Rencontres d'Anesthésie
Sanofi 2019

Hôpitaux de Toulouse

Jeune et échographie gastrique

Louis Delamarre.

RASA

Conflits d'intérêts

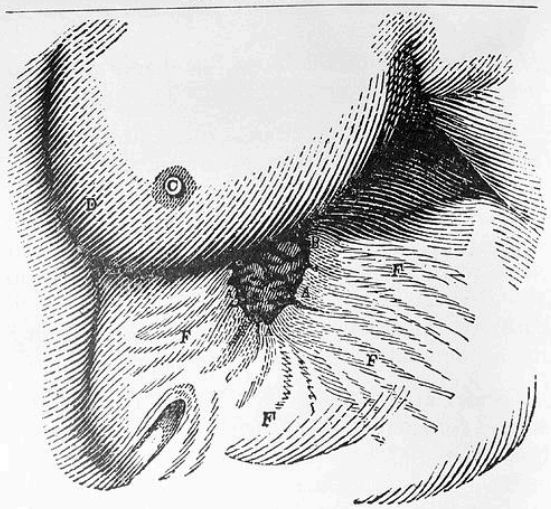
Aucun

D'un tir de mousquet aux règles de jeûne moderne

Recommandations

L'échographie gastrique

Dean Cornewell, 1938



This engraving represents the ordinary appearance of the left breast and side, the aperture filled with the valve; the subject in an erect position.

A A A The circumference and edge of the aperture, within which is seen the valve.

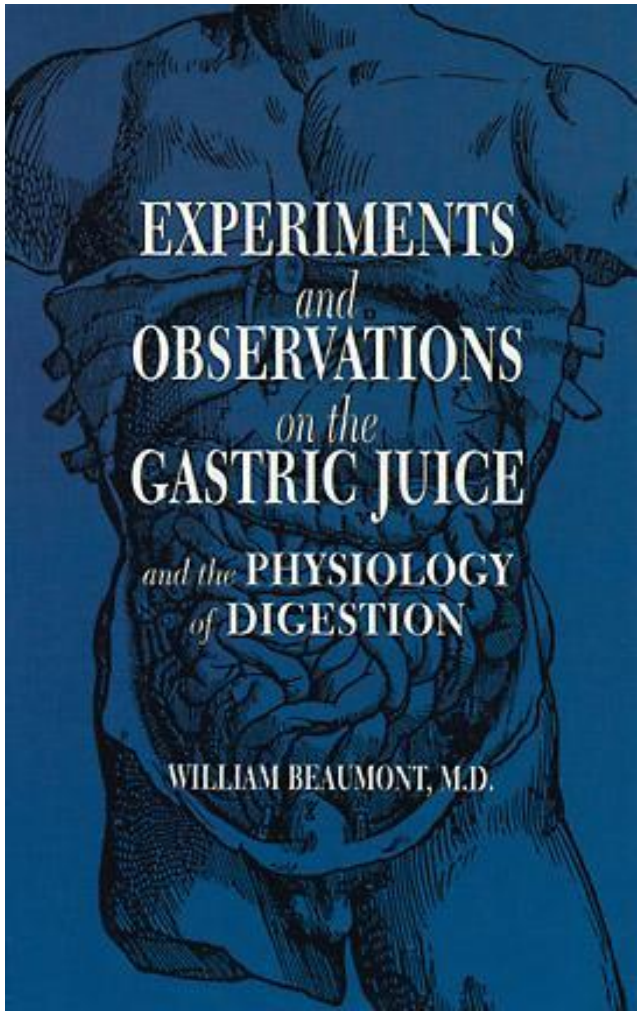
B The attachment of the valvular portion of the stomach to the superior part of the aperture.

C The nipple.

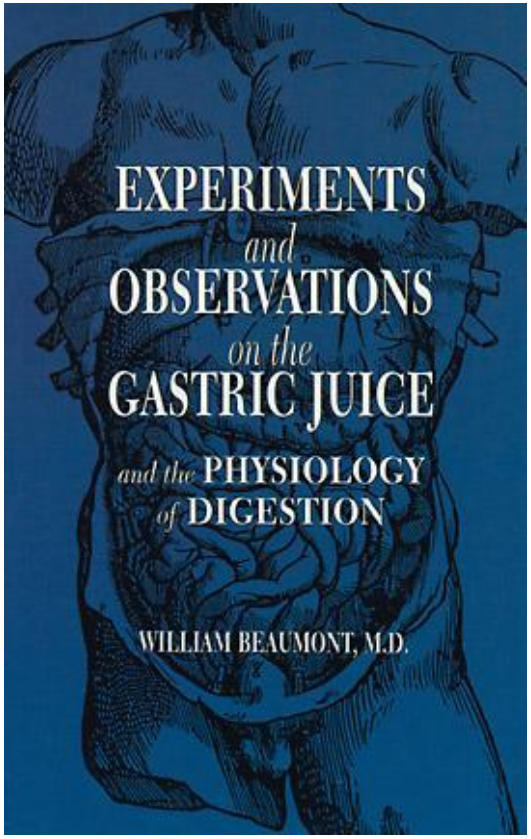
D The anterior portion of the breast.

E The scar where the opening was made with the scalpel, and the cartilages taken out.

F F F F Cicatrice of the original wound, around the aperture.



Beaumont W. 1833



Beaumont W. 1833

Table 2. Beaumont's direct observation of digestion through St Martin's gastric fistula in 1831.

Date	Ingestion time	Stomach contents	View time	Stomach contents	View time	Stomach contents	Time to empty
March 13	13:00	Roast beef, bread potatoes	16:30	Chymification complete	18:00	Gastric juice only, tinged with bile	5.0 hr
March 14	12:00	Milk 500 mL, bread 120 g	12:30	Milk coagulated, bread soft pulp, fluid	14:00	Almost empty	2.0 hr
March 15	08:15	Sausage, light pancakes, coffee 500 mL	09:30	Full of fluid mixed with food	12:00	Gastric juice only	3.75 hr
March 16	08:30	Fresh meat, vegetable hash, bread, coffee 500 mL	10:30	Few food particles, oil and fluid	11:00	Little gastric juice	2.5 hr
March 16	14:00	Lean beef, pork, potatoes, carrots, turnips, bread			17:00	White frothy mucus, no food	3.0 hr
March 18	09:00	Soused tripe, pig's feet, bread, coffee	09:30	All food half digested, reduced to pulp	10:00	Little gastric juice, few fibrous particles	1.0 hr
March 18	13:00	Calf's-foot jelly 250 g	13:20	Few jelly particles floating in fluid	14:00	Little fluid, no jelly	1.0 hr
April 7	08:00	Hard-boiled eggs (3), pancakes, coffee	08:45	About half digested	10:15	Stomach empty	2.25 hr
April 7	11:15	Roasted eggs (2), ripe apples (3)	11:45	Heterogeneous mixture	12:15	Stomach empty	1.0 hr
April 7	14:00	Roast pig, vegetables	15:00	Half chymified	16:30	Very little gastric juice	2.5 hr
April 8	14:00	Wild goose	15:00	Floating oil and shreds of flesh	16:30	Stomach empty	2.5 hr
April 9	15:00	Boiled dried cod, potatoes, parsnips, bread, butter	16:30	Completely chymified	17:00	Stomach empty	2.0 hr

