Université Claude Bernard Lyon 1

Hôpitaux de Lyon

ARRET CARDIAQUE TRAUMATIQUE

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Liens d'intérêt avec les industries de santé en rapport avec le thème de la présentation (loi du 4 mars 2002)

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Investigateur principal d'une recherche ou d'une étude clinique	➢ Oui
Co-Investigateur d'une étude clinique	➢ Oui

INTRODUCTION

- **CAUSES DE DÉCÈS DU TRAUMA :**
  - 1) Hémorragie (40 %)
  - 2) Trauma crânien grave (20-25 %)
- **PRONOSTIC DES AC EST DÉSASTREUX** :
  - Survie Trauma fermé : 1-2 %

David et al. Crit Care Med 2007

  - Survie Trauma pénétrant : 5 à 30 %

Fulton et al. *J Am Coll Surg* 1995 ; Rosemurgy et al. J Trauma 1993 ;
Lorenz et al. *J Trauma* 1992 ; Cogbill et al. *J Trauma* 1983 ; Vij et al. *Surgery* 1983

ARRÊT CARDIAQUE TRAUMATIQUE

1- Pronostic

2- Etiologie de l'AC Traumatique

3- Prise en Charge de l'AC Traumatique

4- Evolution Thérapeutique

5- Conclusion

Traumatic Cardiac Arrest: Who Are the Survivors?

David Lockey, FRCA, FIMC, RCS(Ed)
Kate Crewdson, MB, BS, BSc
Gareth Davies, FFAEM, FRCP

From the London Helicopter Emergency Medical Service, Royal London Hospital, London, United Kingdom.

Study objective: Survival from traumatic cardiac arrest is poor, and some consider resuscitation of this patient group futile. This study identified survival rates and characteristics of the survivors in a physician-led out-of-hospital trauma service. The results are discussed in relation to recent resuscitation guidelines.

Methods: A 10-year retrospective database review was conducted to identify trauma patients receiving out-of-hospital cardiopulmonary resuscitation. The primary outcome measure was survival to hospital discharge.

Results: Nine hundred nine patients had out-of-hospital cardiopulmonary resuscitation. Sixty-eight (7.5% [95% confidence interval 5.8% to 9.2%]) patients survived to hospital discharge. Six patients had isolated head injuries and 6 had cervical spine trauma. Eight underwent on-scene thoracotomy for penetrating chest trauma. Six patients recovered after decompression of tension pneumothorax. Thirty patients sustained asphyxial or hypoxic insults. Eleven patients appeared to have had "medical" cardiac arrests that occurred before and was usually the cause of their trauma. One patient survived hypovolemic cardiac arrest. Thirteen survivors breached recently published guidelines.

Conclusion: The survival rates described are poor but comparable with (or better than) published survival rates for out-of-hospital cardiac arrest of any cause. Patients who arrest after hypoxic insults and those who undergo out-of-hospital thoracotomy after penetrating trauma have a higher chance of survival. Patients with hypovolemia as the primary cause of arrest rarely survive. Adherence to recently published guidelines may result in withholding resuscitation in a small number of patients who have a chance of survival. [Ann Emerg Med. 2006;48:240-244.]

0196-0644/$-see front matter

doi:10.1016/j.annemergmed.2006.03.015

INTRODUCTION

Background

Survival rates of 0% to 3.7% have been reported for victims of traumatic cardiac arrest.[1-4] Resuscitation of this patient group is therefore considered by many to be futile and an inappropriate use of resources.[1,2,4] The National Association of EMS Physicians and the American College of Surgeons Committee on Trauma produced guidelines in 2003 about withholding or termination of resuscitation in out-of-hospital traumatic cardiopulmonary arrest.[5] Since the publication of these guidelines, 2 articles have described improved survival rates,[6,7] and 1 has described possible breaches of the guidelines.[6]

Importance

It is important for providers of emergency care to know the true survival rate of patients in traumatic cardiac arrest and to be aware of patient subgroups associated with particularly good or bad outcomes. It is also important to know whether published guidelines are reliable.

Goals of This Investigation

The aim of this study was to establish long-term survival rates for patients with out-of-hospital traumatic cardiac arrest who were attended to by a physician-led trauma service. The characteristics of patients who survived to be discharged from hospital were evaluated. The records of surviving patients were

Survie : 7.5 %

909 Patients réanimés

Table. Survival by mechanism of injury.*

Mechanism of Injury	Number	Survivors (%) [95% CI]
Blunt trauma (assault, falls, under train, MVC, struck by falling object, other)	542	18 (3.3) [1.8–4.8]
Asphyxial injury (conflagration, drowning, electrocution, traumatic asphyxia, hanging)	176	30 (17.0) [11.5–22.6]
"Medical"+trauma	39	11 (28.2) [14.1–42.3]
Penetrating trauma	114	9 (7.9) [2.9–12.8]

*Plus 38 patients who were lost to follow-up.
MVC, Motor vehicle collision.

- Arrêt Hypoxique
- AC Pénétrant + Thoraco EH

vs.

- Hypovolémie : ↓

Does the prognosis of cardiac arrest differ in trauma patients?*

Jean-Stephane David, MD, PhD; Pierre-Yves Gueugniaud, MD, PhD; Bruno Riou, MD, PhD; Emmanuel Pham, PhD; Pierre-Yves Dubien, MD; Patrick Goldstein, MD; Marc Freysz, MD, PhD; Paul Petit, MD

Objective: It is proposed to not resuscitate trauma patients who have a cardiac arrest outside the hospital because they are assumed to have a dismal prognosis. Our aim was to compare the outcome of patients with traumatic or nontraumatic ("medical") out-of-hospital cardiac arrest.

Design: Cohort analysis of patients with out-of-hospital cardiac arrest included in the European Epinephrine Study Group's trial comparing high vs. standard doses of epinephrine.

Setting: Nine French university hospitals.

Patients: A total of 2,910 patients.

Interventions: Patients were successively and randomly assigned to receive repeated high doses (5 mg each) or standard doses (1 mg each) of epinephrine at 3-min intervals.

Measurements and Main Results: Return of spontaneous circulation, survival to hospital admission and discharge, and secondary outcome measures of 1-yr survival and neurologic outcome were recorded. In the trauma group, patients were younger (42 ± 17 vs. 62 ± 17 yrs, $p < .001$), presented with fewer witnessed out-of-hospital cardiac arrests (62.3% vs. 79.7%), and had fewer instances of ventricular fibrillation as the first documented pulseless rhythm (3.4% [95% confidence interval, 1.2–5.5%] vs. 17.3% [15.8–18.7%]). A return of spontaneous circulation was observed in 91 of 268 trauma patients (34.0% [28.3–39.6%]) compared with 797 of 2,642 medical patients (30.2% [28.4–31.9%]), and more trauma patients survived to be admitted to the hospital (29.9% [24.4–35.3%] vs. 23.5% [22.0–25.2%]). However, there was no significant difference between trauma and medical groups at hospital discharge (2.2% [0.5–4.0%] vs. 2.8% [2.1–3.4%]) and 1-yr survival (1.9% [0.3–3.5%] vs. 2.5% [1.9–3.1%]). Among patients who were discharged, a good neurologic status was observed in two trauma patients (33.3% [4.3–77.7%]) and 37 medical patients (50% [38.1–61.9%]).

Conclusions: The survival and neurologic outcome of out-of-hospital cardiac arrest were not different between trauma and medical patients. This result suggests that, under the supervision of senior physicians, active resuscitation after out-of-hospital cardiac arrest is as important in trauma as in medical patients. (Crit Care Med 2007; 35:2251–2255)

KEY WORDS: cardiac arrest; trauma; resuscitation; outcome

It is usually assumed that trauma victims with cardiac arrest in the prehospital setting have a dismal prognosis, leading physicians to consider cardiopulmonary resuscitation as futile (1). Despite advances in medical care, survival rates of 0% to 2% have been consistently reported for blunt trauma patients who arrive at a trauma center with no signs of life (2–6). Unfortunately, many of these survivors experience severe permanent neurologic disability (5, 7). Consequently, according to the guidelines from the National Association of EMS Physicians/American College of Surgery Committee on Trauma and the protocols for advanced trauma life support, it is actually suggested to not resuscitate blunt trauma patients with out-of-hospital cardiac arrest (OHCA) or penetrating trauma patients found pulseless, apneic, and with no sign of life, and to make a death pronouncement at the injury scene (6). However, no strong evidence actually demonstrates that the prognosis of trauma patients who experience OHCA is worse than that of patients with nontraumatic ("medical") OHCA, and since the publication of guidelines, three articles have described improved survival rates (8–10). Hence, in many European countries, patients with traumatic OHCA are usually actively treated and receive the same level of care as patients with medical OHCA, with the addition of specific care to trauma (10, 11).

