0.04**	−19.02 (−34.78 to −3.25)	**0.02**	−16.43 (−29.68 to −3.17)	**0.02**

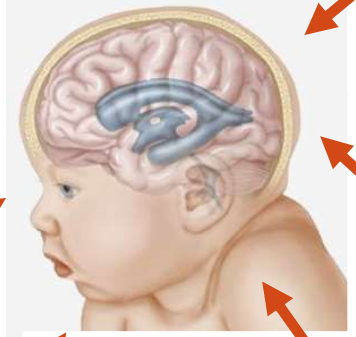
dc, discharge; HFOV, high frequency oscillatory ventilation; GERD, gastroesophageal reflux disease; DOL, day of life; BAERs, brainstem auditory evoked responses; g-tube, gastrostomy tube; j-tube; jejunostomy tube; f/u, follow-up.


Sevoflurane, USP
Inhalation Anesthetic
250 mL
Rx only
Baxter

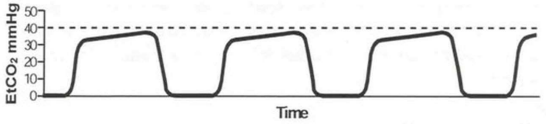

ADRENALINE

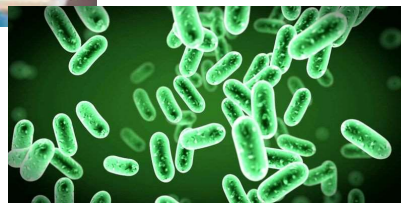


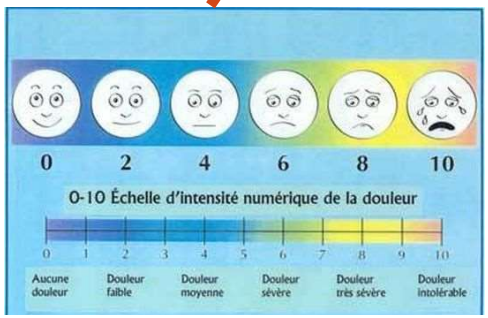

Aorte ascendante
Artère fémorale
Artère radiale

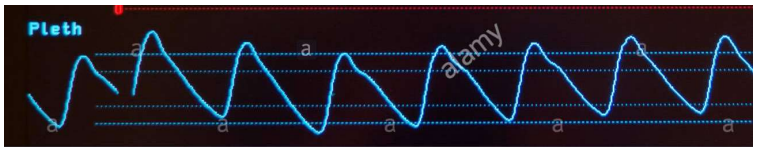





EtCO2 mmHg
50
40
30
20
10
0
Time



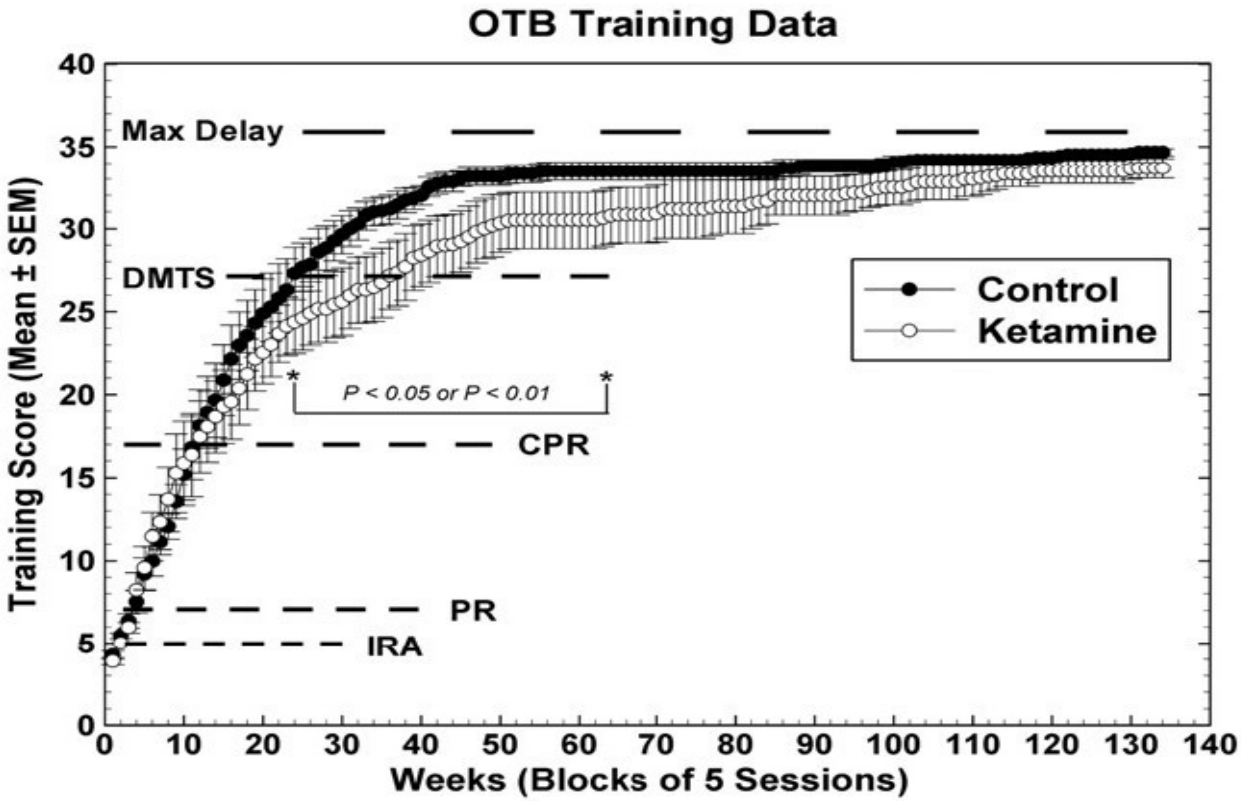

0
2
4
6
8
10
0-10 Échelle d'intensité numérique de la douleur