Phase 1 : La sagesse empirique

1847 : Snow – The Unpleasantness of vomiting [1]

1858 : Snow – Book on Chloroform [2]

> *The best time of all for an operation under chloroform is before breakfast [or] about the time when the patient would be ready for another meal.'*

1862 : Balfour – 1er décès par inhalation de solides [3]

1883 : Sir Joseph Lister : *While it is desirable that there should be no solid matter in the stomach when chloroform is administered, it will be found very salutary to give a cup of tea […]about two hours previously* [4]

1911 : Hewitt -> Lait = Solide [5]

Phase 2 : L'inhalation devient LA complication

1946 : Mendelsson décrit sa série de détresses respiratoires sur inhalation. [6]

1947 : Lee : NPO le jour du bloc [7]

1961 Sellick [8]

Phase 3 : La science de l'estomac plein

1974-1990 : Roberts, Shirley, Raidoo : risque vital quand inhalation >25-50mL
= risque prévalent ++++ [9, 10, 11]

1977 - 1983 : Hester & Heath, Miller :
Petit Déjeuner léger < 4h vs. >4h de l'AG : ø différence vol ou pH gastrique [12, 13]

1991 - 2001: Read, Phillips, Harter, Hausel [14, 15, 16, 17] :
Estomac plein > seuil supérieur du contenu gastrique adulte sain (1,5 ml/kg)

Guidelines [22]

Liquides

NaCl 0.9% x 500mL [19]

- demi-vie de vidange gastrique = 12 min
- 90% eliminés en 1 h
- ~ 100% en 2 h

Liquides sans pulpe, sans lait
H -2
H -1 [23]

Lait maternel
H -4

Solides

Selon type et quantité [20, 21]

- Digestibles : évacuation complète en 4h
- Non-digestibles (cellulose) en 6-12h
- Gras : environ 8h

Repas léger ou lait maternisé
H -6
Repas gras/viande/frit
H -8

Prokinétiques

Métoclopramide
Etudes de faible niveau de preuve

Possible chez patient à risque

AntiH2, IPP

Ranitidine, cimétidine
Omé, panto, lanso, rabeprazole
Réduisent volume et augmentent pH

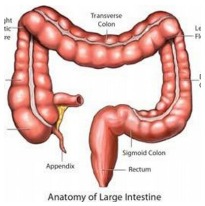
Possible chez patient à risque

	Guidelines [22]
Parturientes hors travail	Idem adulte ISR si Cesa programmée + AG
Parturientes en travail + APD	Fluides + aliments à faible résidu
Obèses	Idem mais ISR
En urgence [24]	Limité à avis d'experts…

Les durées de jeûne en urgence sont INAPPLICABLES

Est-ce un estomac plein ?

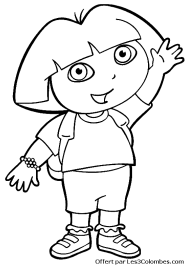
DPA : 2h30



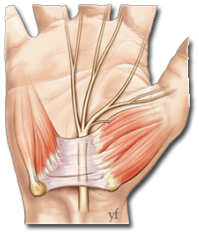
Anatomy of Large Intestine

7h30

Parkinsonien



0h30



Définir l'estomac plein

Roberts & Shirley 1974 : Critical volume = 0.4ml/kg à pH<2.5

Raidoo 1990 : primates. 0.8ml/kg à pH1 -> admis depuis

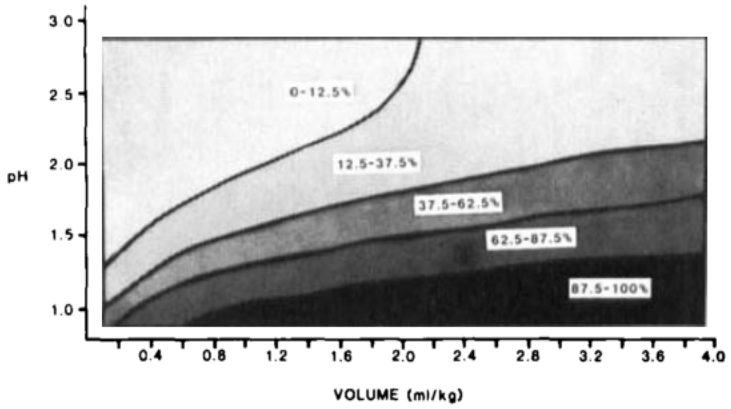


Figure 1. Predicted mortality rates (%) after aspiration. Each shaded area represents the mortality rate interval predicted for a specific pH and volume of solution aspirated.

By James et al. 1984

1991 - 2001: Read, Phillips, Harter, Hausel [14, 15, 16, 17] :

Estomac plein > seuil supérieur du contenu gastrique adulte sain (1,5 ml/kg)

Problème de définition

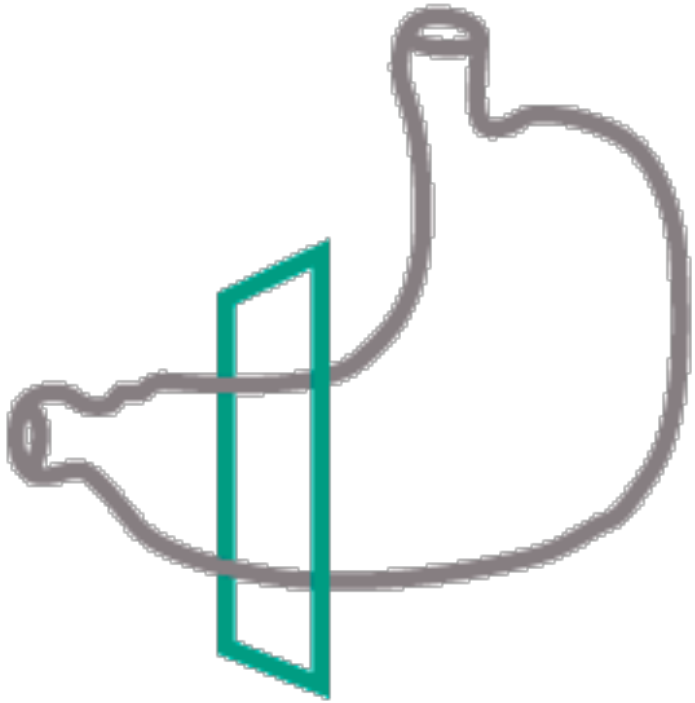
Liquides vs. solides ?