Thus, the aim of this study was to compare survival and neurologic outcome of medical and trauma patients with OHCA.

METHODS

Study Design. We used data obtained during the European Epinephrine Study Group's trial comparing high vs. standard doses of epinephrine (12). In the original study, patients having a nontraumatic "medical" or trauma-related OHCA were included. How-

*See also p. 2432.

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Dr. David had full access to all data in the study and had final responsibility for the decision to submit for publication.

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- Comparaison AC Med et Trauma
- 268 Tr vs. 2642 Med

	Trauma	Medical
Age	**42 ± 17***	62 ± 17
Témoin ?	62 %	**80 %***
FV	3.4 %	**17.3 %***
RACS	**34 %***	30 %
Admission	**30 %***	24 %
Sortie CH	2.2 %	2.8 %
Survie 1 an	1.9 %	2.5 %

- **Bon Pronostic Neuro :**

33 % (Tr) vs. 50 % (Med)

Resuscitation (2007) 75, 276–285

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RESUSCITATION

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CLINICAL PAPER

Outcome in 757 severely injured patients with traumatic cardiorespiratory arrest☆

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KEYWORDS
Cardiopulmonary resuscitation;
CPR;
Emergency treatment;
Tension pneumothorax;
Major trauma;
Polytrauma;
Resuscitation;
Shock;
Thoracocentesis;
Thoracotomy;
Chest tube;
External chest compressions

Summary
Background: Resuscitation of traumatic cardiorespiratory arrest patients (TCRA) is generally associated with poor outcome, however some authors report survival rates of more than 10% in blunt trauma patients. The purpose of this investigation was to determine predictive factors for mortality in trauma patients having received external chest compressions (ECC).
Patients and methods: Twenty thousand eight hundred and fifteen patients from the Trauma Registry of the German Trauma Society were analysed (mean ISS = 24.0). Inclusion criteria were ISS ≥ 16 and available information on ECC either on-scene and/or during trauma room treatment. Included into the Trauma Registry were only patients with ECC and transportation into a hospital. Patients declared dead on-scene without transportation to a hospital were not recorded in the data base. A Logistic regression was performed to find out predictive factors for mortality.
Results: Ten thousand three hundred and fifty nine patients fulfilled the inclusion criteria. *N* = 757 patients received ECC, 415 prehospital, 538 during trauma room

- 757 ACT / 10359 Tr
- Exclusion Mort LSP
- 415 MCE PréH
- 538 MCE IH
- 5.7 % PNO Compr
- 10 % Thoracotomie
- Survie 17 %

Table 2 Results of the logistic regression model with mortality as target variable

Variable	Odds ratio	95% Confidence interval
Thromboplastin time ≤50%	5.2	2.3–11.9
Massive blood transfusion of ≥10 PRBC	4.8	2.0–11.5
No pulse/blood pressure on-scene = 0	4.3	1.6–11.3
Age ≥55 years	2.9	1.1–7.3
Base excess ≤−8	2.7	1.2–5.9
Prehospital chest tube insertion	0.3	0.1–0.8

☆ A Spanish translated version of the summary of this article appears as Appendix in the final online version at 10.1016/j.resuscitation.2007.04.018.

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[1] See Appendix A.

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Outcomes of Trauma Victims With Cardiac Arrest Who Survive to Intensive Care Unit Admission

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Background: The prognosis for patients with return of spontaneous circulation after trauma-related cardiac arrest (TRCA) is unclear. Our purpose was to (1) determine outcomes for patients with TRCA resuscitated and admitted to the intensive care unit (ICU), (2) identify ICU-based predictors of in-hospital death in this population, and (3) compare outcomes of patients resuscitated from TRCA and atraumatic cardiac arrest (ATCA).

Methods: We performed a cohort study using a registry of ICU admissions from 120 US hospitals from 2001 to 2005. Inclusion criteria were age >17 years, admission to ICU via the emergency department, and cardiopulmonary resuscitation preceding ICU arrival. The primary outcome measure was survival to hospital discharge. We compared TRCA and ATCA using binomial test and performed multivariable logistic regression to determine independent predictors of death among trauma subjects.

Results: A total of 4,048 subjects were included (309 TRCA and 3,739 nonTRCA). Forty percent of trauma subjects survived. Independent predictors of death among trauma subjects included persistent postresuscitation cardiovascular failure in the ICU and presentation to a nontrauma center. Despite being younger and having fewer comorbidities, subjects with TRCA had lower survival than subjects with ATCA (40% vs. 49%, $p = 0.003$).

Conclusions: Despite lower survival than ATCAs, a significant percentage of TRCAs surviving to ICU admission were discharged alive. This suggests aggressive support of this population is not necessarily futile. Investigation into whether optimization of postresuscitation factors would improve outcome for these patients may be warranted.

Key Words: Trauma, Cardiac arrest, Outcome, Critical care.

(*J Trauma.* 2011;XX: 000–000)

Trauma-related cardiac arrest (TRCA) is known to carry a poor prognosis for survival,[1–7] and arguments for futility of aggressive support have been made for this patient population.[8,9] However, to date, no study has specifically examined a cohort of patients surviving to intensive care unit (ICU) admission after return of spontaneous circulation after TRCA. The outcomes for such a population are not clear and factors suggesting futility in treatment of specific patients remains to be determined.

Recently, one series suggested that victims of TRCA may have similar prognosis to patients with atraumatic cardiac arrest (ATCA); however, most of the subjects in this study did not have return of spontaneous circulation.[10] Whether trauma patients who are resuscitated and survive to ICU admission differ from ATCAs in terms of overall survival is unknown.

We hypothesized that the outcomes for victims of TRCA with return of spontaneous circulation may be better than those for nontrauma patients. Our purpose was to (1) determine outcomes for patients with TRCA who are resuscitated and admitted to the ICU, (2) identify ICU-based independent predictors of in-hospital death in this population, and (3) compare outcomes of patients resuscitated from TRCA and ATCA. Because the presence of persistent postresuscitation cardiovascular failure (e.g., persistent hypotension/vasopressor requirement) in the ICU phase of therapy has recently been identified as a common occurrence and an important independent predictor of outcome in nontrauma postcardiac arrest patients,[11] we also aimed to determine the incidence of postresuscitation cardiovascular failure in the trauma population and its prognostic significance.

PATIENTS AND METHODS

We conducted a multicenter registry study using the Project IMPACT database (Cerner Corporation, Kansas City, MO), a large voluntary administrative database developed by the Society of Critical Care Medicine and specifically designed for the critically ill patient. Currently, 201 adult ICUs from 120 hospitals across the United States participate in Project IMPACT, which now contains data for >550,000 patients. Participating Project IMPACT hospitals upload data quarterly to a central repository that maintains and manages the database. Data fields include hospital and ICU organizational characteristics, admission source (e.g., emergency department [ED]), patient demographics, preadmission functional status, laboratory, hemodynamic and other physiologic data, procedures and complications, ICU length of stay, hospital length stay, and outcomes. All data are collected at each institution by dedicated on-site personnel who must be trained and certified by Project IMPACT in advance including passing a written certification examination to ensure uniformity in both database

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Presented in abstract form at the New Jersey Chapter of the American College of Surgeons Annual Meeting, December 6, 2008, Secaucus, New Jersey.
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Objectif :
- Pronostic ACT admis en réa
- Facteurs pronostic
- Comparer avec ACM

Registre multicentrique US
309 ACT vs. 3739 ACM

Survie ACT < ACM (40 vs. 49%), p< 0.01

TABLE 4. Multivariate Logistic Regression Analysis With In-hospital Mortality as the Dependent Variable in TRCAs

Variable	Coefficient	Odds Ratio (95% Confidence Interval)
Age > mean	0.50	1.64 (0.91–2.96)
Any comorbidity	1.28	3.62 (0.33–39.73)
Persistent postresuscitation cardiovascular failure*	1.58	4.82 (2.68–8.70)
Heart rate > median	0.33	1.38 (0.78–2.47)
Temperature < median	1.20	3.32 (1.85–6.00)
Presentation to nontrauma designated center	1.07	2.93 (1.07–8.42)

* Defined as any systolic <90 mm Hg within 1 hour of ICU arrival[11] and/or need for vasopressor support.

aggressive support of this population is not necessarily futile.