0 1 2 3 4 5 6 7 8 9 10
Aucune douleur
Douleur faible
Douleur moyenne
Douleur sévère
Douleur très sévère
Douleur intolérable


Pleth

CONSÉQUENCES COMPORTEMENTALES DE L'EXPOSITION AUX ANESTHÉSIQUES



- Singes Rh Macaques
- AG Kétamine 24h
- Operant task battery
  - Apprentissage d'une tache
  - Différenciation des couleurs
  - Motivation
  - Mémoire à court terme



Paule et al. Neurotox and terat. 2011

QUELS OUTILS DE MONITORING?

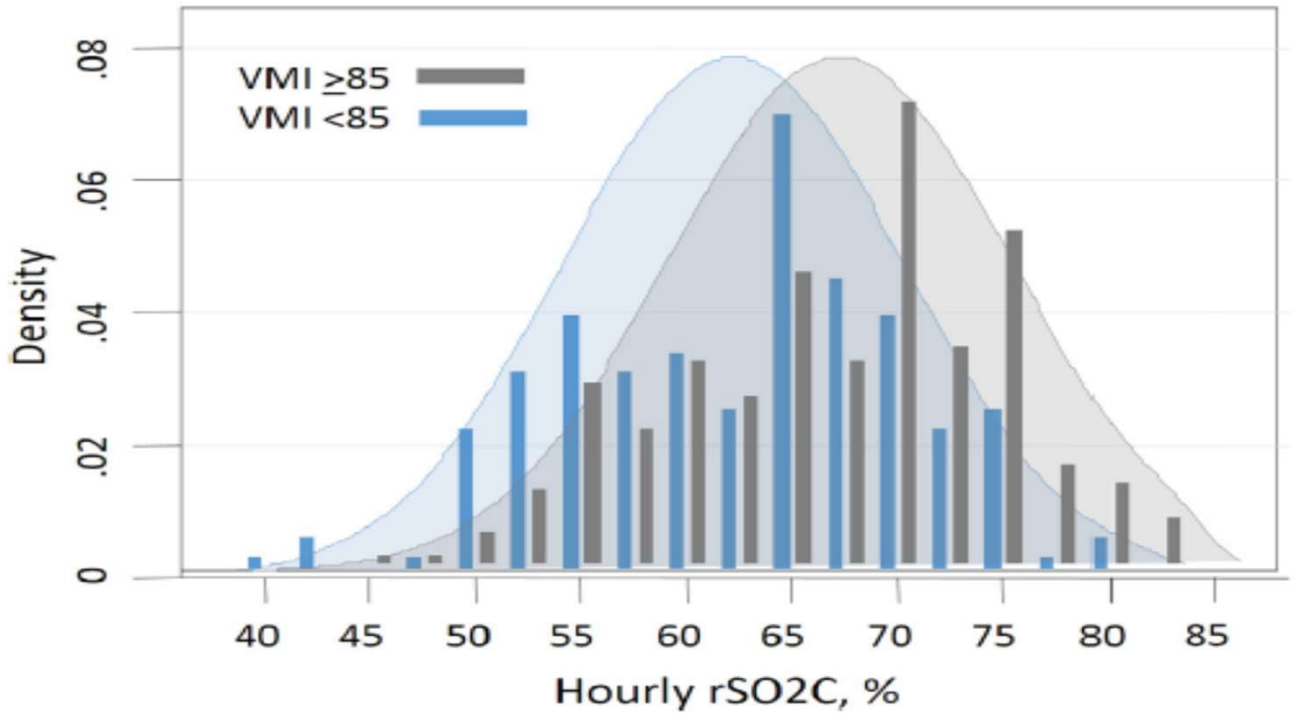


FIGURE 1. Distribution of hourly cerebral saturation *(rSO_2C)* in patients with normal and low performance on visual-motor integration *(VMI)* testing. Average values and distributions were lower in patients with low VMI scores ($P < .05$). See text for details.