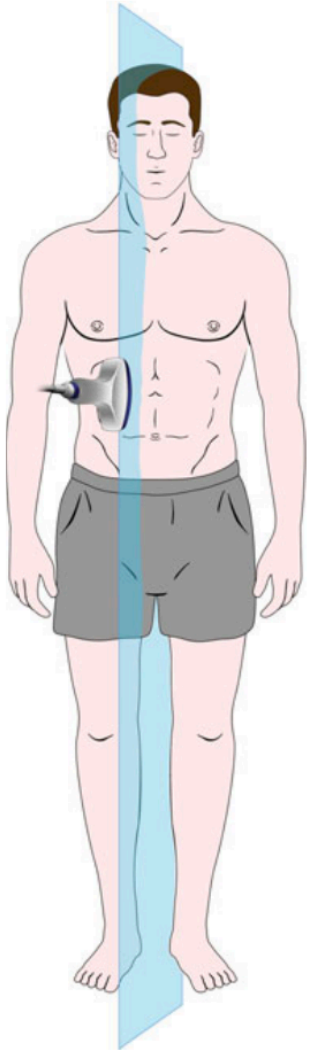
Poids des facteurs de risque ?

Volume gastrique ≠ volume régurgité ≠ volume inhalé ?

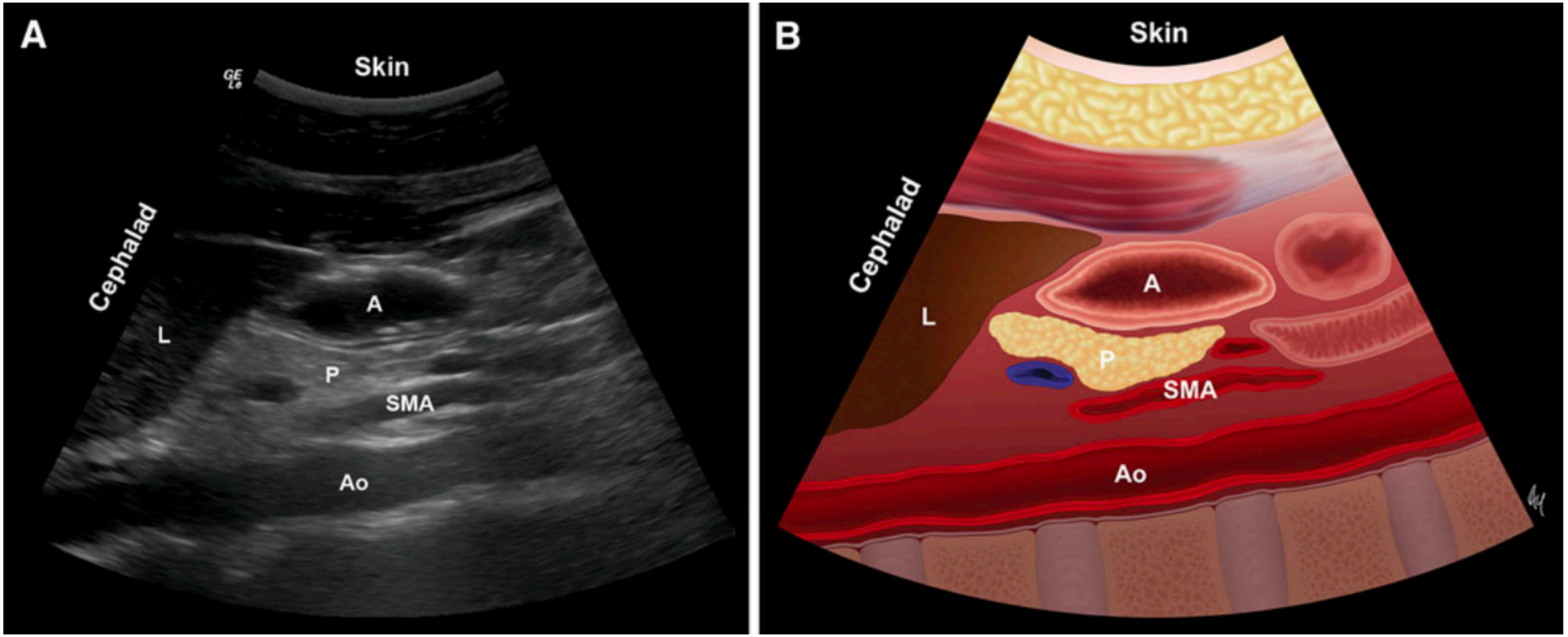
Performance du jugement clinique ?

