congrès annuel de l'ADARPEF | Les 24 & 25 mars 2023 Couvent des Jacobins - Rennes

ADARPEF

Rachianesthésie chez le nourrisson

-

ETAT DES LIEUX

Chrystelle SOLA
Département Anesthésie – Réanimation
Femme - Mère - Enfant
CHU Montpellier

Un peu d'histoire …

- 1ière publication par *August Bier* en **1898**
- Séries de cas (> 200 enfants) dès **1909-1910**

Cocaïne 0,5%

[SEPT. 25, 1909. THE LANCET.]

A STUDY OF SPINAL ANÆSTHESIA IN CHILDREN AND INFANTS.

FROM A SERIES OF 200 CASES.

BY H. TYRRELL GRAY, M.A., M.C. CANTAB., F.R.C.S. ENG.,
RESIDENT MEDICAL SUPERINTENDENT, HOSPITAL FOR SICK CHILDREN, GREAT ORMOND-STREET, LONDON.



ANESTHESIOLOGY
Journal of the American Society of Anesthesiologists, Inc.
July 31, 1950

SPINAL ANESTHESIA IN CHILDREN: REPORT BASED ON 350 PATIENTS UNDER 13 YEARS OF AGE *†

SAMUEL BERKOWITZ, M.D., AND BARNETT A. GREENE, M.D.
Brooklyn, New York

Received for publication July 31, 1950

The *advantages* to be gained by the use of spinal anæsthesia have so far impressed me that I am convinced it will occupy an important place in the surgery of children in the future.

Un peu d'histoire …

1928 Agents IV → 1942 Curares → 1950 Halogénés

- 1970-80: regain d'intérêt pour l'ALR
  - Gestion de la douleur peri opératoire
  - Diminution des réactions neuro-endocrines
  - Amélioration des fonctions respiratoires et digestives
  - Diminution des durées de ventilation post opératoire
  - Alternative à l' AG chez le nourrisson à risque





Un peu d'histoire …

- **Alternative à l' AG chez le nourrisson à risque**



ANESTH ANALG

1984

Spinal Anesthesia for Surgery in the High-Risk Infant.

Abajian, J. Christian MD; Paul Mellish, R. W. MD; Browne, Allen F. MD; Perkins, Frederick M. MD; Lambert, Donald H. , PhD MD; Mazuzan, John E. Jr MD

January 1986
ANESAV
ISSN 0003-3022

Anesthesiology

Spinal Anesthesia in Premature Infants Recovering from Respiratory Distress Syndrome

EVA V. HARNIK, M.D.,* GREGORY R. HOY, M.D.,† SAMUEL POTOLICCHIO, M.D.,‡
DAVID R. STEWART, M.D.,§ RICHARD E. SIEGELMAN, M.D.¶

1986

The Journal of
The American Society of
Anesthesiologists, Inc.
Volume 64 • Number 1
Complete Contents
Pages 3, 5, and 7

Un peu d'histoire …

- Alternative … risque

ANESTH ANALG

Spinal Anesthesia for …

Abajian, J. Christian MD; Paul Mellis… mbert,
Donald H. , PhD MD; Mazuzan, John…

1984

January 1986
ANSAY
ISSN 0003-3022

Anesthesiology

Spinal Anesth… ry Distress Syndrome

EVA … CCHIO, M.D.,‡ D.¶

The Journal of
The American Society of
Anesthesiologists, Inc.
Volume 64 • Number 1

Complete Contents
Pages 3, 5, and 7

1986





Alternative AG … en pédiatrie

Chirurgie sous ombilicale et extrémité inf < 60 (90) minutes

→ **Urgence en situation d'estomac "plein"**

(Torsion testiculaire/Hernie Étranglée/Trauma membre inf)

→ **Pathologies respiratoires aigues/chroniques**

→ **Haut risque d'hyperthermie maligne**

→ **Gestion aiway difficile connue/anticipée** (Dysmorphie faciale…)

→ **Désordres métaboliques/endocriniens/Neuro-musculaires sévères**

AG et Neurotoxicité … ?

The NEW ENGLAND JOURNAL of MEDICINE

Anesthetic Neurotoxicity — Clinical Implications of Animal Models

Bob A. Rappaport, M.D., Santhanam Suresh, M.D., Sharon Hertz, M.D., Alex S. Evers, M.D., and Beverley A. Orser, M.D.,

2015

ed. The group produced a new statement recommending that surgical procedures performed under anesthesia be avoided in children under 3 years of age unless the situation is urgent or potentially harmful if not attended to.

FDA WARNING

December 2016.

FDA Drug Safety Communication: FDA review results in new warnings about using general anesthetics and sedation drugs in young children and pregnant women

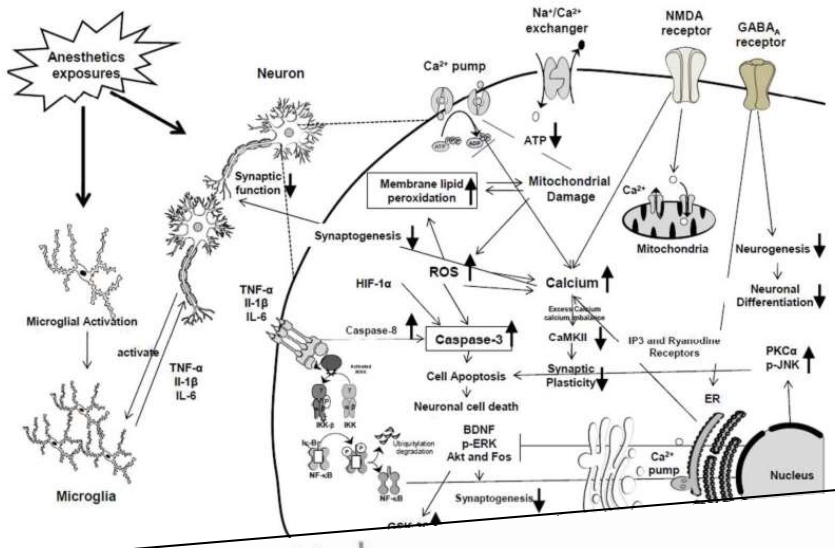
April 2017.

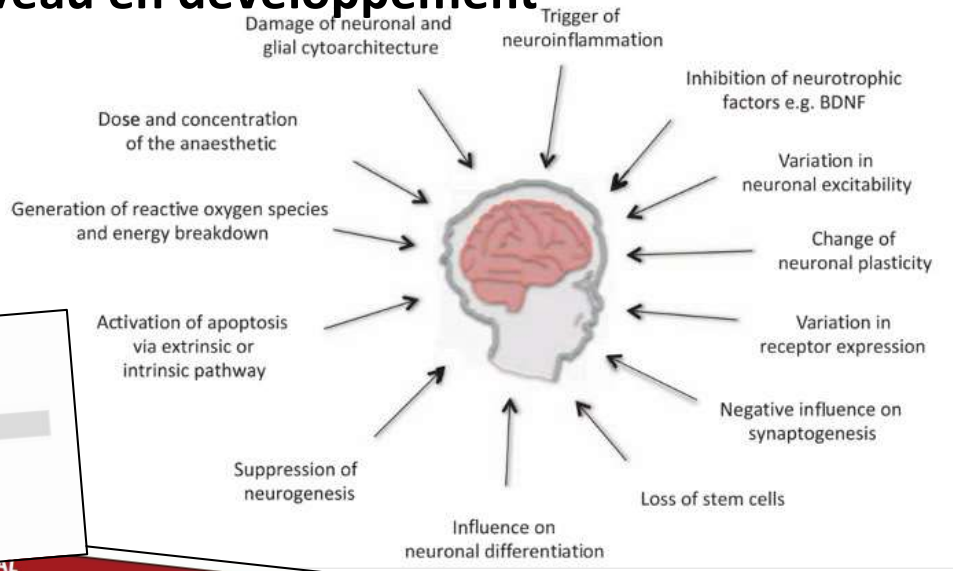
FDA Drug Safety Communication: FDA approves label changes for use of general anesthetic and sedation drugs in young children



Propofol
Sevoflurane
Kétamine
Midazolam
Etomidate
Pentobarbital

Mécanismes Possibles de la neurotoxicité induite par les agents anesthésiques sur le cerveau en développement





Review Article

General anaesthetics and the developing brain: an overview

B. Sinner,[1] K. Becke[2] and K. Engelhard[3]

Anesthesia and the developing brain: clinical research

Andrew J. Davidson[1,2,3], Karin Becke[4], Jurgen de Graaff[5], Gaia Giribaldi, Hansen[9,10], Rodney W. Hunt[3,11,12], Caleb Ing[13], Andreas Loepke[14], Mary Ellen McCann[15], Ormond[1], Alessio Pini Prato[16], Ida Salvo[17], Lena Sun[13,18], Laszlo Vutskits[19], Suellen Walker[20] & Nicola Disma[6]

The rise and fall of anaesthesia-related neurotoxicity and the immature developing *human* brain

T. G. Hansen[1,2] and P.-A. Lönnqvist[3,4]

Indications chez le nourrisson…

Chir. Viscérale

- Herniorraphie
- Colostomie
- Périnéoplastie
- Biopsie rectale
- Abcès rectal
- Gastrostomie
- Laparoschisis
- Résection digestive
- Pylorotomie

Chir. orthopédique

- Chirurgie de hanche
- Amputation
- Ténotomie
- plâtre pelvi pedieux
- Correction pied bot
- Arthrographie Mbre inf.
- Biopsie musculaire
- Excision de tumeur

Chir. urogénitale

- Torsion annexes
- Orchidopexie/tomie
- Cure d'Hydrocèle
- Circoncision
- Cystoscopie
- Valves urètres post
- Cathéter sus-pubien
- Vésicostomie
- Cure d'hypospadias

