la 2e JOURNÉE COMMUNE
de RÉANIMATION
Mai 2017

Craniectomie décompressive dans le traumatisme crânien grave

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- Le TCG est un problème majeur de santé publique

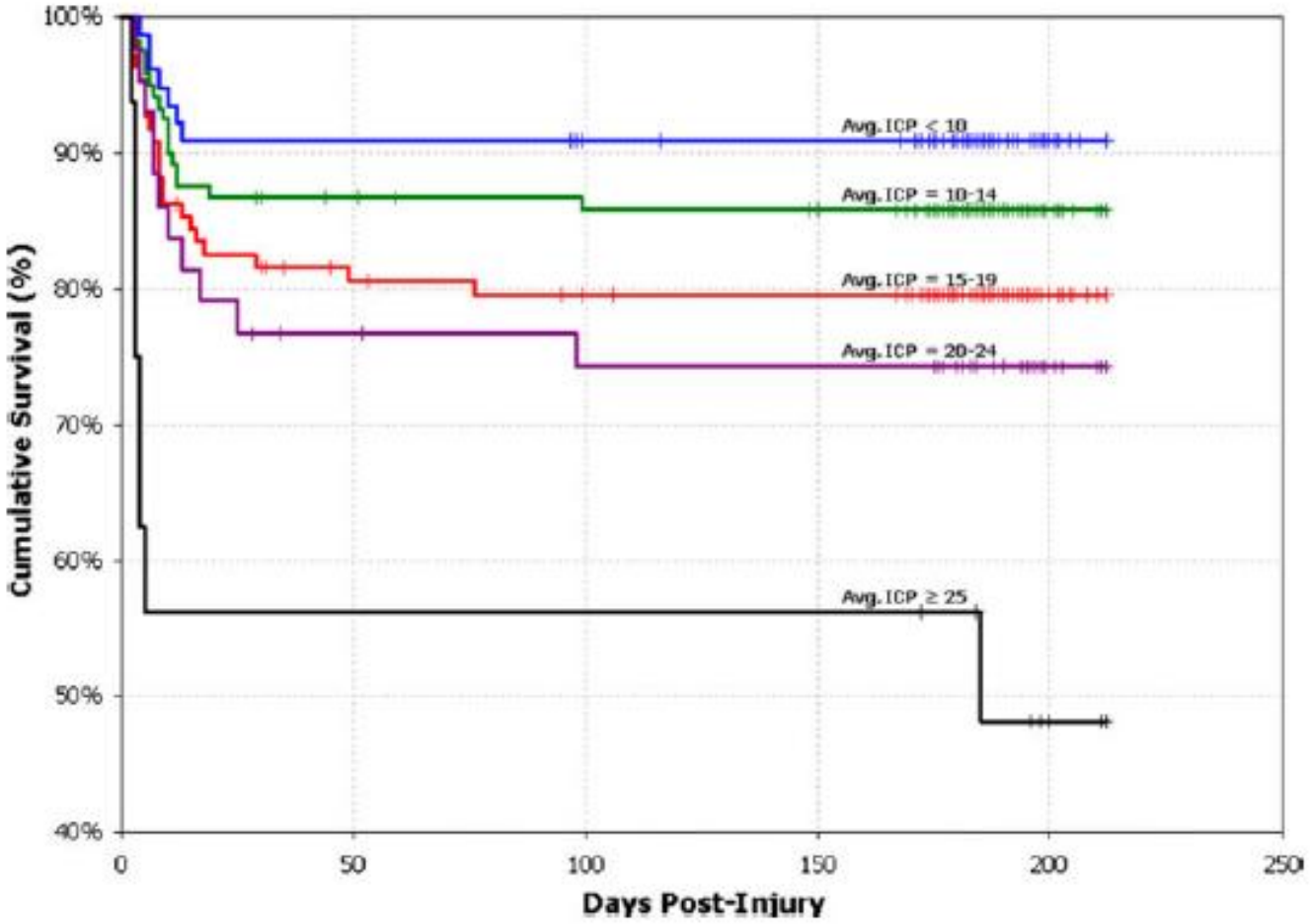
- **Le TCG est la 1ère cause de mortalité chez les moins de 44 ans**

Kauvar et al, J Trauma 2003

Parameter	Place				
	Europe[1]	U.S.[2]	Australia[3]	Asia[4]	India[5]
Incidence rate[6,7]	235	103	226	344	160
Prevalence rate[6]	NR	1893	NR	709	97
Mortality rate[6]	15.4	18.1	NR	38	20
Severity (% Mi/Mo/Sev)	79/12/9	80/10/10	76/12/11	78/9/13	71/15/13
Case fatality rate[8]	2.7[a]	6.2	2.4	11	6
External cause (% Fall/MVC/Vio)	37/40/7	21/25/6	49/25/9	23/65/7	59/25/14
Outcomes[9] (% GOS unfavor)	50[b]	64[c]	NR	27	9

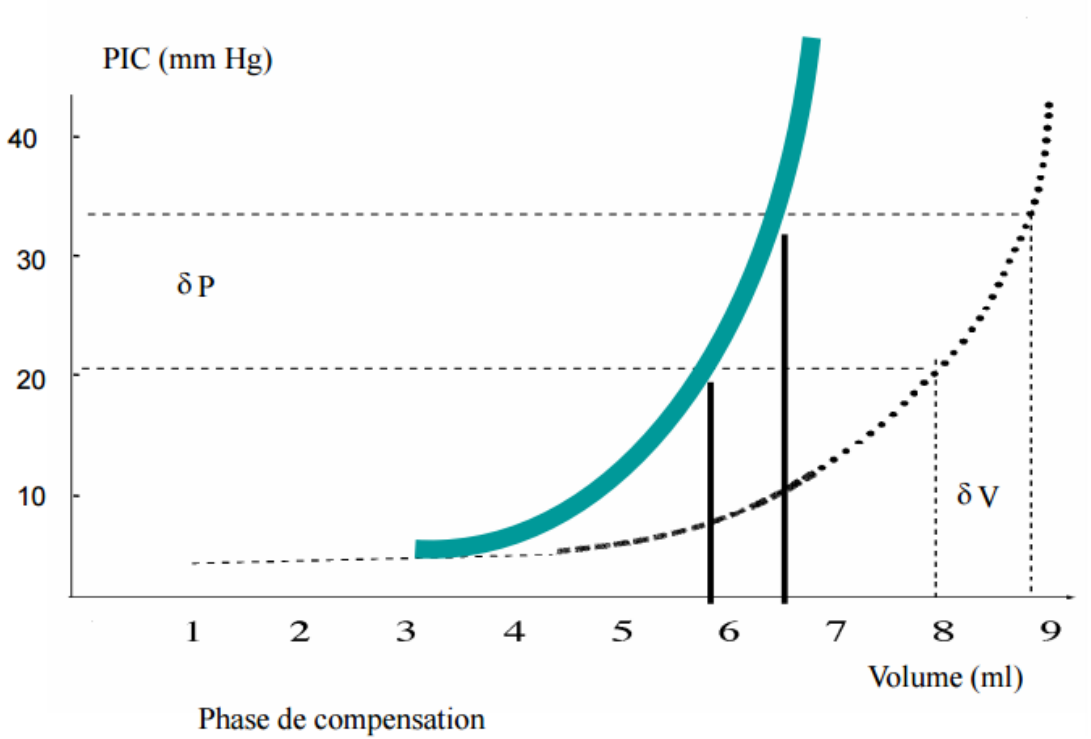
Tagliaferri et al, Acta Neurochir (2006) 148: 255–268

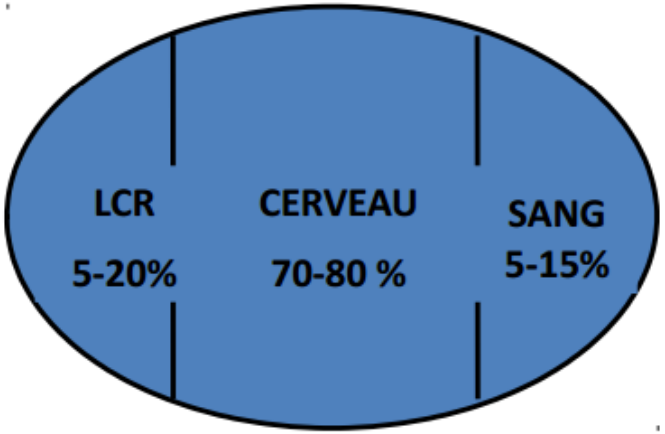
TC + HTIC : ⬆mortalité - pronostic neurologique défavorable



Intensive Care Med (2012) 38:1800–1809

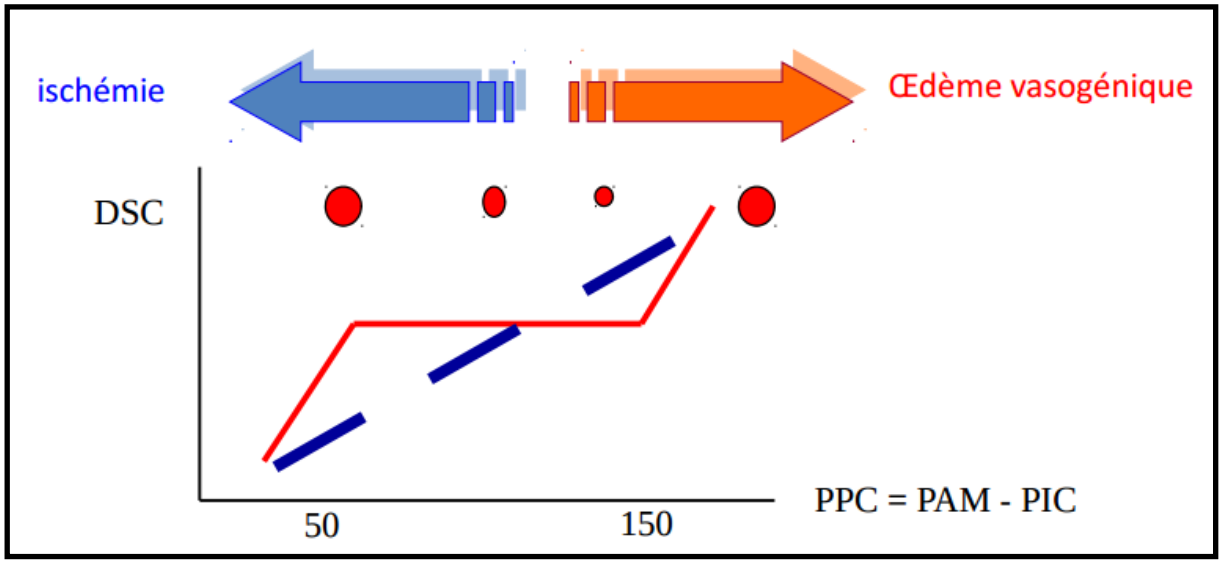
Courbe P/V de Langfitt





PIC normale: 5-15 mmHg
Hypertension intracrânienne (HTIC) > 20 mmHg

Hémodynamique cérébrale



sujet sain

PPC = PAM – PIC
– DSC = PPC / RVC
– Autorégulation
• Maintien d'un DSC stable face aux variations de PPC
• Par modification des RVC

traumatisé crânien

Vasoréactivité diminuée (lésions endothéliales)
• objectif de PPC : 60-70 mm Hg
• Si perte de l'autorégulation :
– toute ⇧ de la PAM entraîne une ⇧ parallèle de la PIC

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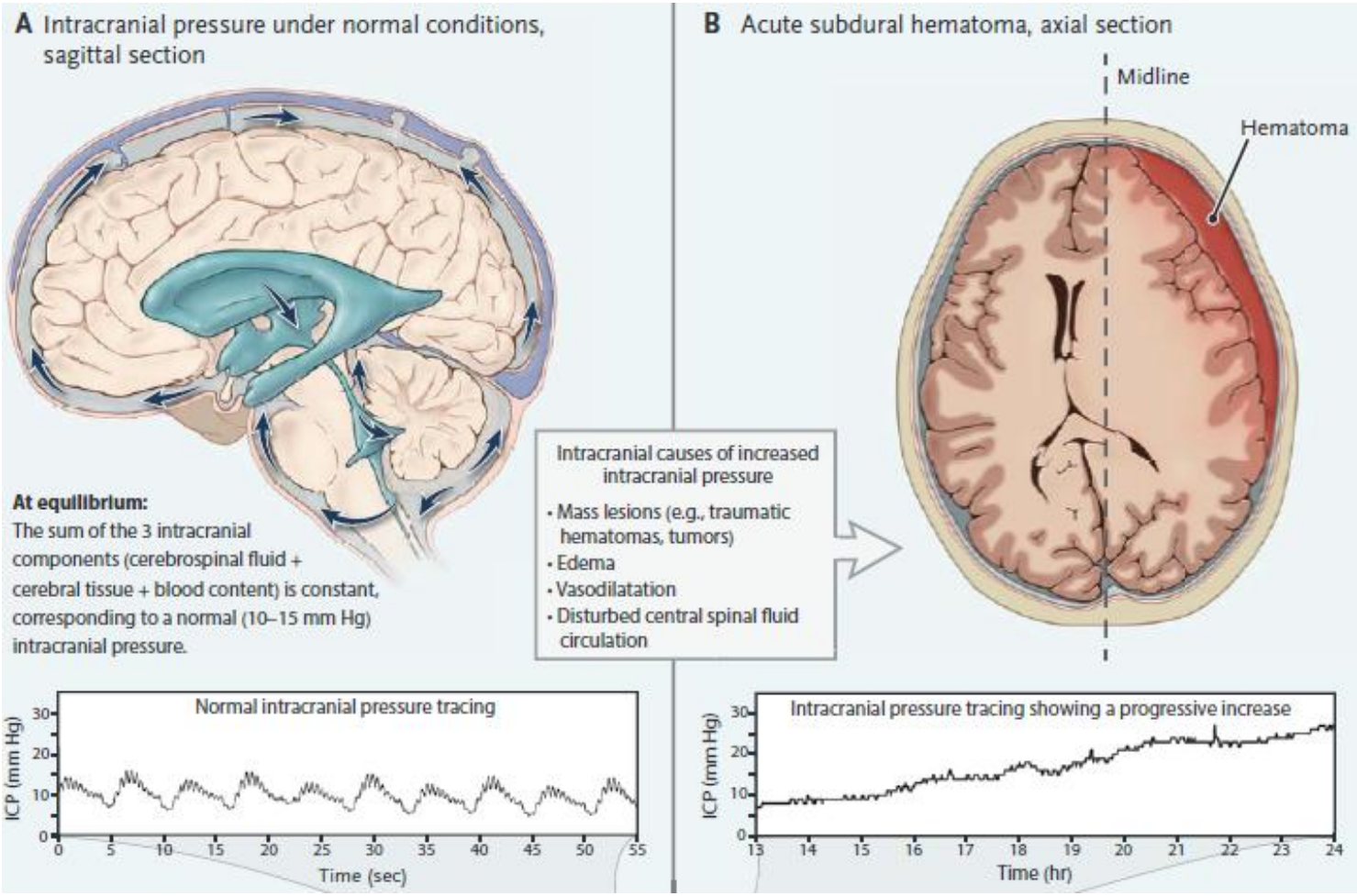
Traumatic Intracranial Hypertension

Nino Stocchetti, M.D., and Andrew I.R. Maas, M.D., Ph.D.



N Engl J Med 2014;370:2121-30

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Traumatic Intracranial Hypertension

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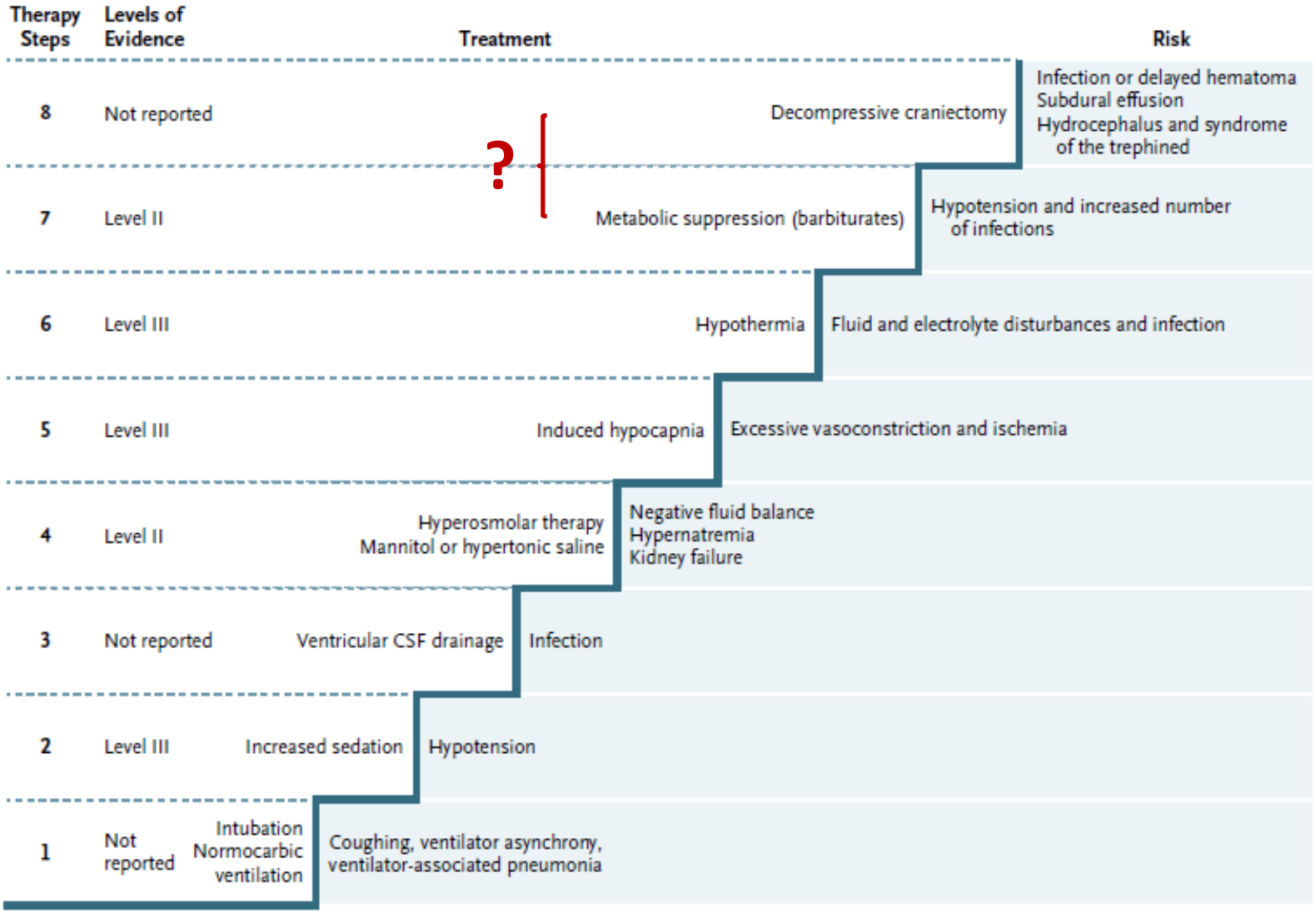


N Engl J Med 2014;370:2121-30

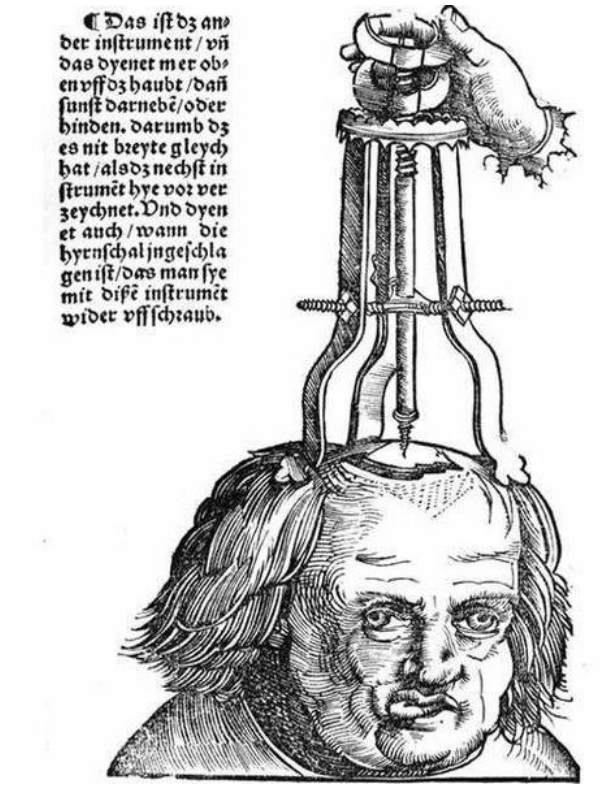
La craniectomie décompressive

- **Est-elle efficace ?**
- **Quelle morbidité ?**
- **Quelles indications ?**

Pour qui ?

Timing ?

Pour quel pronostic fonctionnel ?



Effet sur la PIC

Decompressive craniectomy and head injury: brain morphometry, ICP, cerebral hemodynamics, cerebral microvascular reactivity, and neurochemistry

Edson Bor-Seng-Shu · Eberval G. Figueiredo · Erich Talamoni Fonoff · Yasunori Fujimoto · Ronney B. Panerai · Manoel Jacobsen Teixeira

Neurosurg Rev (2013) 36:361–370

Authors and year	*N*	Preop ICP	Postop ICP	*p* value	Monitoring	Duraplasty	Type of study
Polin et al., 1997	26	32.1	21.3	0.0001		Yes	Retrospective
Yoo et al., 1999	6	31.7	3.5		IV	Yes	Prospective
Munch et al., 2000	9	22.1±11.1	19.7±10.8	0.04		Yes	Retrospective
Taylor et al., 2001	13	26.4±7.9	17.4±3.4		IV, IP	No	Prospective
Whitfield et al., 2001	26	37.5±10	18.1±16	0.003		Yes	Prospective
Stiefel et al., 2004	7	26±4	19±11	<0.0001	IP	Yes	Prospective
Aarabi et al., 2006	40	24	14.6	<0.01	IV	Yes	Retrospective
Heppner et al., 2006	6	35±8	12±6	<0.05	IP		Prospective
Skoglund et al., 2006	9	29.2±3.5	11.1±6	<0.01	IV, IP	Yes	Retrospective
Jagannathan et al., 2007	22	30	<20			yes	retrospective
Olivecrona et al., 2007	21	36.4±3.4	13.1±2.1	<0.001	IV, IP	Yes	Retrospective
Ho et al., 2008	16	25±6	15.5±2	<0.001	IP	Yes	Prospective
Timofeev et al., 2008[a]	27	21.2 (18.7–24.2)	15.7 (12.3–19.2)	0.01	IP	Yes	Retrospective
Howard et al., 2008	16	35±13.5	14.6±8.7	0.05			Retrospective
Williams et al., 2009	96	30	7		IV		Retrospective
Daboussi et al., 2009	26	37±17	20±13	0.0003	IP	Yes	Prospective
Bao et al., 2010	37	37±6.4	11.2±7.1	<0.05	IV, IP	Yes	Retrospective
Eberle et al., 2010	19	41±13.5	16.3±12.6	<0.05	IV, IP	Yes	Retrospective

Effet sur la PIC

Decompressive craniectomy and head injury: brain morphometry, ICP, cerebral hemodynamics, cerebral microvascular reactivity, and neurochemistry

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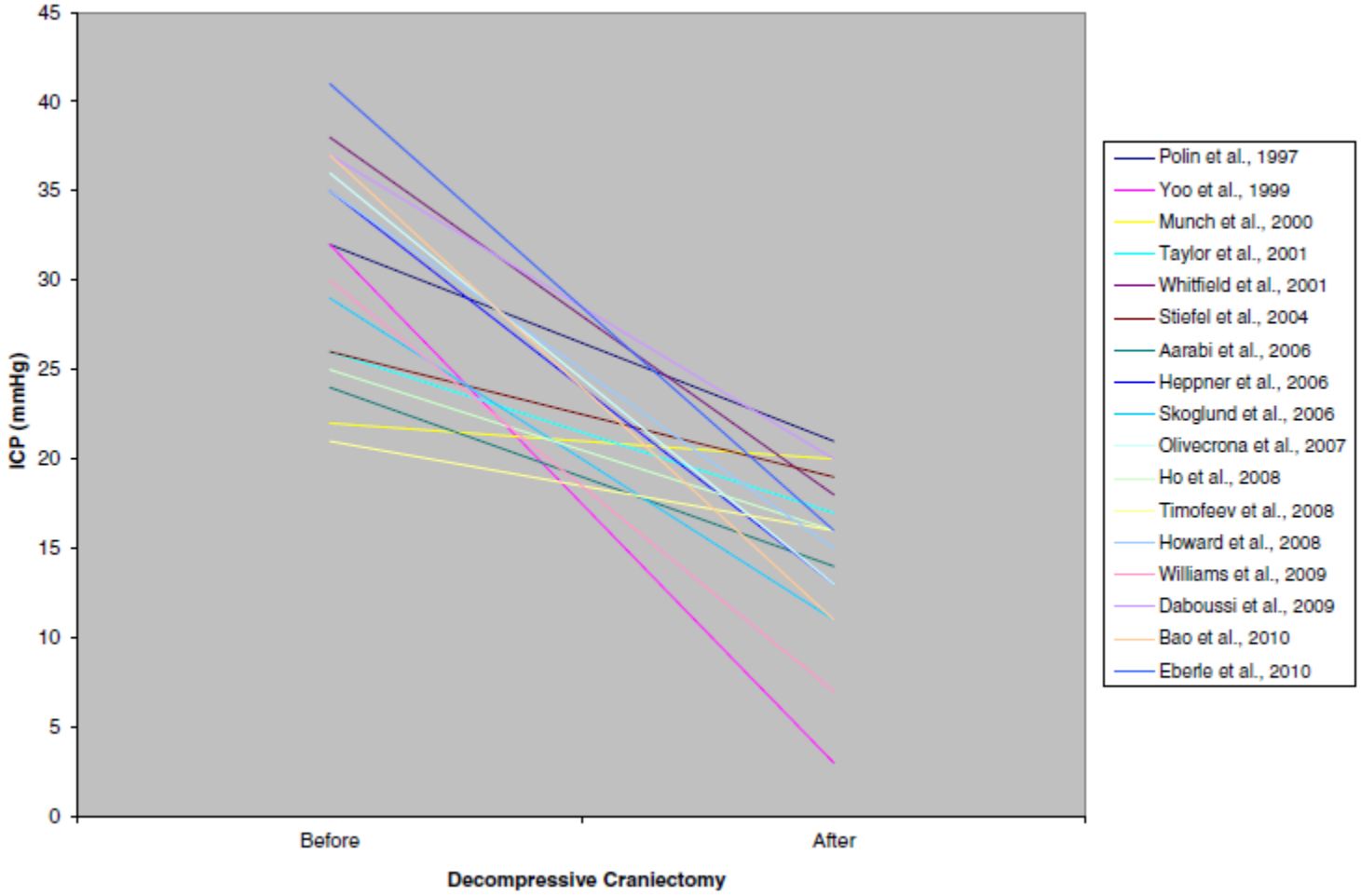


Hémodynamique cérébrale

Cerebral hemodynamic changes gauged by transcranial Doppler ultrasonography in patients with posttraumatic brain swelling treated by surgical decompression

EDSON BOR-SENG-SHU, M.D., PH.D., ROBERTO HIRSCH, M.D., PH.D., MANOEL JACOBSEN TEIXEIRA, M.D., PH.D., ALMIR FERREIRA DE ANDRADE, M.D., PH.D., AND RAUL MARINO JR., M.D., PH.D.

J Neurosurg 104:93–100, 2006

Preoperative and postoperative TCD blood flow velocity of patients with brain swelling who underwent surgical decompression

Artery	Side	No. of Patients	Preop BFV (cm/sec)	Postop BFV (cm/sec)	p Value
MCA	decompressed	19	53 ± 38	94 ± 33	<0.001
cervical ICA	decompressed	16	29 ± 15	44 ± 9	<0.008
MCA	opposite	17	51 ± 26	76 ± 16	<0.001
cervical ICA	opposite	15	35 ± 11	44 ± 10	<0.015

*Percentage change in TCD hemodynamic parameters of 19 patients before and after surgical decompression**

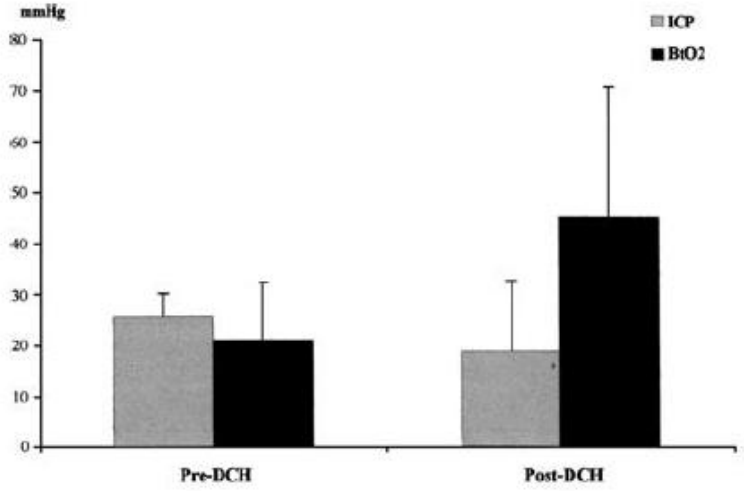
TCD Parameter	Artery	Operated Side	Opposite Side	p Value
flow velocity	MCA	175 ± 209%	132 ± 183%	<0.05
flow velocity	cervical ICA	91 ± 119%	44 ± 59%	NS
PI	MCA	−33 ± 36 %	−30 ± 34%	NS
PI	cervical ICA	−37 ± 23%	−24 ± 34%	NS

Oxygénation cérébrale

Cerebral oxygenation following decompressive hemicraniectomy for the treatment of refractory intracranial hypertension

MICHAEL F. STIEFEL, M.D., PH.D., GREGORY G. HEUER, M.D., PH.D.,
MICHELLE J. SMITH, B.S., STEPHANIE BLOOM, M.S.N, EILEEN MALONEY-WILENSKY, M.S.N,
VINCENTE H. GRACIAS, M.D., M. SEAN GRADY, M.D., AND PETER D. LEROUX, M.D.