Echographie Gastrique





Cubillos. Can J Anesth. 2012



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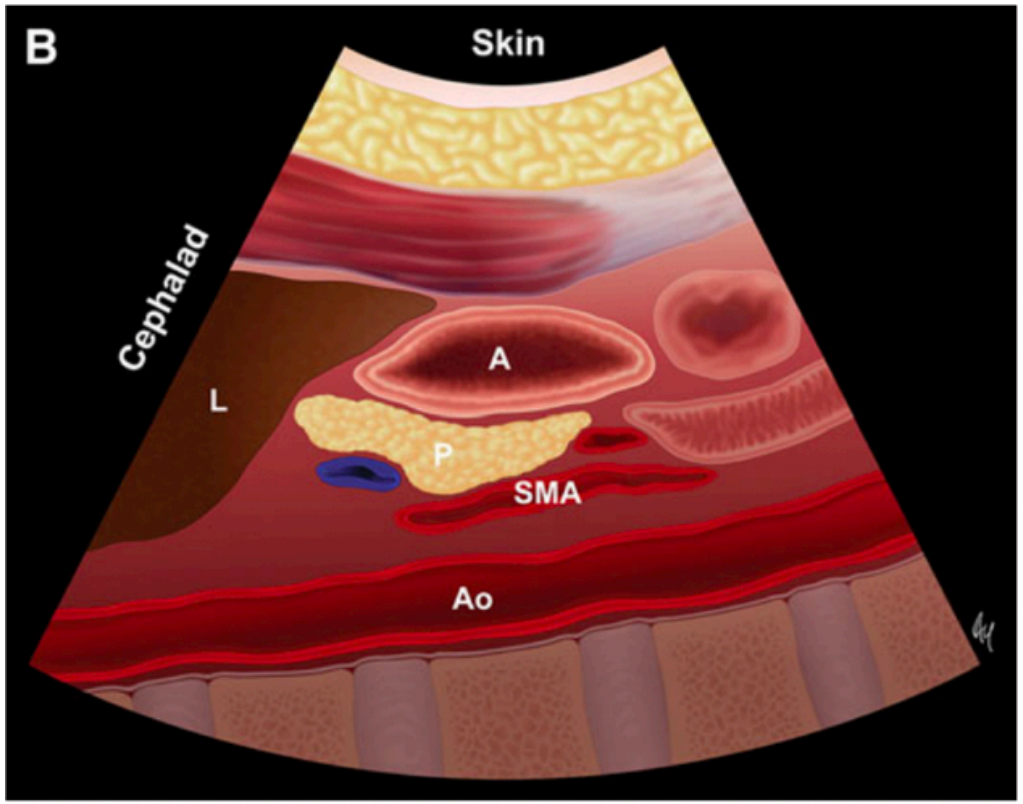
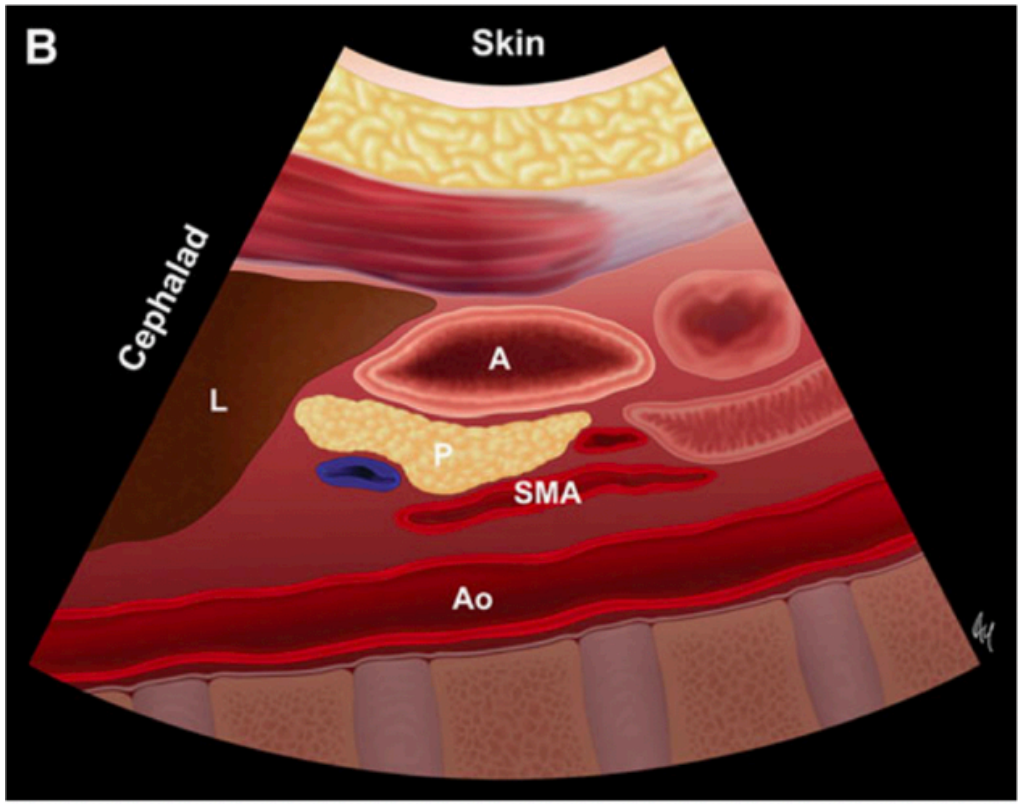


Cubillos. Can J Anesth. 2012
Gastricultrasound.org



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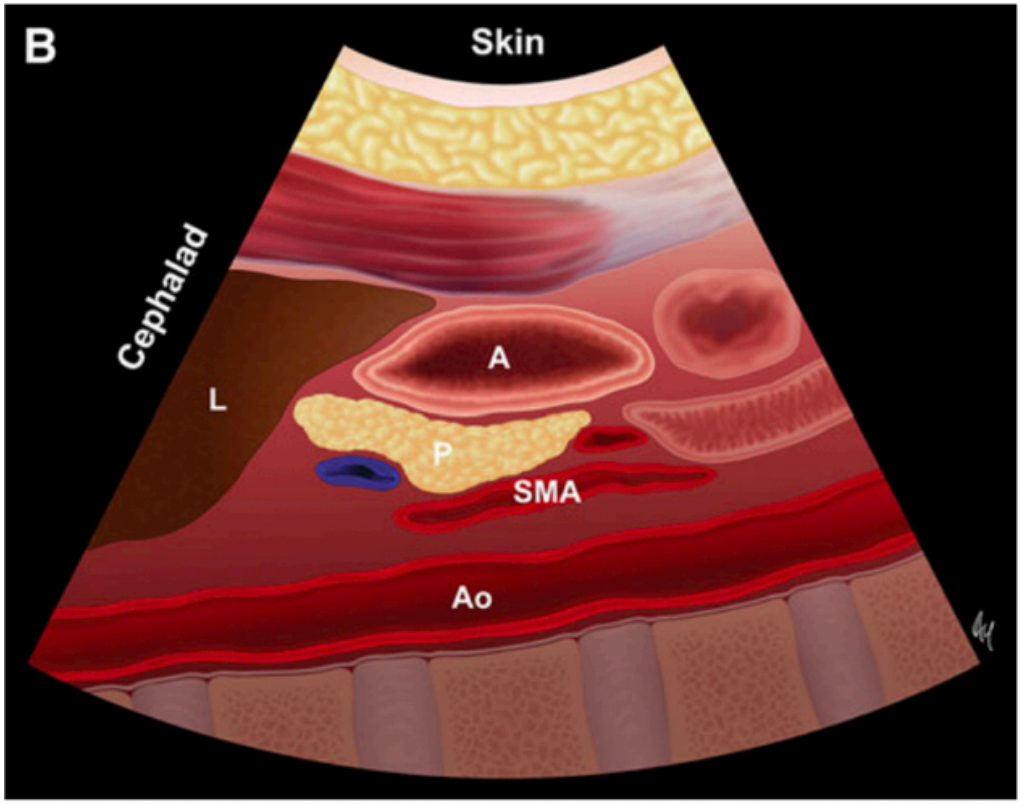