Myelo-méningocèle, tératome
Picc-line

Place de la Rachi …

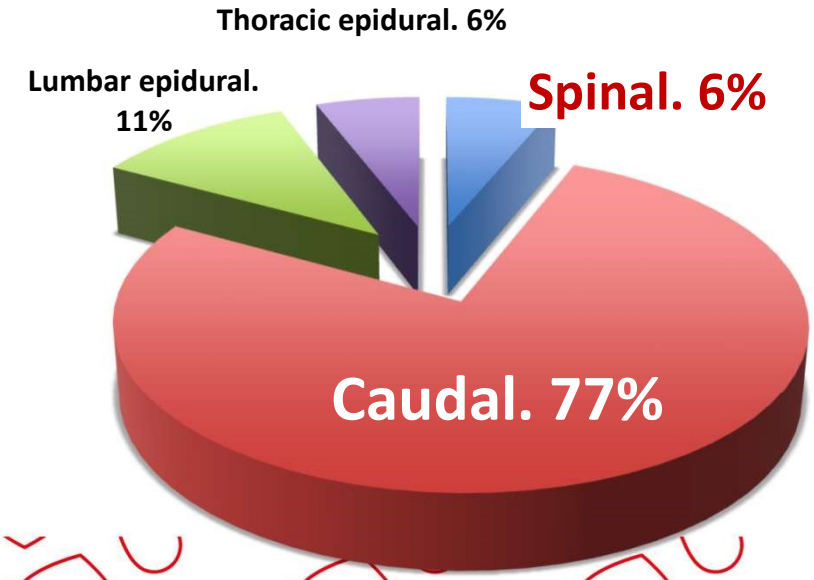
BLOCS centraux

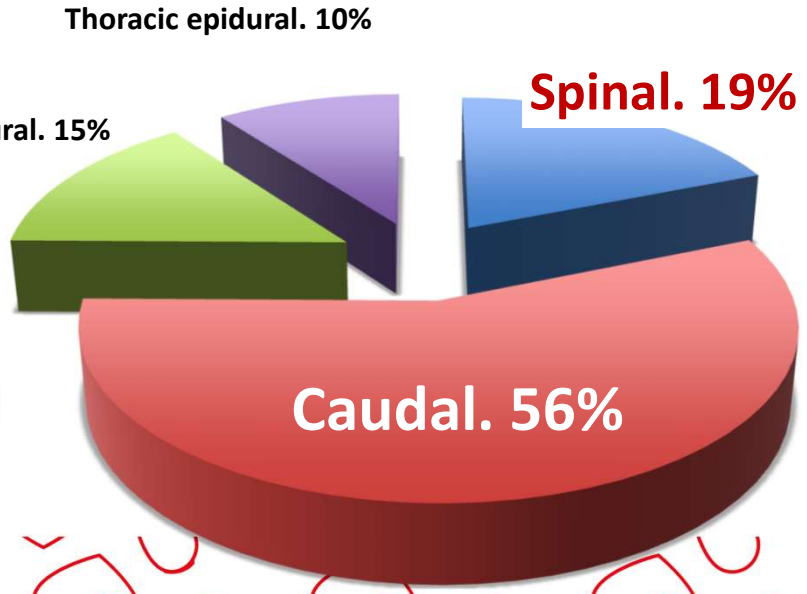


43 % des ALR

22 % des ALR







APRICOT

2017

Dadure C. et al. Lancet Respir Med. 2017

Place de la Rachi …

Techniques	< 1 month	1 to < 6 months	6 to <12 months	1 to < 3 years	3 to <12 years	> 12 years	Total blocks	%
Central :								
Spinals	8	33	4	3	22	45	115	6.2
Caudals	43	236	123	481	518	34	1435	76.9
Lumbar EB	1	6	10	26	108	59	210	11.3
Thoracic EB	2	6	10	14	28	43	105	5.6
Sub-Total 1	**54 (2.9%)**	**283 (15.2%)**	**147 (7.9%)**	**524 (28.1%)**	**676 (36.2%)**	**181 (9.7%)**	**1865**	**100**

RachiA = 2,6 % des ALR dont 40 % chez le nourrisson < 1 an

Dadure C. et al. Lancet Respir Med. 2017

Place de la Rachi …

ANESTHESIOLOGY
Trusted Evidence: Discovery to Practice

2018

Complications in Pediatric Regional Anesthesia

An Analysis of More than 100,000 Blocks from the Pediatric Regional Anesthesia Network ***Walker et al.***

	Neonate	1–5 months	6–11 months	1–2 yr	3–9 yr	≥ 10 yr	Total
Total	705	7,385	12,595	16,738	20,974	27,931	86,328
Neuraxial							
Caudal	520	5,630	10,918	12,989	7,515	544	38,116
Lumbar epidural	2	20	29	49	203	373	676
Sacral intervertebral	0	5	4	4	3	0	16
Subarachnoid	19	201	18	41	185	1,570	2,034
Thoracic epidural	3	12	8	16	37	86	162

RachiA = 2 % des ALR dont 12 % chez le nourrisson < 1 an

Indications chez le nourrisson…

Chir. Viscérale
- Herniorraphie
- Colostomie
- Périnéoplastie
- Biopsie rectale
- Abcès rectal
- Gastrost
- Lap
- Rése
- Pylor

Chir. orthopédique
- Chirurgie de hanche
- Amputation
- Ténotomie
- plât
- de tumeur

Chir. urogénitale
- Ter xes
- Vtomie
- èle
- ple
- Valves urètres post
- Cathéter sus-pubien
- Vésicostomie
- Cure d'hypospadias

TRÈS PEU UTILISÉE EN PRATIQUE

Myelo-méningocèle, tératome
Picc-line

Place de la Rachi …

Pediatric Anesthesia

SHORT REPORT

Current Utilization of Infant Spinal Anesthesia: A Survey of Members of the Society for Pediatric Anesthesia

Benjamin Sanofsky, Emmett Whitaker, Brian Waldschmidt

2023

Society for Pediatric Anesthesia
education • research • patient safety

400 réponses (12%)

JAMAIS DE RACHI = 70%



> 12 RACHI/AN =7%

Choix AG > Rachi

1/ Défaut de pratique - formation

2/ Préférence du chirurgien

3/ Inconfort avec gestion peri op

4/ Durée limité

Choix Rachi > AG

1/ Risque Respi

2/ Risque hémodynamique

3/ Risques généraux de l'AG

Place de la Rachi …

ADARPEF

Pediatric Anesthesia

SHORT REPORT

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400 réponses (12%)

JAMAIS DE RACHI = 70%

2 RACHI/AN =7%

NEUROTOXICITÉ AG ????

Choix AG > Rachi

1/ défaut de prati

2/ Pré

3/ Incor gestion peri op

4/ durée limite

Choix Rachi > AG

1/ Risque Respi

2/ Risque hémodynamique

3/ Risques généraux de l'AG

Rachi or not Rachi …

CURRENT OPINION

Is spinal anaesthesia in young infants really safer and better than general anaesthesia?

Nicola Disma[a], *Natasha Clunies-Ross*[a], *and George A. Chalkiadis*[b,c,d]

2017



Alternative AG …

FACTEURS DE RISQUE D'APNÉE POST OPÉRATOIRE

< 60 semaines d' aménorrhée

Bronchodysplasie – ATCD Apnée

Petit Poids de naissance – ATCD ECUN

Anémie – Hb < 10 g.dl-1 / Hématocrite < 30%

Lésion du SNC

PM / sédation / opiacé

Regional (spinal, epidural, caudal) versus general anaesthesia in preterm infants undergoing inguinal herniorrhaphy in early infancy (Review) Jones LJ

2015

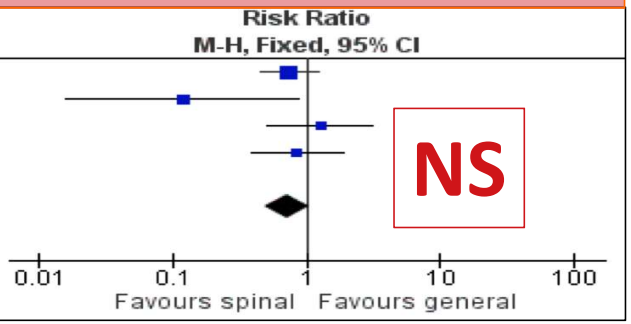
THE COCHRANE COLLABORATION®

ADARPEF

Apnéé/bradycardie (12 à 24 h après la chirurgie):

Study or Subgroup	Spinal Events	Spinal Total	General Events	General Total	Weight	Risk Ratio M-H, Fixed, 95% CI
El-Gohary 2004	9	15	12	15	37.3%	0.75 [0.46, 1.22]
Somri 1998	1	24	7	20	23.7%	0.12 [0.02, 0.89]
Welborn 1990	8	20	5	16	17.3%	1.28 [0.52, 3.16]
Williams 2001	6	14	7	14	21.7%	0.86 [0.39, 1.91]
Total (95% CI)		**73**		**65**	**100.0%**	**0.72 [0.48, 1.06]**
Total events	24		31			

Heterogeneity: Chi² = 4.89, df = 3 (P = 0.18); I² = 39%
Test for overall effect: Z = 1.69 (P = 0.09)

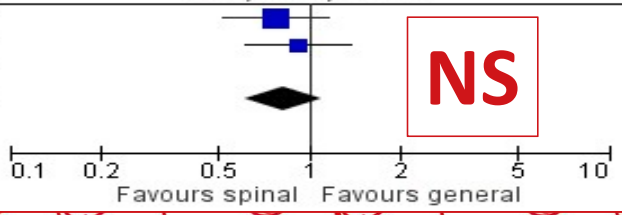


NS

Oxygen désaturation (12 à 24 h après la chirurgie):