J Neurosurg 101:241–247, 2004



Comparison of cerebral oxygenation before and after DCH

Case No.	Brain Tissue Oxygenation Pre-DCH* (mm Hg)	Brain Tissue Oxygenation Post-DCH* (mm Hg)	% Change	p Value
1	39.30 ± 19.40	98.90 ± 22.70	152	<0.0001
2	34.00 ± 15.70	39.50 ± 11.30	16	0.5
3	30.40 ± 6.20	51.60 ± 33.00	70	<0.0001
4	0.63 ± 0.06	30.40 ± 7.40	4725	<0.0001
5	12.60 ± 6.40	41.00 ± 17.40	225	<0.0001
6	13.30 ± 4.30	21.10 ± 3.80	58	<0.0001
7	17.90 ± 10.30	36.00 ± 5.00	100	<0.0001

Oxygénation cérébrale

Cerebral oxygenation, vascular reactivity, and neurochemistry following decompressive craniectomy for severe traumatic brain injury

CHI LONG HO, M.D., M.CH., CHEE MENG WANG, F.R.C.S.(SN), KAH KEOW LEE, B.N., IVAN NG, F.R.C.S.(SN), AND BENG TI ANG, F.R.C.S.(SN)

J Neurosurg 108:943–949, 2008

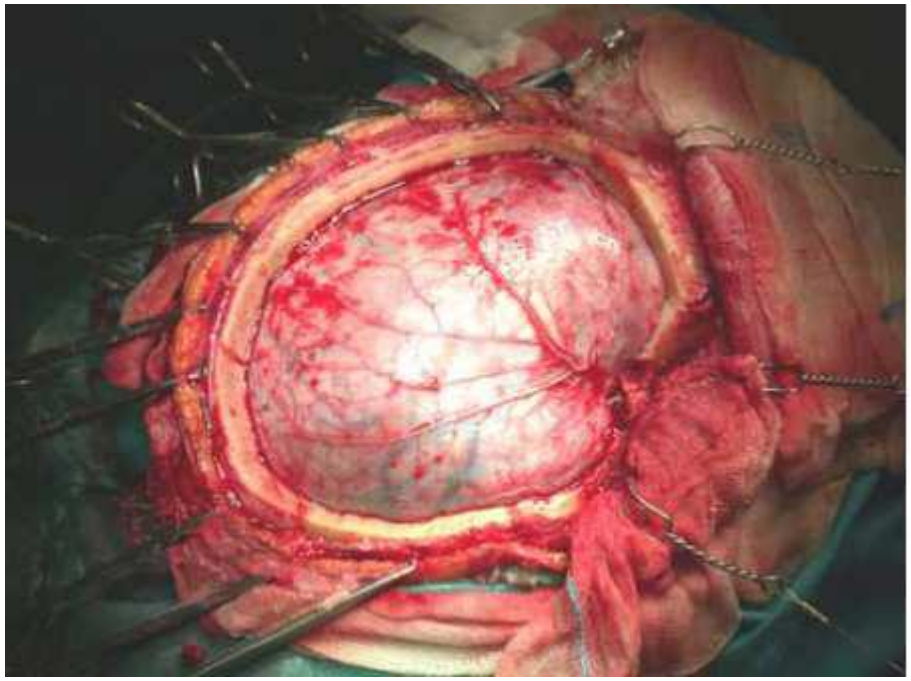
*Physiological characteristics and cerebral microdialysis values of patients with TBI before and after decompressive craniectomy**

Variable	Group 1 (Poor Outcome)				Group 2 (Favorable Outcome)			
	Before DC	After DC	% Change	p Value	Before DC	After DC	% Change	p Value
PRx	0.34 ± 0.2	0.25 ± 0.2	−26	0.02	0.31 ± 0.2	0.19 ± 0.1	−39	<0.001
ICP (mm Hg)†	27 ± 8				23 ± 4			
ICP (mm Hg)‡	25 ± 4	18 ± 2	−27	<0.001	18 ± 4	13 ± 2	−25	<0.001
MABP (mm Hg)	87 ± 4	100 ± 4	15	<0.001	99 ± 5	92 ± 4	−8	<0.001
CPP (mm Hg)	62 ± 6	82 ± 3	32	<0.001	79 ± 6	78 ± 4	−2	0.3
$PbtO_2$ (mm Hg)	17 ± 4	20 ± 3	21	0.03	3 ± 2	17 ± 4	455	<0.001
glycerol (μmol/L)	124 ± 75	22 ± 12	−82	<0.001	139 ± 55	22 ± 10	−84	<0.001
lactate (mmol/L)	6 ± 2	5 ± 2	−21	0.04	7 ± 4	3 ± 2	−49	<0.001
l:p ratio	54 ± 10	39 ± 5	−27	0.04	137 ± 85	40 ± 12	−71	<0.001
glutamate (mmol/L)	13 ± 6	13 ± 3	−2	0.8	36 ± 54	3 ± 1	−92	<0.001
glucose (mmol/L)	2 ± 0.5	2 ± 0.4	0.3	0.9	0.6 ± 2	1 ± 1	50	<0.001

Technique chirurgicale

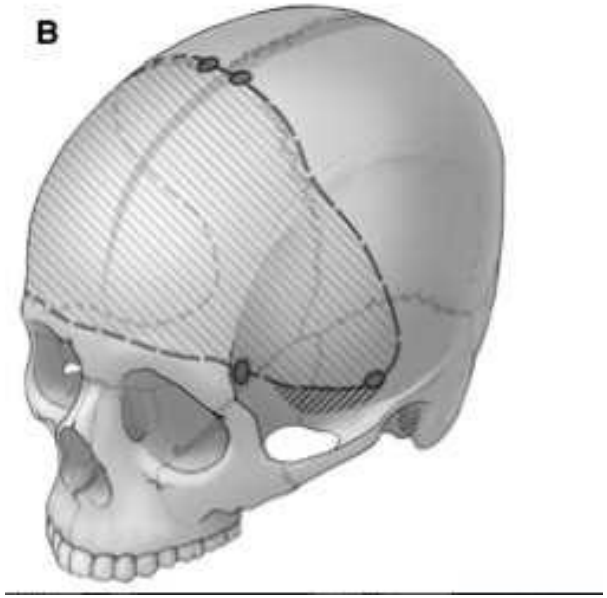
Hémicraniectomie
Fronto-temporo-pariétale

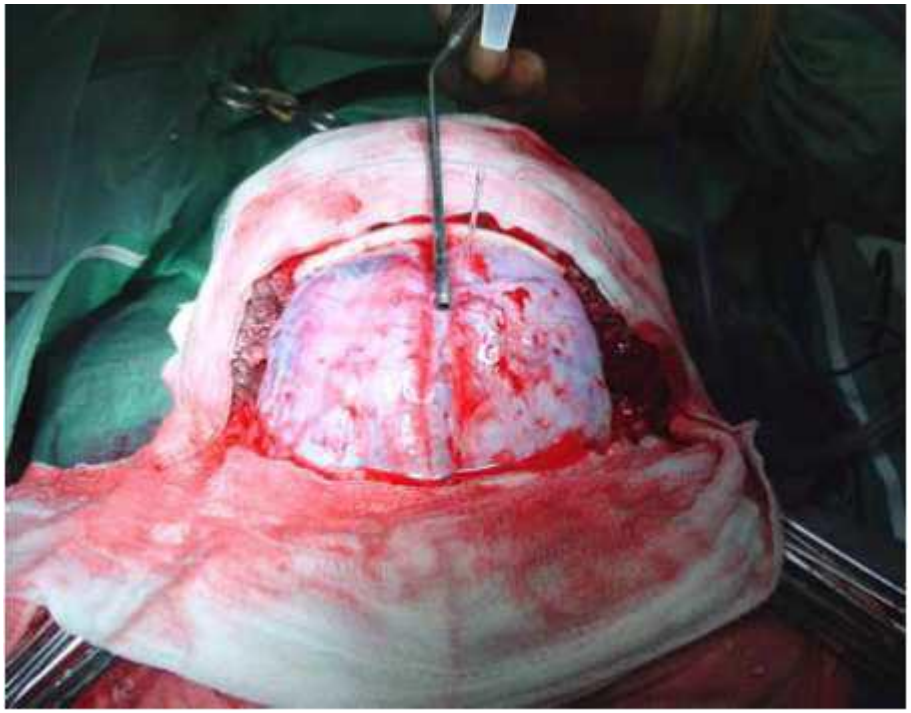
FIG. 4



Technique chirurgicale

Craniectomie bifrontale





Indications

Traitement de l'hypertension intracrânienne réfractaire

Indications

5 études randomisées:

- **A randomized trial of very early decompressive craniectomy in children with traumatic brain injury and sustained intracranial hypertension. Childs Nerv Syst 2001; 17: 154-62**

- **Efficacy of standard trauma craniectomy for refractory intracranial hypertension with severe traumatic brain injury: a multicenter, prospective, randomized controlled study. J Neurotrauma 2005; 22: 623-8**

- **Effects of unilateral decompressive craniectomy on patients with unilateral acute post traumatic brain swelling after severe traumatic brain injury. Crit Care 2009; 13: R185**

- **Decompressive craniectomy in diffuse traumatic brain injury. N Engl J Med 2011; 364: 1493-502 : étude DERCA**

- **Trial of Decompressive Craniectomy for Traumatic Intracranial Hypertension. N Engl J Med 2016;375:1119-30: étude RESCUE-ICP**

Glasgow Outcome Scale

Score	Description
1	**DEATH**
2	**PERSISTENT VEGETATIVE STATE** Patient exhibits no obvious cortical function
3	**SEVERE DISABILITY** (Conscious but disabled). Patient depends upon others for daily support due to mental or physical disability or both.
4	**MODERATE DISABILITY** (Disabled but independent). Patient is independent as far as daily life is concerned. The disabilities found include varying degrees of dysphasia, hemiparesis, or ataxia, as well as intellectual and memory deficits and personality changes
5	**GOOD RECOVERY** Resumption of normal activities even though there may be minor neurological or psychological deficits

Anna Taylor
Warwick Butt
Jeffrey Rosenfeld
Frank Shann
Michael Ditchfield
Elizabeth Lewis
Geoffrey Klug
David Wallace
Robert Henning
James Tibballs

A randomized trial of very early decompressive craniectomy in children with traumatic brain injury and sustained intracranial hypertension

27 patients

Si PIC> 20 mmHg TT médical vs TT médical + craniectomie bitemporale

	Control (n=14)	Decompression (n=13)
ICP (mmHg) mean	21.9 (SD 8.5)	17.4 (SD 3.4)
Range (mmHg)	11–44	11–25
ICP >20 mmHg		
Number of episodes	223	107
ICP >30 mmHg		
Number of episodes	59	9

Table 2 Outcome 6 months after injury

	Control (n=14)	Decompression (n=13)
Glasgow Outcome Score		
Favourable	2	7
Unfavourable	12	6
Health State Utility Index		
Favourable	1	6
Unfavourable	13	7

Childs Nerv Syst 2001; 17: 154-62

Efficacy of Standard Trauma Craniectomy for Refractory Intracranial Hypertension with Severe Traumatic Brain Injury: A Multicenter, Prospective, Randomized Controlled Study

JI-YAO JIANG,[1] WEI XU,[2] WEI-PING LI,[3] WEN-HUI XU,[4] JUN ZHANG,[5] YING-HUI BAO,[1] YU-HUA YING,[1] and QI-ZHONG LUO[1]

486 patients

STC

LC

Table 3. Intracranial Pressure before and after Craniectomy in STC and LC Groups

Group	n	Before craniectomy (mm Hg)	After craniectomy (mm Hg) 1d	3d	7d
STC group	36	35 ± 4.1	24 ± 2.7	22 ± 2.3	16 ± 3.7
LC group	47	33 ± 4.6	27 ± 4.3	26 ± 3.8	23 ± 3.1

STC, standard trauma craniectomy; LC, limited craniectomy.

Table 2. Outcomes in STC and LC Groups

Group	n	GR/MD	SD/PVS	Death
STC	241	96 (39.8%)(96/241)	82 (34.0%)(82/241)	63 (26.2%)(63/241)
LC	245	70 (28.6%)(70/245)	89 (36.3%)(89/245)	86 (35.1%)(86/245)

STC, standard trauma craniectomy; LC, limited craniectomy; GR, good recovery; MD, moderate deficit; SD, severe deficit; PVS, persistent vegetative status.

Neurotrauma 2005; 22: 623-8

Research

Open Access

Effects of unilateral decompressive craniectomy on patients with unilateral acute post-traumatic brain swelling after severe traumatic brain injury

Wusi Qiu[1,2,3*], Chenchen Guo[1,2], Hong Shen[2,3*], Keyong Chen[1], Liang Wen[2], Hongjie Huang[1], Min Ding[1], Li Sun[1], Qizhou Jiang[1] and Weiming Wang[1]

74 patients

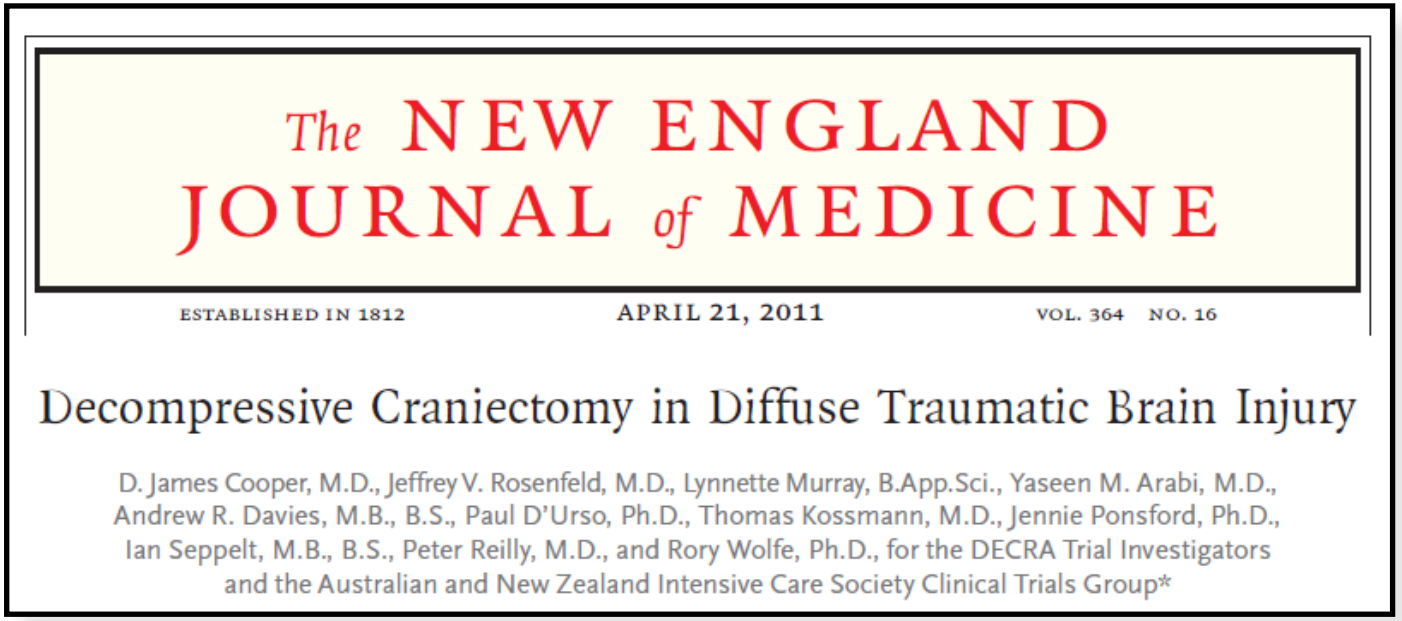
- **Œdème cérébral unilatéral + DLM > 5mm**
- **DC vs craniectomie temporoparietale**
- **Baisse significative de la PIC (30%)**

Clinical outcome of two groups at six months follow-up (n, (%))

GOS scores	Unilatereal DC group (n = 37)	Control group (n = 37)
5	15 (41)	5 (14)
4	6 (16)	7 (19)
3	5 (14)	4 (11)
2	1 (3)	0
1	10 (27)	21 (57)

DC = decompressive craniectomy; GOS = Glasgow Outcome Scale.

Crit Care 2009; 13: R185



The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 APRIL 21, 2011 VOL. 364 NO. 16

Decompressive Craniectomy in Diffuse Traumatic Brain Injury

D. James Cooper, M.D., Jeffrey V. Rosenfeld, M.D., Lynnette Murray, B.App.Sci., Yaseen M. Arabi, M.D., Andrew R. Davies, M.B., B.S., Paul D'Urso, Ph.D., Thomas Kossmann, M.D., Jennie Ponsford, Ph.D., Ian Seppelt, M.B., B.S., Peter Reilly, M.D., and Rory Wolfe, Ph.D., for the DECRA Trial Investigators and the Australian and New Zealand Intensive Care Society Clinical Trials Group*

Essai contrôlé, randomisé, multicentrique

Craniectomie bifrontale dans les lésions diffuses traumatiques

Méthodes: patients

Inclusion	Exclusion
• Age: 15-59 ans • Traumatisme Crânien grave non pénétrant • Score de Glasgow: 3-8 • Marshall class III = lésions diffuses et modérées au TDM	• Mydriase bilatérale aréactive • Lésion tumorale • ACR sur les lieux • Lésion médullaire associée • Traitement actif optimal non indiqué pour le patient selon l'équipe médicale

Méthodes: protocole

- Si PIC réfractaire => randomisation
- Dans les 72h suivant le trauma :

– Craniectomie Décompressive associée au traitement standard

Craniectomie bifrontotemporoparietale

– Un groupe: traitement standard seul (DVE continue, barbituriques)

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Table 1. Baseline Characteristics of the Patients.*

Characteristic	Decompressive Craniectomy (N=73)	Standard Care (N=82)	P Value†
Age — yr			0.89
Median	23.7	24.6	
Interquartile range	19.4–29.6	18.5–34.9	
Male sex — no. (%)	59 (81)	61 (74)	0.44
Systolic blood pressure — mm Hg	135.4±32.0	135.7±27.6	0.95
Glasgow Coma Scale			
Overall score‡			0.31
Median	5	6	
Interquartile range	3–7	4–7	
Motor score§			0.49
Median	3	3	
Interquartile range	1–4	1–5	
Maximum score for head injury on Abbreviated Injury Scale — no. (%)¶			0.52
3 or 4	35 (48)	44 (54)	
5	38 (52)	38 (46)	
Injury Severity Score‖			0.88
Median	33	32	
Interquartile range	25–38	24–41	
Trauma Score–Injury Severity Score **			0.46
Median	0.74	0.72	
Interquartile range	0.42–0.88	0.51–0.90	
Reactivity of pupils — no./total no. (%)			0.04
Neither pupil	19/71 (27)	10/80 (12)	
One or both pupils	52/71 (73)	70/80 (88)	
Hypotension — no. (%)	24 (33)	25 (30)	0.93
Hypoxemia — no. (%)	18 (25)	24 (29)	0.55

N Engl J Med 2011; 364: 1493-502

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Table 1. (Continued.)

Characteristic	Decompressive Craniectomy (N=73)	Standard Care (N=82)	P Value†
Time from injury to hospital — hr			0.90
Median	1.0	1.2	
Interquartile range	0.8–1.8	0.7–1.9	
Time from injury to randomization — hr			0.60
Median	35.2	34.8	
Interquartile range	23.3–52.8	25.8–45.4	
Marshall class — no. (%)††			0.39
Diffuse injury II	17 (23)	27 (33)	
Diffuse injury III or IV	53 (73)	53 (65)	
Nonevacuated mass lesion (VI)	3 (4)	2 (2)	

N Engl J Med 2011; 364: 1493-502

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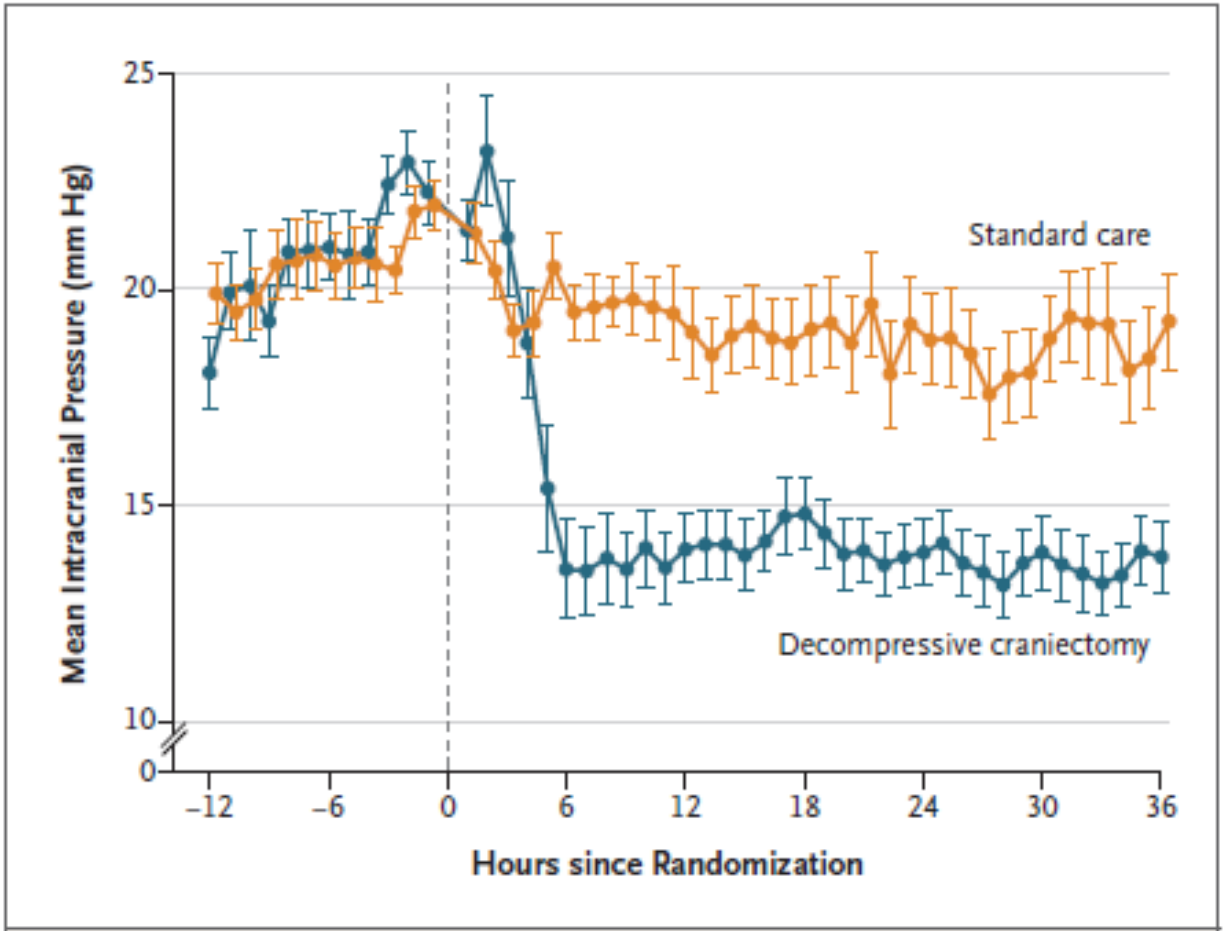

Figure 1. Intracranial Pressure before and after Randomization.

Shown are the mean measurements of intracranial pressure in the two study groups during the 12 hours before and the 36 hours after randomization. The I bars indicate standard errors.

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Table 2. Primary and Secondary Outcomes.*

Outcome	Decompressive Craniectomy (N=73)	Standard Care (N=82)	P Value†
Intracranial pressure and cerebral perfusion pressure			
Intracranial pressure after randomization — mm Hg	14.4±6.8	19.1±8.9	<0.001
No. of hr of intracranial pressure >20 mm Hg — median (IQR)	9.2 (4.4–27.0)	30.0 (14.9–60.0)	<0.001
Intracranial hypertension index — median (IQR)‡	11.5 (5.9–20.3)	19.9 (12.5–37.8)	<0.001
Cerebral hypoperfusion index — median (IQR)§	5.7 (2.5–10.2)	8.6 (4.0–13.8)	0.03
Duration of hospital intervention			
Days of mechanical ventilation — median (IQR)	11 (8–15)	15 (12–20)	<0.001
Days of ICU stay — median (IQR)	13 (10–18)	18 (13–24)	<0.001
Days of hospitalization — median (IQR)	28 (21–62)	37 (24–44)	0.82
Extended Glasgow Outcome Scale			
Score — no. (%)			
1 (dead)	14 (19)	15 (18)	
2 (vegetative state)	9 (12)	2 (2)	
3 (lower severe disability)	18 (25)	17 (21)	
4 (upper severe disability)	10 (14)	8 (10)	
5 (lower moderate disability)	13 (18)	20 (24)	
6 (upper moderate disability)	6 (8)	13 (16)	
7 (lower good recovery)	2 (3)	4 (5)	
8 (upper good recovery)	1 (1)	3 (4)	
Median score (IQR)	3 (2–5)	4 (3–5)	0.03
Unfavorable score of 1 to 4 — no. (%)	51 (70)	42 (51)	0.02

N Engl J Med 2011; 364: 1493-502

Discussion

Biais selon les auteurs:

- Pas de double aveugle

- Groupes non strictement comparables : la proportion de patients présentant une mydriase bilatérale aréactive était plus importante dans le groupe CD

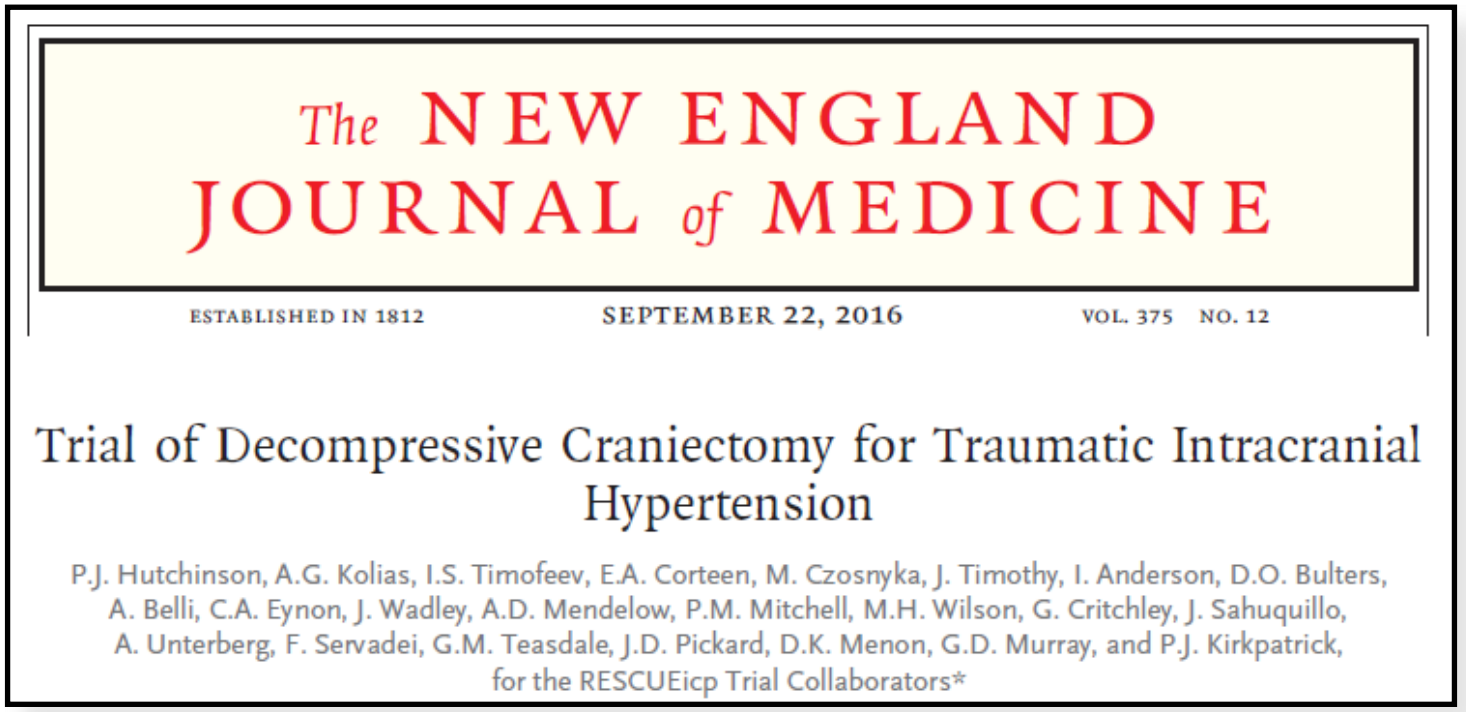
- Changement d'objectif principal en cours d'étude
  - Inclusions longues
  - Fragilité des résultats

- Prise en charge post-opératoire : **PPC?**

Conclusion de l'étude DECRA

Dans les lésions diffuses :

La craniectomie décompressive n'améliore pas le pronostic neurologique



The NEW ENGLAND JOURNAL of MEDICINE

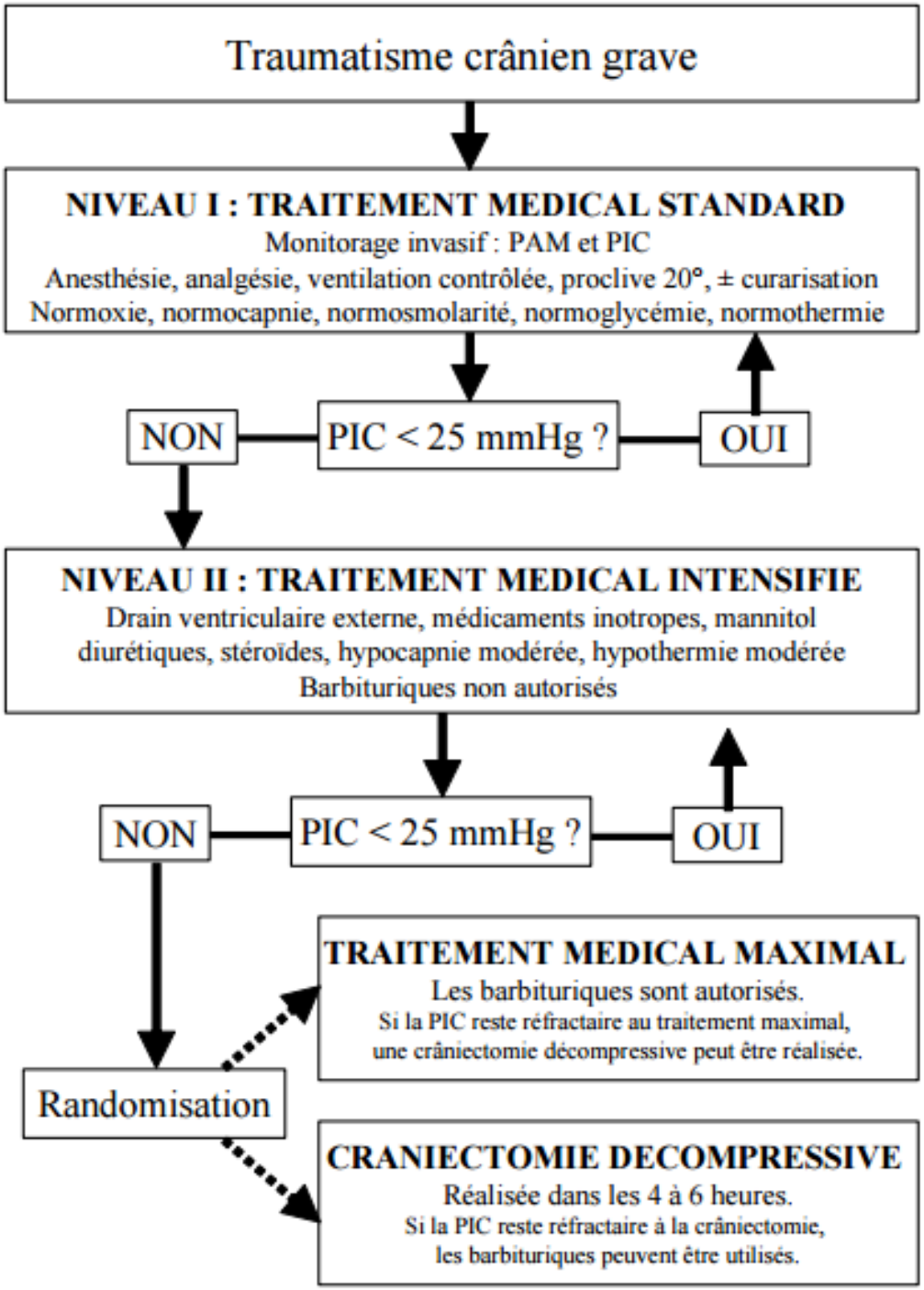
ESTABLISHED IN 1812 SEPTEMBER 22, 2016 VOL. 375 NO. 12

Trial of Decompressive Craniectomy for Traumatic Intracranial Hypertension

P.J. Hutchinson, A.G. Kolias, I.S. Timofeev, E.A. Corteen, M. Czosnyka, J. Timothy, I. Anderson, D.O. Bulters, A. Belli, C.A. Eynon, J. Wadley, A.D. Mendelow, P.M. Mitchell, M.H. Wilson, G. Critchley, J. Sahuquillo, A. Unterberg, F. Servadei, G.M. Teasdale, J.D. Pickard, D.K. Menon, G.D. Murray, and P.J. Kirkpatrick, for the RESCUEicp Trial Collaborators*

The Randomised Evaluation of Surgery with Craniectomy for Uncontrollable Elevation of Intracranial Pressure (RESCUEicp) trial to assess the effectiveness of craniectomy as a last-tier intervention in patients with TBI and refractory intracranial hypertension.