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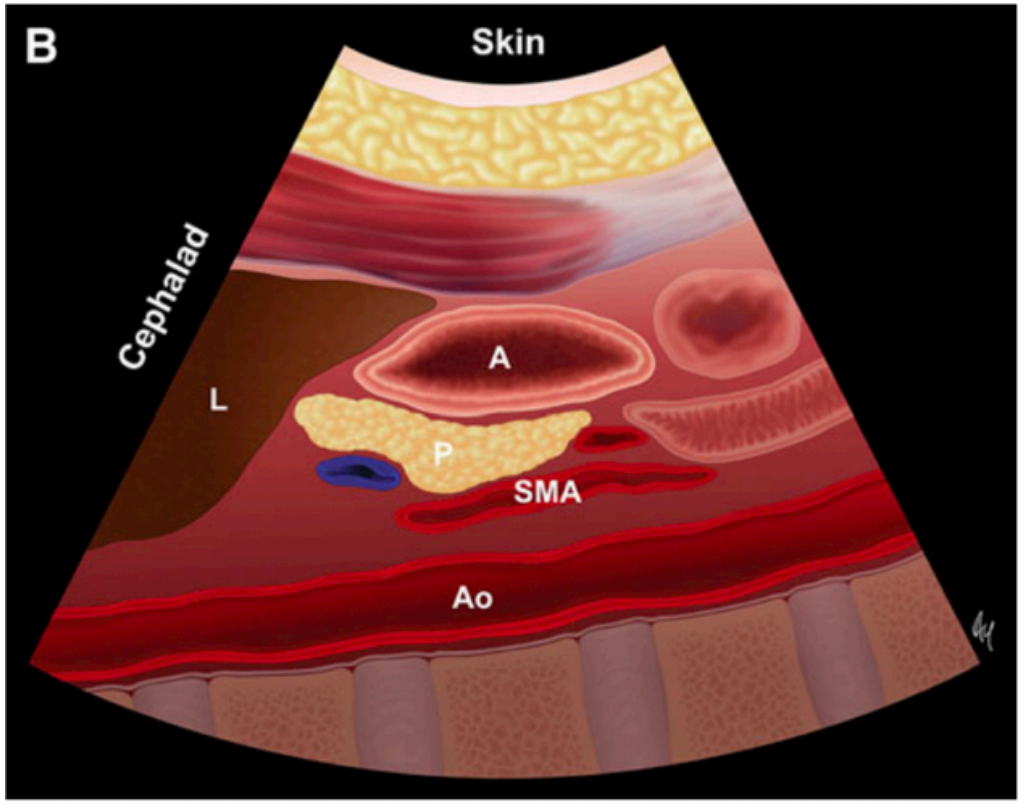


Cubillos. Can J Anesth. 2012
Gastricultrasound.org

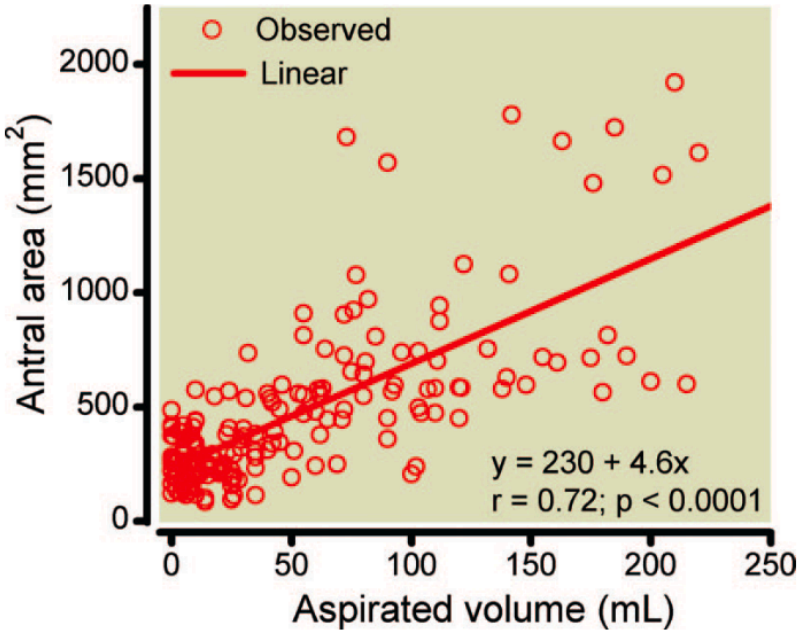
Clinical Assessment of the Ultrasonographic Measurement of Antral Area for Estimating Preoperative Gastric Content and Volume

180 patients (76 urgents)