FACTEURS PRONOSTIC

- **Facteurs de « Mauvais Pronostic »**
  - Arrêt prolongé > 10 min
  - TC Grave et/ou Hémorragie, lésions majeures
  - Absence de signes de vie sur les lieux du traumatisme

Battistella et al. *Arch Surg* 1999 ; Lorenz et al., *J Trauma* 1992

- **Facteurs de « Bon Pronostic »**
  - Arrêt bref < 4 min
  - Manœuvres de réanimation < 20 min
  - Plaie par arme blanche *vs.* plaie par arme à feu
  - Tamponnade
  - Arrêt survenant devant un médecin expérimenté
  - Etiologie facilement curable (FV, PNO …)
  - Présence d'une activité pupillaire

Bertelli et al., *Rev Esc Enferm USP* 1999 ; Vij et al., *Surgery* 1983

ARRÊT CARDIAQUE TRAUMATIQUE

1- Pronostic

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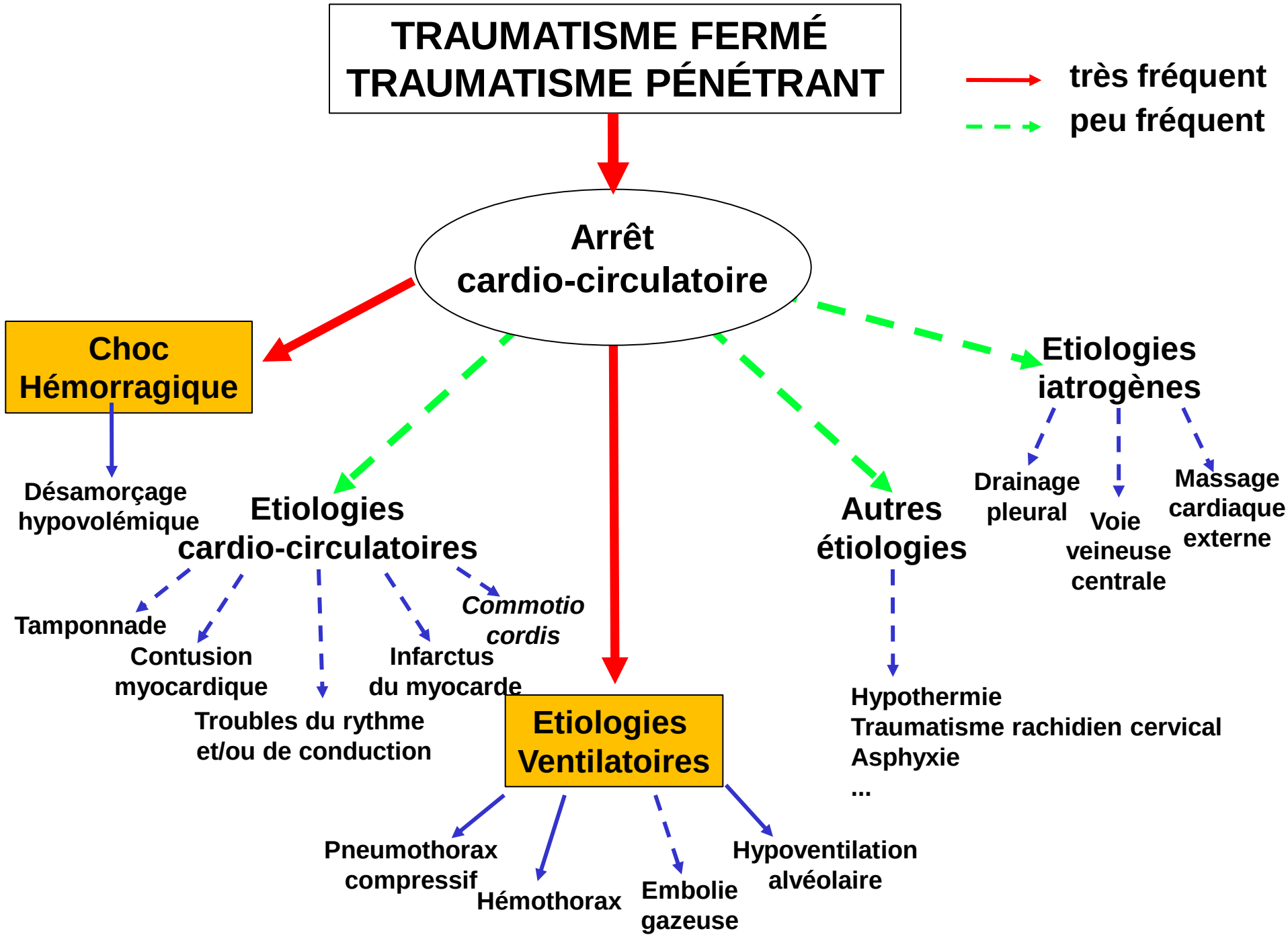
4- Evolution Thérapeutique

5- Conclusion


TRAUMATISME FERMÉ
TRAUMATISME PÉNÉTRANT
très fréquent
peu fréquent
Arrêt cardio-circulatoire
Choc Hémorragique
Désamorçage hypovolémique
Etiologies cardio-circulatoires
Tamponnade
Contusion myocardique
Troubles du rythme et/ou de conduction
Infarctus du myocarde
Commotio cordis
Etiologies Ventilatoires
Pneumothorax compressif
Hémothorax
Embolie gazeuse
Hypoventilation alvéolaire
Autres étiologies
Hypothermie
Traumatisme rachidien cervical
Asphyxie
...
Etiologies iatrogènes
Drainage pleural
Voie veineuse centrale
Massage cardiaque externe