The NEW ENGLAND JOURNAL of MEDICINE



The NEW ENGLAND JOURNAL of MEDICINE

Table 1. Characteristics of the Patients at Baseline.*

Characteristic	Surgical Group (N = 202)	Medical Group (N = 196)
Age — yr	32.3±13.2	34.8±13.7
Male sex — no./total no. (%)	165/202 (81.7)	156/195 (80.0)
GCS motor score at first hospital — no./total no. (%)†		
1 or 2	96/181 (53.0)	85/170 (50.0)
3–6	85/181 (47.0)	85/170 (50.0)
Pupillary abnormality — no. (%)‡	59 (29.2)	57 (29.1)
Hypotension — no. (%)§	40 (19.8)	42 (21.4)
Hypoxemia — no. (%)¶	49 (24.3)	52 (26.5)
History of drug or alcohol abuse — no. (%)	50 (24.8)	69 (35.2)
Extracranial injury — no. (%)	75 (37.1)	83 (42.3)
Injury classification on basis of CT imaging — no./total no. (%)‖		
Diffuse injury	161/198 (81.3)	141/186 (75.8)
Mass lesion	37/198 (18.7)	45/186 (24.2)

N Engl J Med 2016;375:1119-30

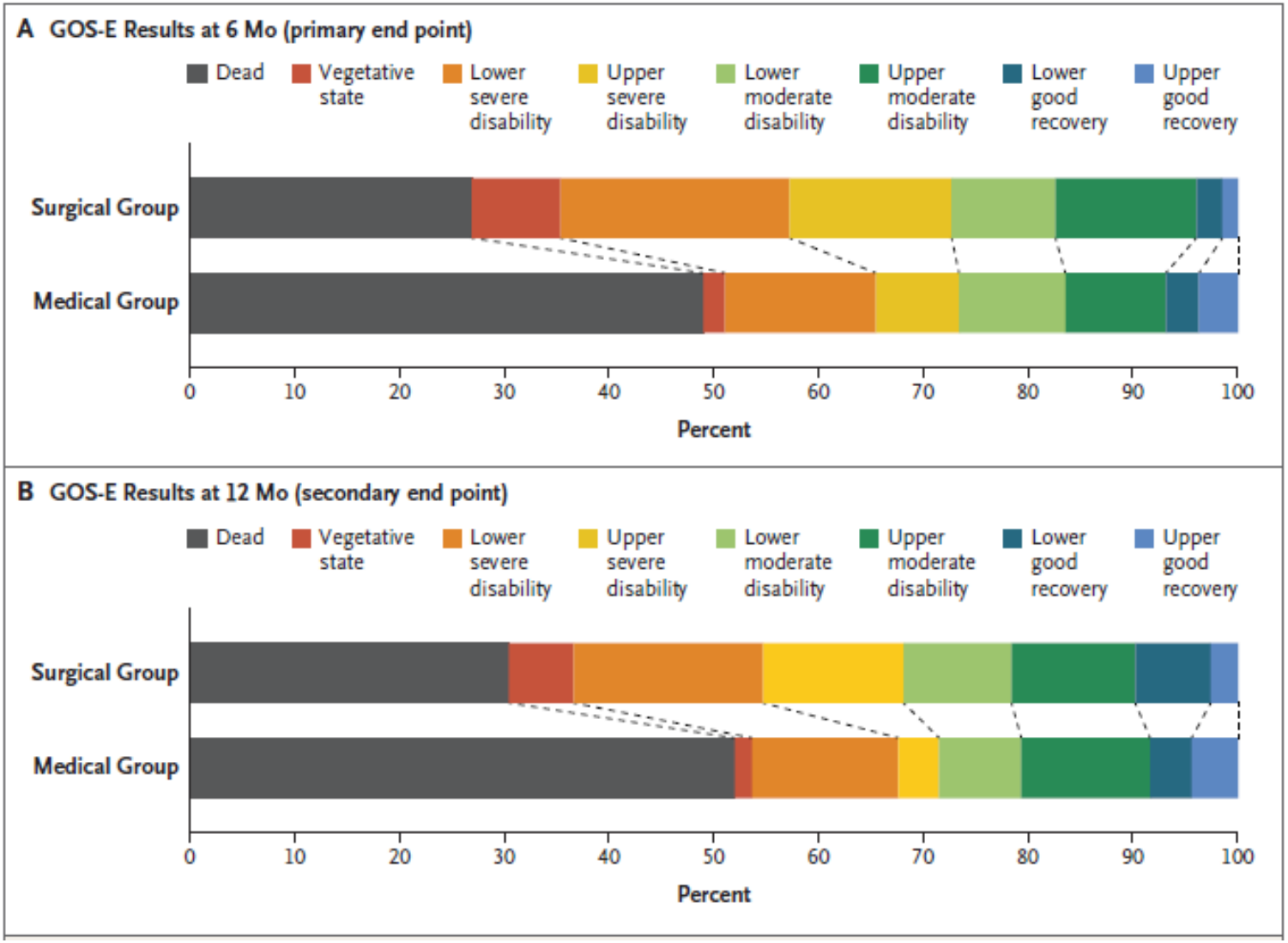
The NEW ENGLAND JOURNAL of MEDICINE

Table 2. Treatments and Interventions.*

Treatment or Intervention	Surgical Group (N = 202)	Medical Group (N = 196)
Craniotomy for evacuation of hematoma — no. (%)	26 (12.9)	30 (15.3)
Ventriculostomy — no. (%)	34 (16.8)	43 (21.9)
Neuromuscular paralysis — no. (%)	101 (50.0)	103 (52.6)
Pharmacologic blood-pressure augmentation — no. (%)	112 (55.4)	116 (59.2)
Osmotherapy — no. (%)	146 (72.3)	144 (73.5)
Therapeutic hypothermia — no. (%)	47 (23.3)	53 (27.0)
Decompressive craniectomy — no. (%)†	187 (92.6)	73 (37.2)
Bifrontal — no./total no. (%)	109/173 (63.0)	NA
Unilateral — no./total no. (%)	64/173 (37.0)	NA
Barbiturates — no. (%)‡	19 (9.4)	171 (87.2)

N Engl J Med 2016;375:1119-30

The NEW ENGLAND JOURNAL of MEDICINE



N Engl J Med 2016;375:1119-30

Conclusion de l'étude RESCUE-ICP

Apres craniectomie décompressive, la mortalité était réduite a 26 ,9% (vs. 48,9% dans le groupe médical) au prix d'une augmentation du nombre de comas végétatifs et états pauci-relationnels (8,5% versus 2,1%)

Les bons résultats, estimes par le score de GOS étendu a 6 mois, n'étaient pas modifies : 26,6% dans le groupe médical contre 27,4% dans le groupe intervention

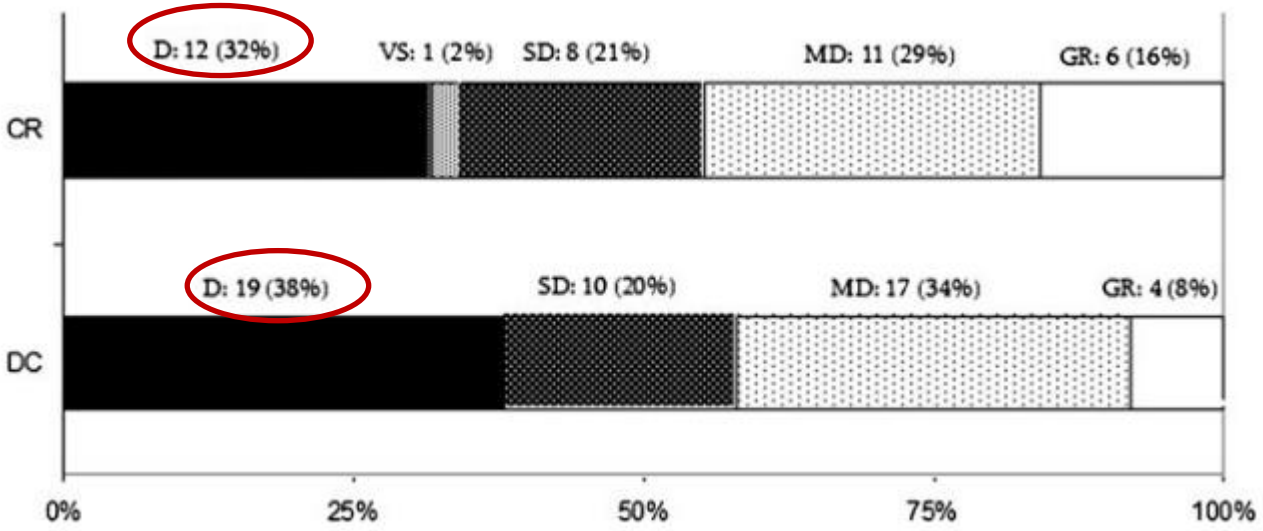
Outcome following evacuation of acute subdural haematomas: a comparison of craniotomy with decompressive craniectomy

Lucia M. Li · Angelos G. Kolias · Mathew R. Guilfoyle · Ivan Timofeev · Elizabeth A. Corteen · John D. Pickard · David K. Menon · Peter J. Kirkpatrick · Peter J. Hutchinson

Acta Neurochir (2012) 154:1555–1561

91 patients

Étude rétrospective, 51 DC vs 40 CR



Surgical management of acute subdural haematomas: current practice patterns in the United Kingdom and the Republic of Ireland

A. G. Kolias[1], W. J. Scotton[1], A. Belli[2], A. T. King[3], P. M. Brennan[4], D. O. Bulters[5], M. S. Eljamel[6], M. H. Wilson[7], M. C. Papadopoulos[8], A. D. Mendelow[9], D. K. Menon[10], P. J. Hutchinson[1] & UK Neurosurgical Research Network & RESCUE-ASDH collaborative group*

British Journal of Neurosurgery, June 2013; 27(3): 330–333

RESCUE-ASDH is a multi-centre, pragmatic, parallel group randomised trial that aims to compare the clinical and cost-effectiveness of decompressive craniectomy versus craniotomy for the management of adult head-injured patients undergoing evacuation of an acute subdural haematoma (ASDH).

Facteurs pronostics ?

Management of Severe Traumatic Brain Injury by Decompressive Craniectomy

Münch, Elke M.D.; Horn, Peter M.D.; Schürer, Ludwig M.D., Ph.D.; Piepgras, Axel M.D., Ph.D.; Paul, Torsten; Schmiedek, Peter M.D., Ph.D.

Neurosurgery. 2000 Aug;47(2):315-22

49 patients

	No. of Patients	GOS Score after 6 Months		
		Mean ± SD	Median	*P* Value
Initial GCS				
≥8 points	26	3.9 ± 1.0	4	
<8 points	23	1.4 ± 0.6	1	0.023
Surgical decompression				
Rapid[b]	31	3.1 ± 1.9	4	
Delayed[c]	18	1.9 ± 1.6	1	0.046
Age				
<50 yr	29	3.0 ± 1.9	3	
≥50 yr	15	1.9 ± 1.6	1	0.046

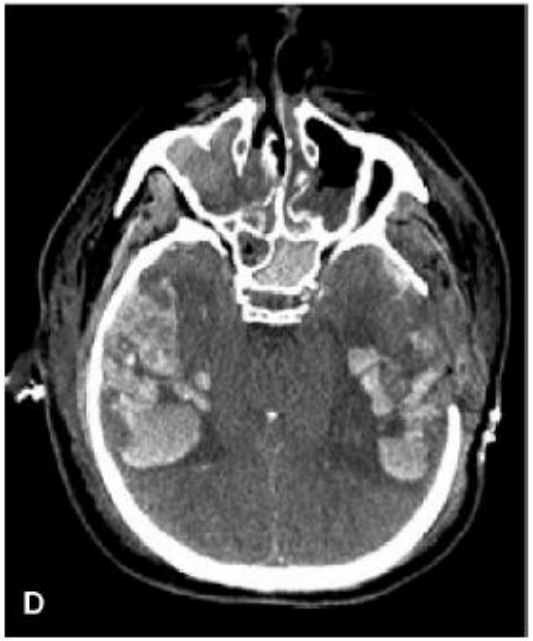
Facteurs pronostics ?

- **GCS** — **Bon**
- **Délai aggravation** — **Bon**
- **Pupilles +** — **moyen**
- **PIC postop haute** — **mauvais**
- **Age ?**
- ***Coté ?***

Complications précoces

Expansion de contusions intraparenchymateuses

Préopératoire



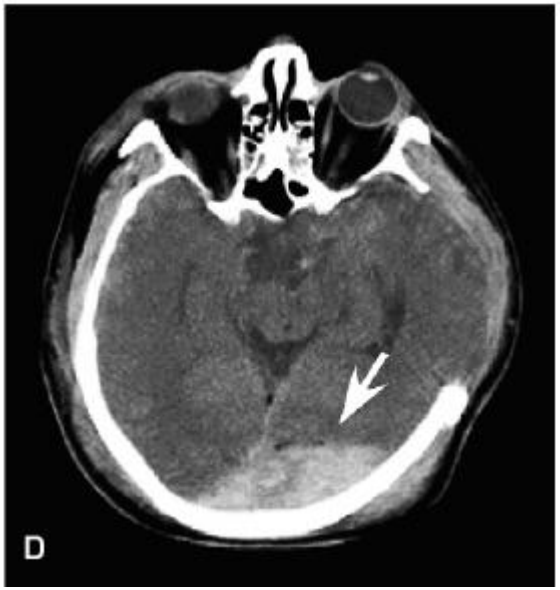
Postopératoire

Neurosurg Focus 26 (6):E7, 2009

Complications précoces

L'hématome sous dural ou extra dural

Préopératoire



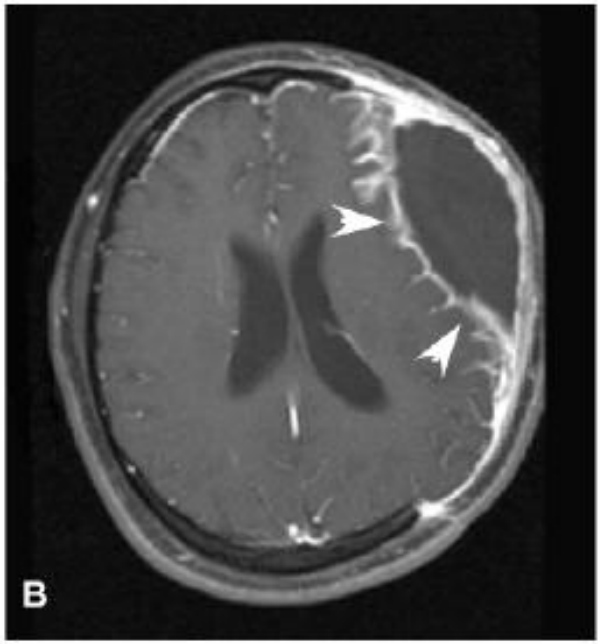
Postopératoire

Neurosurg Focus 26 (6):E7, 2009

Complications précoces

Hydrome sous dural

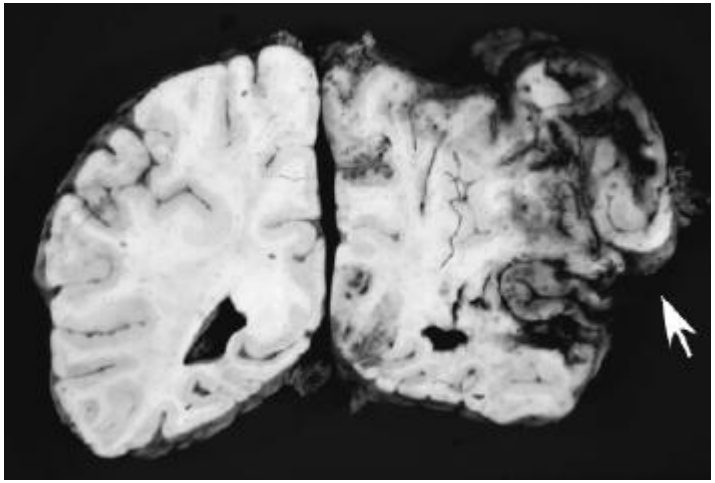
empyème sous dural



Neurosurg Focus 26 (6):E7, 2009

Complications précoces

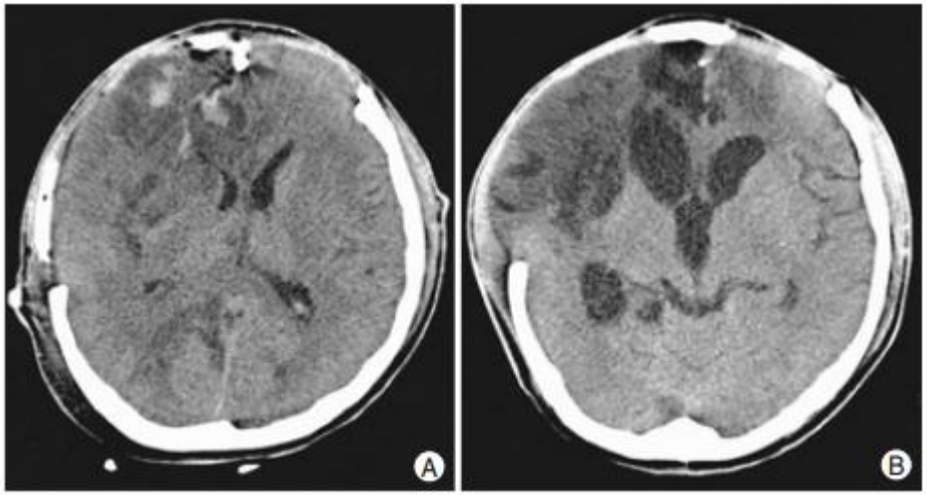
Hernie du cerveau



Neurosurg Focus 26 (6):E7, 2009

Complications tardives

Hydrocéphalie

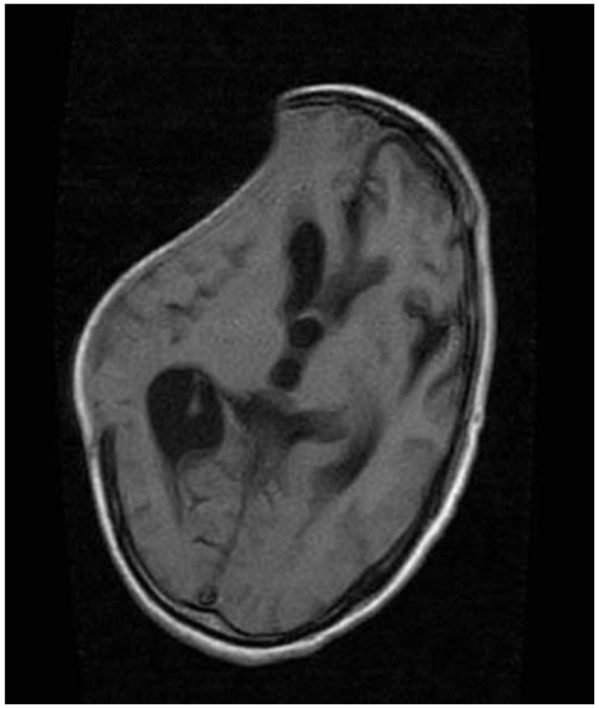


J Korean Neurosurg Soc 43 : 227-231, 2008

Complications tardives

Syndrome des trépanés

Dégradation neurologique secondaire
– Céphalée
– Confusion
– Troubles de mémoire
– Troubles de l'humeur
– Parfois déficit moteur controlatéral
– Améliorée par la cranioplastie



Neurosurgery 79:525–534, 2016

Syndrome of the Trephined: A Systematic Review

Kimberly Ashayeri, BA*
Eric M. Jackson, MD‡
Judy Huang, MD‡
Henry Brem, MD‡
Chad R. Gordon, DO, FACS‡§

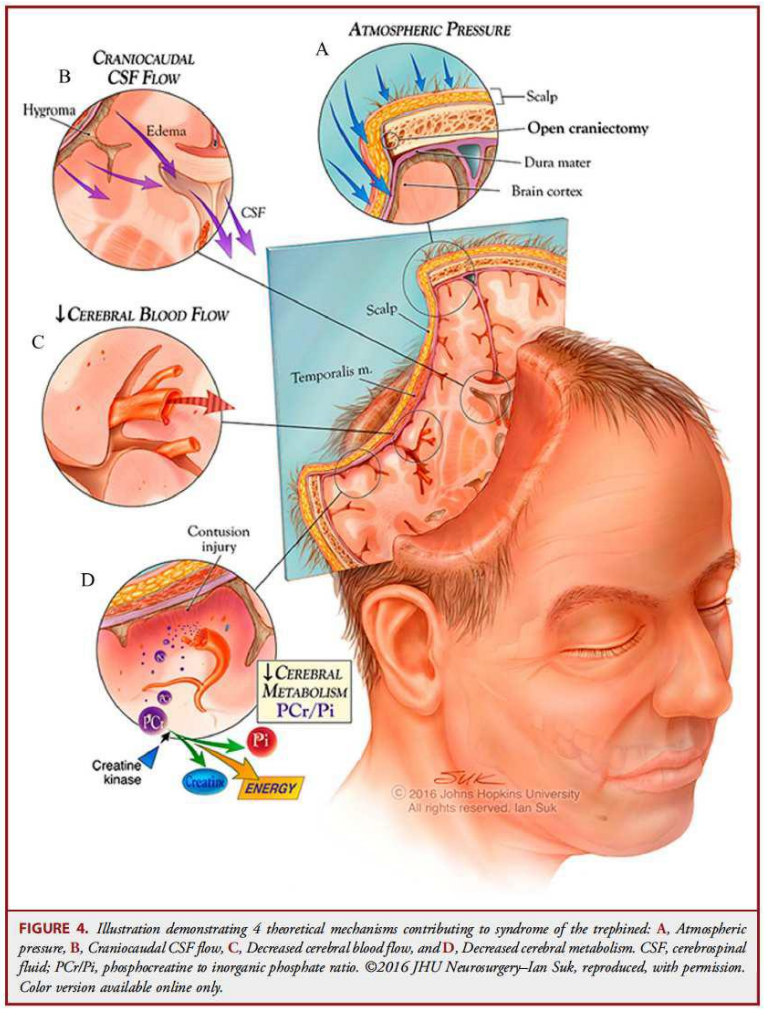


FIGURE 4. *Illustration demonstrating 4 theoretical mechanisms contributing to syndrome of the trephined: A, Atmospheric pressure, B, Craniocaudal CSF flow, C, Decreased cerebral blood flow, and D, Decreased cerebral metabolism. CSF, cerebrospinal fluid; PCr/Pi, phosphocreatine to inorganic phosphate ratio. ©2016 JHU Neurosurgery–Ian Suk, reproduced, with permission. Color version available online only.*

TABLE 3. Presenting Symptoms of SoT, Grouped According to Unifying Features

Presenting Symptom	No. (%) of Cases
Motor weakness	33 (56.9)
Cognitive deficits	24 (41.4)
Language deficit	16 (27.6)
Altered level of consciousness	15 (25.7)
Headache	11 (19.0)
Psychosomatic	10 (17.2)
Seizure	6 (10.3)
Cranial nerve deficits	3 (5.2)

Neurosurgery 79:525–534, 2016

Syndrome of the Trephined: A Systematic Review

Kimberly Ashayeri, BA*
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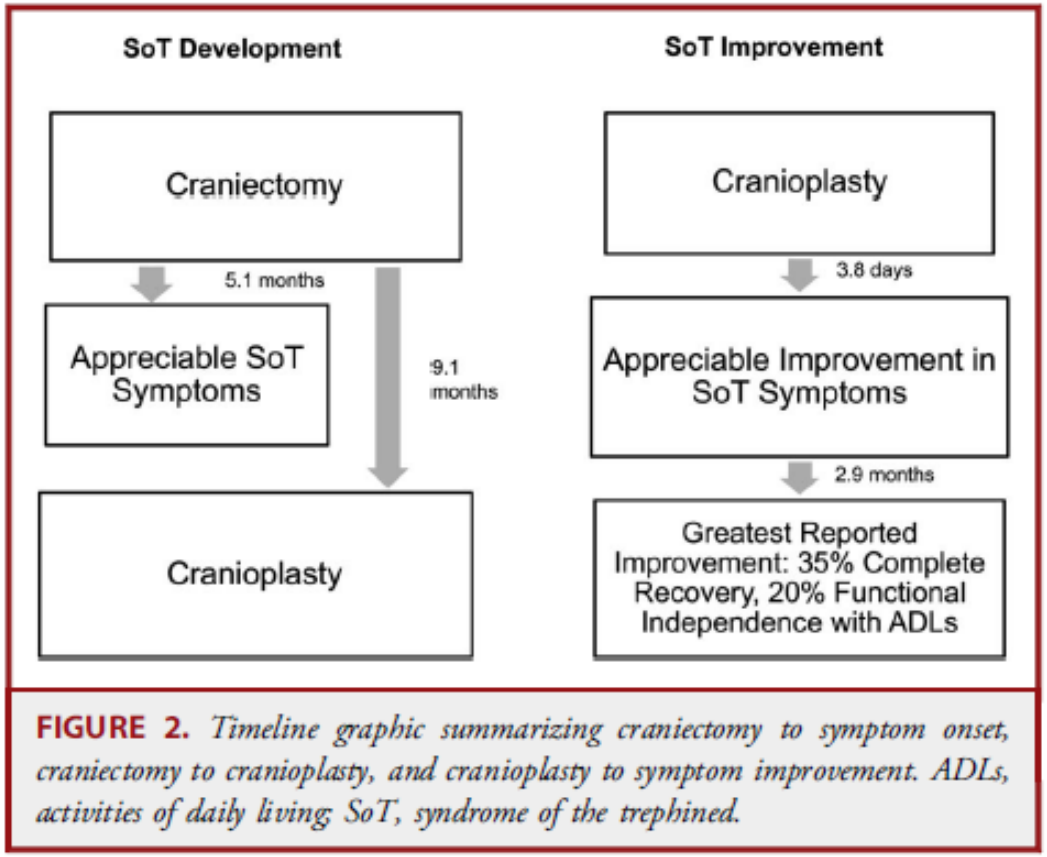


FIGURE 2. *Timeline graphic summarizing craniectomy to symptom onset, craniectomy to cranioplasty, and cranioplasty to symptom improvement. ADLs, activities of daily living; SoT, syndrome of the trephined.*

Neurosurgery 79:525–534, 2016

SFAR

Recommandations Formalisées d'Experts

Actualisation des recommandations

PRISE EN CHARGE DES TRAUMATISES CRANIENS GRAVES A LA PHASE PRECOCE (24 premières heures)

le 21 septembre 2016

R4.2 - Il faut probablement réaliser une craniectomie décompressive pour contrôler la pression intracrânienne à la phase aiguë en cas d'hypertension intracrânienne réfractaire, dans le cadre d'une discussion multidisciplinaire.
(GRADE 2+) Accord FORT

Brain Trauma FOUNDATION

Guidelines for the Management of Severe Traumatic Brain Injury

4th Edition

September 2016

Level I

- There was insufficient evidence to support a Level I recommendation for this topic.

Level II A

- Bifrontal DC is not recommended to improve outcomes as measured by the Glasgow Outcome Scale–Extended (GOS-E) score at 6 months post-injury in severe TBI patients with diffuse injury (without mass lesions), and with ICP elevation to values >20 mm Hg for more than 15 minutes within a 1-hour period that are refractory to first-tier therapies. However, this procedure has been demonstrated to reduce ICP and to minimize days in the intensive care unit (ICU).