Study or Subgroup	Spinal Events	Spinal Total	General Events	General Total	Weight	Risk Ratio M-H, Fixed, 95% CI
El-Gohary 2004	10	15	13	15	62.6%	0.77 [0.51, 1.16]
Krane 1995	8	10	7	8	37.4%	0.91 [0.61, 1.37]
Total (95% CI)		**25**		**23**	**100.0%**	**0.82 [0.61, 1.11]**
Total events	18		20			

Heterogeneity: Chi² = 0.36, df = 1 (P = 0.55); I² = 0%
Test for overall effect: Z = 1.29 (P = 0.20)



NS

Ex preterm

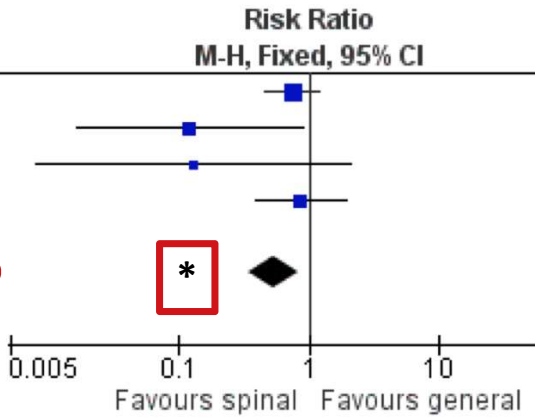
Herniorraphie

Apnées post op sans AUCUNE SÉDATION ASSOCIÉE

2015

Study or Subgroup	Spinal Events	Total	General Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
El-Gohary 2004	9	15	12	15	38.5%	0.75 [0.46, 1.22]
Somri 1998	1	24	7	20	24.5%	0.12 [0.02, 0.89]
Welborn 1990	0	11	5	16	14.6%	0.13 [0.01, 2.12]
Williams 2001	6	14	7	14	22.4%	0.86 [0.39, 1.91]
Total (95% CI)		**64**		**65**	**100.0%**	**0.53 [0.34, 0.82]**
Total events	16		31			

Heterogeneity: Chi² = 6.49, df = 3 (P = 0.09); I² = 54%
Test for overall effect: Z = 2.82 (P = 0.005)



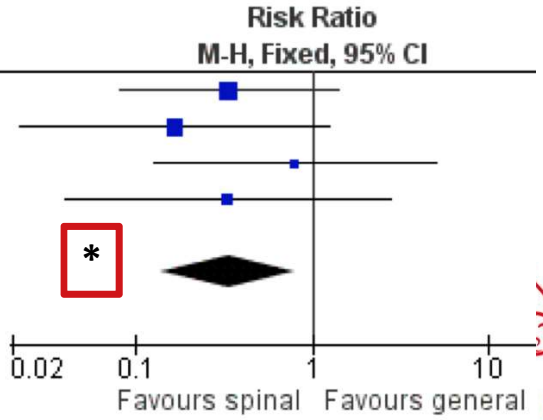
↘ 47% du risque d' apnée postop

Nbre de sujets à traités = 4

Apnées post op SANS ANTÉCÉDENT D'APNÉE

Study or Subgroup	Spinal Events	Total	General Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
El-Gohary 2004	2	15	6	15	34.8%	0.33 [0.08, 1.39]
Somri 1998	1	20	6	20	34.8%	0.17 [0.02, 1.26]
Welborn 1990	2	20	2	16	12.9%	0.80 [0.13, 5.07]
Williams 2001	1	14	3	14	17.4%	0.33 [0.04, 2.83]
Total (95% CI)		**69**		**65**	**100.0%**	**0.34 [0.14, 0.81]**
Total events	6		17			

Heterogeneity: Chi² = 1.31, df = 3 (P = 0.73); I² = 0%
Test for overall effect: Z = 2.44 (P = 0.01)



↘ 66% du risque d' apnée postop

Nbre de sujets à traités = 5.7

Sécurité ... Respiratoire ?

ADARPEF

Study or Subgroup
El-Gohary 2004
Somri 1998
Welborn 1990
Williams 2001
Krane 1995

Prévention/réduction des apnées post opératoires

Ex prématuré

Né à terme ???

Définition
→ Apnées ?
→ Désaturation ?



Co-morbidité(s)

Modalités de surveillance

Inguinal hernia repair in PRETERM NEONATES: … spinal or general anaesthesia … regarding intraoperative and postoperative complications? A systematic review and meta-analysis

2019

Name, publication year	Type	Study design	n
Welborn *et al*, 1990[33]	SA	RCT	11
	GA		16
Krane *et al*, 1995 [32]	SA	RCT	9
	GA		9
Somri *et al*, 1998 [19]	SA	RCT	20
	GA		20
Kim *et al*, 2003[30]	SA	RCS	15
	GA		14
Lambertz *et al*, 2014 [31]	SA	RCS	69
	GA		31
Davidson *et al*, 2015[17]	SA	RCT	102
	GA		196

K.Dohms et al. BMJ 2019

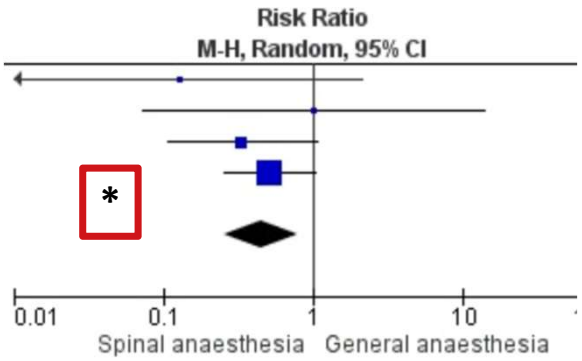
Inguinal hernia repair in PRETERM NEONATES: … spinal or general anaesthesia … regarding intraoperative and postoperative complications?

A systematic review and meta-analysis

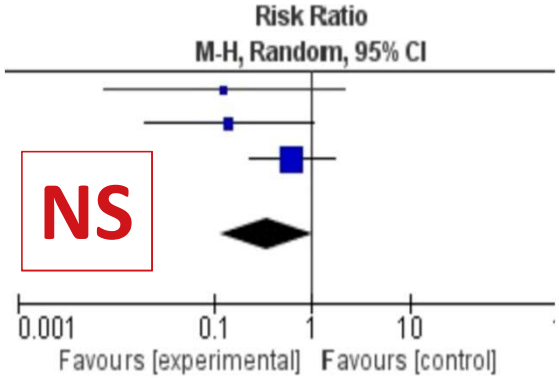
ADARPEF

2019

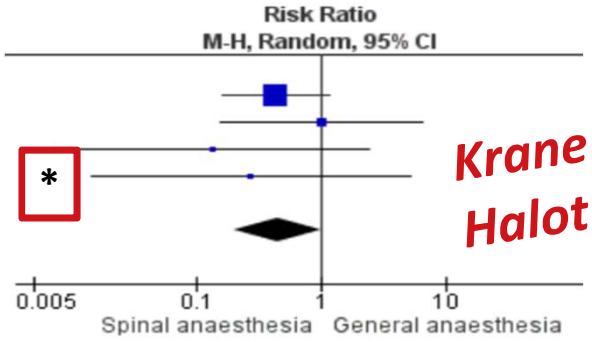
Apnée post op



Apnée tardive

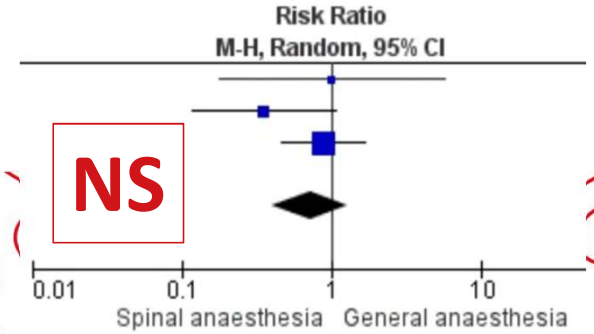


Bradycardie

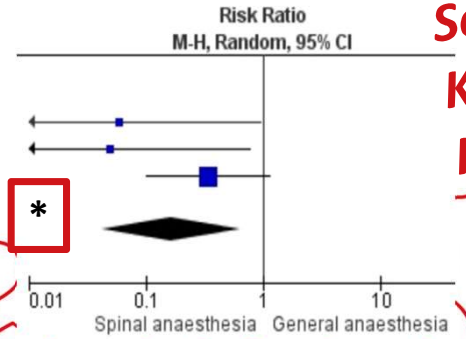


Krane et al. 1995
Halothane

O2 post op



VM post op



Somri et al, 1998
Kim et al, 2003
Halothane / Enflurane

K.Dohms et al. BMJ 2019

The General Anesthesia Compared to Spinal Anesthesia Study—Comparing Apnea and Neurodevelopmental Outcomes, a Randomized Controlled Trial