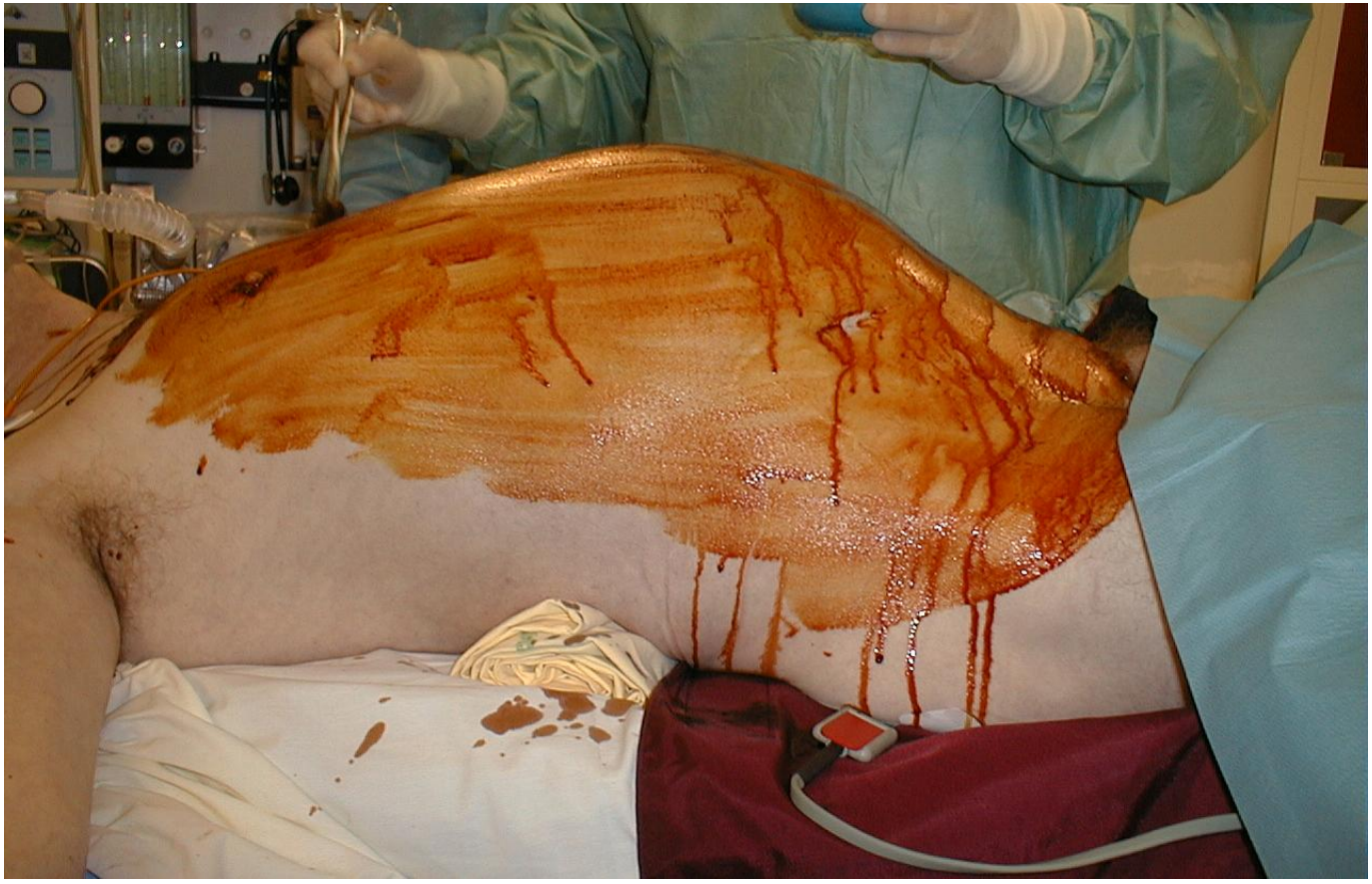
CAUSES HÉMODYNAMIQUES

40 % des Décès Post Traumatique !!!!!

Désamorçage Hypovolémique
Bradycardie Paradoxale
Tamponnade
Comotio Cordis

DESAMORCAGE BRUTAL

- Désincarcération / Déshabillage du blessé
- Brancardage
- Dégonflage inopiné du pantalon antichoc



BRADYCARDIE PARADOXALE

- Liée à la stimulation de mécanorécepteurs cardiaques (VG)

  => meilleur remplissage diastolique

Barriot et al. Int Care Med 1987

- Circonstances de survenue :
  - Hémorragie massive et rapide (~ 7 %)
  - TT préalable bradycardisant (β^-)
  - Usage chronique de cocaïne
  - Anesthésie générale

- CAT : remplissage rapide et massif

± catécholamines transitoirement

Parasympatholytiques (atropine) => CI Absolue

TAMPONNADE CARDIAQUE

- 2ème cause de décès lors de traumatisme cardiaque pénétrant

Symbas, *Am Heart J* 1976

- Péricarde toujours lésé lors de trauma cardiaque pénétrant

- Rôle ambivalent de la tamponnade :
  - Comprime les cavités cardiaques
  - *MAIS* limite et retarde l'hémorragie massive

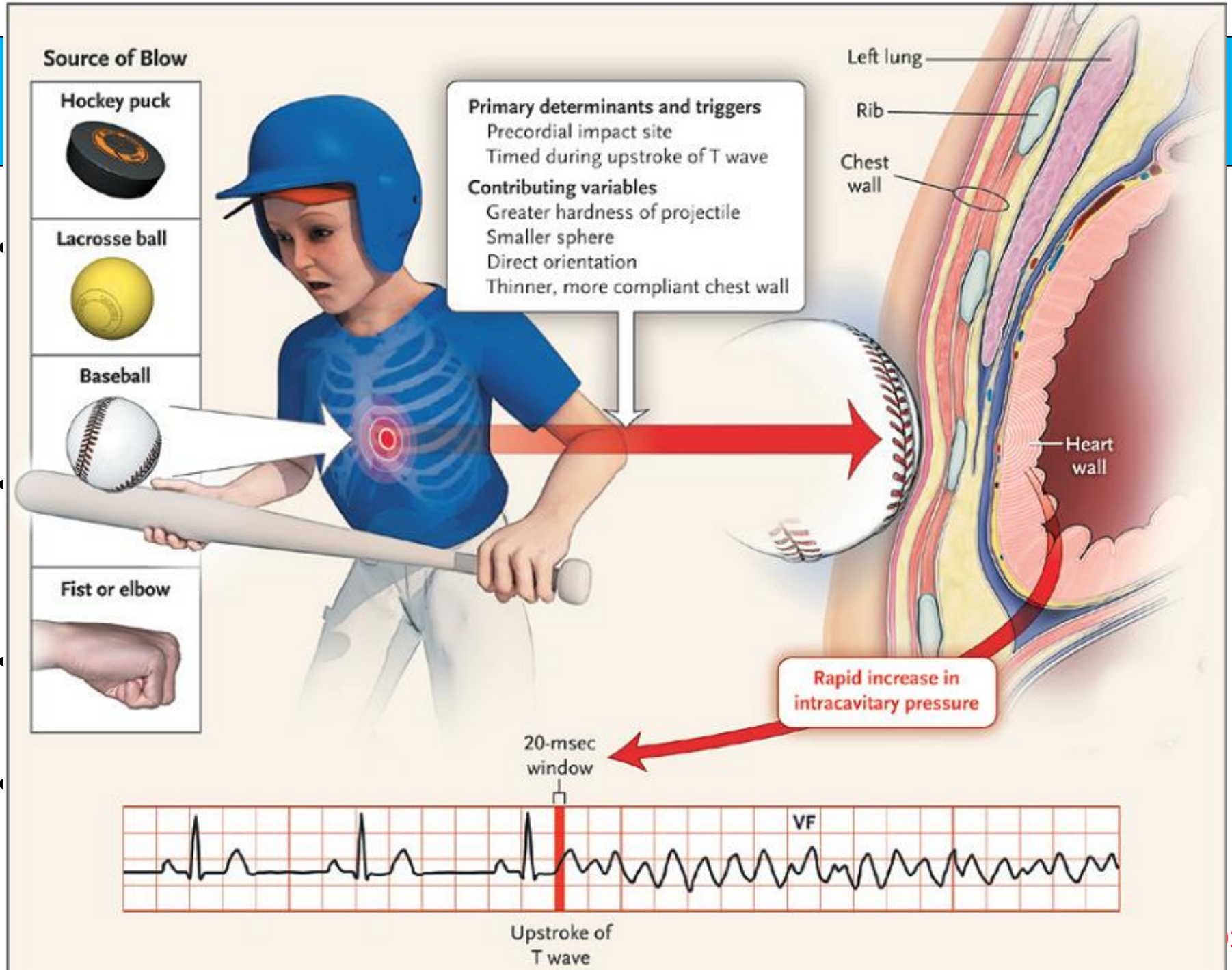
(2/3 des patients avec tamponade, 1/3 sans mais hémothorax)

→ Permet à certains blessés d'arriver vivant à l'hôpital

Moreno et al, *J Trauma* 1986

→ Récemment individualisée en tant que facteur de survie

Coats et al, *J Trauma* 2001


Source of Blow
Hockey puck
Lacrosse ball
Baseball
Fist or elbow
Primary determinants and triggers
Precordial impact site
Timed during upstroke of T wave
Contributing variables
Greater hardness of projectile
Smaller sphere
Direct orientation
Thinner, more compliant chest wall
Left lung
Rib
Chest wall
Heart wall
Rapid increase in intracavitary pressure
20-msec window
VF
Upstroke of T wave

Un homme dans un état grave après un tir de flash-ball

Mots clés : Flash-Ball, Tir, Blessé, FRANCE, MARSEILLE, Brice Hortefeux

Par lefigaro.fr

12/12/2010 | Mise à jour : 20:43 Réagir

Des pompiers stationnent dimanche devant la résidence de la Madrague, à Marseille, pour évacuer l'homme victime d'un arrêt cardiaque à la suite d'un tir de flash-ball. Crédits photo : ANNE-CHRISTINE POUJOULAT/AFP

L'homme, âgé d'une quarantaine d'années, a été victime d'un arrêt cardiaque après avoir reçu un tir de flash-ball d'un policier, qui intervenait pour mettre un terme à une rixe dans un foyer de travailleurs.