Brain Trauma FOUNDATION

Guidelines for the Management of Severe Traumatic Brain Injury

4th Edition

September 2016

A large frontotemporoparietal DC (not less than 12 x 15 cm or 15 cm diameter) is recommended over a small frontotemporoparietal DC for reduced mortality and improved neurologic outcomes in patients with severe TBI.

Conclusion

Bénéfice = sélection indications

Bénéfice fonctionnel

Facteurs pronostics:

- ***GCS initial***
- ***délai aggravation***
- ***délai chirurgie***
- ***signes pupillaires***

MANAGEMENT OF THROMBOPROPHYLAXIS IN MULTIPLE TRAUMA PATIENTS

Youssef Zied Elhechmi, MD
Habib Thameur University Hospital

Guidelines

Que disent les recommandations ?

Guidelines *(The multidisciplinary Task Force for Advanced Bleeding Care in Trauma)*

"Management of bleeding and coagulopathy following major trauma: an updated European guideline"

Critical Care 2013

- **We suggest mechanical thromboprophylaxis with intermittent pneumatic compression (IPC) and/or anti-embolic stockings as soon as possible. (Grade 2C)** *Very weak recommendation; other alternatives may be equally reasonable*
- **We recommend pharmacological thromboprophylaxis within 24 h after bleeding has been controlled. (Grade 1B)** *Strong recommendation, moderate-quality evidence*
- **We do not recommend the routine use of inferior vena cava filters as thromboprophylaxis. (Grade 1C)** *Strong recommendation but may change when higher quality evidence becomes available*

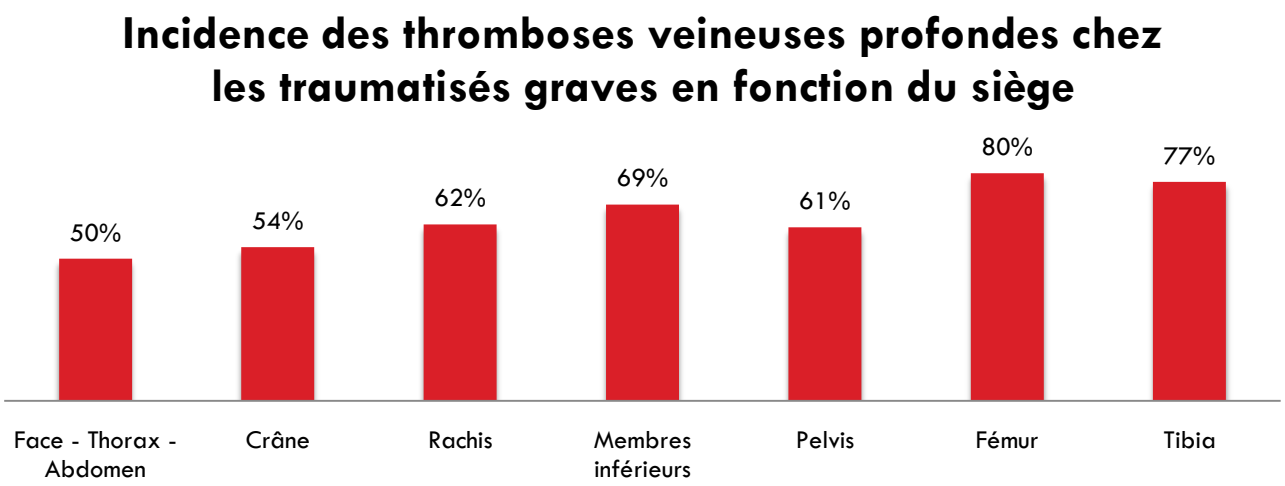
Qu’est ce qui se passerait sans prophylaxie ?

Sans prophylaxie

"A prospective study of venous thromboembolism after major trauma."

N Engl J Med. 1994

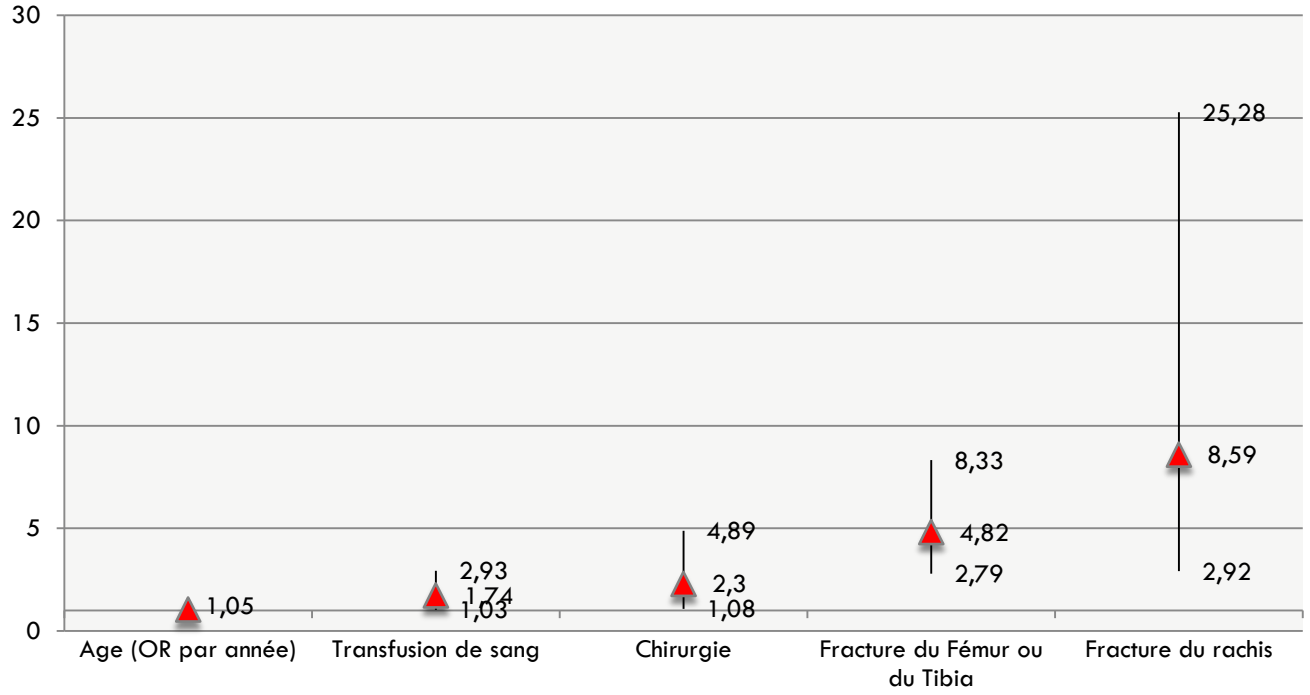
- 716 traumatisés sans prophylaxie, 349 inclus



Les facteurs de risque indépendants de TVP sans prophylaxie

"A prospective study of venous thromboembolism after major trauma."

N Engl J Med. 1994



Oui

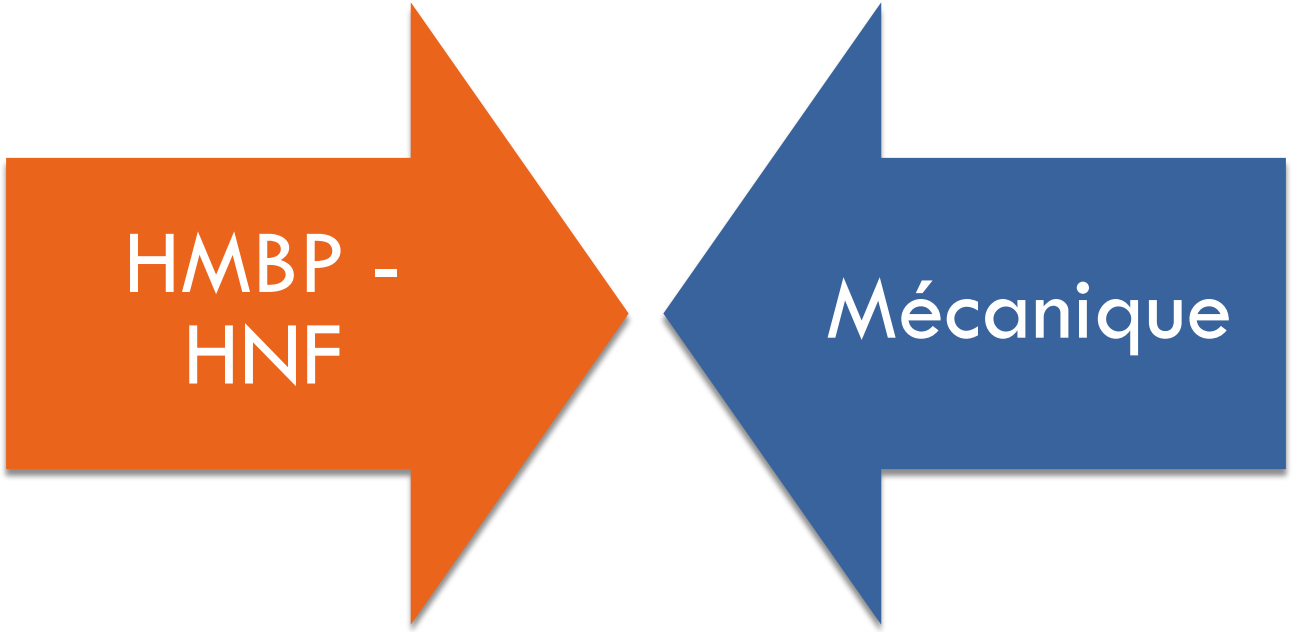
Existe-t-il un risque thrombo-embolique chez le polytraumatisé ?

Quelle prophylaxie ?

Types de prophylaxies

- HNF
- HBPM
- Prophylaxie mécanique
- Nouveaux anti-coagulants oraux

Mécanique Vs HBPM HNF



HBPM&HNF Vs Méc : Critères de jugement

- Réduction du risque de TVP
- Réduction du risque d'EP
- Incidents hémorragiques

Prophylaxie Méc est elle efficace ?

"Thromboprophylaxis for trauma patients (Review)"

Cochrane Database of Systematic Reviews. 2013

- Méta-analyse

	Nb études	Nb de patients	Risque relatif
TVP	5	907	0.55 (0.34-0.90)
EP	5	907	0.77 (0.36-1.66)
Mortalité	5	907	0.74 (0.27-2.04)
Hémorragie	4	603	0.0 (0.0-0.0)

Prophlyaxie Pharmaco Vs Méc

"Thromboprophylaxis for trauma patients (Review)"

Cochrane Database of Systematic Reviews.
2013

- Méta-analyse

	Nb études	Nb de patients	Risque relatif
TVP	6	1033	0.48 (0.25-0.95)
EP	6	1033	0.94 (0.36-2.42)
Mortalité	6	1033	1.5 (0.44-5.16)
Hémorragie	5	953	2.04 (1.08-3.86)
Hémorragie grave	3	764	1.03 (0.26-4.06)
Hémorragie minime	3	764	2.37 (1.13-4.98)

Prophlyaxie Pharmaco Vs Méc

"Thromboprophylaxis for trauma patients (Review)"

Cochrane Database of Systematic Reviews.
2013

- Méta-analyse

	Nb études	Nb de patients	Risque relatif
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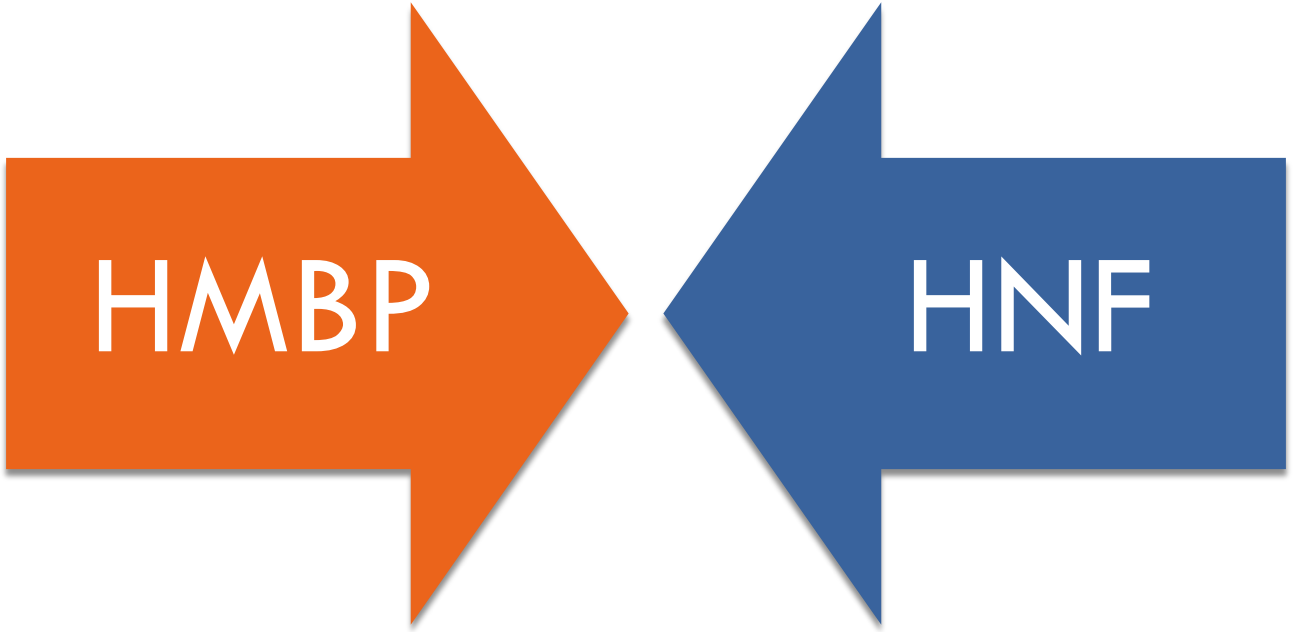
Hémorragie minime	3	764	2.37 (1.13-4.98)

HBPM HNF Vs Mécanique

Supériorité de HBPM – HNF / Mécanique

- ✚ Réduit le risque de survenue de TVP (2x)
- ▬ Augmente le risque des hémorragies minimes (2x)

HBPM Vs HNF



HBPM Vs HNF : Critères de jugement

- Réduction du risque de TVP
- Réduction du risque d'EP
- Incidents hémorragiques
- Thrombopénie induite par l'héparine

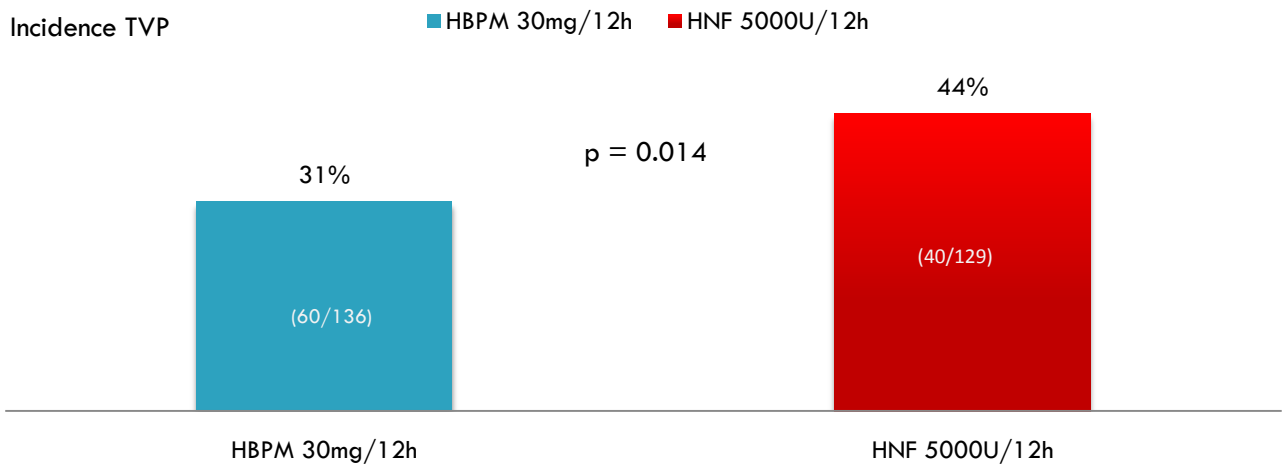
Réduction du risque de TVP*

"A comparison of low-dose heparin with low-molecular-weight heparin as prophylaxis against venous thromboembolism after major trauma."

N Engl J Med. 1996

Geerts WH

- 265 polytraumatisés ont bénéficiés d'une phlébographie avant J14



Réduction du risque de TVP*

A comparison of low-dose heparin with low-molecular-weight heparin as prophylaxis against venous thromboembolism after major trauma."

N Engl J Med. 1996

- 6 patients ont présenté une hémorragie grave (1.7%)
- 1 dans le gpe HNF et 5 dans le gpe HBPM ($p = 0.12$)

Réduction du risque de TVP*

"Dalteparin versus unfractionated heparin in critically ill patients."

N Engl J Med. 2011

- 1873 avec Dalteparin 5000UI/24h Vs HNF 5000UI/12h (Patients de Réa)

	Dalteparin (1827)	HNF (1832)	p	Odds Ratio
Incidence des TVP	5,10%	5,80%	NS	
Incidence des EP	1,30%	2,30%	0,01	0,51 (0,30-0,88)
Hémorragie grave	100 (5,5%)	105 (5,7%)	NS	
Incident hémorragique	236 (12,9%)	247 (13,5%)	NS	
Thrombocytopénie induite par l'héparine	5 (0,3%)	12 (0,7%)	NS	

Réduction du risque d'EP

"Dalteparin versus unfractionated heparin in critically ill patients."

N Engl J Med. 2011

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Thrombocytopénie induite par l'héparine	5 (0,3%)	12 (0,7%)	NS	

Risque hémorragique

"Dalteparin versus unfractionated heparin in critically ill patients."

N Engl J Med. 2011

- 1873 avec Dalteparin 5000UI/24h Vs HNF 5000UI/12h

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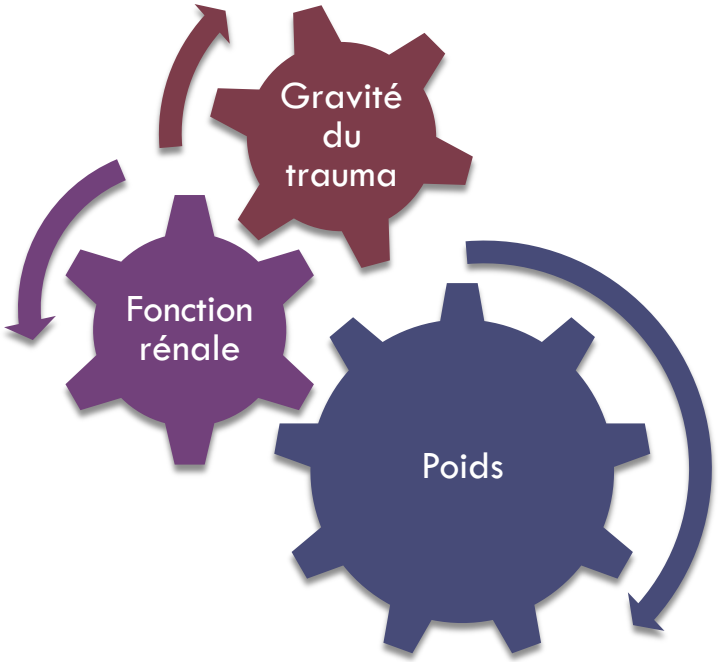
Incident hémorragique	236 (12,9%)	247 (13,5%)	NS	
Thrombocytopénie induite par l'héparine	5 (0,3%)	12 (0,7%)	NS	

Pourquoi les résultats étaient différents ?

Activité anti Xa des HBPM



HBPM : Quelle est la posologie optimale ?

"Increased Enoxaparin Dosing for Venous Thromboembolism Prophylaxis in General Trauma Patients."

Ann Pharmacother. 2017

- La posologie moyenne ayant permi d'atteindre l'objectif thérapeutique contrôlée par l'activité anti Xa était

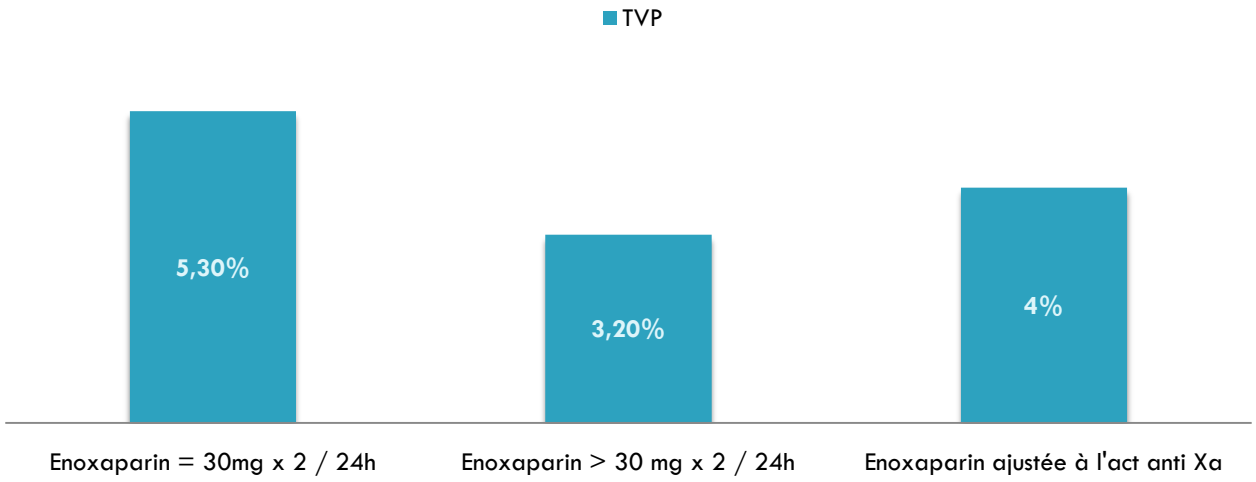
  0.43 – 0.54 mg/Kg/12h

- 3 (0.37%) incidents hémorragiques parmi 958 patients

"Increased Enoxaparin Dosing for Venous Thromboembolism Prophylaxis in General Trauma Patients."

Ann Pharmacother. 2017

Les taux de TVP avec optimisation initiale ou secondaire

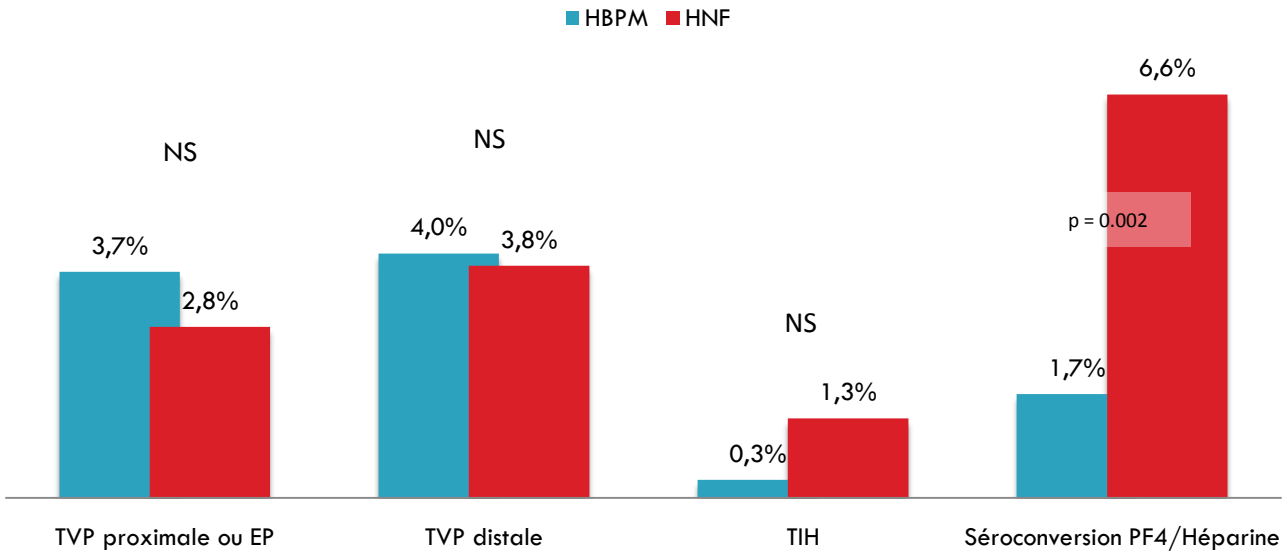


HBPM Vs HNF : TIH

"The severity of trauma determines the immune response to PF4/heparin and the frequency of heparin-induced thrombocytopenia."

Blood. 2010

- 298 HBPM Vs 316 HNF (Réa exclus)

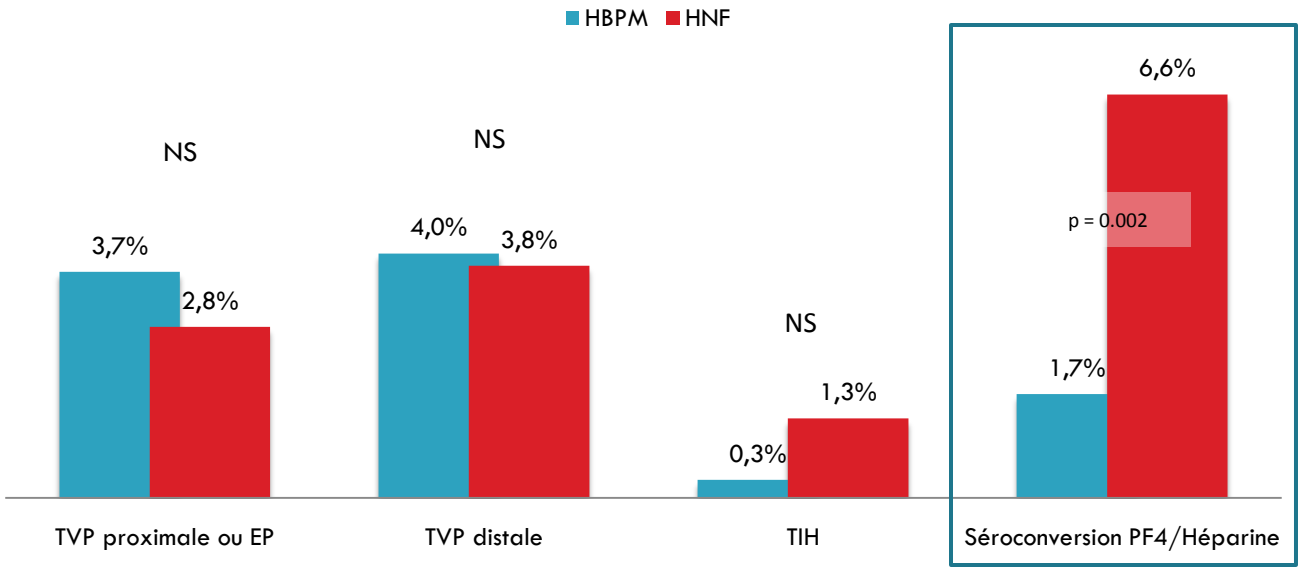


HBPM Vs HNF : TIH

"The severity of trauma determines the immune response to PF4/heparin and the frequency of heparin-induced thrombocytope nia."

Blood. 2010

- 298 HBPM Vs 316 HNF

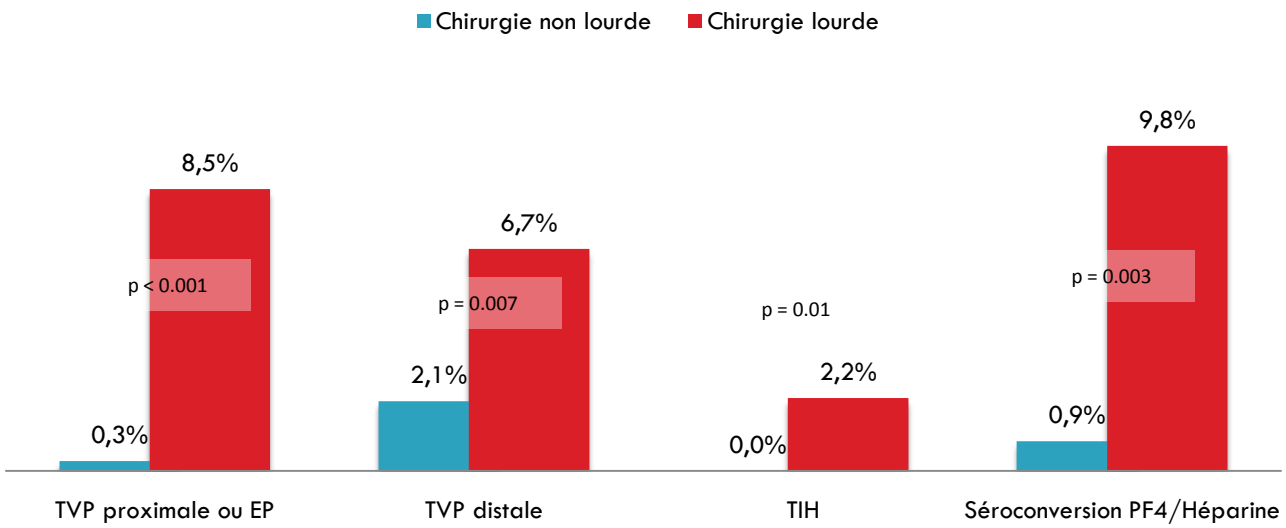


HBPM Vs HNF : TIH

"The severity of trauma determines the immune response to PF4/heparin and the frequency of heparin-induced thrombocytopenia."

Blood. 2010

- Chirurgie lourde Vs Non lourde

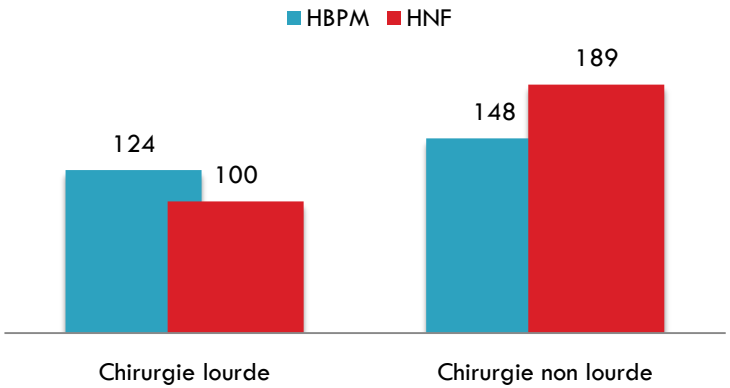


HBPM Vs HNF : TIH

"The severity of trauma determines the immune response to PF4/heparin and the frequency of heparin-induced thrombocytopenia."