ANESTHESIOLOGY
Trusted Evidence: Discovery to Practice®

Apnea after Awake Regional and General Anesthesia in Infants

Andrew J. Davidson, M.D.,

2015

ADARPEF

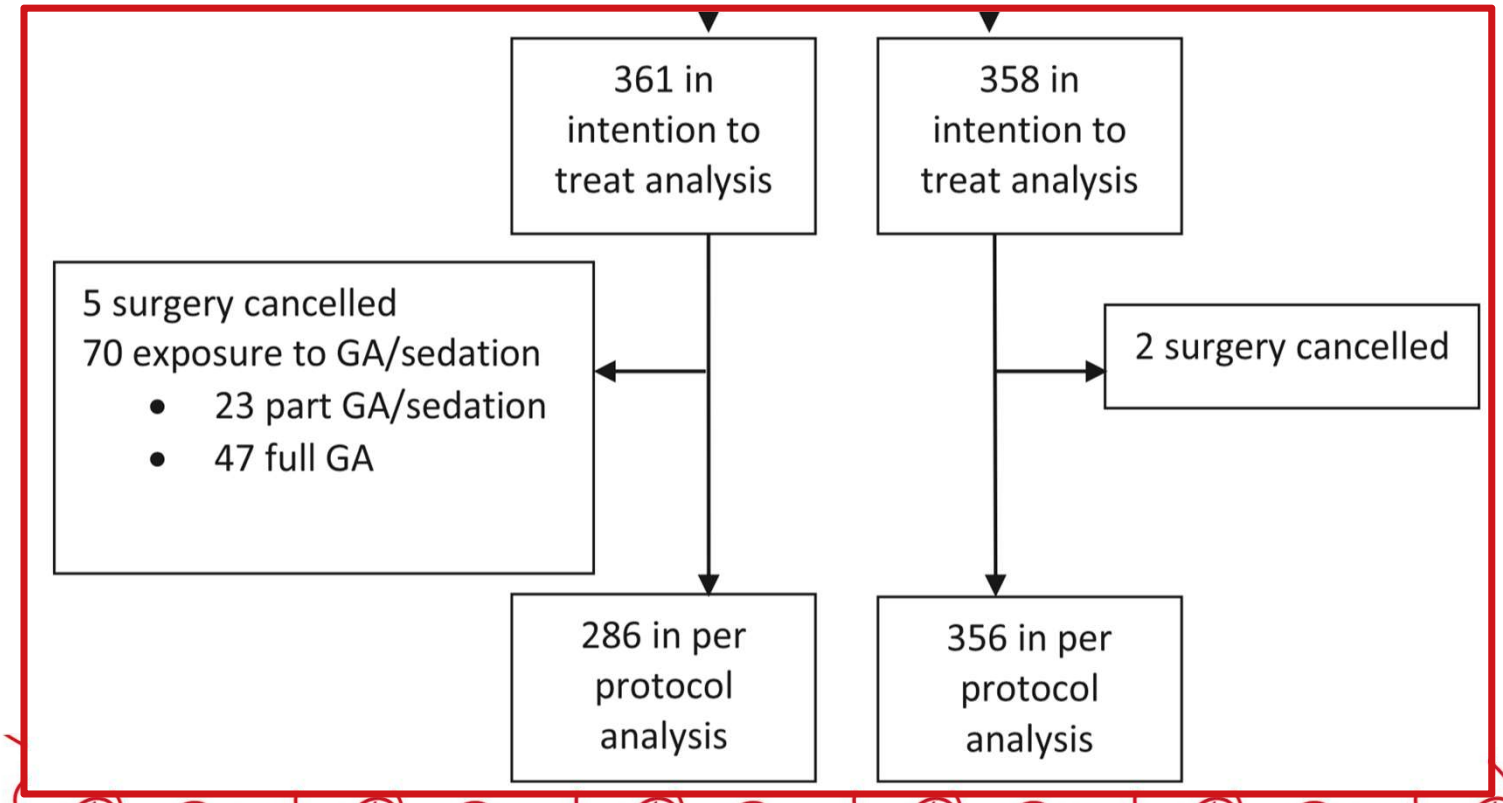
RCT International

- NN < 60 SA
- Chirurgie Inguinale
- **ALR vs AG**



Opioïd Free





The General Anesthesia Compared to Spinal Anesthesia Study—Comparing Apnea and Neurodevelopmental Outcomes, a Randomized Controlled Trial

ANESTHESIOLOGY
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Apnea after Awake Regional and General Anesthesia in Infants

Andrew J. Davidson, M.D.,

2015

ADARPEF

- **50% d'anciens prématurés**
- **> 1 épisode d' apnée en post op = 3% (ITT)**

  ALR → 6 ds le bras ALR seule

  → 4 ds le bras ALR avec conversion AG

  AG →15 ds le bras AG

  AG vs ALR = NS

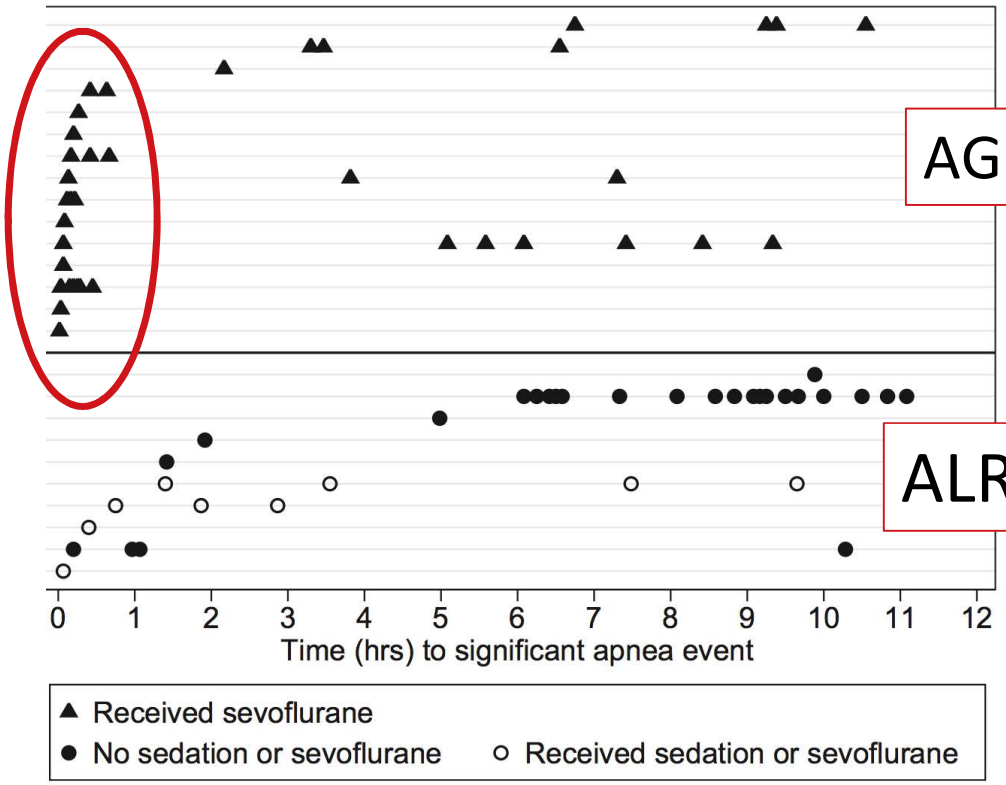
- **Facteur de risque majeur = Prématurité**

ANCIENS PRÉMAS = 6% vs A TERME = 0,3%

2015

The General Anesthesia Compared to Spinal Anesthesia Study—Comparing Apnea and Neurodevelopmental Outcomes, a Randomized Controlled Trial

ADARPEF



Aucune évidence en faveur de l'ALR sur l'incidence des apnées

OR, 0.63; 95% CI [0.31 to 1.30]

p = 0.2133 by ITT

MOINS d'apnées précoces

OR, 0.20; 95% CI [0.05 to 0.91]

p = 0.0367 by ITT

MOINS d'actions thérapeutiques

OR, 0.09; 95% CI [0.01 to 0.64] p = 0.0164

L'ALR réduit la profondeur des désaturations post op



The General Anesthesia Compared to Spinal Anesthesia Study—Comparing Apnea and Neurodevelopmental Outcomes, a Randomized Controlled Trial

ANESTHESIOLOGY
Trusted Evidence: Discovery to Practice®

Apnea after Awake Regional and General Anesthesia in Infants

Andrew J. Davidson, M.D.,

2015

ADARPEF







« Absence de standardisation du niveau de surveillance et du système de monitorage»

Monitorage continu/observation/alarme sur moniteur d'impédence

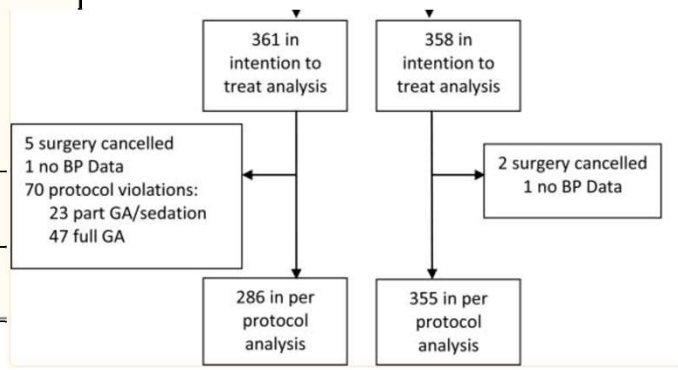
☞ **SOUS ÉSTIMATION INCIDENCE DES APNÉES ???**

Sécurité … Hémodynamique

Differences in Blood Pressure in Infants after General Anesthesia compared to Awake Regional Anesthesia (GAS Study-a prospective randomized trial)

2017

Outcome by frequency and by time period	GA (355)	RA (354)	As per Protocol-RA (286)	RA to Supplemental GA/Sedation (23)	RA to Full GA (37)
Any Epoch < 35 mm Hg	49% (175)	16%(56)	9% (27)	22% (5)	51% (19)
Any Epoch < 45 mm Hg	87% (309)	41%(145)	34% (98)	52% (12)	76% (28)



ITT population RR = 2.1, 95% CI:1.8 – 2.4

APP population RR = 2.5, 95% CI:2.1 – 3.0

RR Intervention for hTA
2.8 (95% CI:1.7 –4.4)

M.E. McCann et al. Anesth. Analg.