Un homme était dans un état critique dimanche à Marseille, victime d'un arrêt cardiaque après avoir reçu un tir de flash-ball d'un policier, ont indiqué la police et le parquet. Le policier intervenait pour mettre un terme à une rixe survenue dans un foyer de travailleurs.

L'homme, âgé d'une quarantaine d'années et résidant dans ce foyer situé dans le 15e arrondissement de la ville, avait

Le Flash | Économie | Sport

Actu

20h49 USA: le blizzard frappe le Midwest

20h10 FN: "il faut être vigilant" (Hortefeux)

20h04 Proglio quitte la direction de Veolia

19h52 Kosovo: le parti de Hashim Thaçi en tête

19h32 CSM: Jean-Pierre Machelon nommé ?

19h19 Vosges: un forcené se suicide

18h58 Foot: Lyon bat Toulouse 2-0

18h56 Suède: la photo du kamikaze publiée

| Tout le Flash Actu 1/8

CAC 40 : 3.857,35 (-0,02%)

Valeur OK

Bourse | mes outils | cotations | communiqués

Le Flash | Économie | Sport

Actu

20h49 USA: le blizzard frappe le Midwest

20h10 FN: "il faut être vigilant" (Hortefeux)

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19h32 CSM: Jean-Pierre Machelon nommé ?