Blood. 2010

- Double blinded randomized controlled trial ?
- Ce biais ne figure pas dans la publication



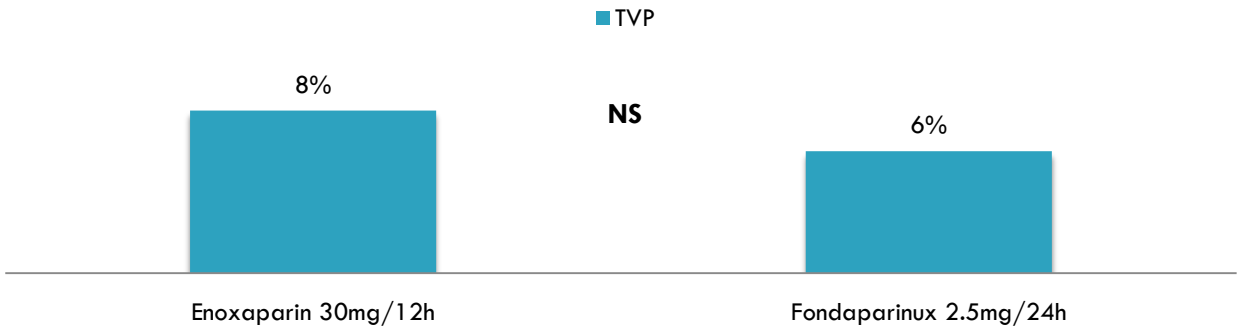
	Chirurgie lourde	Chirurgie non lourde	p	OR
HBPM	124	148	0.008	1.58 (1.12-1.22)
HNF	100	189		

Fondaparinux Vs Enoxaparin

"Postoperative fondaparinux versus postoperative enoxaparin for prevention of venous thromboembolism after elective hip-replacement surgery: a randomised double-blind trial."

Lancet. 2002

- 1584 patients opérés pour fracture de hanche
- Incidence des TVP à J11



Fondaparinux Vs Enoxaparin

"Postoperative fondaparinux versus postoperative enoxaparin for prevention of venous thromboembolism after elective hip-replacement surgery: a randomised double-blind trial."

Lancet. 2002

- Aucune différence significative en matière d'incidents hémorragiques

	Fondaparinux (1128)	Enoxaparin (1129)	p
Hémorragie fatale	0,00%	0,00%	NS
Hémorragie grave	0,00%	0,09%	NS
Hémorragie nécessitant une reprise	0,18%	0,18%	NS
Hémorragie avec Bleeding Index ≥ 2	1,60%	0,71%	NS
Autre hémorragies	1,51%	2,13%	NS
Décès toutes causes confondues	0,27%	0,09%	NS

HBPM Vs HNF

HNF

- ✚ Réduit le risque de TVP aussi bien que HBPM avec un coût moindre

HBPM

- ✚ Réduirait le risque d'EP (2x)
- Même risque hémorragique (sans posologie ajustée)
- ▬ ½ vie plus longue
- ▬ Coût plus important

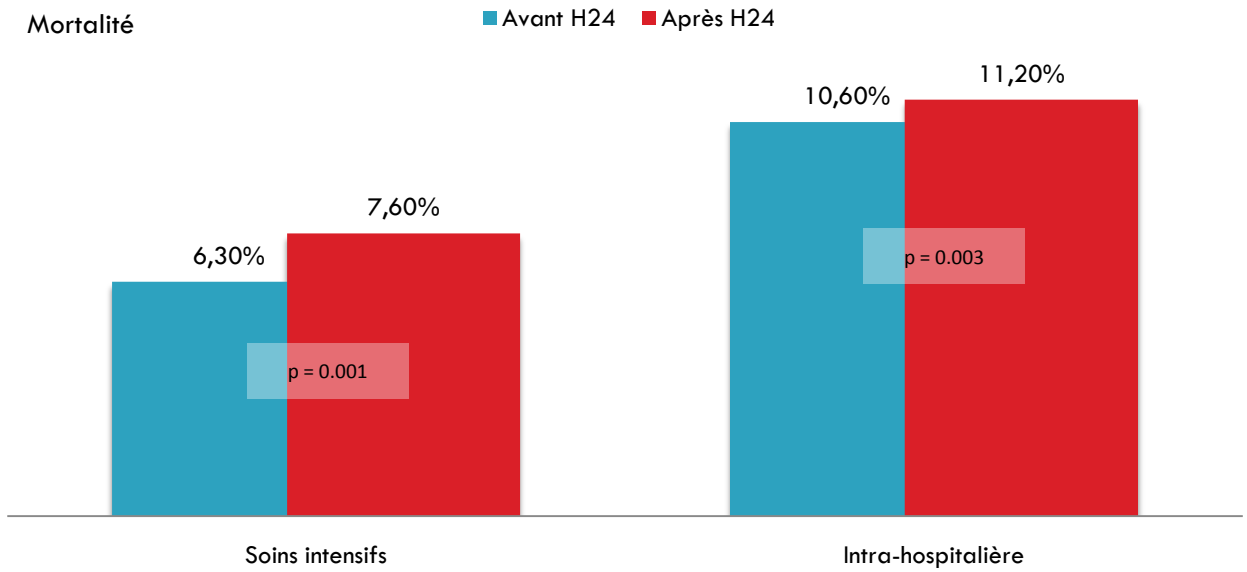
Quand débuter la thromboprophylaxie ?

Si on retardait la thromboprophylaxie ?

"Omission of early thromboprophylaxis and mortality in critically ill patients: a multicenter registry study."

Chest. 2011

- 175'665 patients en réa (134 centres)



La thromboprophylaxie réduit-elle la mortalité ?

"Thromboprophylaxis for trauma patients (Review)"

Cochrane Database of Systematic Reviews.
2013

- Méta-analyse

Analysis 1.3. Comparison 1 Prophylaxis vs No prophylaxis, Outcome 3 Mortality.

Review: Thromboprophylaxis for trauma patients

Comparison: 1 Prophylaxis vs No prophylaxis

Outcome: 3 Mortality

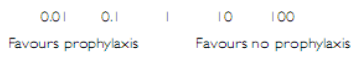
Study or subgroup	Prophylaxis n/N	No Prophylaxis n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Dennis 1993	3/281	4/114		73.3 %	0.30 [0.07, 1.34]
Fisher 1995	0/145	0/159			Not estimable
Knudson 1994 All groups	1/121	1/130		12.4 %	1.07 [0.07, 16.99]
Velmahos 2005	2/26	1/21		14.3 %	1.62 [0.16, 16.61]
Total (95% CI)	**573**	**424**		**100.0 %**	**0.59 [0.20, 1.70]**

Total events: 6 (Prophylaxis), 6 (No Prophylaxis)

Heterogeneity: $Chi^2 = 1.67$, $df = 2$ ($P = 0.43$); $I^2 = 0.0\%$

Test for overall effect: $Z = 0.98$ ($P = 0.33$)

Test for subgroup differences: Not applicable

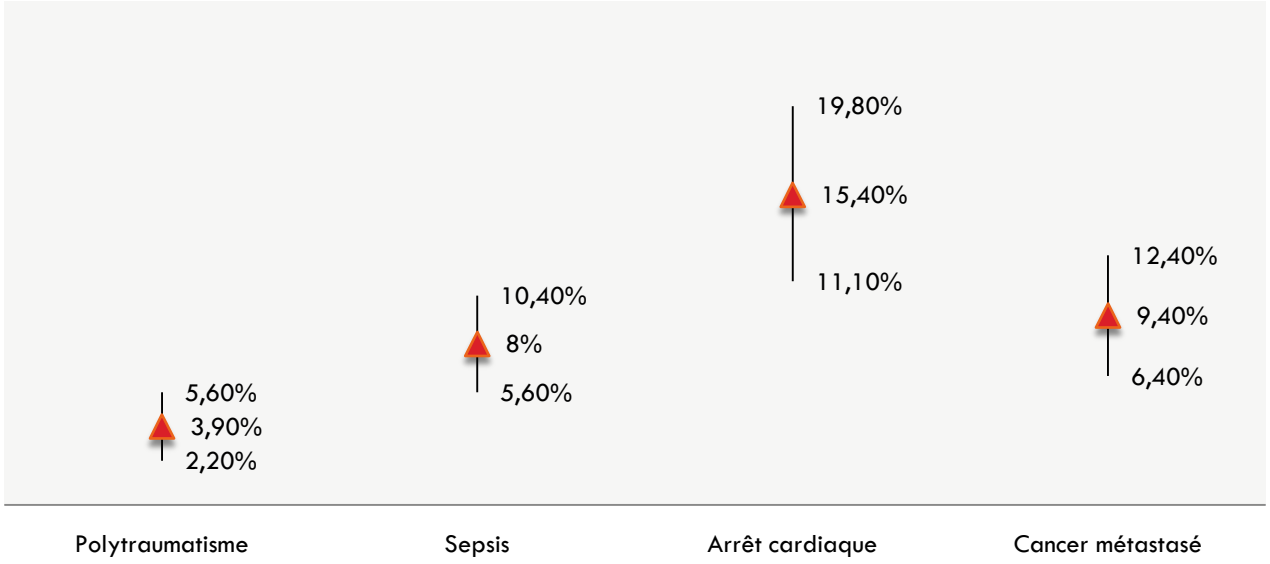


Si on retardait la thromboprophylaxie ?

"Omission of early thromboproph ylaxis and mortality in critically ill patients: a multicenter registry study."

Chest. 2011

- Mortalité évitable



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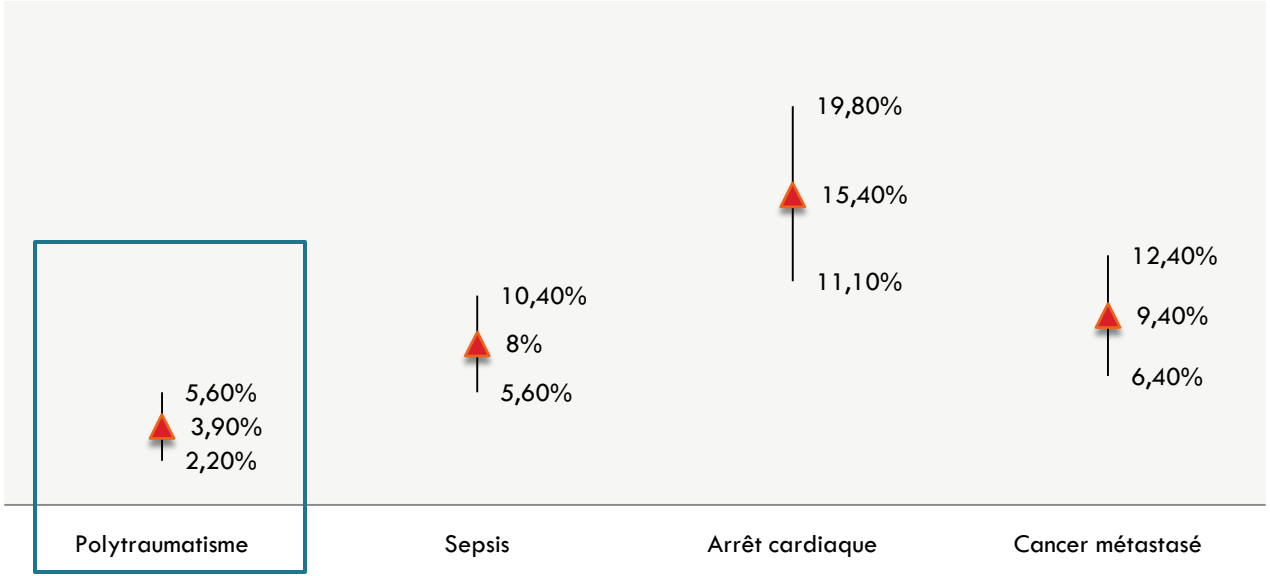

Quand débuter ?

- Débuter la thromboprophylaxie avant H24 réduirait le risque de mortalité chez les traumatisés

Y a-t-il une place pour les nouveaux ACO ?

"Apixaban versus enoxaparin for thromboprophylaxis after knee replacement (ADVANCE-2): a randomised double-blind trial."

Lancet. 2010

	Apixaban		Enoxaparin		Relative risk	p value	Absolute risk difference (%)
	n/N	Rate (%)	n/N	Rate (%)			
During intended treatment							
All venous thromboembolism and all-cause death*	147/976	15·06% (12·95 to 17·46)	243/997	24·37% (21·81 to 27·14)	0·62 (0·51 to 0·74)	<0·0001	−9·27% (−12·74 to −5·79)
Major venous thromboembolism†	13/1195	1·09% (0·62 to 1·88)	26/1199	2·17% (1·47 to 3·18)	0·50 (0·26 to 0·97)	0·0186	−1·04% (−2·03 to −0·05)
Symptomatic venous thromboembolism or venous thromboembolism-related death‡	7/1528	0·46% (0·20 to 0·97)	7/1529	0·46% (0·20 to 0·97)	1·00 (0·35 to 2·85)	..	0·00% (−0·48 to 0·48)
All deep vein thrombosis§	142/971	14·6% (12·5 to 17·0)	243/997	24·4% (21·8 to 27·1)	..	..	..
Symptomatic deep vein thrombosis‡	3/1528	0·20% (0·04 to 0·61)	7/1529	0·46% (0·20 to 0·97)	..	..	..
Proximal deep vein thrombosis, symptomatic or asymptomatic¶	9/1192	0·76% (0·38 to 1·46)	26/1199	2·17% (1·47 to 3·18)	..	..	..
Pulmonary embolism, fatal or non-fatal‡	4/1528	0·26% (0·08 to 0·70)	0/1529	0·00% (0·00 to 0·31)	..	..	..
Pulmonary embolism, fatal‡	1	..	0	..	..	..	..
Death‡	2/1528	0·13% (0·01 to 0·52)	0/1529	0·00% (0·00 to 0·31)	..	..	..
During intended follow-up for randomised patients who entered follow-up							
Symptomatic deep vein thrombosis‡	2/1458	0·14%	1/1469	0·07%	..	..	..
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0.06

"Apixaban versus enoxaparin for thromboprophylaxis after knee replacement (ADVANCE-2): a randomised double-blind trial."

Lancet. 2010

- La fonction rénale n'est pas clairement mentionnée

	Patients randomly allocated to treatment		Primary efficacy population	
	Apixaban (n=1528)	Enoxaparin (n=1529)	Apixaban (n=976)	Enoxaparin (n=997)
Renal status				
Estimated creatinine clearance >60 mL/min	1258 (82%)	1291 (84%)	820 (84%)	858 (86%)

"Apixaban versus enoxaparin for thromboprophylaxis after knee replacement (ADVANCE-2): a randomised double-blind trial."

Lancet. 2010

- Psologie d'Enoxaparin non adaptée au poids : 40mg / 24h

	Patients randomly allocated to treatment		Primary efficacy population	
	Apixaban (n=1528)	Enoxaparin (n=1529)	Apixaban (n=976)	Enoxaparin (n=997)
Age (years)	67 (59–73; 65·6)	67 (60–73; 65·9)	66 (59–72; 65·1)	67 (60–73; 66·0)
Weight (kg)	78 (68·0–89·0; 78·7)	78 (68·0–88·0; 78·3)	78 (69·0–90·0; 79·2)	78 (69·0–89·0; 78·5)
BMI (kg/m²)	29·1 (25·8–32·4; 29·3)	29·3 (26·1–32·7; 29·5)	29·0 (26·0–32·3; 29·3)	29·3 (26·2–32·8; 29·5)

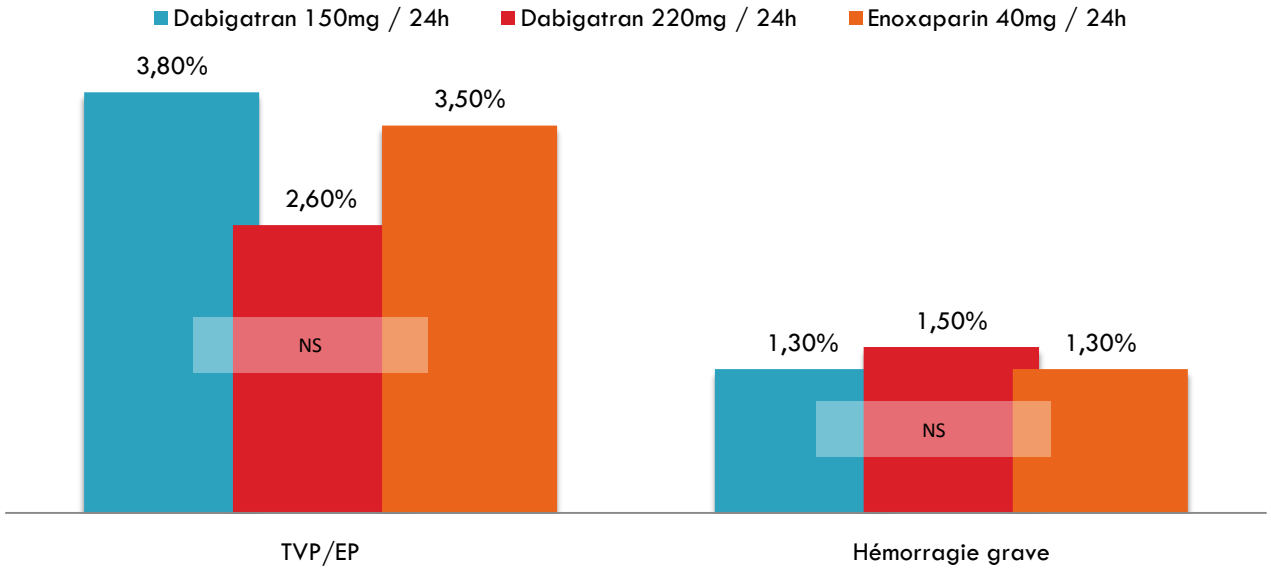
Dabigatrn Vs Enoxaparin *(PTG)*

"A New Oral Aniticoagulant, Dabigatran Etexilate, Is Effective and Safe in Preventing Venous Thromboembolism after Total Knee Replacement Surgery (The RE-MODEL Trial)"

Blood 2006

Bengt I. Eriksson

- Etude de non infériorité (1541 patients)



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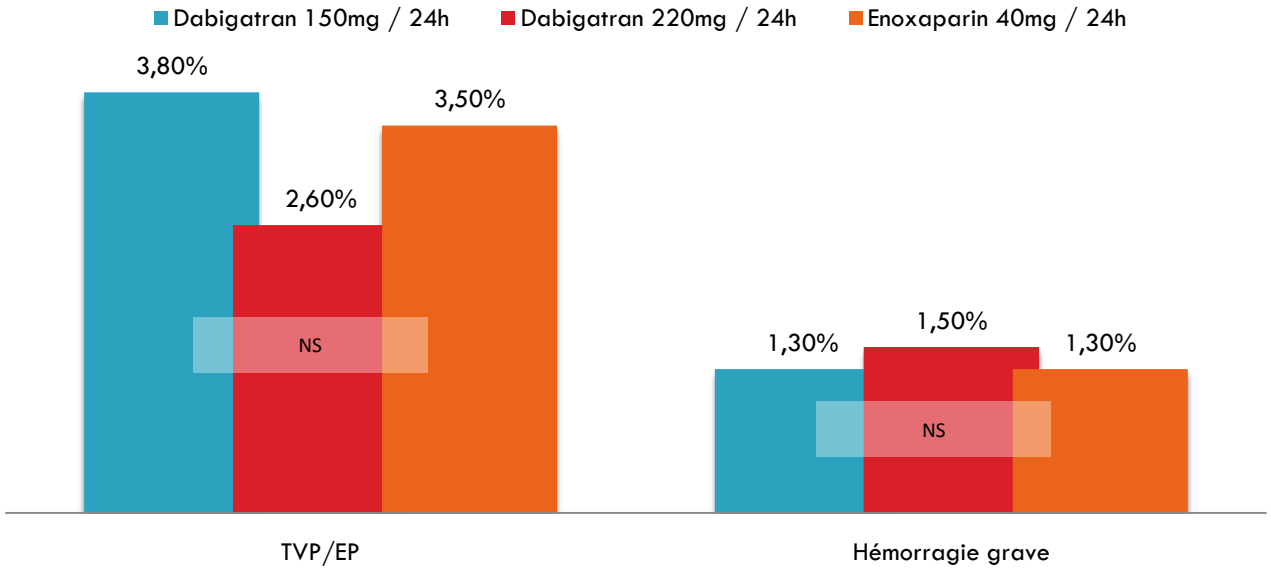
Blood 2006

Bengt I. Eriksson

- Etude de non infériorité (2651 patients)



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Blood 2006

- Risque hémorragique

	Dabigatran etexilate		Enoxaparin (n=1154)
	220 mg (n=1146)	150 mg (n=1163)	
Number of patients with major bleeding*	23 (2·0%, 1·3 to 3·0%)	15 (1·3%, 0·7 to 2·1%)	18 (1·6%; 0·9 to 2·5%)
Fatal	1	1	0
In a critical organ	0	0	0
Clinically overt associated with 20 g/L or more fall in haemoglobin†	18	12	12
Clinically overt leading to transfusion of two or more units of packed cells or whole blood†	21	8	16
Warranting treatment cessation	1	1	1
Leading to re-operation	2	3	3
Onset of major bleeding events‡			
Onset before the first oral dose	13/23 (56·5%)	7/15 (46·7%)	8/18 (44·4%)§
Onset after the first oral dose	10/23 (43·5%)	8/15 (53·3%)	10/18 (55·6%)§
Number of patients with clinically relevant non-major bleeding‡	48 (4·2%)	55 (4·7%)	40 (3·5%)
Number of patients with minor bleeding‡	70 (6·1%)	72 (6·2%)	74 (6·4%)

Data are n (%, 95% CI). For all bleeding outcomes, none of the differences between each dabigatran etexilate dose and enoxaparin were significant. *Patients may have been included in more than one category. †In excess of that expected by the investigator. ‡Data are n/N (%). §Placebo capsule.

Table 3: **Bleeding events during the treatment period**

Dabigatrn Vs Enoxaparin *(PTH)*

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En résumé…

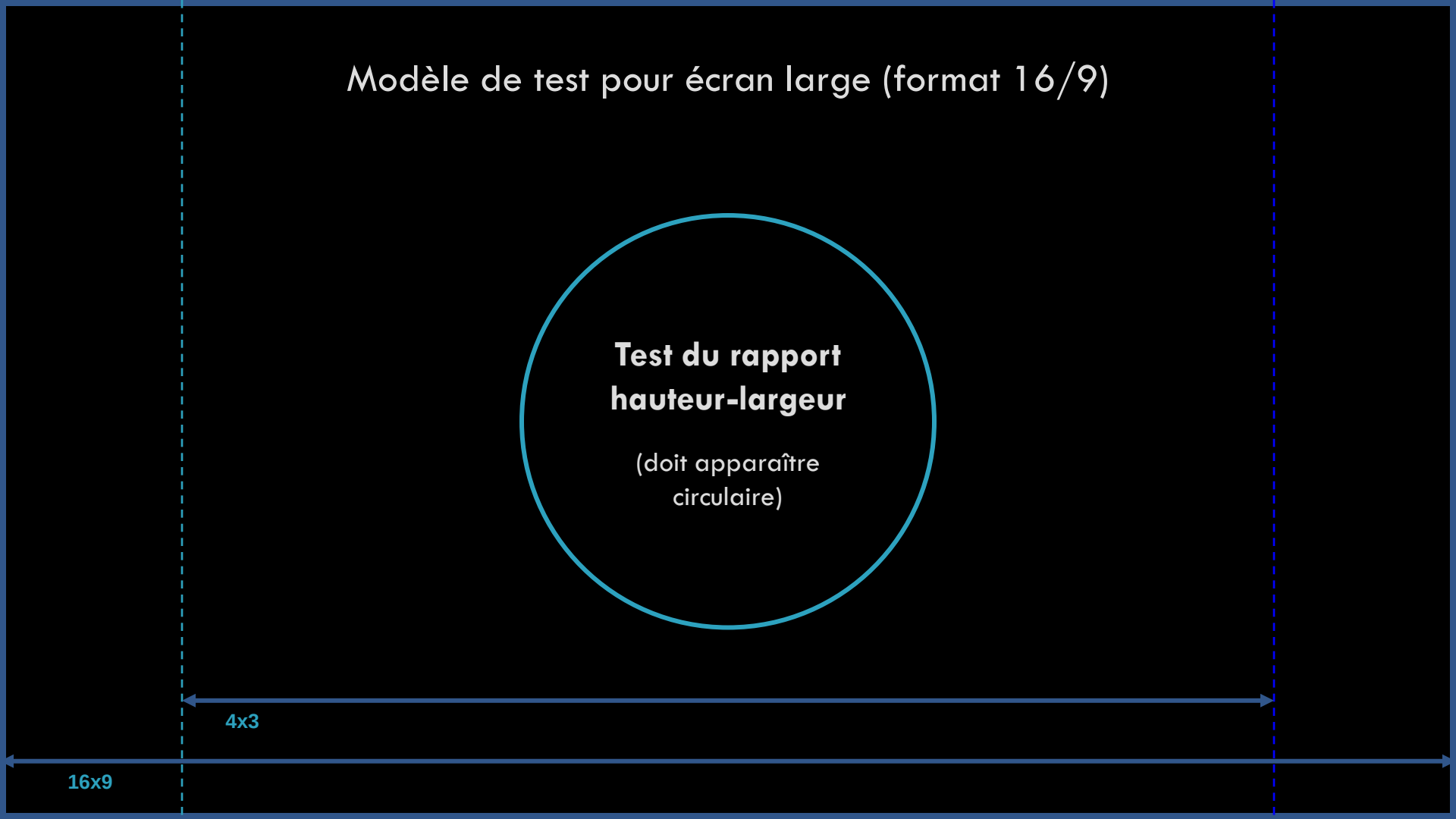
Summary

Thromboprophylaxie & Trauma

- La prophylaxie réduit le risque de TVP et d'EP de manière significative
- Il est conseillé de débuter la prophylaxie le plus précocèment possible après contrôle du saignement
- Le risque d'hémorragie grave existe mais avec une incidence très faible, dépendant aussi du type de traumatisme du de degré de contrôle de l'hémorragie, et de plusieurs facteurs confondants qui n'ont pas été suffisament étudiés comme le poids ou la fonction rénale ou l'existence de défaillance multi-viscérale
- Les HBPM seraient supérieures à HNF dans la réduction des EP
- L'optimisation de la posologie des HBPM pourrait améliorer leur efficaicté dans la prévention de la MTEV tout en réduisant le risque hémorragique
- Les nouveaux ACO pourraient être aussi efficace dans la prévention de la MTEV que les HBPM. Le risque de développer une hémorragie grave serait équivalent en chirurgie froide de la hanche et du genou. Des études sont encore nécessaires avant de pouvoir valider son utilisation chez les polytraumatisés

Merci

Modèle de test pour écran large (format 16/9)



PRISE EN CHARGE DU TRAUMATISME FERMÉ DU THORAX (MANAGEMENT OF BLUNT CHEST TRAUMA)

Dr Ouerghi. S

Service d'anesthésie réanimation

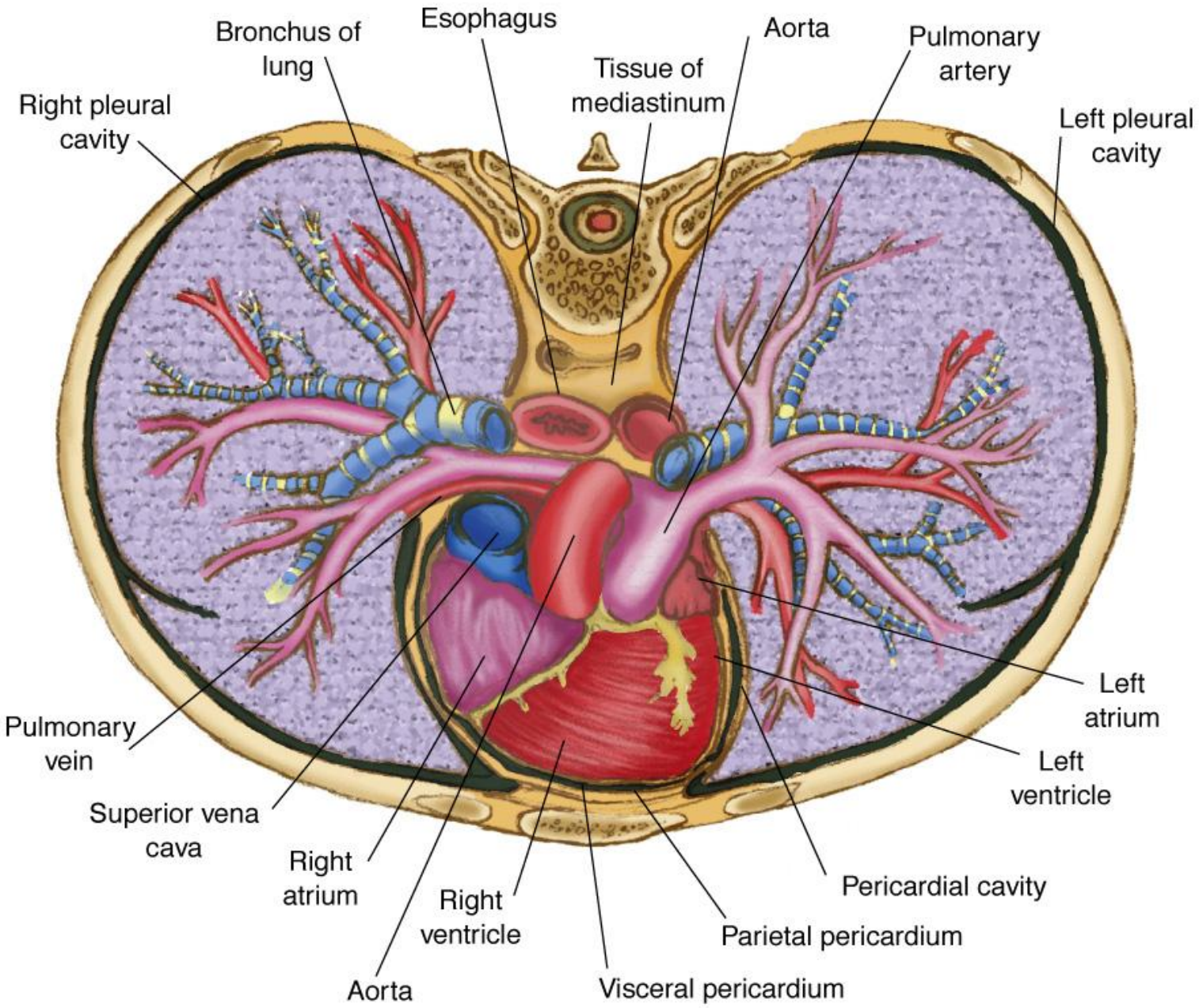
Hôpital Abderrahmen Mami, Ariana, Tunis

Introduction

TT= problème de santé

- **1/3 des admission de traumatologie**
- **GRAVE** *Curr Probl Surg 2004 ; 41 : 211-380*
  - cause initiale de décès: dans 25 % des cas
  - dans 50 % des cas mortel
- **30%: polytraumatisé**
- **Lésions évolutive: la gravité dynamique**
- **pas de corrélation entre les lésions pariétales et endothoraciques : Difficulté d'évaluer la gravité initiale**