Sécurité … Hémodynamique

Differences in Intraoperative Hemodynamics Between Spinal and General Anesthesia in Infants Undergoing Pyloromyotomy

2017

	Spinal Anesthesia (n=51) % Change ± SD	General Anesthesia (n=52) % Change ± SD	Difference SA – GA (95% CI)
Baseline SBP versus			
Mean intraoperative SBP	−8.2 ± 16.8	−24.2 ± 17.2	16.2 (9.5 – 22.9)
Baseline MAP versus			
Mean intraoperative MAP	−16.3 ± 19.9	−24.6 ± 19.3	8.4 (0.8 – 16)

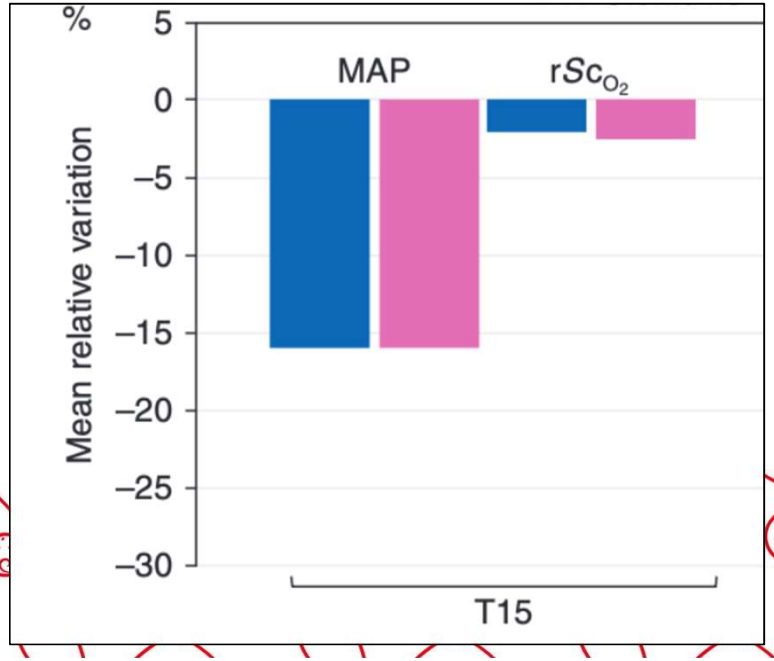
Ing et al. Pediatric Anesth.

Sécurité ... Hémodynamique ?

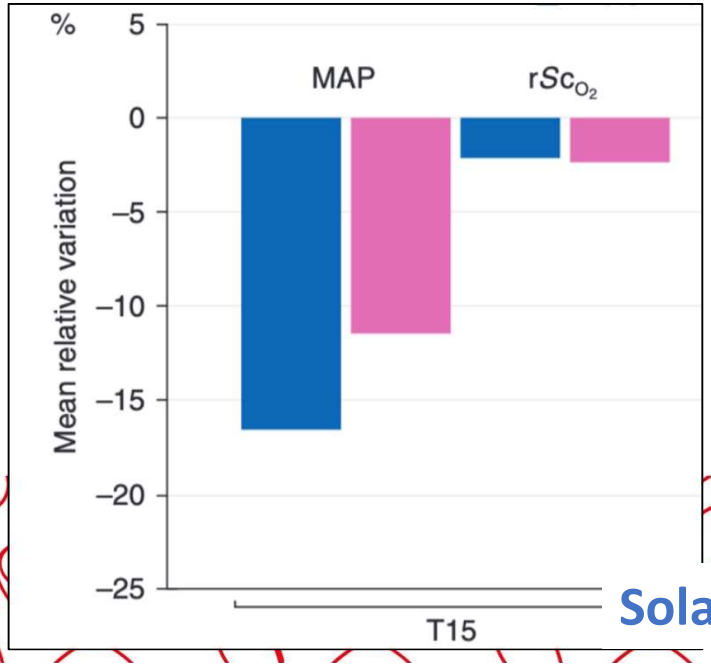
Spinal anaesthesia in neonates and infants: what about the cerebral oxygen saturation?

2017

IT Clonidine No Clonidine



Preterm birth Term birth



Sola et al. BJA

Sécurité ... Complications

Author, year	N	Complications (number)
Ecoffey C,[9] 2010	387	High spinal (1)
Kachko,[14] 2007	505	Failure (24), bradycardia (9), high spinal (3), apnea (4)
Williams,[10] 2006	1554	Failure (18), bradycardia (24), desaturation (10)
Imbelloni,[3] 2006	307	Failure (6), bradycardia (2), hypotension (1), PDPH (3), bronchospasm (1)
Kokki,[5] 2005	303	Failure (12), Bradycardia (2), Hypotension (1), Desaturation (3), PDPH (13), TNS (6)
Puncuh,[12] 2004	1132	Failure (23), hypotension (17), desaturation (7), airway obstruction (27), PDPH (7), backache (9)
Kokki,[1] 2000	195	PDPH (9)
Abajian[6] 1984	78	Failure (8), no complications
Berkowitz,[4] 1953	350	No neurological sequelae/ PDPH,
Gray,[3] 1909	100	Retching (6), vomiting (21)

2014

ÉCHEC +++

Complications sévères exceptionnelles

Evènements significatifs souvent mineurs

Aucune séquelle neurologique définitive

Gupta, A., Saha, U. (2014). Spinal anesthesia in children: A review.

Succès / Echec ...

Auteur	Nombre de Rachi	Échec	Reflux sg	Conversion AG	Sédation
PUNCUH (2004)	1132 1 We-14yr				
WILLIAMS (2006)	1554 540- 7800 g				
KACHKO (2007)	505 Infants				
FRAWLEY (2015)	222 Infants < 60 APC				

Succès / Echec ...

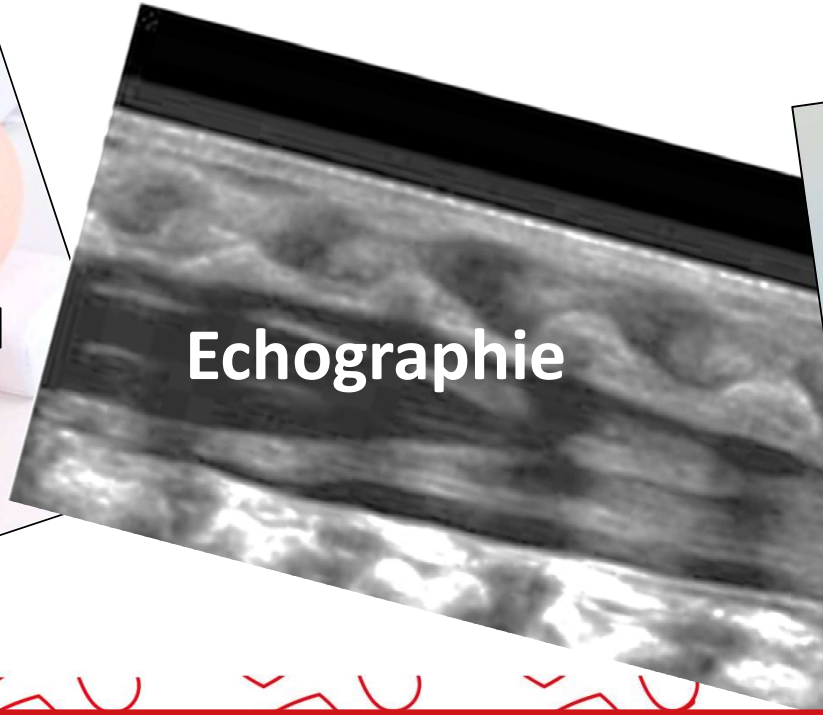
Auteur	Nombre de Rachi	Échec	Reflux sg	Conversion AG	Sédation
PUNCUH (2004)	1132 1 We-14yr	2%	?	?	2.4%
WILLIAMS (2006)	1554 540- 7800 g	Novi		1.2 %	24 %
KACHKO (2007)	505 Infants	30% à la 1ière tentative	12,4%	1.04 %	28 %
FRAWLEY (2015)	222 Infants < 60 APC	13.1 %	30 %	5,9 %	7,2 %

2 à 20 %

Succès / Echec ...

- **Données très disparates ++++**







Simulation, Echographie, Adjuvant ...

Echographie …

The use of ultrasound guidance for perioperative neuraxial and peripheral nerve blocks in children (Review)

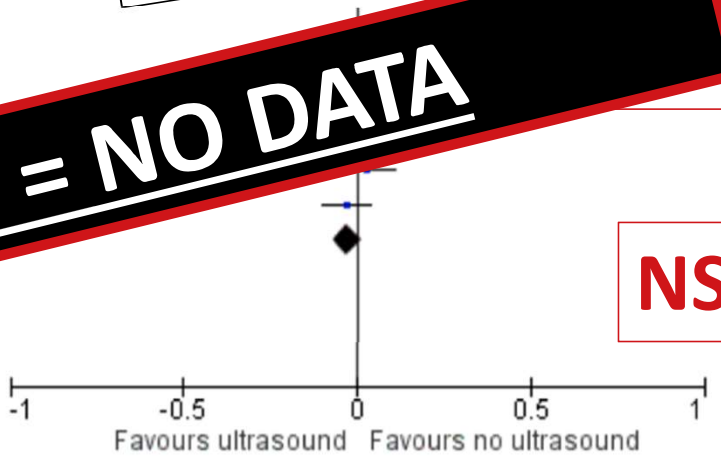
Cochrane Library

2019

Rachianesthésie = NO DATA

…u bloc

1.1.3 Neuraxial block							
Willschke 2006	0	30	2	34	4.9%	-0.06 [-0.15, 0.04]	2006
Liu 2012	0	52	4	50	5.0%	-0.08 [-0.16, 0.00]	2012
Tachibana 2012	0	10	0	10	4.4%	0.00 [-0.17, 0.17]	
Wang 2013	5	70	3	70	5.0%		
Ahiskalioglu 2018	2	68	4	66			
Subtotal (95% CI)		**230**					
Total events	7						
Heterogeneity: Tau² = 0.00							
Test for overall ef							