Hoffman et al. J Thorac Cardiovasc 2013

LIMITES…

EJA

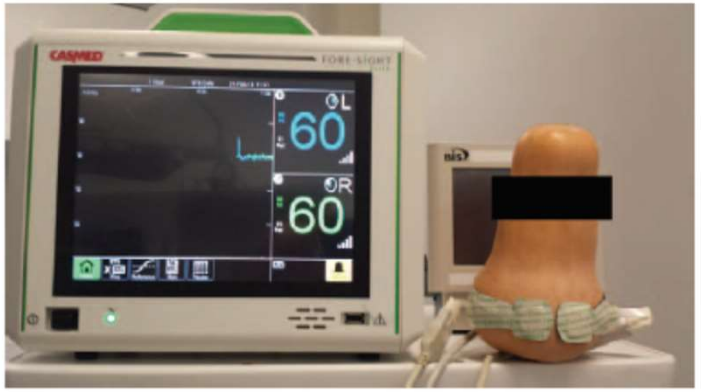
Eur J Anaesthesiol 2018; **35**:1–4

ORIGINAL ARTICLE

Near-infrared spectroscopy in vegetables and humans

An observational study

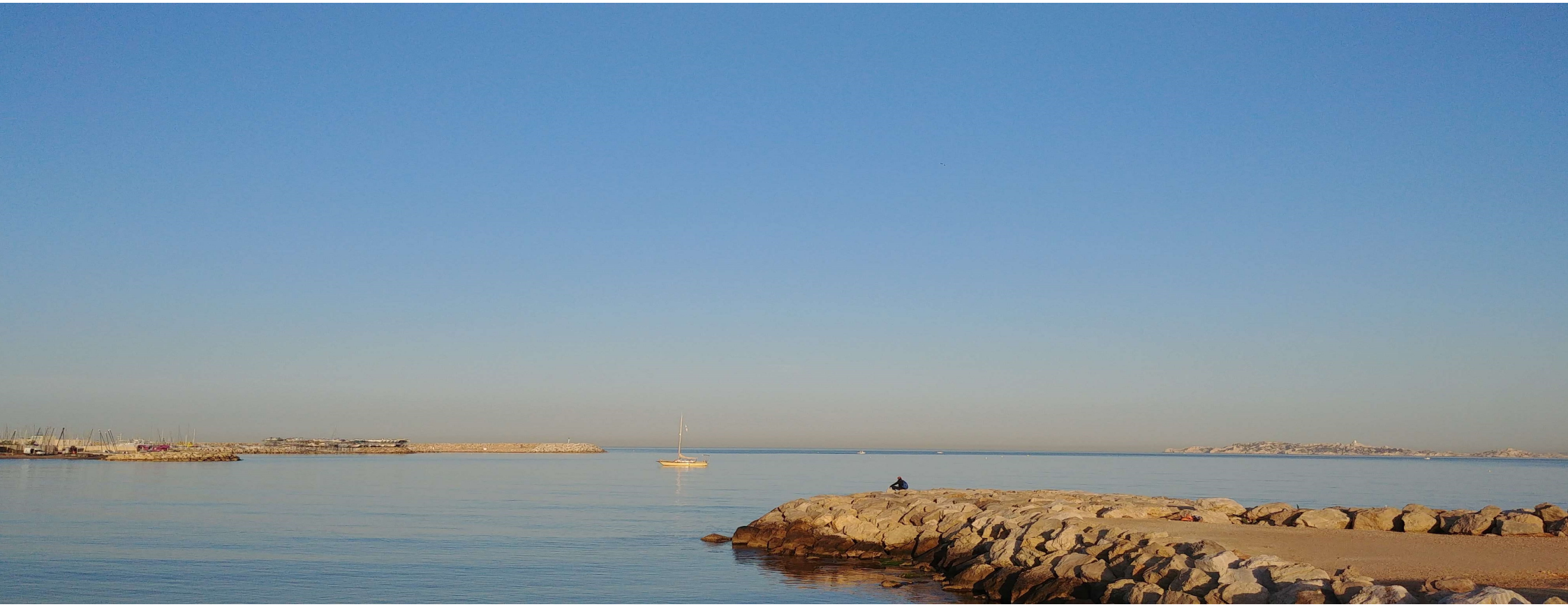
Fig. 2



Experimental setup. A butternut squash is being studied. The oximetry probes are applied transversely at the widest level. The optical sensors are affixed side to side with the light emitting diodes positioned laterally. A portion of the subject was obscured to ensure anonymity.

CONCLUSION

- ✓ Les malformations congénitales majeures sont responsables de séquelles parfois lourdes et persistantes jusqu'à l'âge adulte (HDC, AOE)
- ✓ Les troubles neuropsychologiques sont toujours supérieurs chez ces enfants que dans la population générale
- ✓ La qualité de vie peut être franchement altérée dans l'enfance mais semble s'améliorer à l'âge adulte
- ✓ La protection cérébrale du nouveau-né chirurgical reste encore un champs très peu exploré



Merci from Marseille