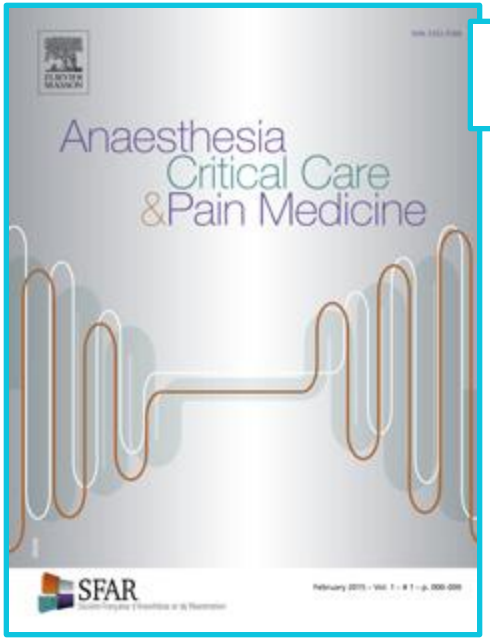
Multidisciplinaire : l'urgentiste, le réanimateur et le chirurgien


Bronchus of lung
Esophagus
Aorta
Pulmonary artery
Tissue of mediastinum
Right pleural cavity
Left pleural cavity
Pulmonary vein
Left atrium
Left ventricle
Superior vena cava
Right atrium
Right ventricle
Pericardial cavity
Parietal pericardium
Aorta
Visceral pericardium

Anesth Reanim. 2015; 1: 272–287

en ligne sur / *on line on*
www.em-consulte.com/revue/anrea
www.sciencedirect.com

Traumatisme thoracique : prise en charge des 48 premières heures



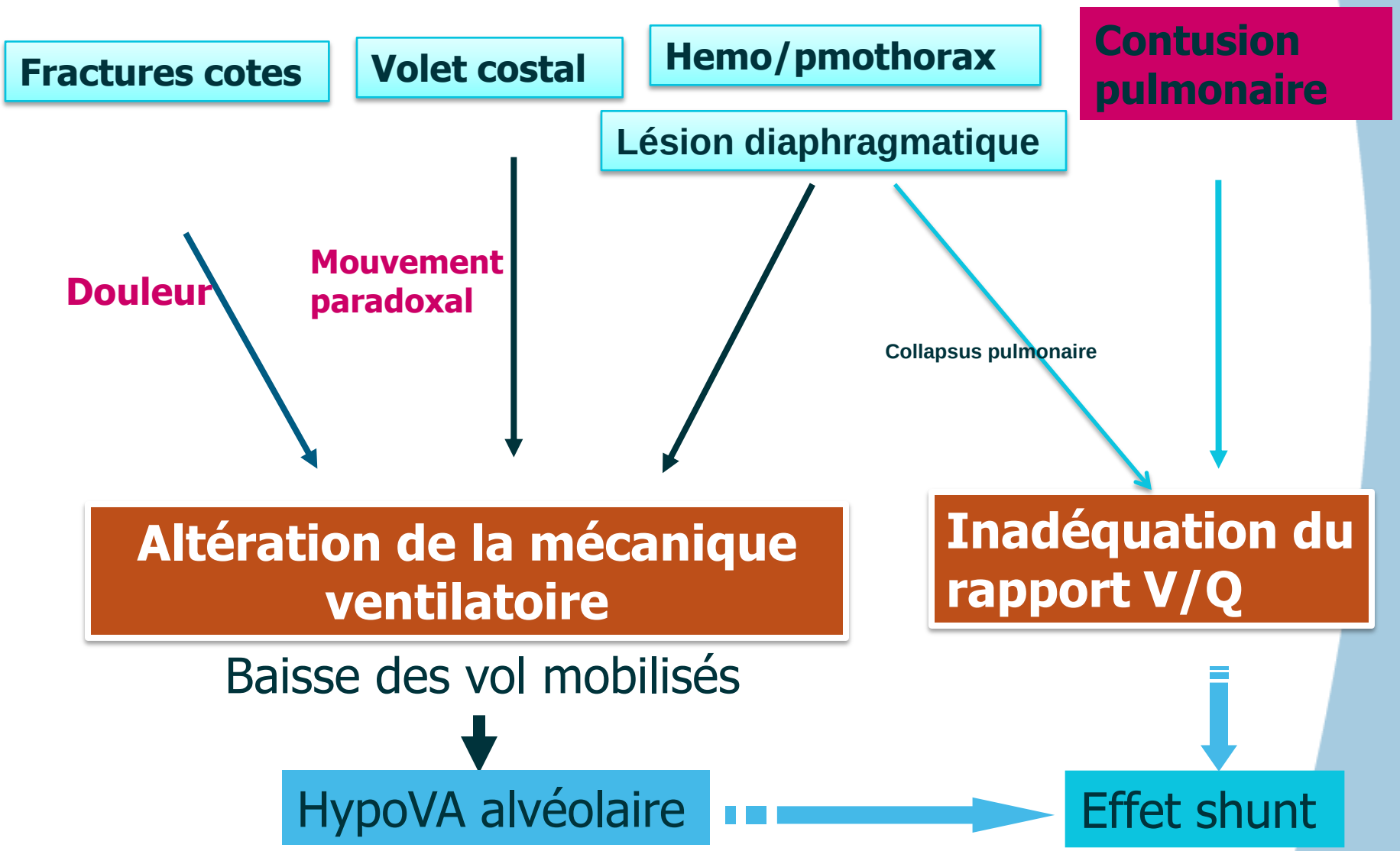
Title: Chest Trauma: First 48 hours management

SOCIETY FOR VASCULAR SURGERY® DOCUMENTS

Endovascular repair of traumatic thoracic aortic injury: Clinical practice guidelines of the Society for Vascular Surgery

J Vasc Surg 2011;53:187-92.

Physiopathologie: L'IRA traumatique



Physiopathologie: Détresse hémodynamique

Plaie du cœur

des gros vaisseaux

Contusion myocardique

PNO

Sommation d'hémorragie de moyenne abondance

Tamponnade

Plaie du parenchyme

Plaie de l'azygos

Luxation du cœur

Hgie extra-thoracique

Plaie A. pariétale

Choc hémorragique 80%

Choc cardiogénique 1%

Choc obstructif 10-20%

Revue des Maladies Respiratoires (2011) 28, 152–163

Evaluation initiale: les objectifs

- Apprécier la gravité initiale du traumatisme
- Mettre en œuvre les mesures thérapeutiques qui éviteront la survenue de complications
- Programmer la réévaluation dynamique lors d'un séjour hospitalier ou en consultation externe

Evaluation initiale: les objectifs

- **Détresse vitale:**
  - Détresse hémodynamique
  - Détresse respiratoire
  - Détresse neurologique

- **Autres éléments de gravité**

Arch Bronconeumol. 2013;49(5):177–180

ARCHIVOS DE BRONCONEUMOLOGIA

www.archbronconeumol.org

Original Article

Evolution and Complications of Chest Trauma☆

Variable	Description	Cases	Complications, %	P
Sex	Men	220 (58.2%)	–	–
	Women	158 (41.8%)	–	–
Age (age groups)	16–20 years	14	3 (17.6)	.40
	21–25 years	14	0 (0)	.17
	26–30 years	33	2 (6.3)	.34
	31–35 years	39	2 (5.3)	.21
	36–40 years	28	3 (10.3)	.85
	41–45 years	28	2 (7.7)	.54
	46–50 years	26	1 (3.8)	.21
	51–55 years	30	1 (3.4)	.16
	56–60 years	10	3 (3.4)	.06
	61–65 years	17	4 (22.2)	.13
	66–70 years	22	3 (15)	.13
	71–75 years	25	1 (4)	.22
	75–80 years	33	4 (12.5)	.83
	81–85 years	37	6 (16.2)	.32
	>85 years	22	8 (32)	.001
Cause of trauma	Falls	219	–	–
	Motor vehicle accidents	58	–	–
	Workplace accidents	19	–	–
	Sports accidents	33	–	–
	Assaults	53	–	–
Types of trauma	Rib contusion	248	11 (4.4)	.99
	1 rib fracture	61	5 (8.2)	.39
	2 rib fractures	20	5 (25)	.04
	3 rib fractures	14	4 (28.6)	.039
	4 rib fractures	11	5 (45.5)	0
	>5 rib fractures	6	4 (66.7)	0
	Sternal fracture	7	1 (14.3)	.8
	Rib and sternal fracture	5	4 (80)	.00
Place where the trauma occurred	Home	160	–	–
	Road	145	–	–
	Nursing homes	68	–	–
	Others	5	–	–
Comorbidities	Hypertension	128	18 (14.1)	.23
	Dyslipidemia	64	9 (14.1)	.45
	Diabetes mellitus	32	6 (18.8)	.17
	COPD	29	9 (31)	.001
	Anticoagulation	20	7 (35)	.01
	Chronic Renal Failure	8	3 (37.5)	.019

376 cas des traumatismes thoraciques

- **Le risque de complications augmente significativement**

- **Fractures > 02 côtes**
  - Age >85 ans
  - **Comorbidités : BPCO, traitement anticoagulant**

- **Le risque des réadmission augmente si âge >60 ans**

EVALUATION OF THORACIC TRAUMA SEVERITY SCORE IN PREDICTING THE OUTCOME OF ISOLATED BLUNT CHEST TRAUMA PATIENTS

International Journal of Surgery and Medicine (2016) 2(3): 100-106

Grade	PaO2/FiO2	Rib Fractures	Lung Contusion	Pleura	Age (years)	POINTS
0	>400	0	No	No	<30	0
I	300-400	1-3	Unilobar unilateral	Pneumothorax	30-41	1
II	200-300	3-6	unilobar bilateral or bilobar unilateral	Haemothorax or haemo/pneumothorax unilateral	42-54	2
III	150-200	>3 bilateral	bilateral <2 lobules	Haemothorax or haemo/pneumothorax bilateral	55-70	3
IV	<150	Flail chest	Bilateral ≥2 lobules	Tension pneumothorax	>70	5

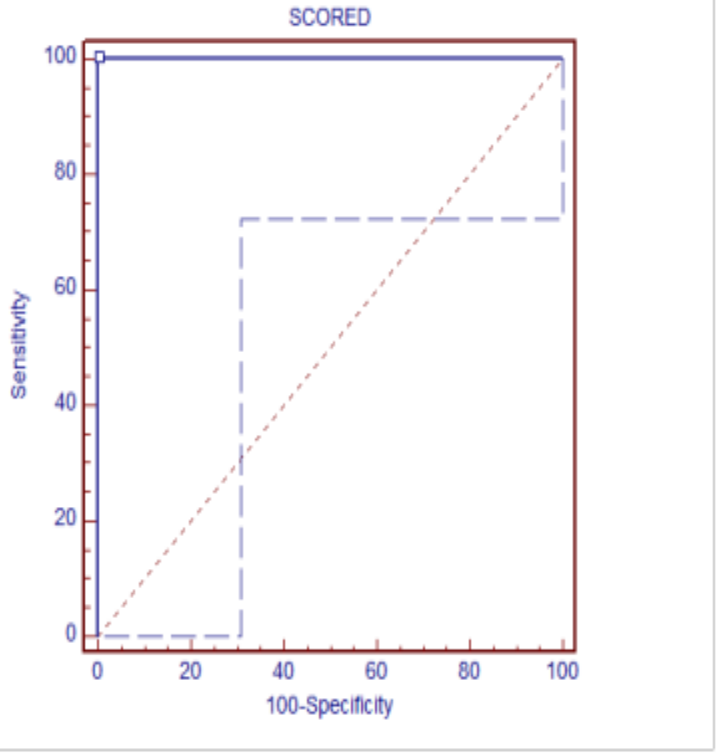


Figure (1) shows that the TTSS; Thoracic trauma severity score when larger than (7) is 100% sensitive and 100% specific for prediction of poor outcome (Death and ICU admission) versus good outcome (Discharge from ER and inpatient admission) with 100% positive predictive value and 100% negative predictive value.

ET POUR RÉSUMER

ÉLÉMENTS DE GRAVITÉ

- âge>65 ans
- Pathologie pulmonaire ou cardiovasculaire chronique
- Trouble de coagulation

- Circonstances: traumatisme de haute cinétique

- Fractures > à 2 côtes et surtout si âge > 65 ans
- FR > 25 c/min et/ou SpO2 < 90 en AA ou < 95 sou oxygène
- Détresse circulatoire avec chute de PAS > 30% ou PAS < 110 mm hg (G1+)

- Score MGAP pour le triage (G2+)

TRAUMATISME THORACIQUE:

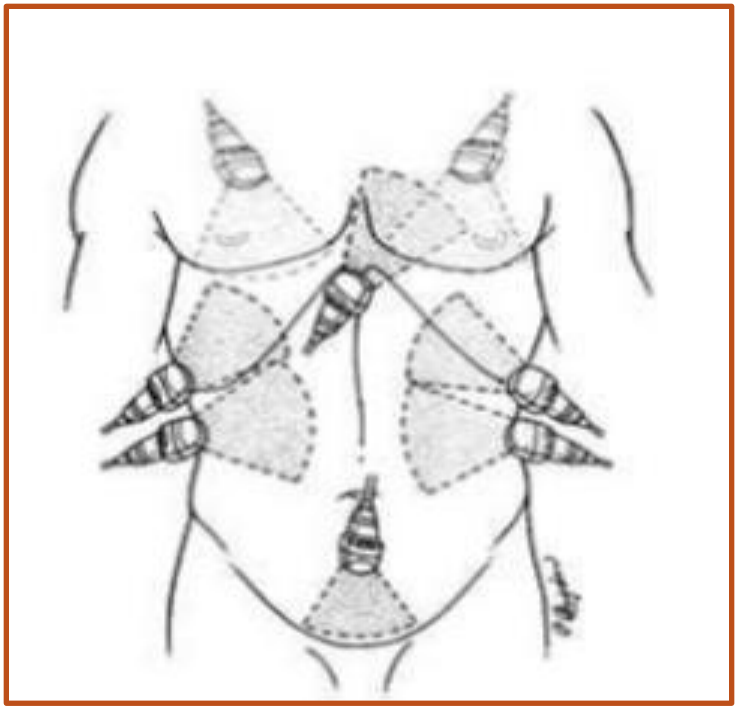
5 causes de mortalité immédiate	5 causes de mortalité tardive
Obstruction des VAS	Contusion pulmonaire
Pneumothorax suffocant	Contusion myocatdique
hémothorax	Rupture trachéo-bronchique
tamponnade	Rupture diaphragmatique
Volet thoracique	Rupture oesophagienne

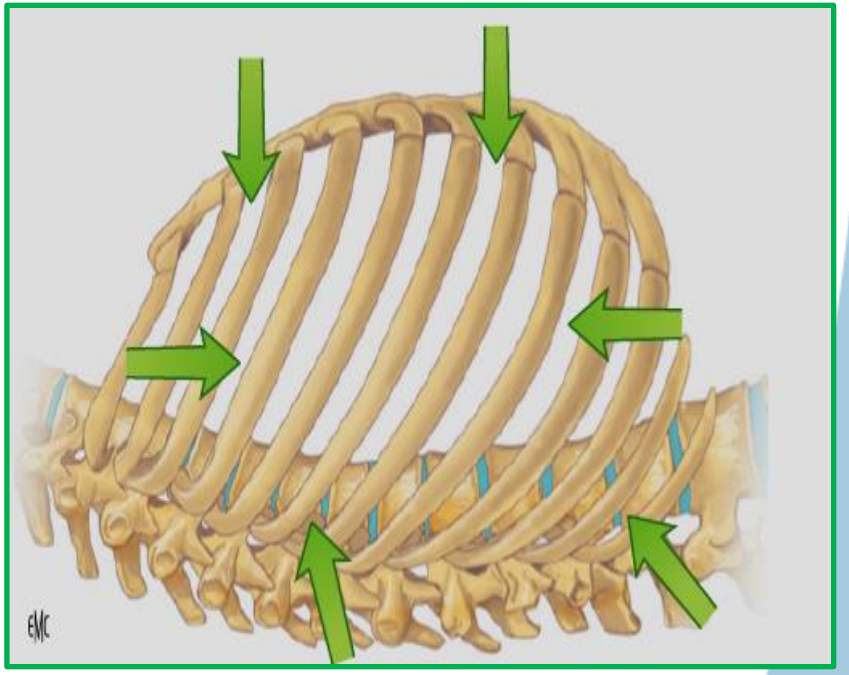
Ex clinique /écho/péricarde/Rx T

Body-TDM

Evaluation initiale: les objectifs

diagnostic rapide de la cause ➔➔ sanction thérapeutique quasi-immédiate





- Ultraschall Med. 2005 Aug;26(4):285-90.

[Ultrasound diagnosis in blunt thoracic trauma

Abstract

AIM: Aim of the study was to determine the rate of injuries detectable by ultrasonography in patients suffering from blunt thoracic trauma.

- **Concerning the diagnosis of rib fractures (65% versus 36%) and pleural effusions (37% versus 11%), ultrasonography is superior to chest-x-ray.**
- **A new and remarkable result is that subpleural infiltrates which are supposed to be lung contusions are also detectable by ultrasonography.**

Diagnostic Accuracy of Ultrasonography in the Acute Assessment of Common Thoracic Lesions After Trauma

CHEST 2012; 141(5):1177–1183

- a prospective, observational cohort study

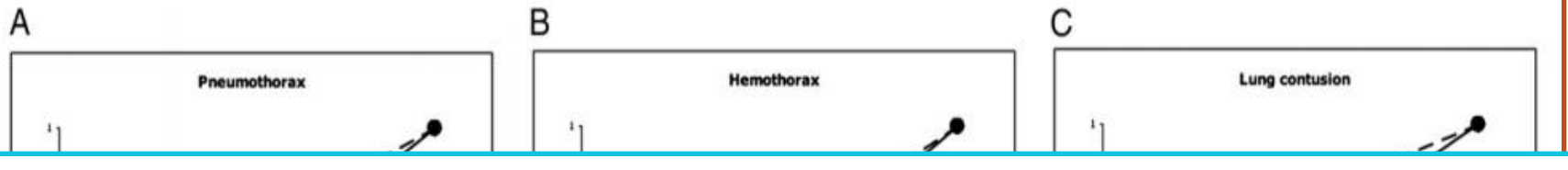


Table 3—*Comparison of the AUC-ROC of CE + CXR and Thoracic Ultrasonography for Detecting Pneumothorax, Hemothorax, and Lung Contusion, According to the Presence of a Respiratory and/or CV Failure on Admission*

Findings	Lung Fields in Patients With SOFA 3-4 (n = 69)	Lung Fields in Patients With SOFA 0-2 (n = 168)	*P* Value
Pneumothorax (n = 53)			
CE + CXR	0.65 (0.51-0.79)	0.61 (0.51-0.71)	.62
Ultrasonography	0.86 (0.73-0.98)	0.70 (0.61-0.80)	.05
Hemothorax (n = 35)			
CE + CXR	0.45 (0.32-0.59)	0.67 (0.56-0.79)	.02
Ultrasonography	0.66 (0.51-0.81)	0.70 (0.59-0.81)	.67
Lung contusion (n = 147)			
CE + CXR	0.71 (0.62-0.80)	0.65 (0.58-0.72)	.32
Ultrasonography	0.74 (0.62-0.87)	0.73 (0.66-0.81)	.84

evaluated in a subgroup of 35 patients with hemodynamic and/or respiratory instability.

Usefulness of Ultrasonography in Predicting Pleural Effusions > 500 mL in Patients Receiving Mechanical Ventilation*

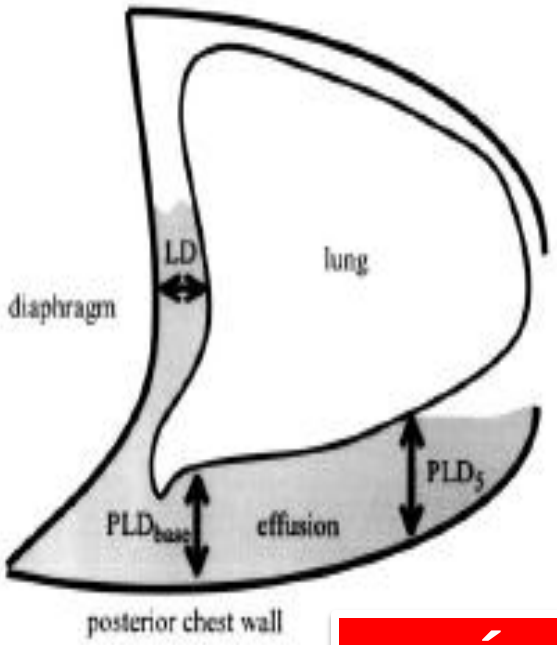
Antoine Roch, MD PHD; Mirela Bojan, MD; Pierre Michelet, MD; Fanny Romain, MD; Fabienne Bregeon, MD; Laurent Papazian, MD PHD; and Jean-Pierre Auffray, MD

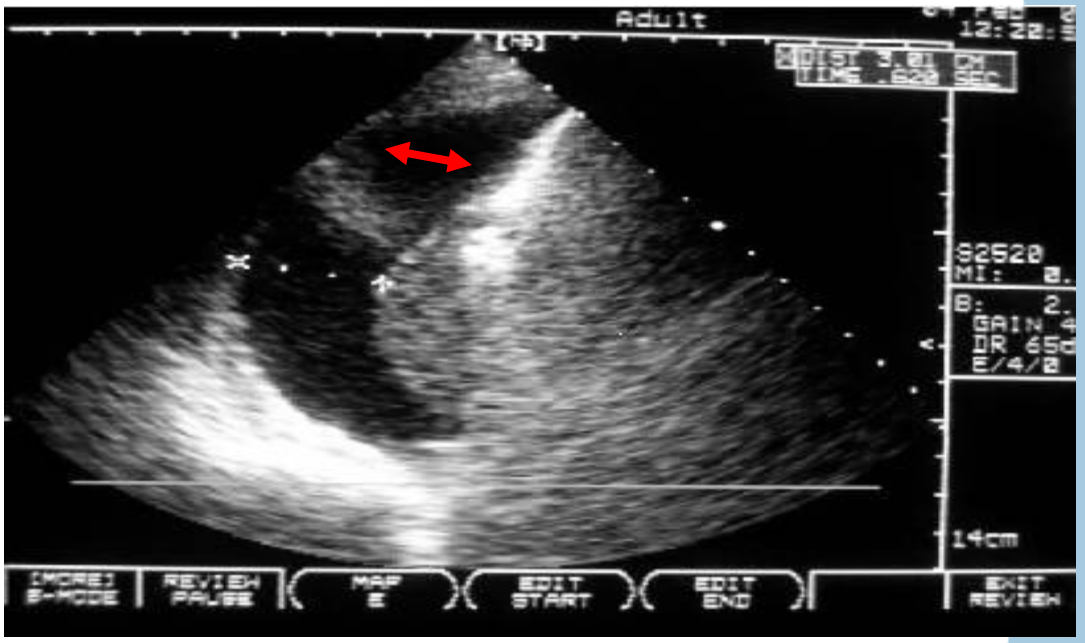
(CHEST 2005; 127:224–232)

M Balik
P Plasil
P Waldauf
J Pazout
M Fric
M Otahal
J Pachl

Ultrasound estimation of volume of pleural fluid in mechanically ventilated patients

Intensive Care Med (2006) 32:318–321





Échographie pleurale : Outil de quantification

ET POUR RÉSUMER

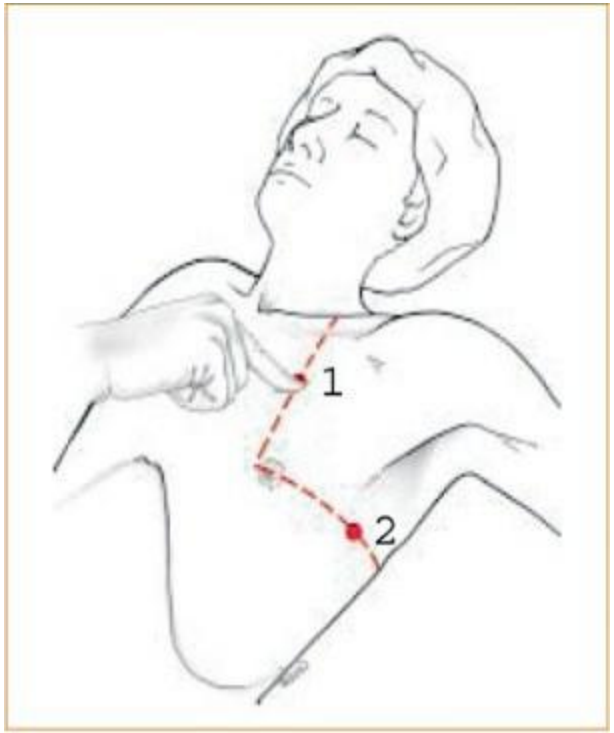
- Au déchocage, les experts recommandent l'échographie pleuro pulmonaire associée à la FAST écho et la radiographie du thorax en première intention **(G1+).**

Détresse hémodynamique ou respiratoire AC post traumatique

Forte suspicionPneumothorax ou hémothorax compressif

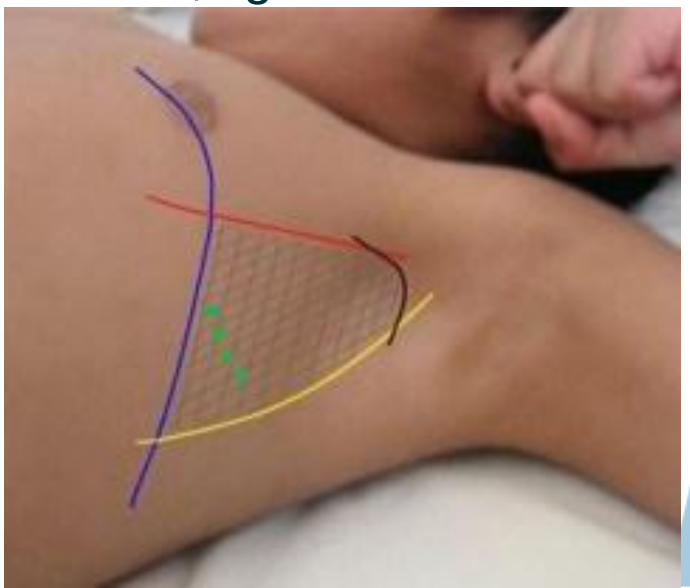
→ Abords pleuraux de sauvetage

L'exsufflation à l'aiguille



La thoracostomie de sauvetage

incision : 4 à 5 cm , trajet inter-costal 4e ou 5e EIC, ligne médio-axillaire



Recommandations

SFAR
Société Française d'Anesthésie et de Réanimation

- Les experts recommandent une décompression en urgence en cas de détresse respiratoire aiguë ou hémodynamique avec forte suspicion de tamponnade gazeuse **(G1+).**

- Les experts suggèrent une thoracostomie par voie axillaire en cas d'arrêt cardiaque et/ou en cas d'échec de l'exsufflation **(G2+).**

Pneumothorax

- **Les experts recommandent de drainer sans délai tout pneumothorax complet, tout épanchement liquidien ou aérique responsable d'un retentissement respiratoire et/ou hémodynamique (G1+).**

En cas de pneumothorax minime, unilatéral et sans retentissement clinique le drainage n'est pas systématique. Dans ces situations les experts recommandent une surveillance simple avec réalisation d'une nouvelle radiographie thoracique de contrôle à 12 h. En cas de nécessité d'une ventilation mécanique invasive, les experts suggèrent que le drainage thoracique ne soit pas systématique. En cas de bilatéralité du pneumothorax, s'ils sont minimes, les experts suggèrent que le drainage thoracique ne soit pas systématique mais discuté au cas par cas selon le caractère de l'épanchement gazeux (Avis d'experts)

Drainage thoracique

- **Voie axillaire** +++: 4 ou 5 espaces intercostaux sur la ligne axillaire moyenne ou antérieure
- **Voie antérieure**: 2 espace intercostal sur la ligne mamelonnaire verticale

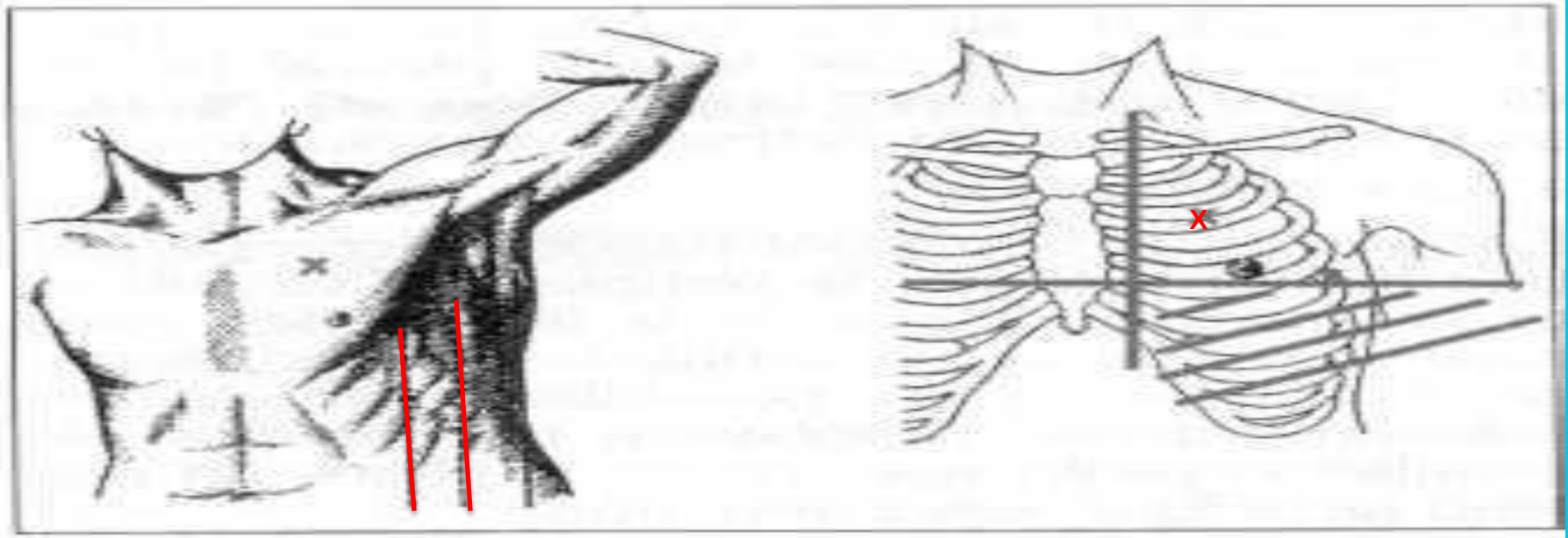
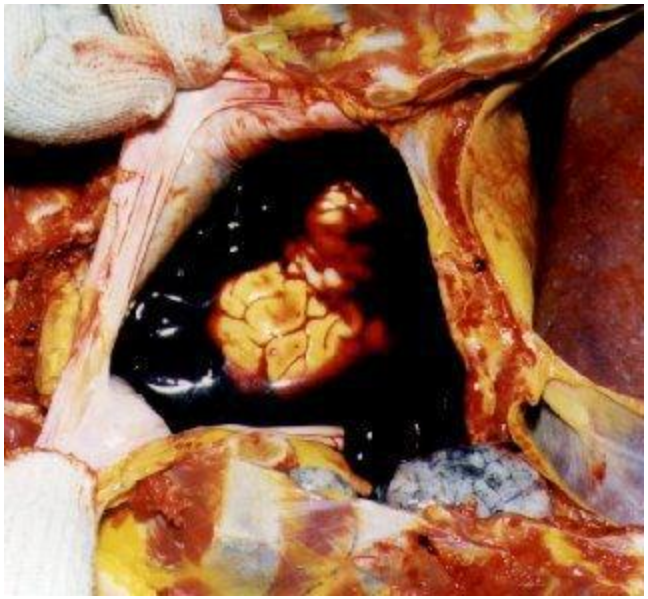


Figure n° 2. Les sites du drainage thoracique.