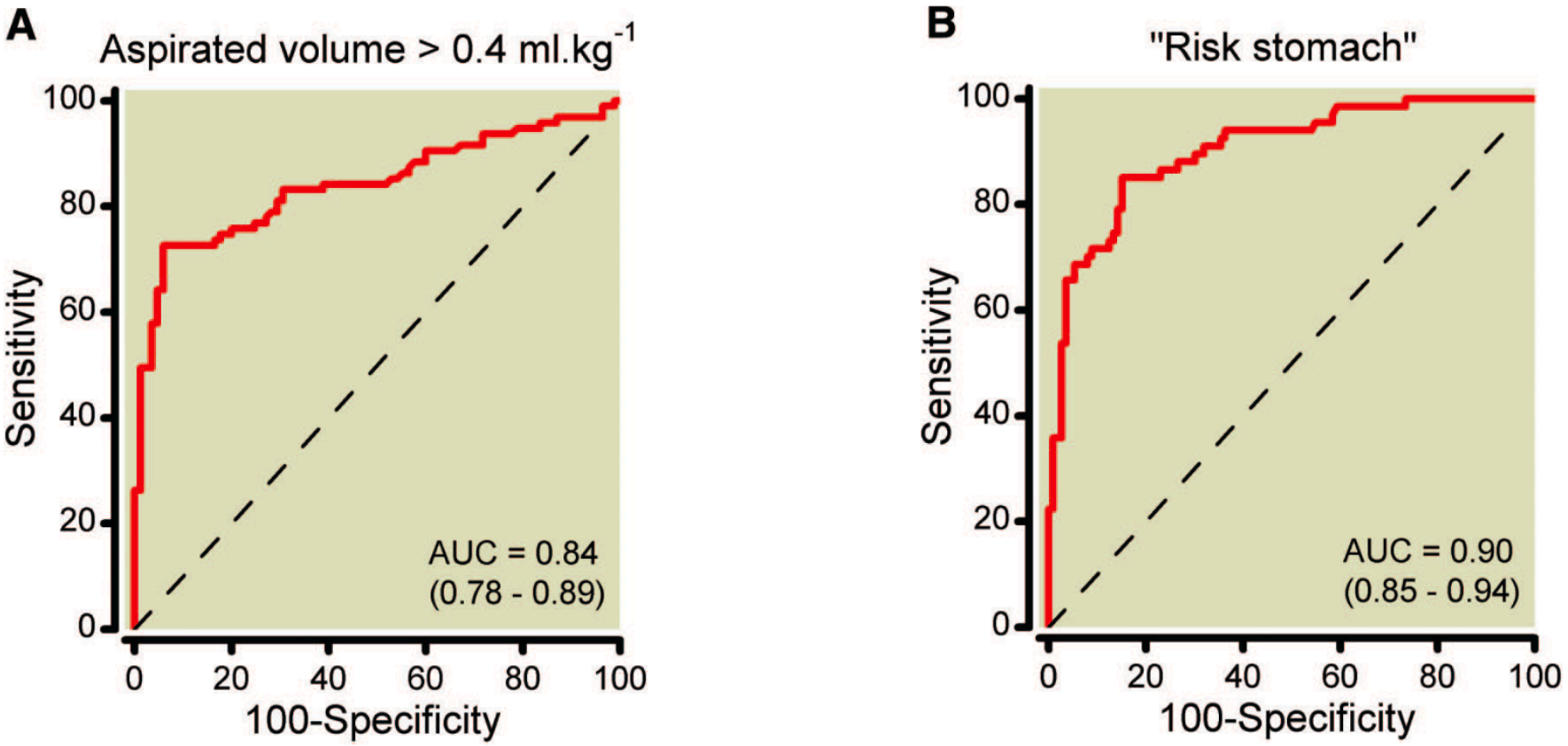
Echo préopératoire

Aspiration gastrique par SNG

Position : Demi-assis



Bouvet. Anesthesiology. 2011



Bouvet. Anesthesiology. 2011

Validation of a Mathematical Model for Ultrasound Assessment of Gastric Volume by Gastroscopic Examination

108 patients – Gastroscopie

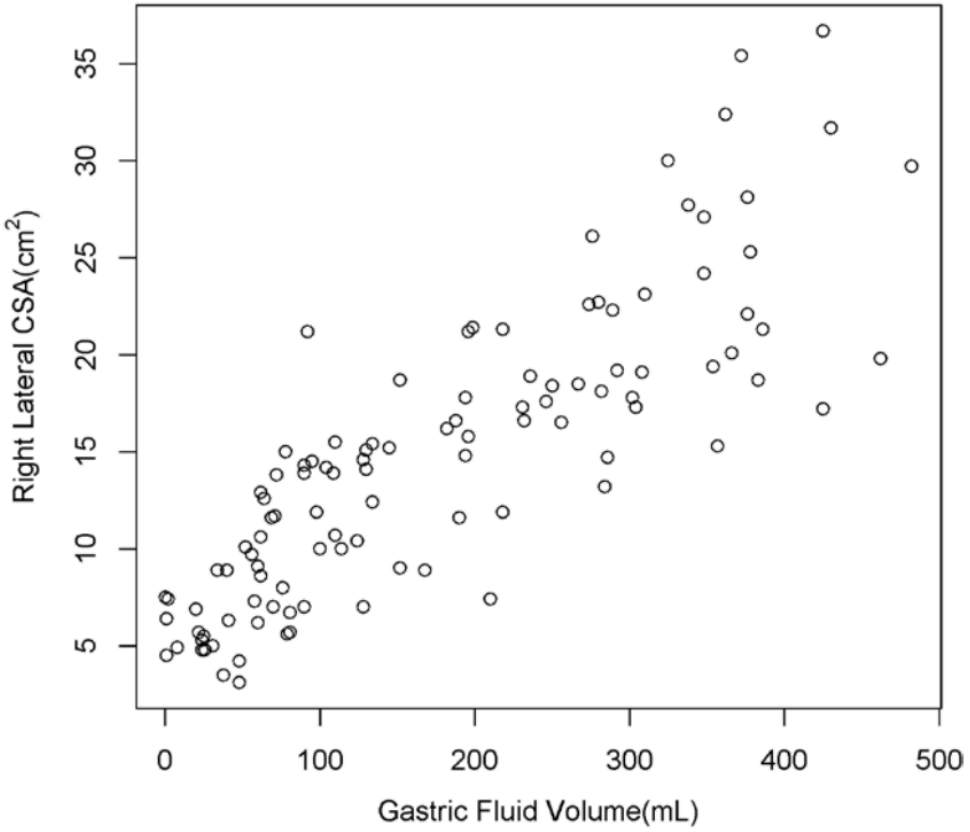
Randomisation - 8 volumes de liquides

Echo préopératoire

Aspiration par gastroscope

Exclusion BMI > 40 $kg.m^{-2}$

Position : Décubitus latéral droit



Perlas. Anesth Analg. 2013

Table 3. Predicted Gastric Volume (mL) Based on Measured Gastric Antral Cross-Sectional Area (CSA) (cm^2), Stratified by Patient Age