NS

Guay J, Suresh S, Kopp S

Echographie …

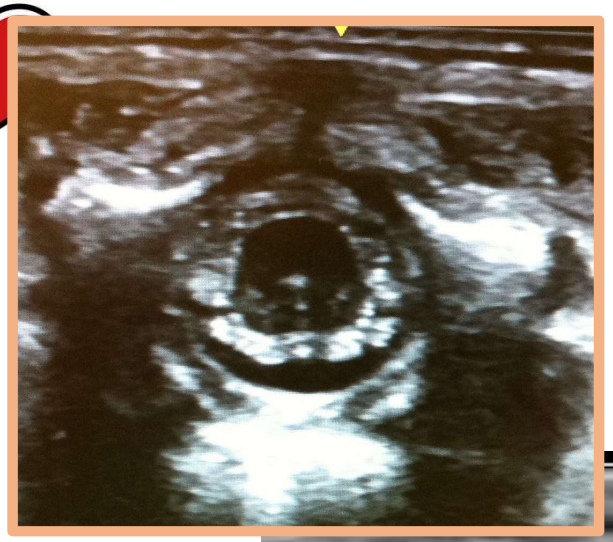
Ultrasound-guided spinal anesthesia in infants: a narrative review *P. Baskin et al.*

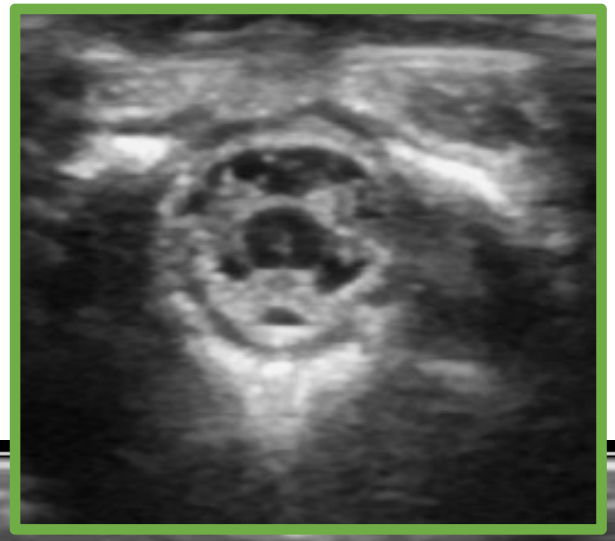
2023

Regional Anesthesia & Pain Medicine

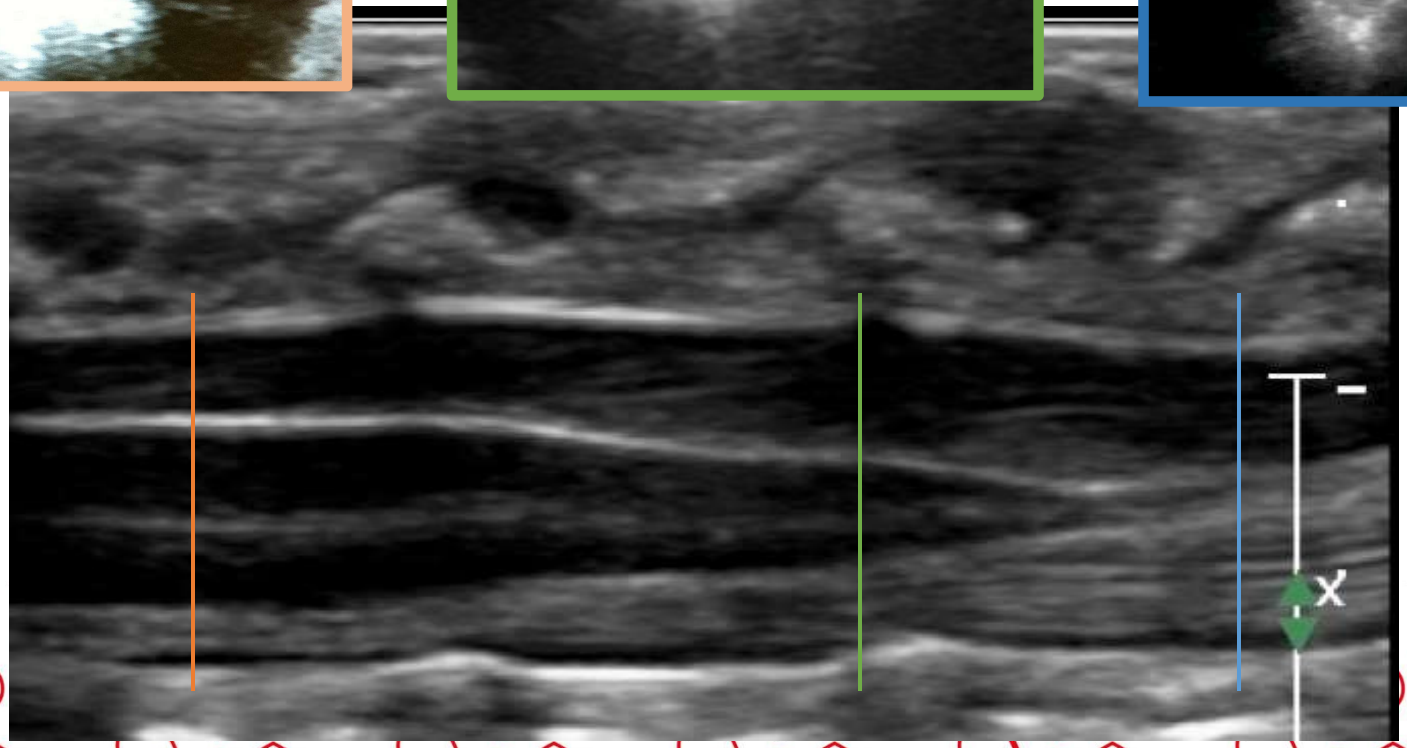
Table 1 Articles spinal anesthesia i

Article type	Auth	
Case report	Kelleh	Prospective Cohort — US improves provider confidence. Success rate not evaluated.
Retrospective study	Cristia	RCT (preliminary findings only) — US does not improve success
Review	Tsui *e*	RCT — US improves success
Review	[redacted]	RCT — US improves success
Review	Irmiz	RCT — US does not improve success
Review	Guay	Review — US does not improve success
		RCT — US does not improve success
		Prospective cohort — US does not improve success