Tamponnade cardiaque

- tachycardie, hypoTA, pouls paradoxal, augmentation PVC (TJ),, TJ),
- Diagnostic : échographie +++
- →→drainage en urgence, ponction sous xiphoidienne



Si hémothorax

Drainage systématique / indications large:
Drains de gros calibre 28-36F

Récupération sang, retransfuser dans 6h

Si hémothorax

UNE THORACOTOMIE D'HÉMOSTASE

- en cas d'instabilité hémodynamique et de saignement intrathoracique actif dans le drain thoracique, en l'absence d'autre cause de saignement.

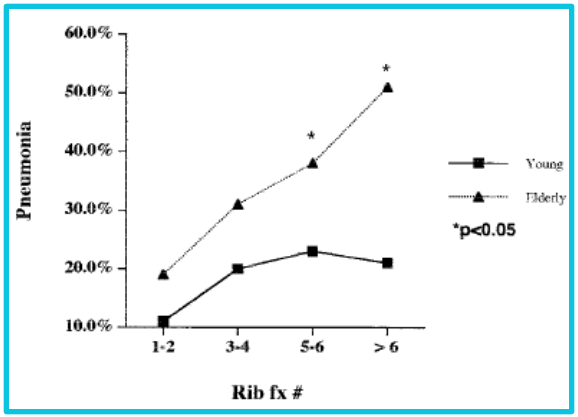
- en cas de stabilité hémodynamique si le débit du drain thoracique est :
  - supérieur à 1500 mL d'emblée avec une poursuite du débit du drainage supérieur à 200 mL/h dès la première heure
  - inférieur à 1500 mL avec poursuite du débit du drainage supérieur à 200 mL/h pendant 3 heures

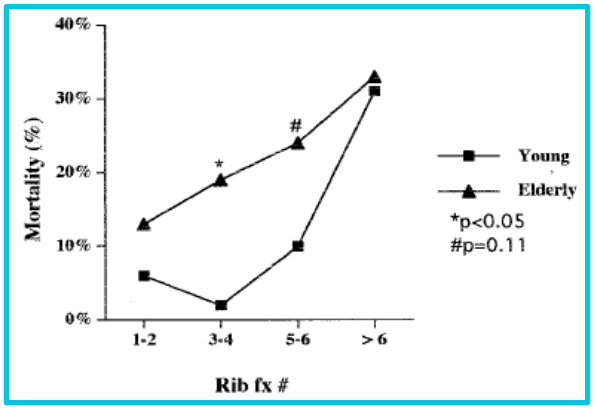
(Avis d'Experts)

Dégâts pariétaux

Fractures de cotes

deux premières côtes





Bulger EM et al J Trauma 2000; 48 : 1040-6

Fractures sternales / rachis

Pas ou peu de répercussions sur la mécanique

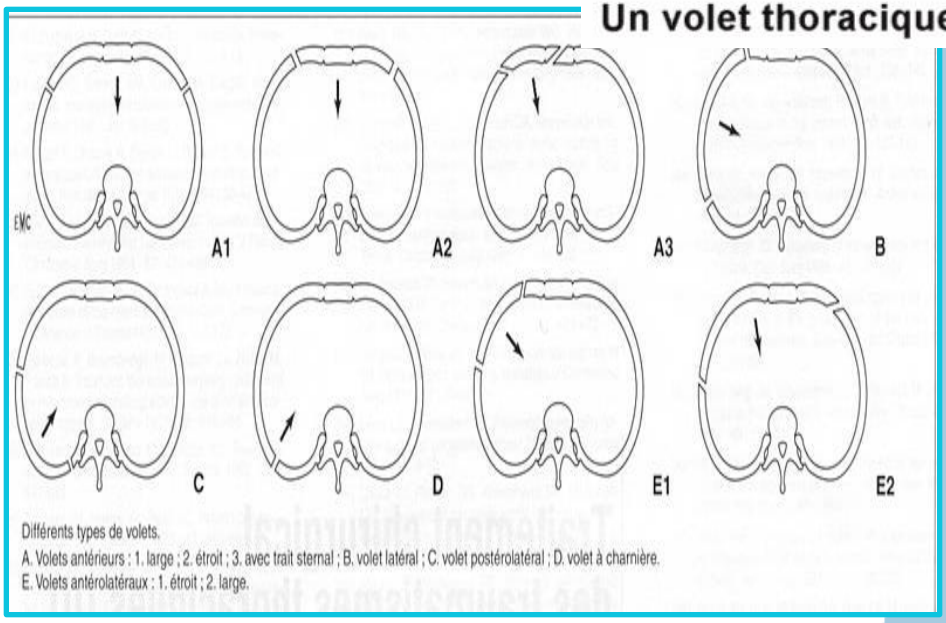
Par contre **Problème de postures**:
du décubitus dorsal et de ventilation des zones postérieures

Dégats pariétaux: Volet thoracique

Un volet thoracique

Au moins 3 cotes contiguës fracturées en 2 localisations minimum

- **volet latéral +++**
- **volet postérieur : rarement mobile**
- **volet antérieur = forme la + grave**



Différents types de volets.
A. Volets antérieurs : 1. large ; 2. étroit ; 3. avec trait sternal ; B. volet latéral ; C. volet postérolatéral ; D. volet à charnière.
E. Volets antérolatéraux : 1. étroit ; 2. large.

Conséquences :

-lacérations d'artères intercostales

-lacération du parenchyme pulmonaire

= **hémo et/ou pneumothorax**

-Conséquence mécanique ventilatoire: augmentation travail respiratoire

-Hyperalgie / ileus secondaire / défaut de mobilisation du pt

Dégâts pariétaux: volet thoracique

CAT?

Stabilisation pneumatique interne:

V invasive / VNI ?

ou

Fixation chirurgicale?

Stabilisation de volets thoraciques ?

Traitement médical

- complications liées à une ventilation prolongée
- Impossibilité de réduire les grandes déformations : séquelles importantes
- Parfois inefficace: grands volets antérieurs

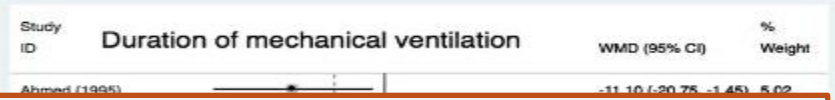
Chirurgie

- dynamique respiratoire physiologique
- ⬇ durée ventilation
- ⬇ les douleurs
- prévenir les complications secondaires : hémo/pneumothorax
- mobilisation précoce du patient
- restauration d'une fonction pulmonaire optimale

Ahmed Z et al. J ThoracCardiovascSurg1995
Tanaka et al. J Trauma 2002
Solberget al. J Trauma 2009
Nirulaet al. World J Surg2009

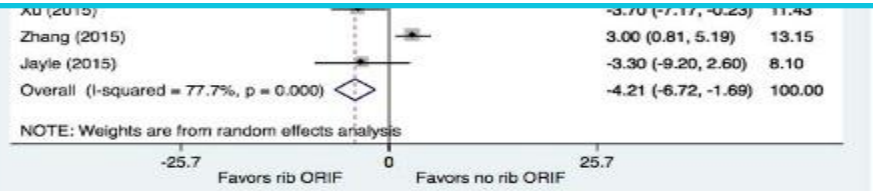
Operative fixation of rib fractures after blunt trauma: A practice management guideline from the Eastern Association for the Surgery of Trauma

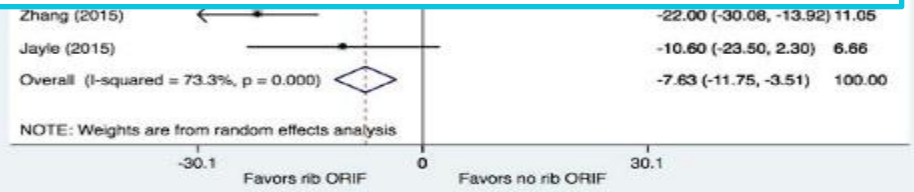
J Trauma Acute Care Surg. 2017;82: 618–626.



In adult patients with flail chest after blunt trauma, we conditionally recommend rib ORIF to decrease mortality; shorten duration of mechanical ventilation, ICU LOS and hospital LOS; incidence of pneumonia and need for tracheostomy. We cannot offer a recommendation for pain control with currently available evidence.

In adult patients with nonflail rib fractures after blunt trauma, we cannot offer a recommendation for any of the outcomes with currently available evidence.





Cochrane Library

Cochrane Database of Systematic Reviews

Surgical versus nonsurgical interventions for flail chest (Review)

Cataneo AJM, Cataneo DC, de Oliveira FHS, Arruda KA, El Dib R, de Oliveira Carvalho PE

- **There was some evidence fromthree small studies that showed surgical treatment was preferable to nonsurgical management in reducing pneumonia, chest deformity, tracheostomy, duration of mechanical ventilation, and length of ICU stay.**

- **Further well-designed studies with a sufficient sample size are required to confirm these results and to detect possible surgical effects on mortality**

Ostéosynthèse pariétale

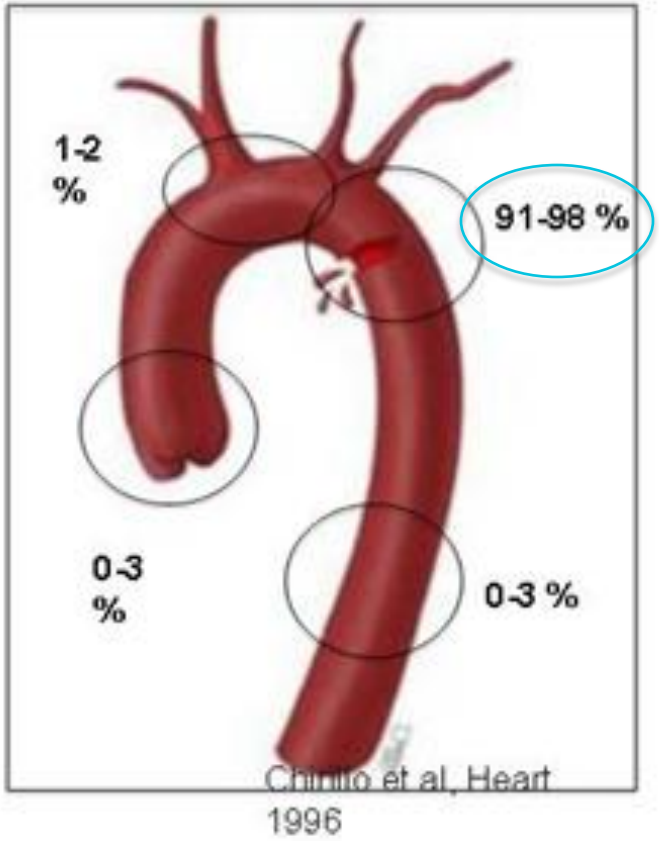
- Les experts recommandent une fixation chirurgicale chez le patient présentant un volet thoracique et ventilé mécaniquement, si l'état respiratoire ne permet pas un sevrage rapide de la ventilation mécanique dans les 36h suivant leur admission (G1+).

- Les experts proposent que tout fracas costal déplacé ou complexe bénéficie d'un avis spécialisé (G2+).

Ne pas laisser l'insuffisance respiratoire se mettre en place !

Lésions traumatiques de l'aorte

- 80% mortel sur le terrain
- Haute énergie
  - Décélération +++ (≈blast)
  - Choc direct (compression) .

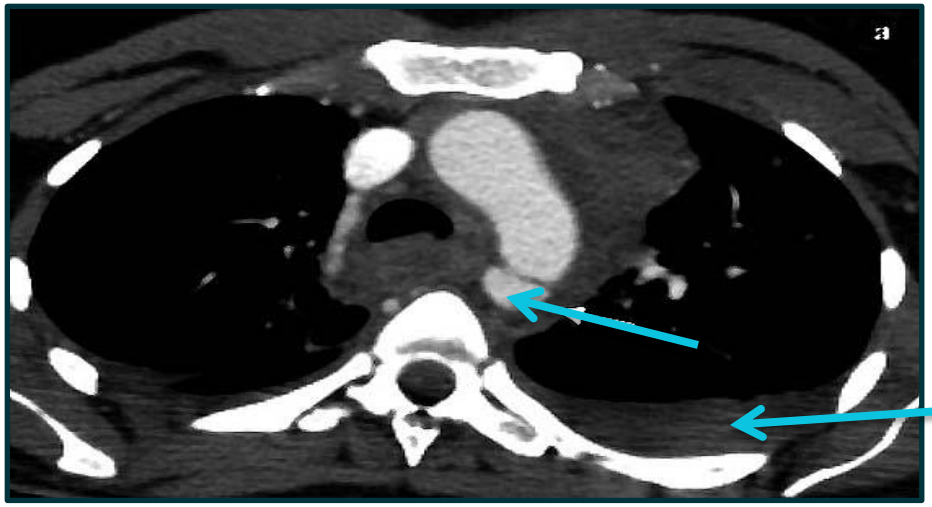


- syndrome de pseudo-coarctation: asymétrie pouls/ TA,
- tamponnade ,
- hémothorax gauche,
- para parésie
- Choc hémorragique

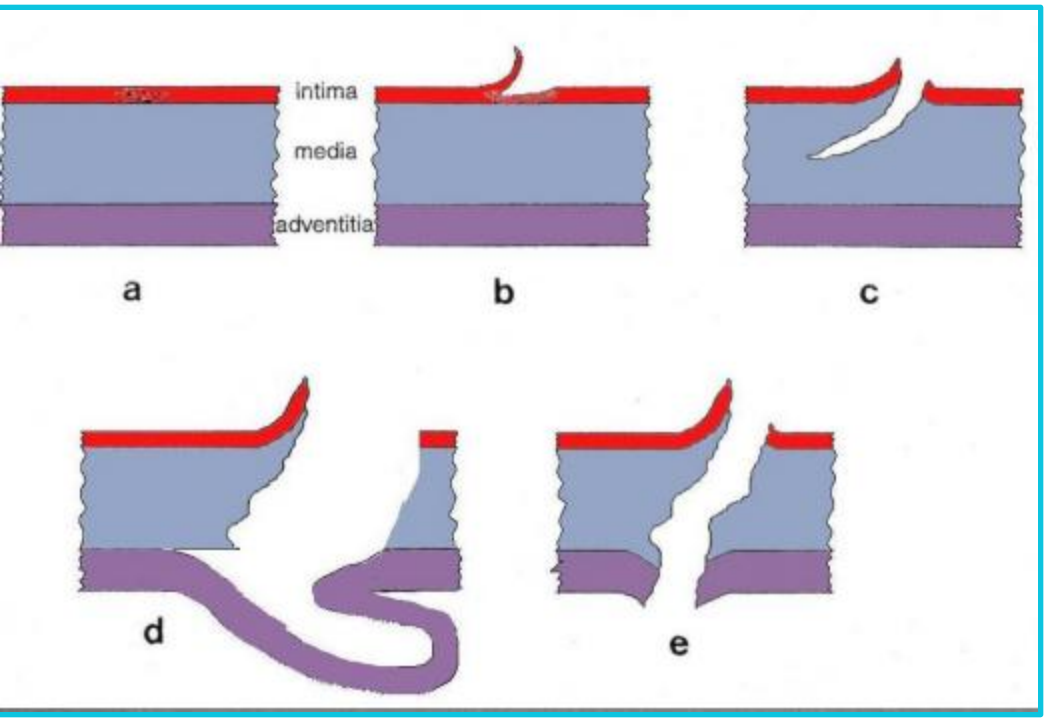
Lésions traumatiques de l'aorte

Radiographie pulmonaire :

- Élargissement du médiastin dans 67% des cas
- Anomalie du bouton aortique dans 21% cas
- Hémothorax gauche 7%
- Abaissement de la bronche souche gauche 4%
- Hématome du dôme pleural 4%
- Déviation de la trachée et/ou SNG 4%
- Normal dans 7 à 44% des cas !!



Lésions traumatiques de l'aorte



- a)Hémorragie intimale
- b) Déchirure intimale
- c) Lésion intimo-médiale
- d) Faux anévrisme : rupture sous adventitielle
- e) Rupture complète

Parmey LF. Non penetrating traumatic injury of the aorta. Circulation 1958; 17 : 1086-101

Traitement

Traitement chirurgical

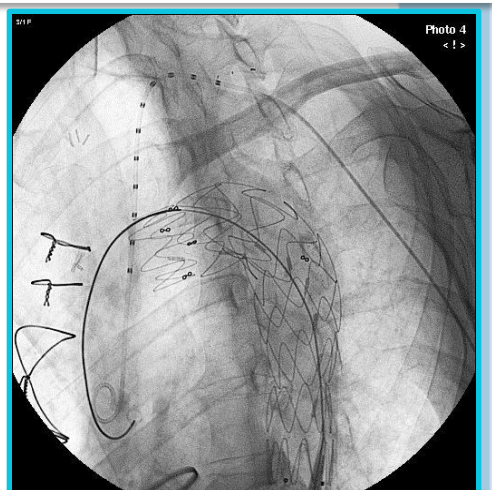
- posterolateral thoracotomy
- ± cardiopulmonary bypass
- 28% mortality rate
- 16% paraplegia rate.

***J Trauma 2004;56:565-70*.**

- unrepaired lesion (2% to 5%)

Ann Thorac Surg 2006;82:873-7

Traitement endovasculaire



Acute traumatic aortic rupture : A comparison of surgical and stent graft repair stent-
Thorac Cardiovasc Surg 2005

Endovascular repair of traumatic rupture of the aortic isthmus : Midterm results isthmus:
J Thorac Cardiovasc Surg 2006

Endovascular repair of traumatic thoracic aortic injury: Clinical practice guidelines of the Society for Vascular Surgery

J Vasc Surg 2011;53:187-92.)

Table II. Summary of guidelines for thoracic endovascular aortic repair (*TEVAR*) in traumatic thoracic aortic injuries

Guideline	*Consensus*	*Grade of recommendation 1—strong 2—weak*	*Quality of evidence A—high B—moderate C—low or very low*
Choice of treatment	We suggest that endovascular repair be performed preferentially over open surgical repair or nonoperative management.	2	C
Timing of repair	We suggest urgent (<24 hours) repair, and at the latest prior to hospital discharge.	2	C
Management of minimal aortic injury	We suggest expectant management with serial imaging for type I injuries.	2	C
Type of repair in the young patient	We suggest endovascular repair regardless of age if anatomically suitable.	2	C
Management of left subclavian artery	We suggest selective revascularization of the left subclavian artery.	2	C
Systemic heparinization	We suggest routine heparinization but at a lower dose than in elective TEVAR.	2	C
Spinal drainage	We do not suggest routine spinal drainage.	2	C
Choice of anesthesia	We suggest general anesthesia.	2	C
Femoral access technique	We suggest open femoral exposure.	2	C

Lésions traumatiques de l'aorte

- Les experts recommandent un traitement endovasculaire des lésions traumatiques de l'isthme aortique en première intention (G1+).

- En l'absence de rupture complète, les experts proposent que la prise en charge d'une autre urgence vitale prime sur la mise en place de l'endoprothèse (G2+).

- Les experts proposent que les lésions aortiques minimes (rupture intimo -médiale) bénéficient d'un avis spécialisé (G2+).

Rupture trachéo-bonchique

- Rare: 1- 3% *Int J Pediatr Otorhinolaryngol. 2002;62:123–128*
- Grave: mortalité > 30% *Chest Surg Clin N Am. 2003;13:291– 304.*
- **Engage le pronostic vital**
  - par obstruction trachéale,
  - pneumothorax compressif,
  - noyade hémorragique

- Siège: près de la carène : 80%
- BSD > BSG . *Eur J Cardiothorac Surg 2002;22:984– 9.*

Rupture trachéo-bonchique

- 3 types de lésions: *Ann Thorac Surg 2001;71:2059–65*
  - les fissures de la membrane postérieure
  - les fractures des arcs cartilagineux
  - la rupture complète et circonférentielle
- Diagnostic :
  - **Le pneumothorax** d'emblée ou après ventilation avec pression +
  - hémoptysie
  - pneumomédiastin
  - Emphysème sous cutané médiastino-cervical
  - Persistance d'un bullage important avec difficulté de réexpansion du poumon après drainage : sévérité de la lésion
  - atélectasie
- La fibroscopie : l'examen de référence:
  - rôle diagnostique / thérapeutique

Rupture trachéo-bonchique : gestion des voies aériennes

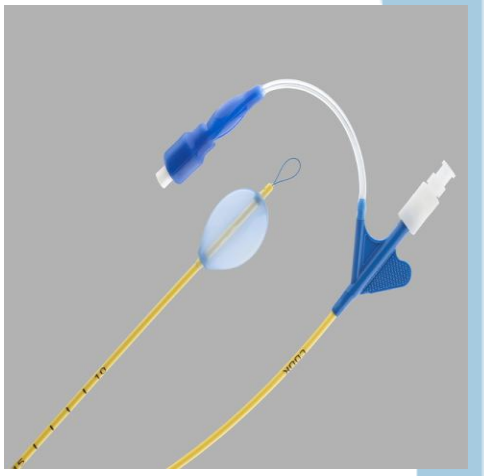
- la difficulté principale si détresse respiratoire
- lésions trachéales hautes: *Anesthesiology 2008;108:159–62*
  - une intubation trachéale sous-lésionnelle (fibro) .
- lésion basse ou bronchique

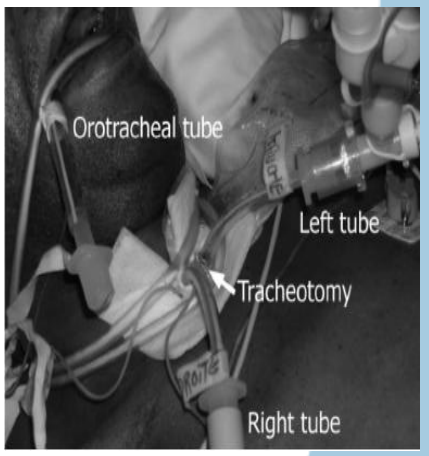
⇨⇨ challenge,

⇨⇨ coopération réanimateur/chirurgien.

⇨⇨ isoler la bronche rompue pour assurer une ventilation correcte du territoire pulmonaire restant

  - intubation sélective controlatérale sous fibroscopique.
  - un bloqueur bronchique
  - Jet ventilation
  - une large trachéotomie avec 2 sondes d'intubation





Anesthesiology 2008 *Eurasian J Med 2014; 46: 209-15*

Rupture trachéo-bonchique : TTT chirurgical vs conservateur

Controverse

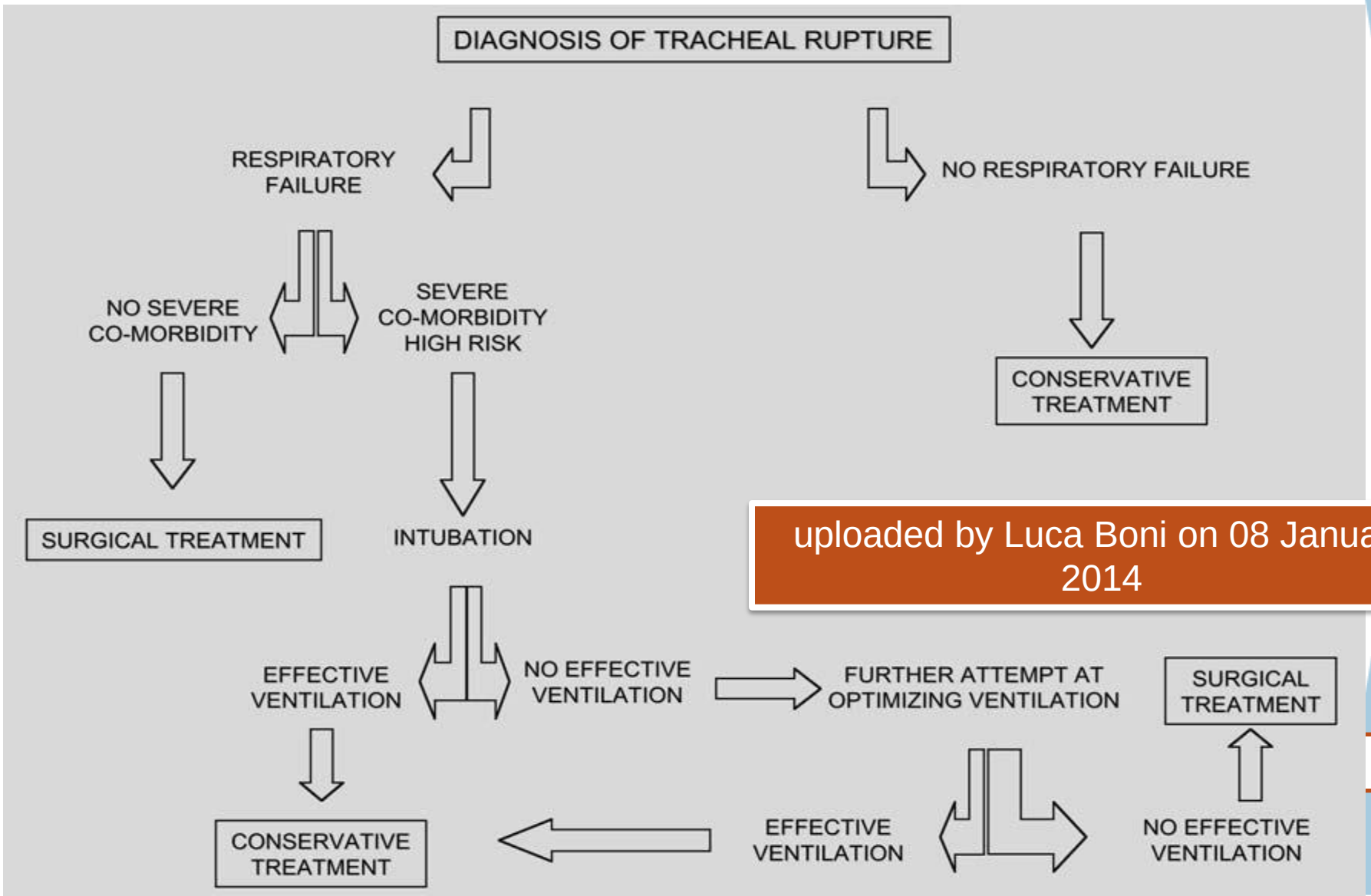
- une rupture trachéal supérieure à 2 cm
- Plaie transmurale
- pneumothorax compressif avec fistule pleurale
- pneumomédiastin et emphysème sous cutané importants,
- une hernie de l'oesophage dans la lumière de la trachée
- la présence de médiastinite

  - cervicotomie ± sternotomie
  - thoracotomie D ou G

Indications for surgery in tracheobronchial ruptures

European Journal of Cardio-thoracic Surgery 20 (2001) 399–404

Rupture trachéo-bonchique : TTT chirurgical vs conservateur



uploaded by Luca Boni on 08 January 2014

Contusion pulmonaire

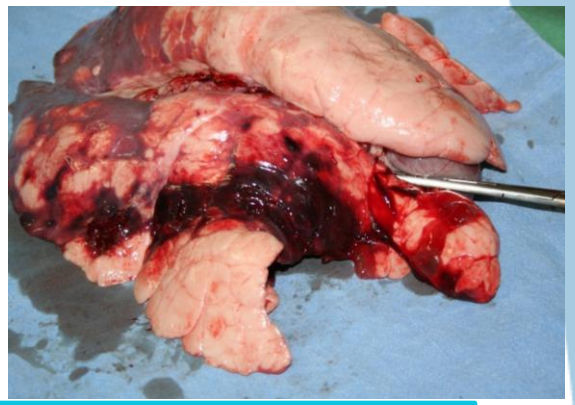
- **50% des traumatisés thoraciques**
- **«de l'hypoxie asymptomatique au SDRA»**
- **Evolutivité rapide des lésions…(24-48h) et de la dégradation clinique: réaction inflammatoire**
- **Risque:**
  - Défaillance Respiratoire - SDRA
  - Surinfection pulmonaire