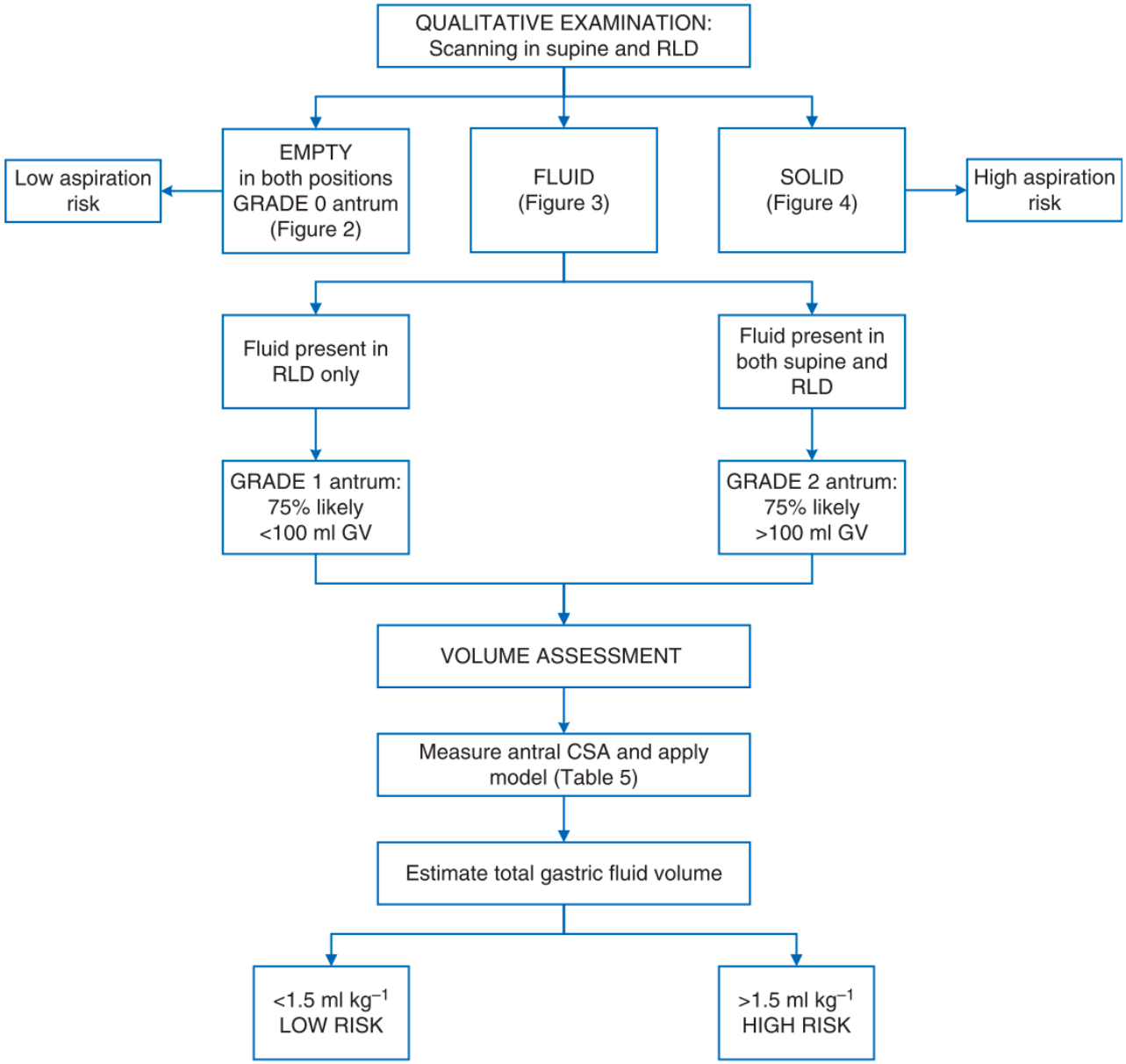
Right lat CSA (cm^2)	Age (years)						
	20	30	40	50	60	70	80
3	45	32	20	7	0	0	0
5	74	62	49	36	23	10	0
7	103	91	78	65	52	40	27
9	133	120	107	94	82	69	56
11	162	149	136	123	111	98	85
13	191	178	165	153	140	127	114
15	220	207	194	182	169	156	143
17	249	236	224	211	198	185	173
19	278	266	253	240	227	214	202
21	307	295	282	269	256	244	231
23	337	324	311	298	285	273	260
25	366	353	340	327	315	302	289
27	395	382	369	357	344	331	318
29	424	411	398	386	373	360	347

Perlas. Anesth Analg. 2013

Table 5 Current models for GV assessment based on antral CSA. CSA, cross-sectional area; GV, gastric volume

	Bouvet and colleagues[30]	**Perlas and colleagues**[31]
Formula	GV (ml) = −215+57 log CSA (mm^2) − 0.78 age (yr) − 0.16 height (cm) − 0.25 weight (kg) − 0.80 ASA+16 ml (emergency)+10 ml (if antacid prophylaxis 100 ml)	GV (ml) = 27.0+14.6 × right-lateral CSA (cm^2) − 1.28 × age (yr)
Scanning plane	Sagittal	Sagittal
Scanning position	Semi-sitting	Right lateral decubitus
Antral CSA measurement	Serosa to serosa	Serosa to serosa
Patient characteristics	Non-pregnant adults	Non-pregnant adults
Age (yr)	18–95	18–85
BMI (kg cm^{-2})	14–31	19–40
Max. predicted volume (ml)	250	500
Correlation coefficient (*r*)	0.72	0.86
Reference standard	Nasogastric suction	Gastroscopy

Van de Putte. BJA 2014



Van de Putte. BJA 2014

Ultrasound assessment of gastric volume in the fasted pediatric patient undergoing upper gastrointestinal endoscopy: development of a predictive model using endoscopically suctioned volumes

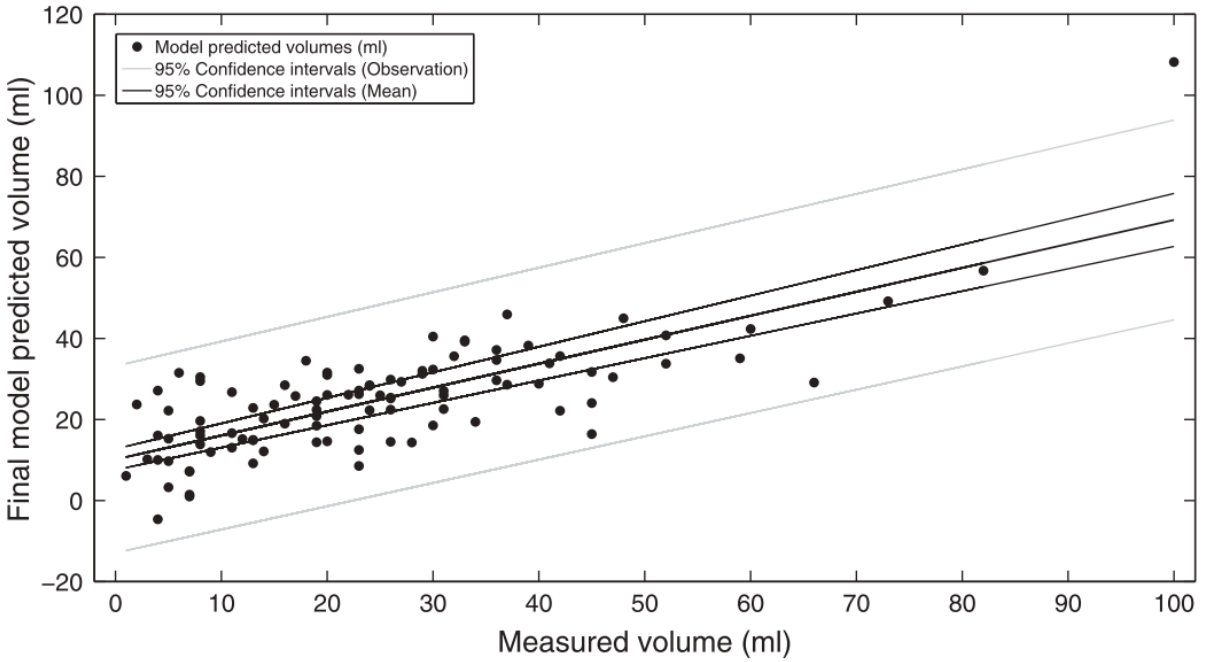
100 patients (11-216 mois)