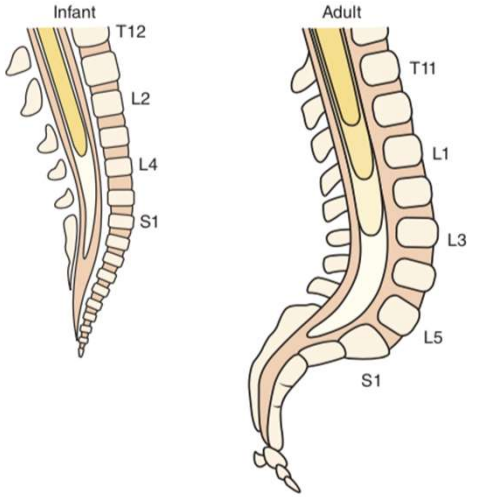


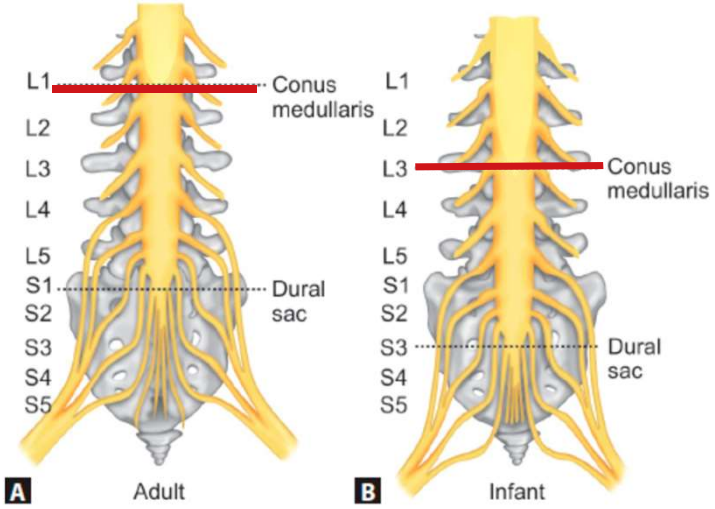


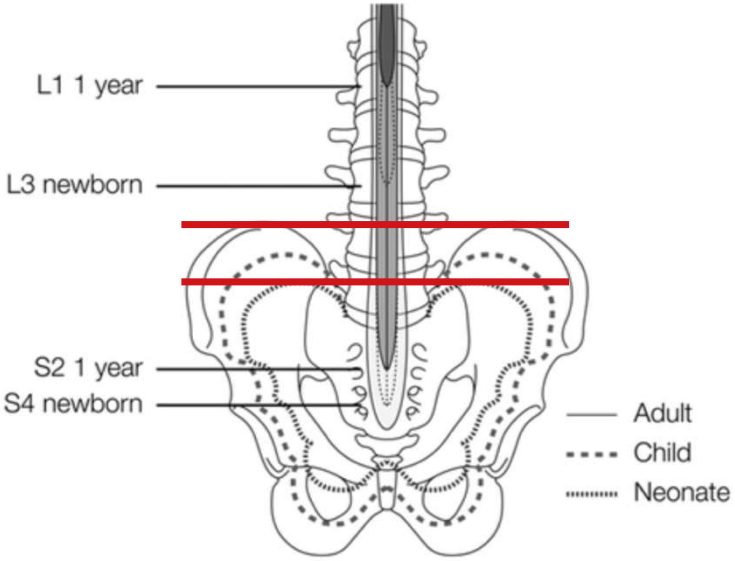



X

Particularités anatomiques …

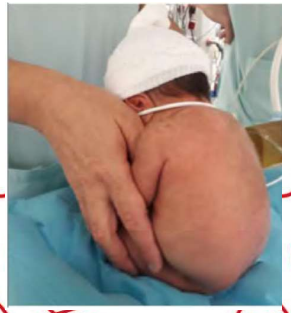






⚠ Position ⚠

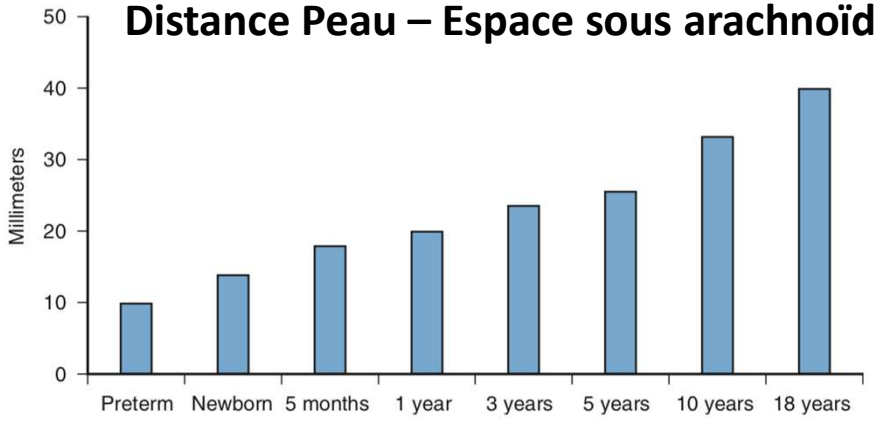




Particularités anatomiques …

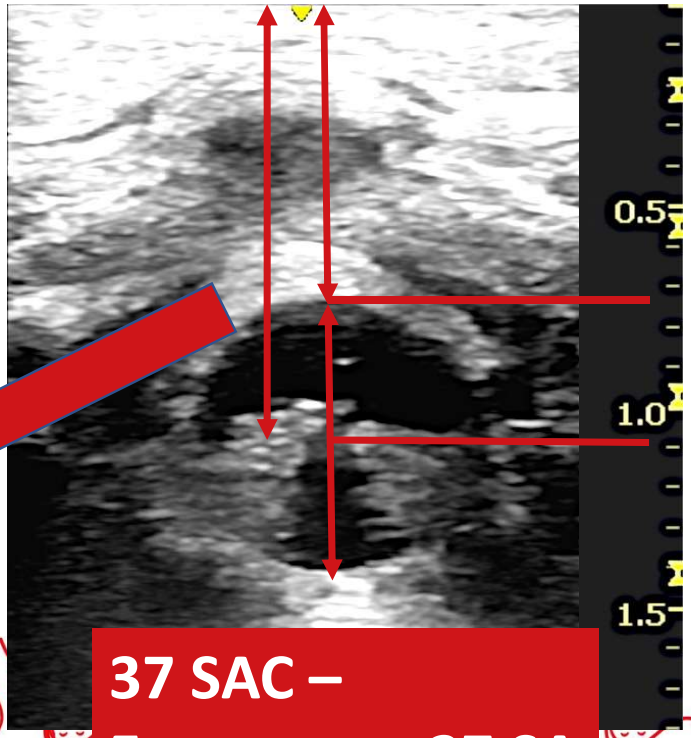
Coté and Lerman's
A Practice of Anesthesia for Infants and Children

Distance Peau – Espace sous arachnoïdien



? ?

Weight-based determination of spinal canal depth
for paediatric lumbar punctures

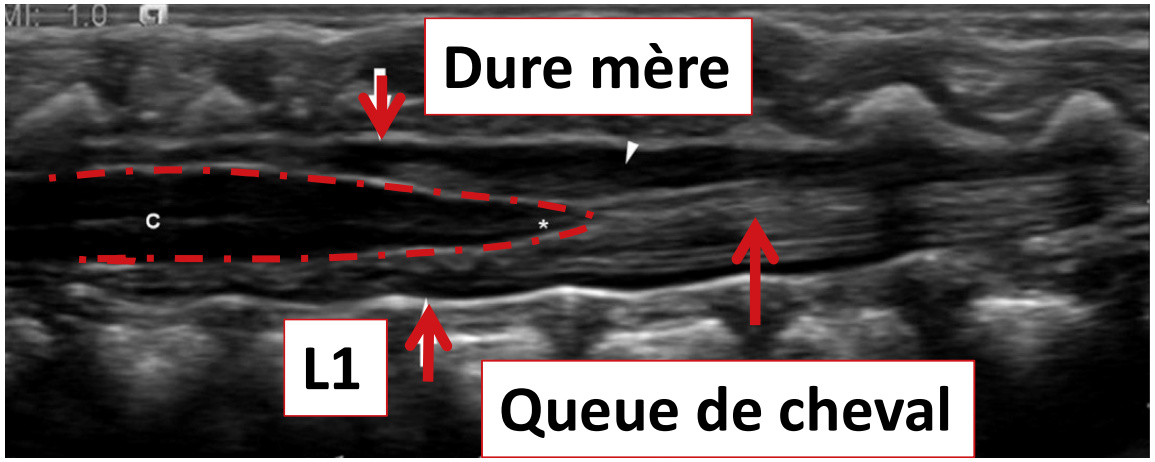


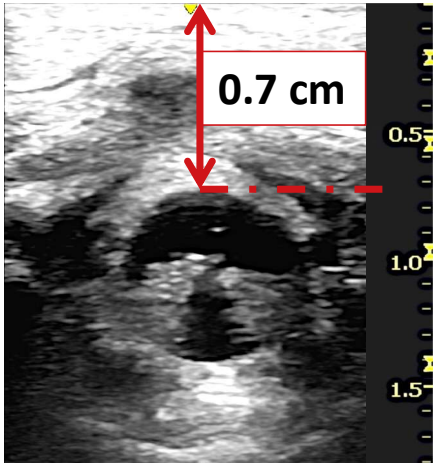
37 SAC –
Ex-preterm 27 SA

distance peau-milieu de l'espace rachidien

Nouveau-né: (2 x kg) + 7mm = distance en mm

1-18 ans: (0.4 x kg) + 20mm = distance en mm





ADARPEF

Echo-repérage pré-procédure

- **Distance Peau - Espace Sous Dural**

- Identification facile

cône médullaire, queue de cheval, cul-de-sac dural

- **Suspicion d'anomalie**

Dysraphisme occulte …

Fossette sacrée…

… Simple :
Unique
pas d'autre signe cutané
Fond visible
< 5 mm de diamètre
< 2,5 cm de l'anus

… Atypique :
Multiples,
autres signes cutanés
≥ 5 mm de diamètre
≥ 2,5 cm de l'anus





Signes d'alerte pour un DSF [5]	Risque d'association avec DSF
Fossette sacrée simple	Bas
Tache lie de vin	Bas
Hyperpigmentation	Bas
Fossette sacrée atypique	Moyen
Touffe de poils	Moyen
Hémangiome	Moyen à élevé selon les séries
Appendice cutané	Elevé
Masse sous-cutanée	Elevé
Aplasia cutis	Elevé
Cicatrice congénitale	Elevé
Sinus dermique	Elevé
≥ 2 lésions cutanées	Elevé

Dysraphisme occulte …

Spinal dysraphism: categorizing risk to optimize imaging

Table 2 Risk groups for occult spinal dysraphism.

Variable	Malfo ano-rectales	Baseline risk
Low risk group		
Offsprings of diabetic mothers		0.3%
Intergluteal dimples		0.34%
Lumbosacral dimple		3.8%
Intermediate risk groups		
Low anorectal malformation		27%
Intermediate anorectal malformation		33%
Complex skin stigmata [a]		36%
High risk group		
High anorectal malformation		44%
Cloacal malformation		46%
Cloacal exstrophy		100%

Medina - Pediatr. Radiol.(2009)

Ultrasonography reveals a high prevalence of lower spinal dysraphism in children with urogenital anomalies

Malfo Uro-génitales

7,5 % d'écho Anormales

Types of urogenital anomaly in children by normal and abnormal ultrasound findings.

Anomaly	Normal ($n = 241$)	Abnormal ($n = 18$)
Uretero-renal		
Vesicoureteric reflux	57	2
Uretero-pelvic obstruction	39	2
Duplication	6	3
Ureterocele	1	–
Genital		
Hypospadias	92	6
Cryptorchidism	84	7
Hernia/hydrocele	33	4
Chordee	8	1
Tumour	2	–
Gliding testis	–	2
Transposition	–	2

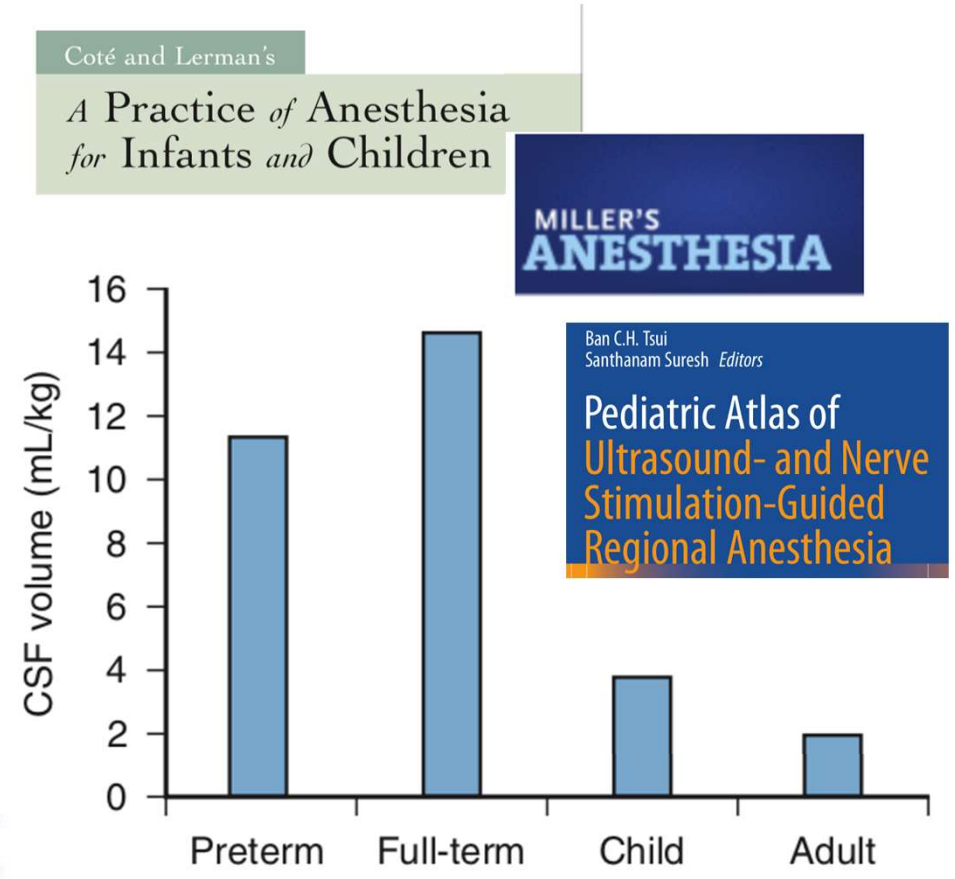
Koo et al. Acta Anaesthesiol Scand2012;