Physiopathologie

la propagation d'une onde de choc au sein du parenchyme pulmonaire

La lésion initiale

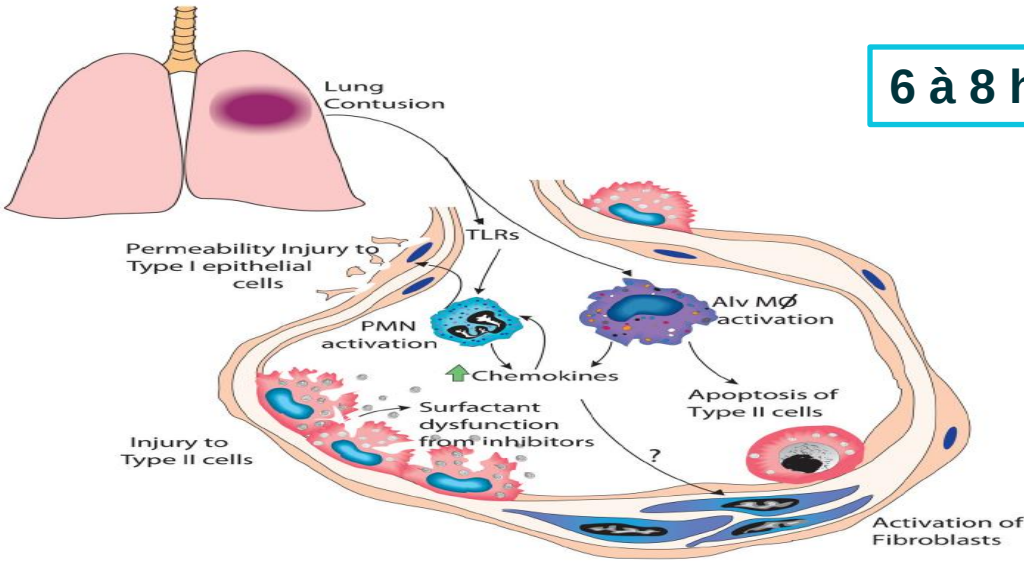
zone contuse



La phase inflammatoire

6 à 8 heures

↑ perméabilité membrane A-C



Œdème lésionnel

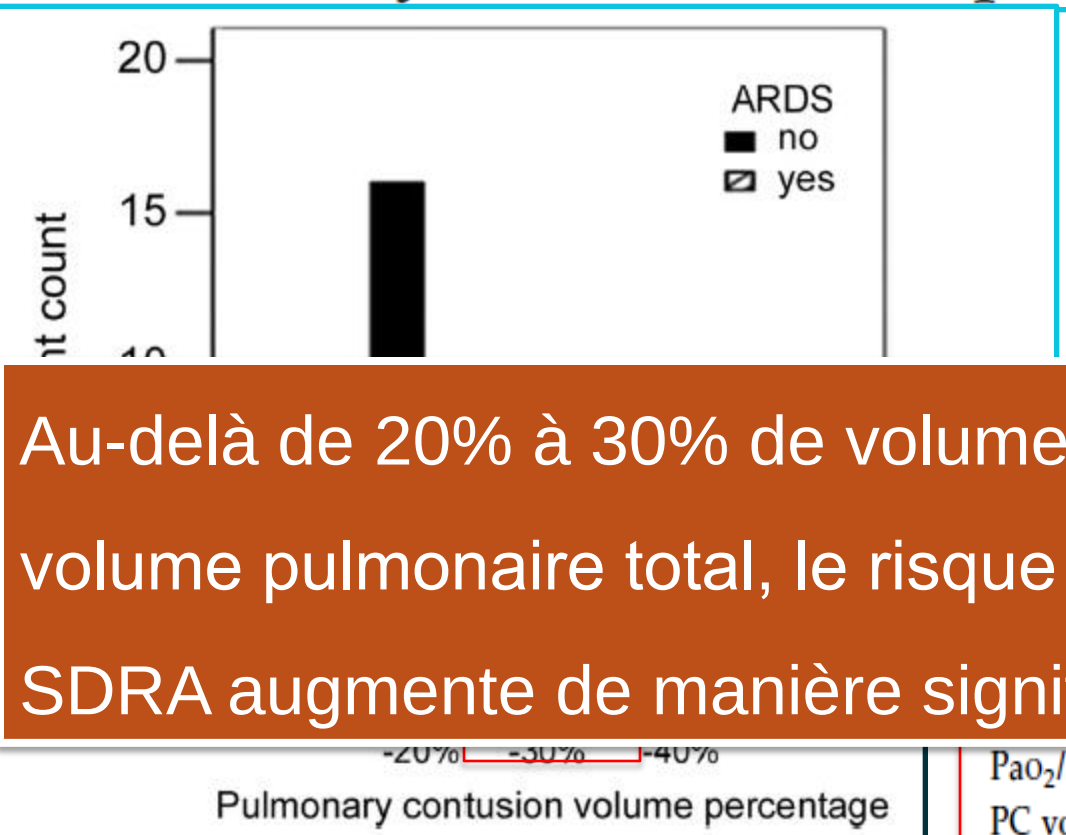
Fibroblaste H48

J7: zone congestion focale+fibrose interstitielle

La détresse respiratoire

The Value of Pulmonary Contusion Volume Measurement With Three-Dimensional Computed Tomography in Predicting Acute Respiratory Distress Syndrome Development

Ann Thorac Surg 2011



60 patients

Au-delà de 20% à 30% de volume contus par rapport au volume pulmonaire total, le risque de survenue d'un SDRA augmente de manière significative (VPP 82 %)

		Acute	p Value
Pao_2/Fio_2	–0.011 (0.004)	0.989 (0.982–0.996)	0.003
PC volume, %	0.072 (0.028)	1.074 (1.017–1.134)	0.010
$Paco_2$	—	—	0.076
Base deficit	—	—	0.165
Chest AIS	—	—	0.324

Contusion: prise en charge ventilatoire

Patient en VS

VNI

Ventilation Invasive

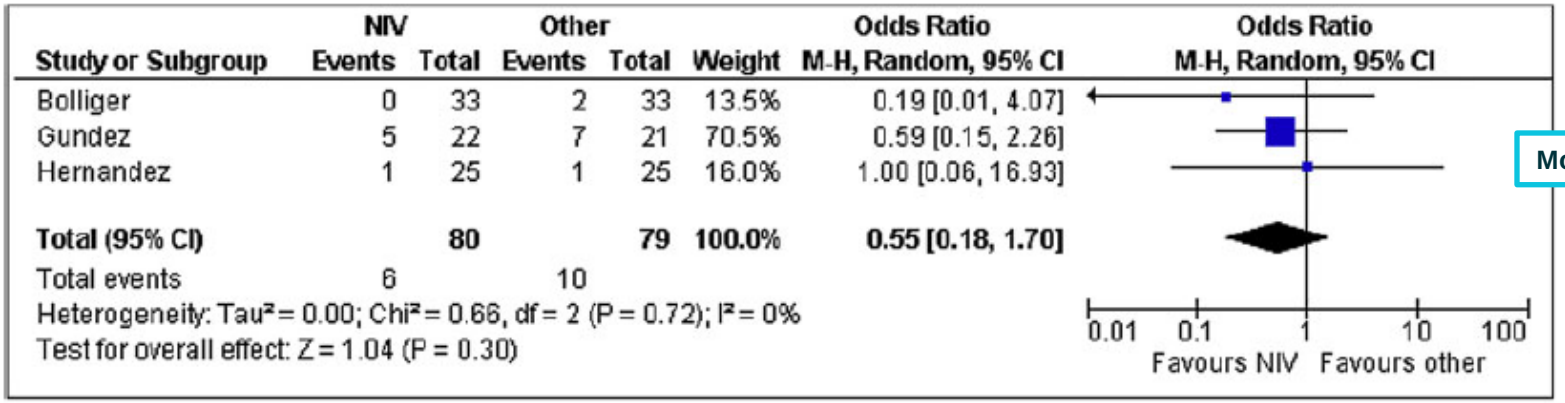
stratégie doit être multimodale

1/ oxygénothérapie
2/ kinésithérapie
3/analgésie

Techniques d'exception

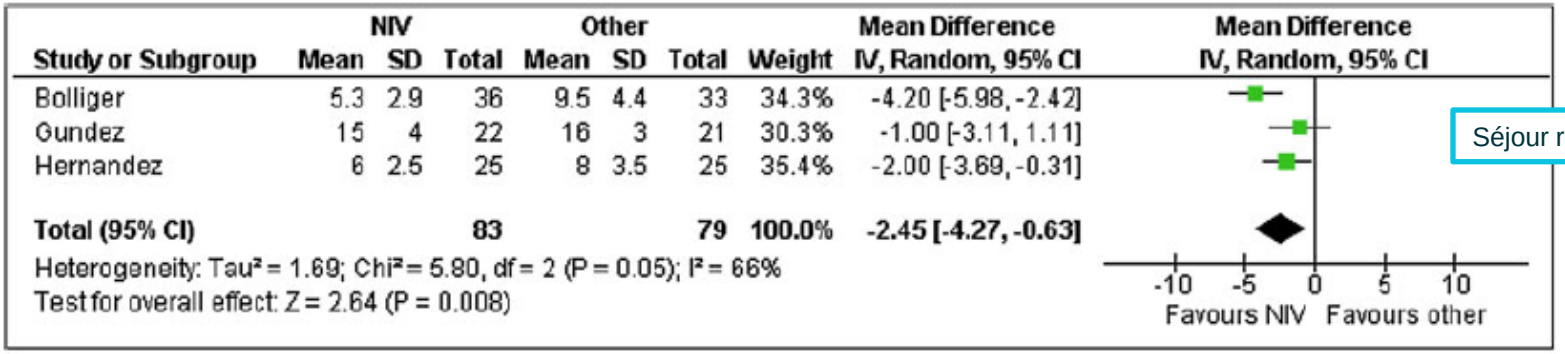
The role of non-invasive ventilation in blunt chest trauma: systematic review and meta-analysis

Eur J Trauma Emerg Surg 2014



Mortalité

Fig. 2 Meta-analysis of the efficacy of NIV, compared to alternate respiratory support strategies, on the outcome of mortality. *NIV* non-invasive ventilation, *M-H* Mantel-Haenszel, *CI* confidence interval



Séjour réa

Fig. 3 Meta-analysis of the efficacy of NIV, compared to alternate respiratory support strategies, on the outcome of ICU length of stay. *ICU* intensive care unit, *NIV* non-invasive ventilation, *M-H* Mantel-Haenszel, *CI* confidence interval

VNI : CI

- Agitation, opposition, GCS<10
- Pneumothorax non drainé
- fracture étage antérieur instable, pneumencéphalie
- Plaie pharynx, oesophage
- Plaie trachéo-bronchique

Résumée

Si ça ne marche pas

VMC: **ventilation protectrice**

Les experts recommandent que le volume courant soit réglé entre 6 et 8 mL/kg de poids idéal en raison du caractère non homogène du poumon traumatisé. La pression plateau doit être maintenue < 30 cmH2O (G1+).

Contusion: prise en charge ventilatoire

Extracorporeal lung support in trauma patients with severe chest injury and acute lung failure: a 10-year institutional experience

Michael Ried[1*†], Thomas Bein[2†], Alois Philipp[3], Thomas Müller[4], Bernhard Graf[2], Christof Schmid[3], David Zonies[5], Claudius Diez[3] and Hans-Stefan Hofmann[1]

- **Niveau de preuve insuffisant**
- **Contraintes de l'anticoagulation**
- **Indications au cas par cas**

Interactive CardioVascular and Thoracic Surgery 19 (2014) 699–701
doi:10.1093/icvts/ivu217 Advance Access publication 3 July 2014

CASE REPORT – THORACIC

Extracorporeal membrane oxygenation as a support for emergency bronchial reconstruction in a traumatic patient with severe hypoxaemia

Chengwu Liu, Yidan Lin, Bin Du and Lunxu Liu*

- **31 ANS RUPTURE DE LA BROCHE DROITE ET HYPOXEMIE SEVERE OPERE SOUS ECMO**

Analgésie

⬇ **douleur, conserver la respiration et la toux, permettre kiné améliore la tolérance de la VNI et de la VS inter-séance**

«est ce que vous avez mal?» : NON
«est ce que vous arrivez à tousser?»

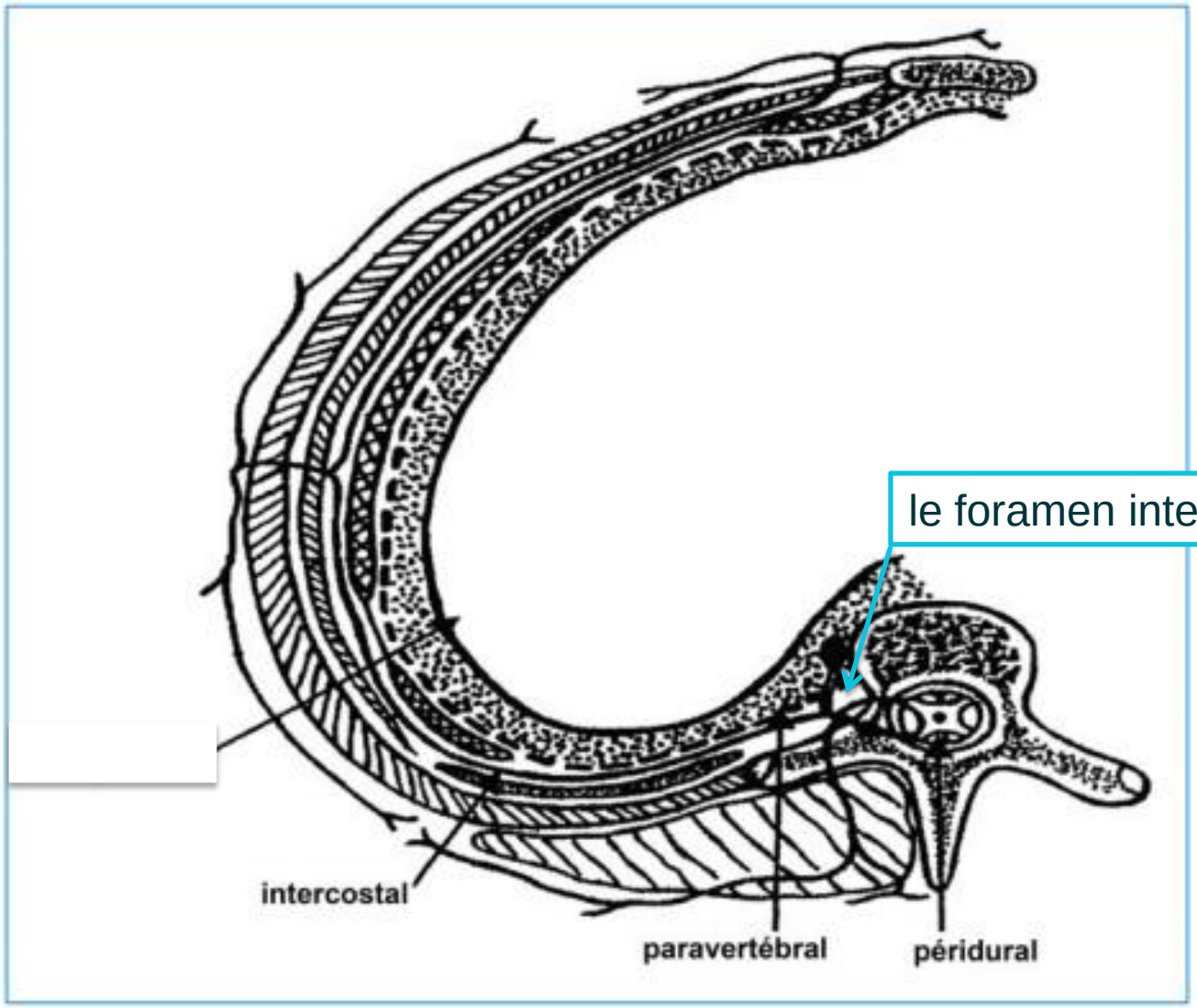
Analgésie voie systémique

Multimodale : en privilégiant la morphine avec une administration par mode PCA *Anesth Reanim. 2015; 1: 272–287*

ALR:

- APD
- BPV
- Blocs intercostaux à proscrire (injections répétées étagées, risque lésion pleurale) *Anesth Reanim. 2015; 1: 272–287*

Rappel: Site d'action de l'AL en ALR



J Trauma AcuteCare Surg. 2016;81: 936–951.

Pain management for blunt thoracic trauma: A joint practice management guideline from the Eastern Association for the Surgery of Trauma and Trauma Anesthesiology Society

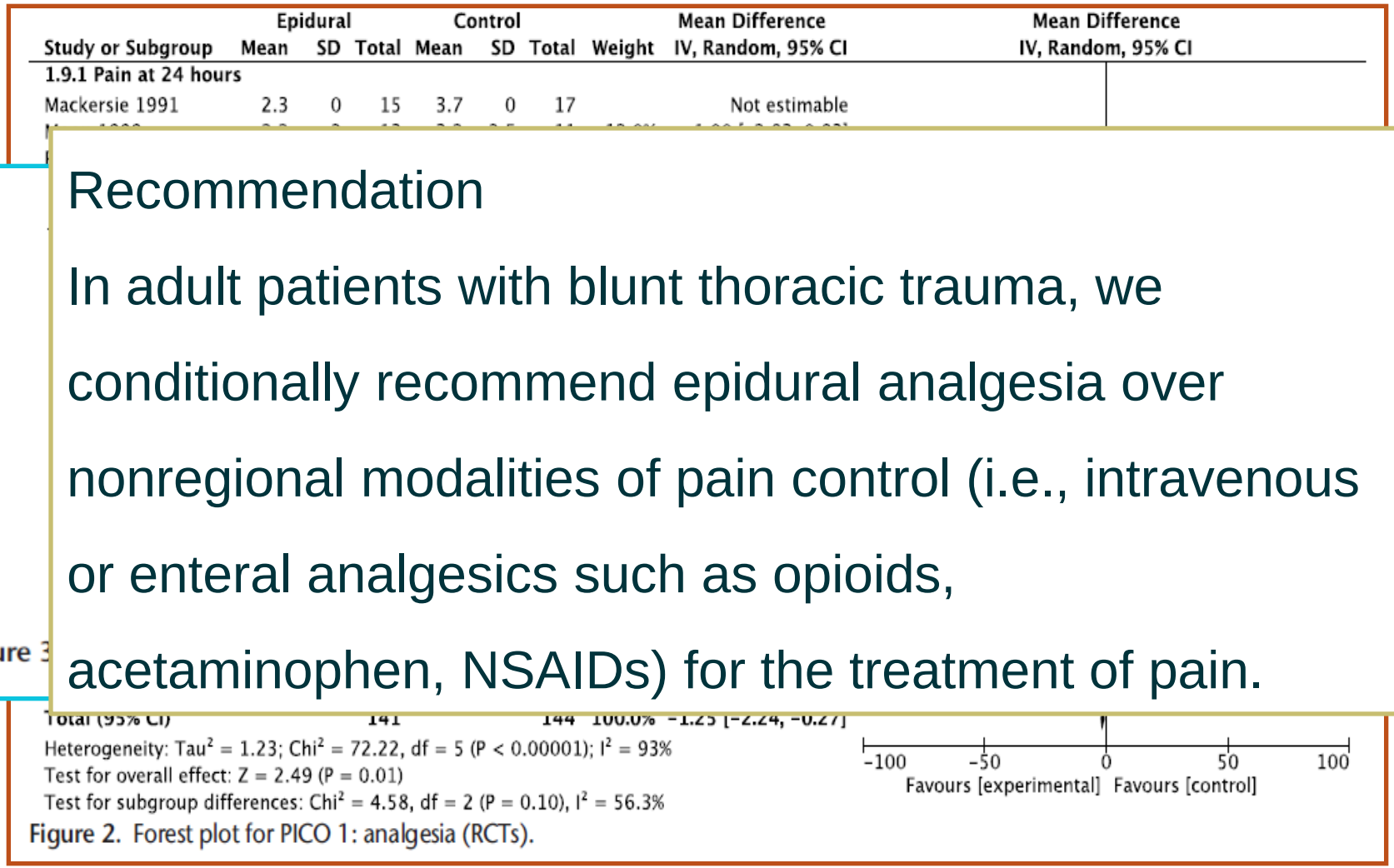
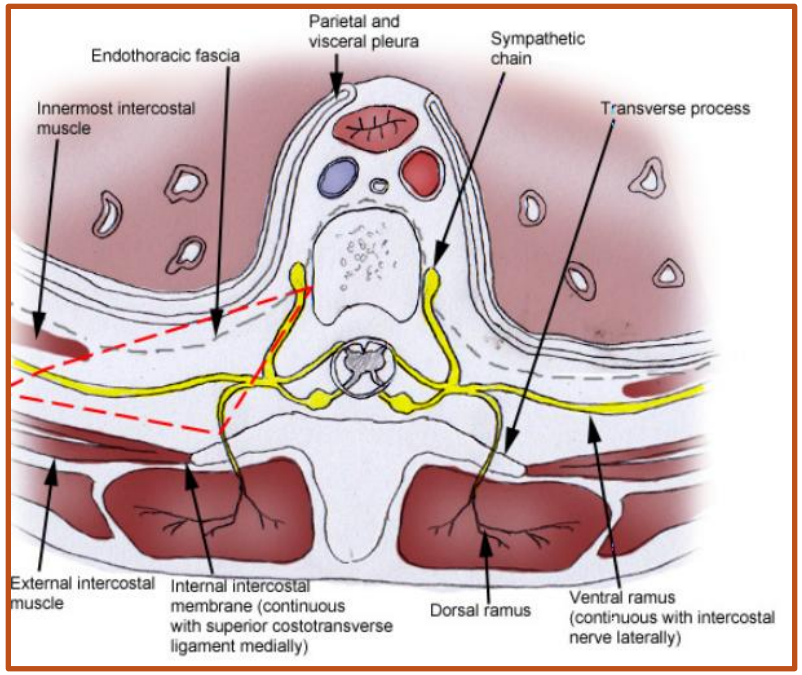


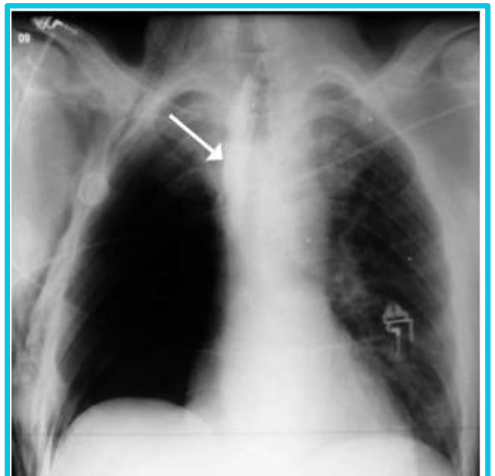
Figure 2. Forest plot for PICO 1: analgesia (RCTs).

Recommendation

In adult patients with blunt thoracic trauma, we conditionally recommend epidural analgesia over nonregional modalities of pain control (i.e., intravenous or enteral analgesics such as opioids, acetaminophen, NSAIDs) for the treatment of pain.

Bloc paravertebral





Pain Management Guidelines for Blunt Thoracic Trauma

J Trauma. 2005;59:1256–1267.

GUIDELINES

Pain management for blunt thoracic trauma: A joint practice management guideline from the Eastern Association for the Surgery of Trauma and Trauma Anesthesiology Society

J Trauma AcuteCare Surg. 2016;81: 936–951.

Prospective, Randomized Comparison of Continuous Thoracic Epidural and Thoracic Paravertebral Infusion in Patients With Unilateral Multiple Fractured Ribs—A Pilot Study

J Trauma. 2009

Recommandations SFAR

- L'anesthésie locorégionale (ALR) doit pouvoir être proposée chez le patient à risque ainsi que chez le patient présentant une douleur non contrôlée dans les 12 heures. (G1+)

- Il faut probablement préférer le bloc para vertébral à l'analgésie péridurale lors de lésions costales unilatérales et si possible sous contrôle échographique pour la mise en place d'un cathéter. (G2+)

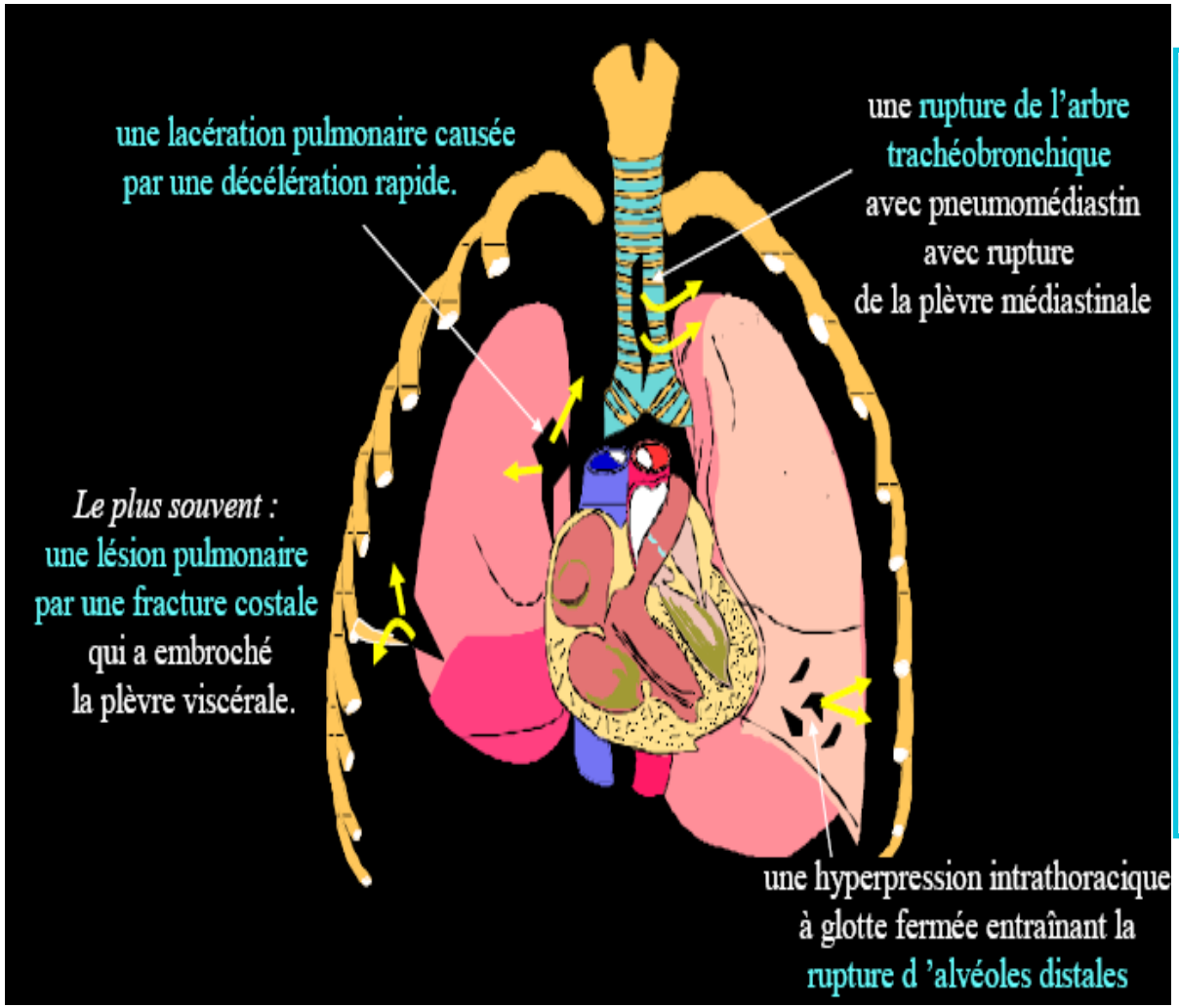
- Lors de lésions complexes (multi-étagées) ou bilatérales, les experts recommandent que l'analgésie péridurale soit proposée, le geste devant être alors réalisé par un anesthésiste réanimateur (G1+)

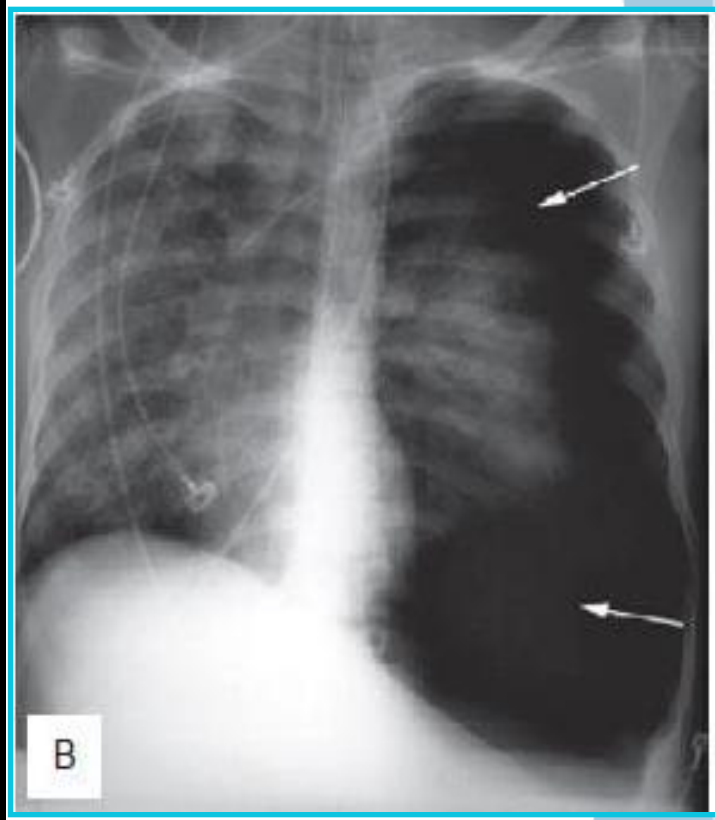
Conclusion

- **l'évaluation initiale : rapide**
- **geste de sauvetage :**
  - drainage thoracique
  - ventilation invasive
  - chirurgie en urgence.
- **Échographie pleurale**
- **la planification de la surveillance : gravité dynamique des traumatismes thoraciques**

MERCI

Epanchement pleural : détresse respiratoire et/ou hémodynamique





Intérêt de l'EPP en phase secondaire

- Evite multiplication des radiations +++
- Majoration de la contusion des premières 24-48h
- Apparition de troubles ventilatoires
- Suivi des épanchements dits «occultes» puisque non vus à la RP mais à la TDM
- Hémothorax épanchement >15 mm = risque x4 de majoration secondaire

DuBoseet al. J Trauma 2012