Admis pour gastroscopie

Echo préopératoire

Aspiration gastrique par gastroscope

Position : Décubitus dorsal et Décub. Latéral droit



Spencer. Ped Anesth. 2014

Mesure plus perfomante en décubitus latéral droit

Volume = -7,8 + (3,5 * RLD CSA) + (0,127) * age (months)

R^2 : 0,6

Table 2 Predicted gastric volume (ml) based on gastric antral cross-sectional area (cm^2) measured in the RLD position (RLD CSA) stratified by patient age (years)

	Age (years)							
Right lateral CSA (cm^2)	2	4	6	8	10	12	14	16
1	0	2	5	8	11	14	17	20
2	2	5	8	11	14	18	21	24
3	6	9	12	15	18	21	24	27
4	9	12	15	18	21	25	28	31
5	13	16	19	22	25	28	31	34
6	16	19	22	25	28	31	35	38
7	20	23	26	29	32	35	38	41
8	23	26	29	32	35	38	42	45
9	27	30	33	36	39	42	45	48
10	30	33	36	39	42	45	49	52
11	34	37	40	43	46	49	52	55
12	37	40	43	46	49	52	55	59
13	41	44	47	50	53	56	59	62
14	44	47	50	53	56	59	62	66
15	48	51	54	57	60	63	66	69

Spencer. Ped Anesth. 2014

Gastric Sonography in the Severely Obese Surgical Patient: A Feasibility Study

60 patients

BMI 35 – 69 $kg.m^{-2}$

Faisabilité :

Plus profond (jusqu'à 3 cm)

95% en décubitus latéral droit

90% en décubitus dorsal

Van de Putte. Anesth Analg. 2014

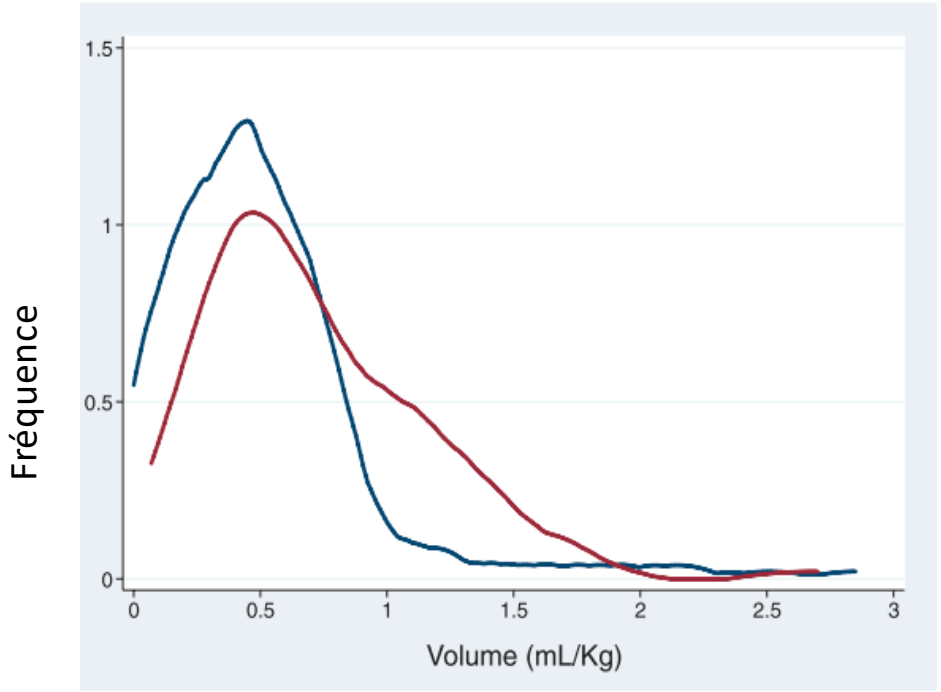
Bedside Gastric Ultrasonography in Term Pregnant Women Before Elective Cesarean Delivery: A Prospective Cohort Study

103 parturientes avant césarienne programmée

52% de grade 0

48% de grade 1

Volume ≤ 1,5 ml/kg chez 95%



Arzola. Anesth Analg 2015

IN REAL LIFE …

When fasted is not empty: a retrospective cohort study of gastric content in fasted surgical patients†

538 patients en chirurgie programmée (62% orthopédie).
Rétrospectif.

Temps de jeûne moyen :
- Solides : 14h
- Liquides 11h

6,2% d'estomac plein (grade 2)

dont 30% avec contenu solide

Van de Putte. British Journal of Anaesthesia, 2017

Prevalence and factors predictive of full stomach in elective and emergency surgical patients: a prospective cohort study

Prévalence estomac plein :
- Programmé : 5%
- Urgences : 56%

440 patients.

Estomac plein = grade 2 de Perlas.

Variables associées à l'estomac plein :

- Chirurgie en urgence
- Diabète
- Morphiniques préopératoires
- Obésité

Variables associées à l'estomac plein ***en urgence ????***

Bouvet. British Journal of Anaesthesia, 2017

LE FUTUR ?

LE FUTUR ?

- Commencer par appliquer les bonnes pratiques !!!!!!!
- 6-4-3-0 en pédiatrie ? [34, 35]
- Carbohydrate loading – Optimisation métabolique préopératoire
- Echo gastrique préopératoire : Quand ? Pour quoi ? Pour qui ?

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