19h19 Vosges: un forcené se

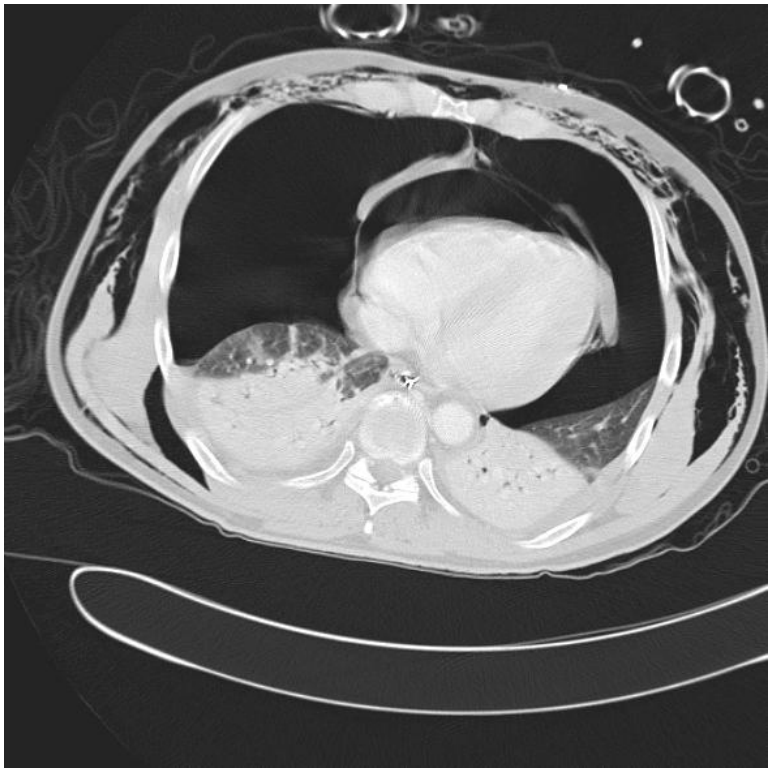
ETIOLOGIES VENTILATOIRES

- **PNEUMOTHORAX COMPRESSIF**

- Fréquent (6 %), dramatique

  - Effondrement retour VD

Hubert-Wagner et al. Resuscitation 2007



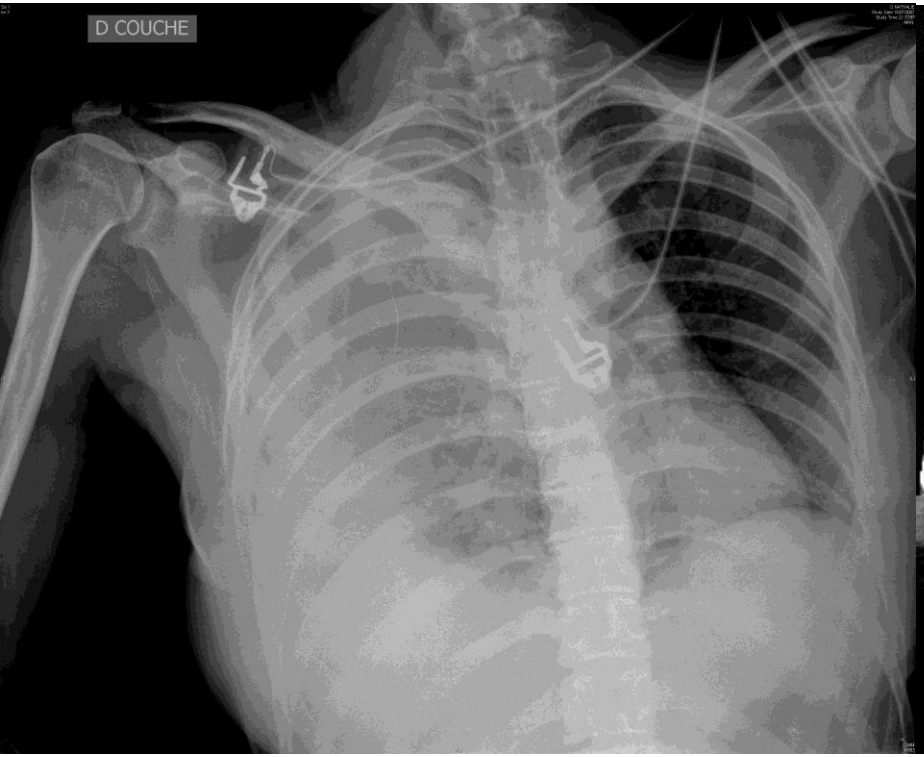
ETIOLOGIES VENTILATOIRES

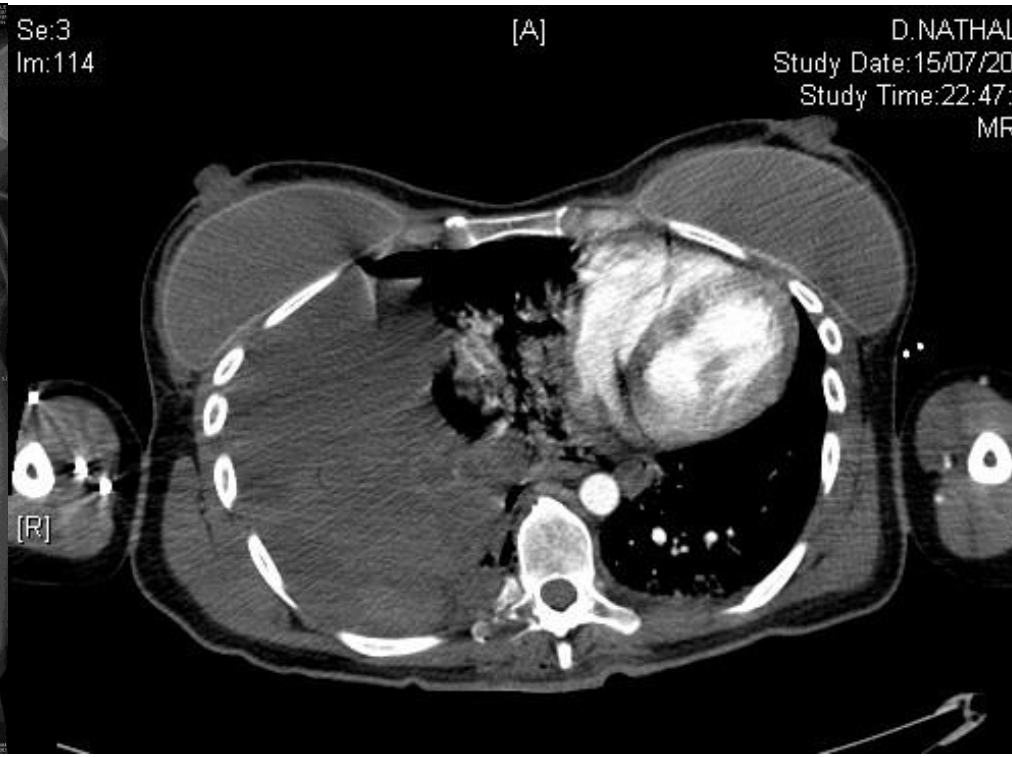
- **HEMOTHORAX COMPRESSIF**

- Fréquent

- Autotransfusion +++

Barriot et al. Chest 1988

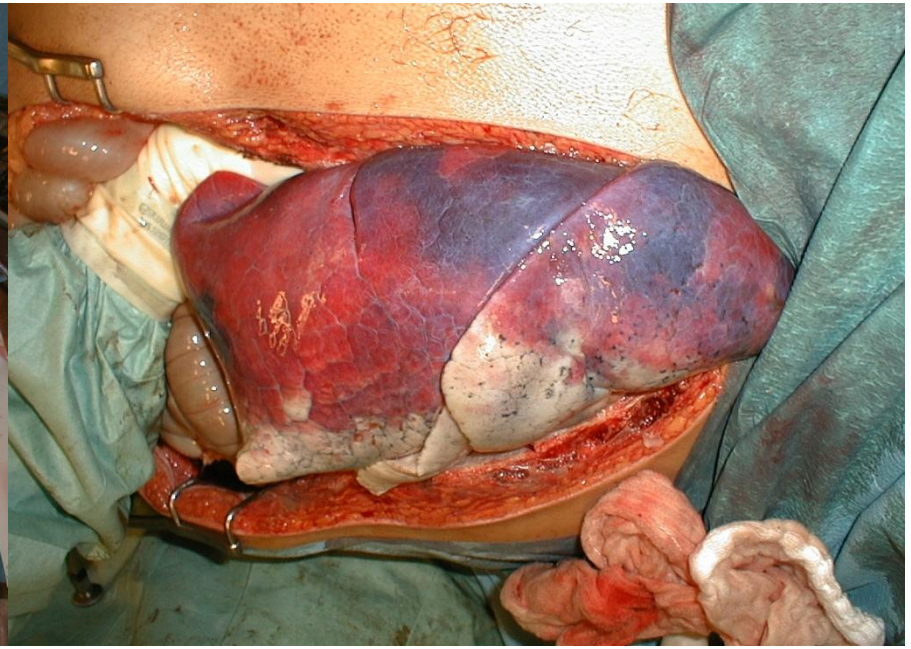




ETIOLOGIES VENTILATOIRES

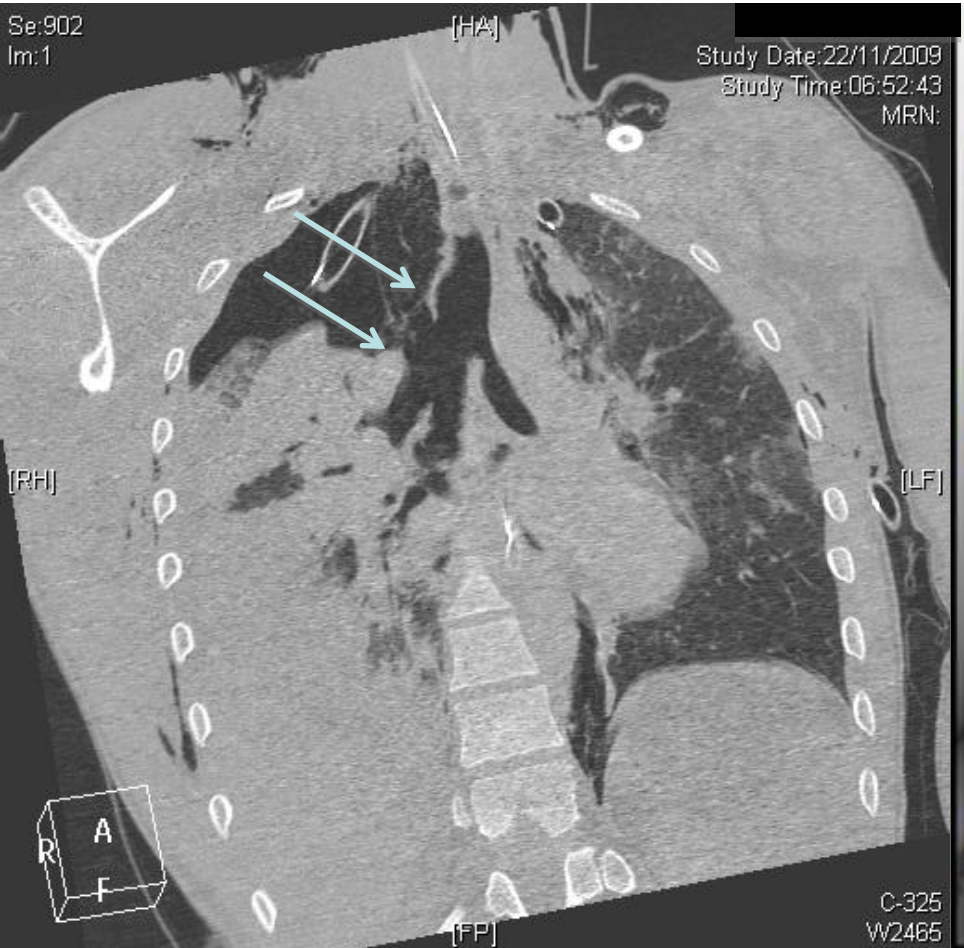
- **HYPOVENTILATION ALVEOLAIRE / HYPOXIE**

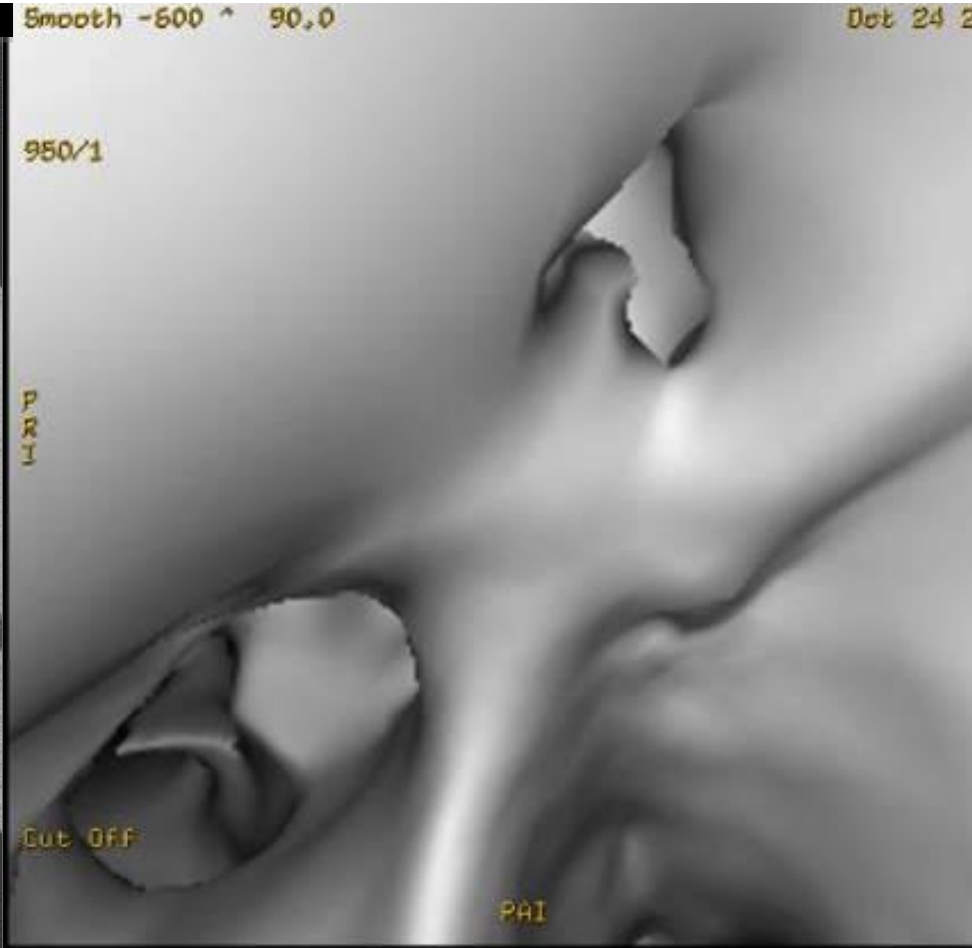
- Contusion pulmonaire et/ou Hémorragie Intra-Alvéolaire