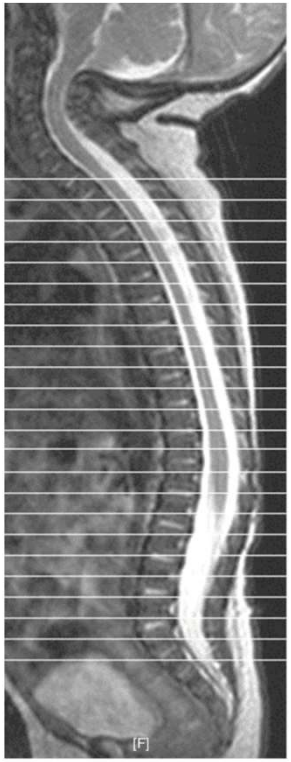
Particularités Pharmaco … ??

Dose ?? **Durée ??**

Volume LCR chez le nourrisson … ??

Particularités Pharmaco …





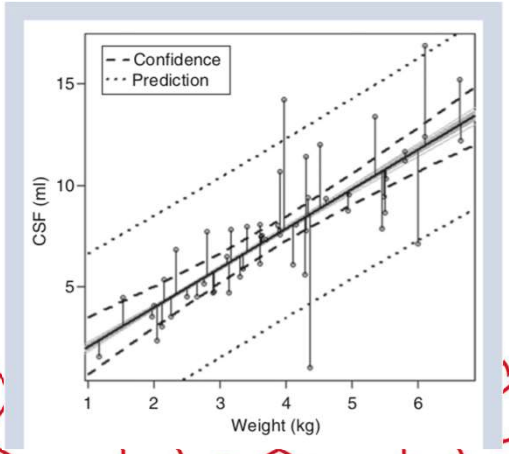
Cerebrospinal fluid volume in neonates undergoing spinal anaesthesia: a descriptive magnetic resonance imaging study 2016

A. Rochette[1,*], M.-P. Malenfant Rancourt[2], C. Sola[1], O. Prodhomme[3], M. Saguintaah[3], R. Schaub[4], N. Molinari[4], X. Capdevila[1] and C. Dadure[1]

CSF = Fonction linéaire du poids

~2 ml kg^{-1},

Indépendamment de la prématurité ou non



Particularités Pharmaco … ??

Répartition LCR Spinal vs Cranial

Dose ??

Durée ??

60 min sans adjuvant

Proteinorachie

Anesthésique local	Posologies usuelles
Bupivacaïne 0,5 % isobare ou hyperbare	< 5 kg : 1 mg/kg (0,2 mL/kg) 5 à 15 kg : 0,4 mg/kg (0,08 mL/kg) > 15 kg : 0,3 mg/kg (0,06 mL/kg)

Adjuvant	Posologies habituelles
Clonidine	1 µg/kg
Morphine	2 à 5 µg/kg

2018

The European Society of Regional Anaesthesia and Pain Therapy/American Society of Regional Anesthesia and Pain Medicine Recommendations on Local Anesthetics and Adjuvants Dosage in Pediatric Regional Anesthesia

Regional Anesthesia & Pain Medicine

Myelinisation

Vascularisation

Clearance LCR

Sécurité Adjuvant… ??

Neuraxial Analgesia in Neonates and Infants: A Review of Clinical and Preclinical Strategies for the Development of Safety and Efficacy Data

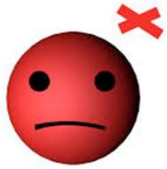
Suellen M. Walker, MBBS, PhD, FANZCA, FFPMANZCA,* and Tony L. Yaksh, PhD†

2012

Définir un ratio thérapeutique chez le NN
Dose toxique
Dose analgésique



Morphine > 300
Clonidine > 300



Ketamine < 1

MDZ, Neostigmine,
Epinephrine, Dexmedetomidine … ???

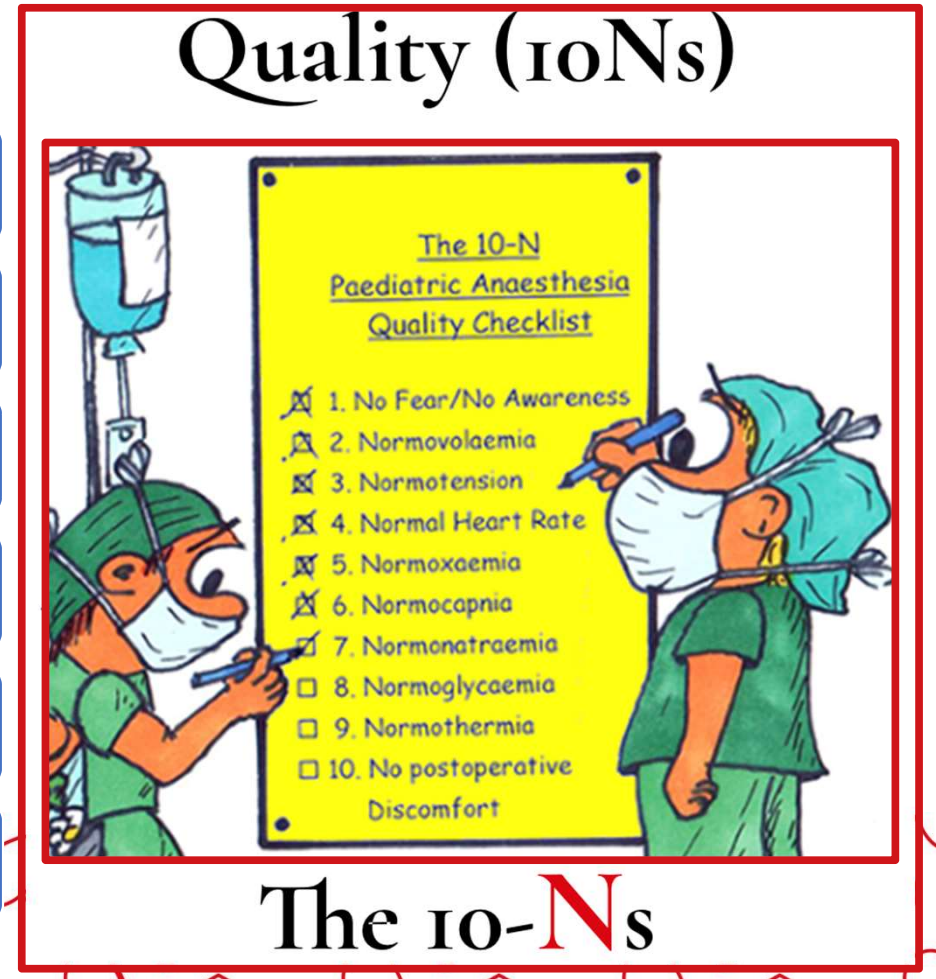


PRIMUM NON NOCERE

Take-Home Messages

Rachianesthésie chez le nourrisson

- Technique simple …. Et Efficace
- Peu de complication
- Absence de contrôle voies aériennes …
- Bonne tolérance hémodynamique
- Epargne agents anesthésiques systémiques
- Epargne morphinique



Rachi et laparoscopie …?

Spinal Anesthesia for Pediatric Laparoscopic Hernia Repair: A Case Report Rebollar et al.

2018

A&A PRACTICE

Laparoscopic Surgery in Infants Under Spinal Anesthesia Block: A Case Report of 3 Cases Franklin Chiao et al.

2019

Subcutaneous Endoscopic-Assisted Ligation of the Internal Ring for Inguinal Hernia Repair in Neonates Under Spinal Anesthesia Derbyshire et al.

Journal of LAPAROENDOSCOPIC & Advanced SURGICAL TECHNIQUES

2022

ALR / Sédation en pédiatrie

ADARPEF

Spinal anesthesia in infants undergoing urologic surgery duration greater than 60 minutes

Jefferson et al.

N=73

2022

Journal of Pediatric urology

Implementation of a spinal anesthesia and sedation protocol that reliably prolongs infant spinal anesthesia: Case series of 102 infants who received spinal anesthesia for urologic surgery

Handlogten et al.

2020

Pediatric Anesthesia

Spinal anesthesia for surgery longer than 60 min in infants: experience from the first 2 years of a spinal anesthesia program

N=35

2018

Anesthesia

Mehdi Trifa[1,2] · Dmitry Tumin[1] · Emmett E. Whitaker[1,3] · Tarun Bhalla[1,3] · Venkata R. Jayanthi[4,5] · Joseph D. Tobias[1,3]

congrès annuel
de l'ADARPEF

Les 24 & 25 mars 2023
Couvent des Jacobins - Rennes

ADARPEF

Merci … !!!

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