ETIOLOGIES VENTILATOIRES

- **HYPOVENTILATION ALVEOLAIRE / HYPOXIE**
  - Rupture Trachéo-Bronchique

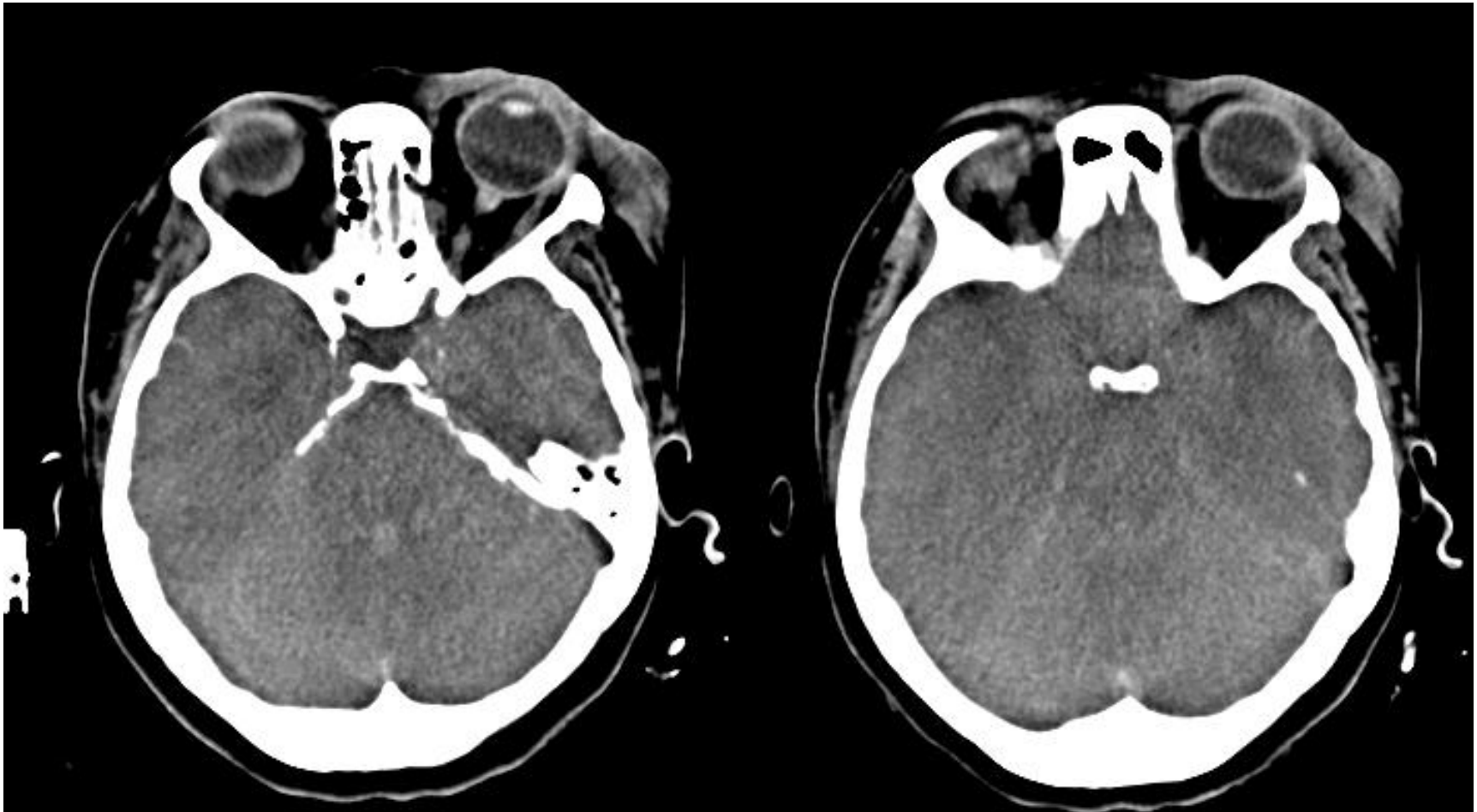




AUTRES ETIOLOGIES

- **ATTEINTES CÉRÉBRALES**

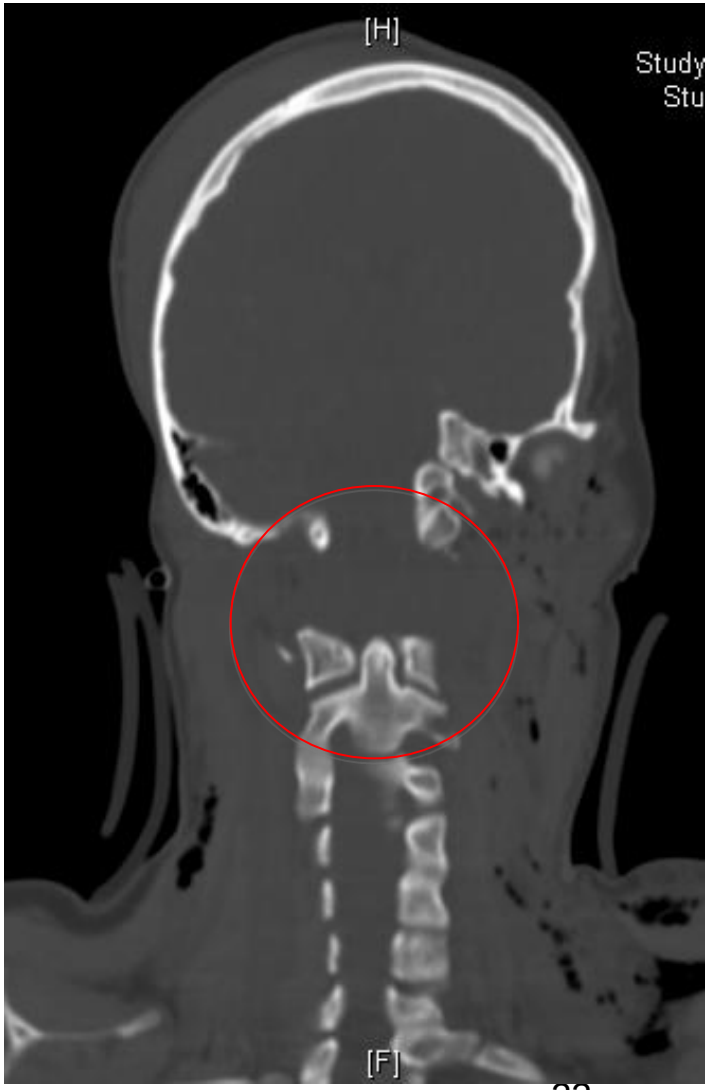
  - Phénomènes reflexes (tr cérébral), hyperkaliémie



AUTRES ETIOLOGIES

- Hypothermie Profonde
- Compression thoracique asphyxiante
- **<u>Lésions médullaires</u>**
  - Dislocations atlanto-occipitales
  - Lésions majeures du rachis cervical
    - Tétraplégies hautes
    - Stimulation vagale extrême

Repart bien !



ARRÊT CARDIAQUE TRAUMATIQUE

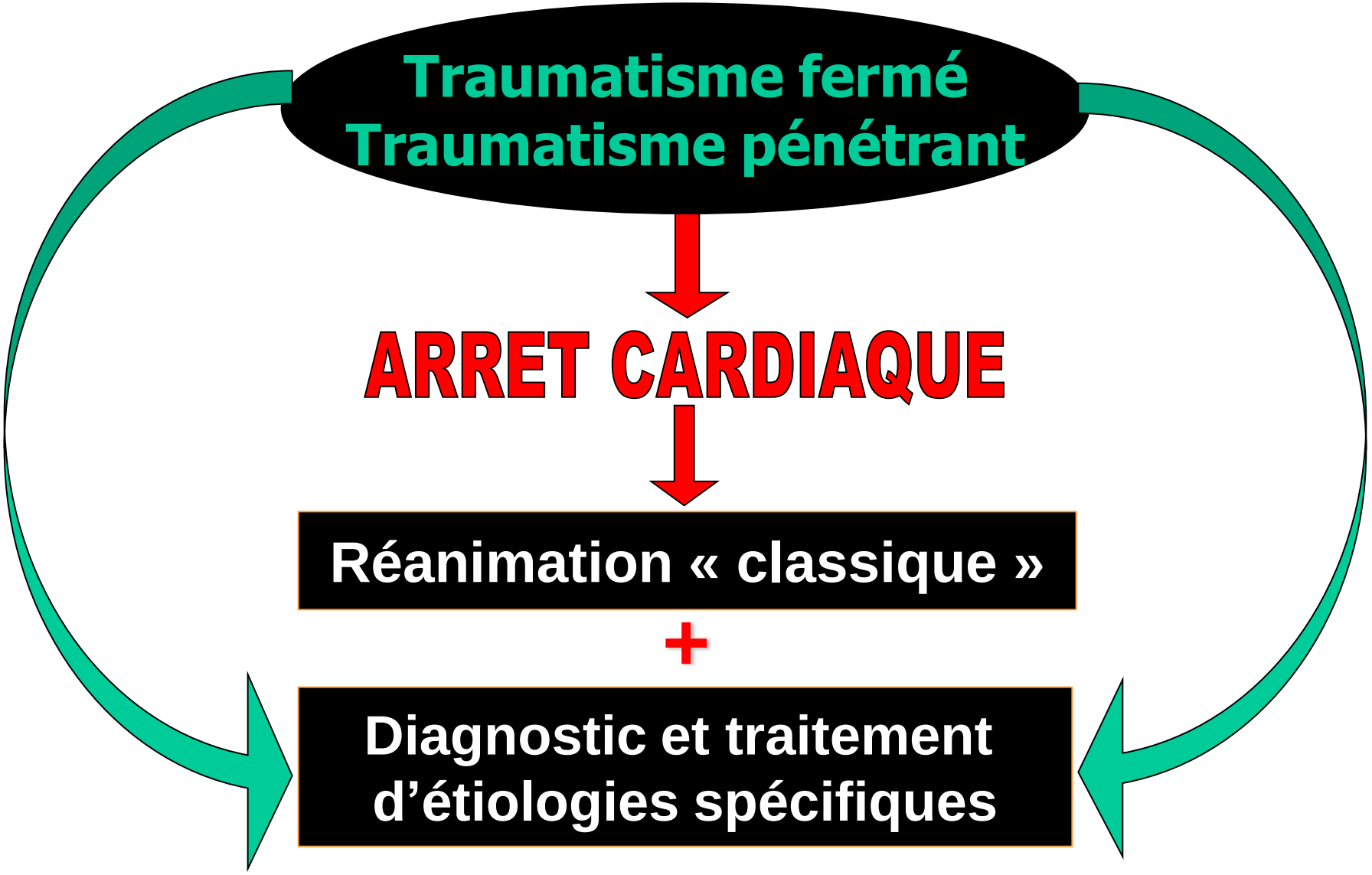
1- Pronostic

2- Etiologie de l'AC Traumatique

3- Prise en Charge de l'AC Traumatique

4- Evolution Thérapeutique

5- Conclusion


Traumatisme fermé
Traumatisme pénétrant
ARRET CARDIAQUE
Réanimation « classique »
+
Diagnostic et traitement
d'étiologies spécifiques

TT SPECIFIQUES TRAUMA

- Hémorragie ? :
  - RV,
  - Garrot, Clampage Aortique
  - Catécholamine
- PNO :
  - Exsufflation
  - Thoracostomie
- Tamponnade :
  - Ponction péricardique ?

Société française d'anesthésie et de réanimation

Société de Réanimation de Langue Française

Société de réanimation de langue française

Recommandations formalisées d'experts

Prise en charge de l'arrêt cardiaque

Avec la participation

du Conseil français de réanimation cardio-pulmonaire (CFRC)
du Samu de France
de la Société française de médecine d'urgence (SFMU)
de la Croix Rouge française
de la Société française de cardiologie (SFC)

Septembre 2006

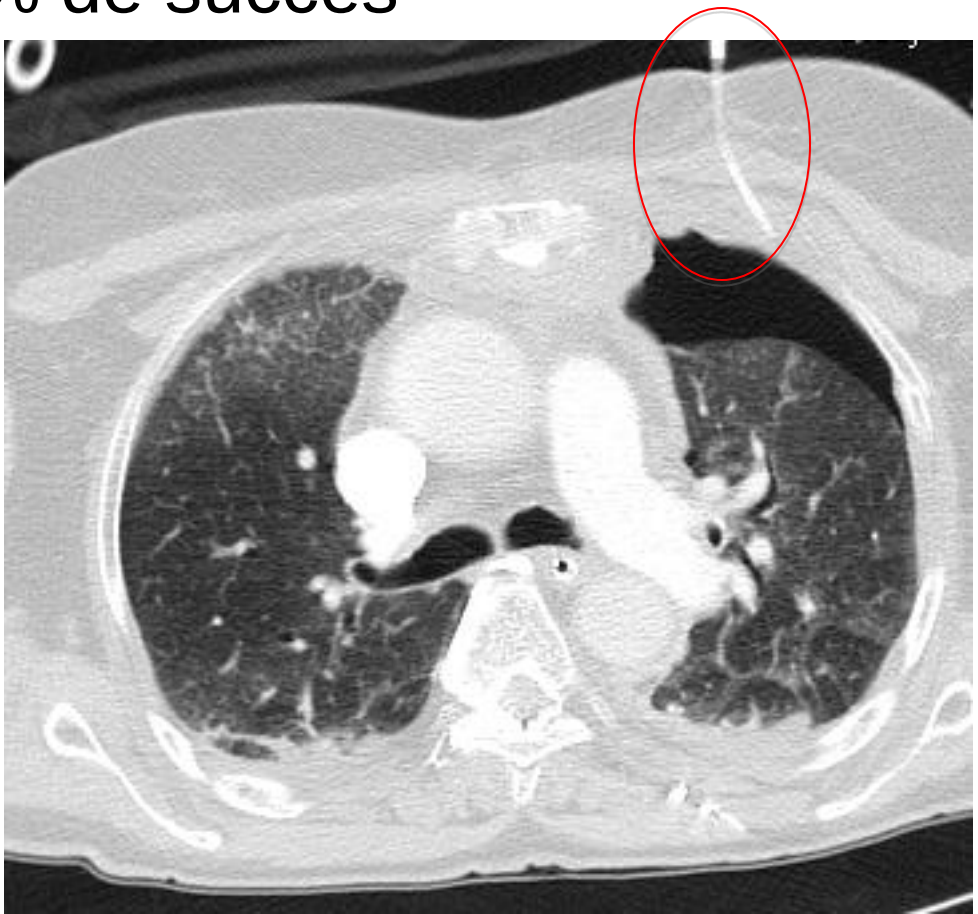
Arrêt cardiaque et traumatisme

- La réanimation d'un AC d'origine traumatique doit en premier lieu suivre les mêmes recommandations que celles en vigueur pour la réanimation des AC d'origine « médicale ». La prise en charge du traumatisme vient en complément de la réanimation de l'arrêt cardiaque mais ne doit pas s'y substituer.
- Les chances de survie après un AC d'origine traumatique sont théoriquement extrêmement faibles (environ 2 %). Cependant, une réanimation doit toujours être tentée, et ce d'autant plus que la prise en charge initiale est effectuée d'emblée par une équipe médicalisée, car des survies inespérées ont été décrites.
- Le pronostic vital après un AC traumatique semble être meilleur après un traumatisme pénétrant qu'après un traumatisme fermé, en particulier si le traumatisme est thoracique et isolé, en raison de la possibilité de pratiquer une thoracotomie de sauvetage. Cette thoracotomie est en général réalisée aux urgences de l'hôpital si le délai de transport est inférieur à 15 minutes.
- Certaines étiologies curables à l'origine d'un AC survenant dans le contexte d'un traumatisme doivent être rapidement identifiées car leur traitement peut permettre de restaurer une activité cardiaque spontanée efficace :
  - Le pneumothorax compressif qui nécessite une ponction exsufflatrice à l'aiguille ou une thoracostomie.
  - Le désamorçage hypovolémique lors d'un choc hémorragique qui nécessite un remplissage majeur et rapide, associé à l'administration d'un vasoconstricteur.
  - La FV survenant dans le cadre d'une « *commotio cordis* » nécessite un CEE.

- RFE (SFAR-SFMU) :
- Arrêt traumatique :
- B Vivien (Paris), JS David (Lyon), www.sfar.org

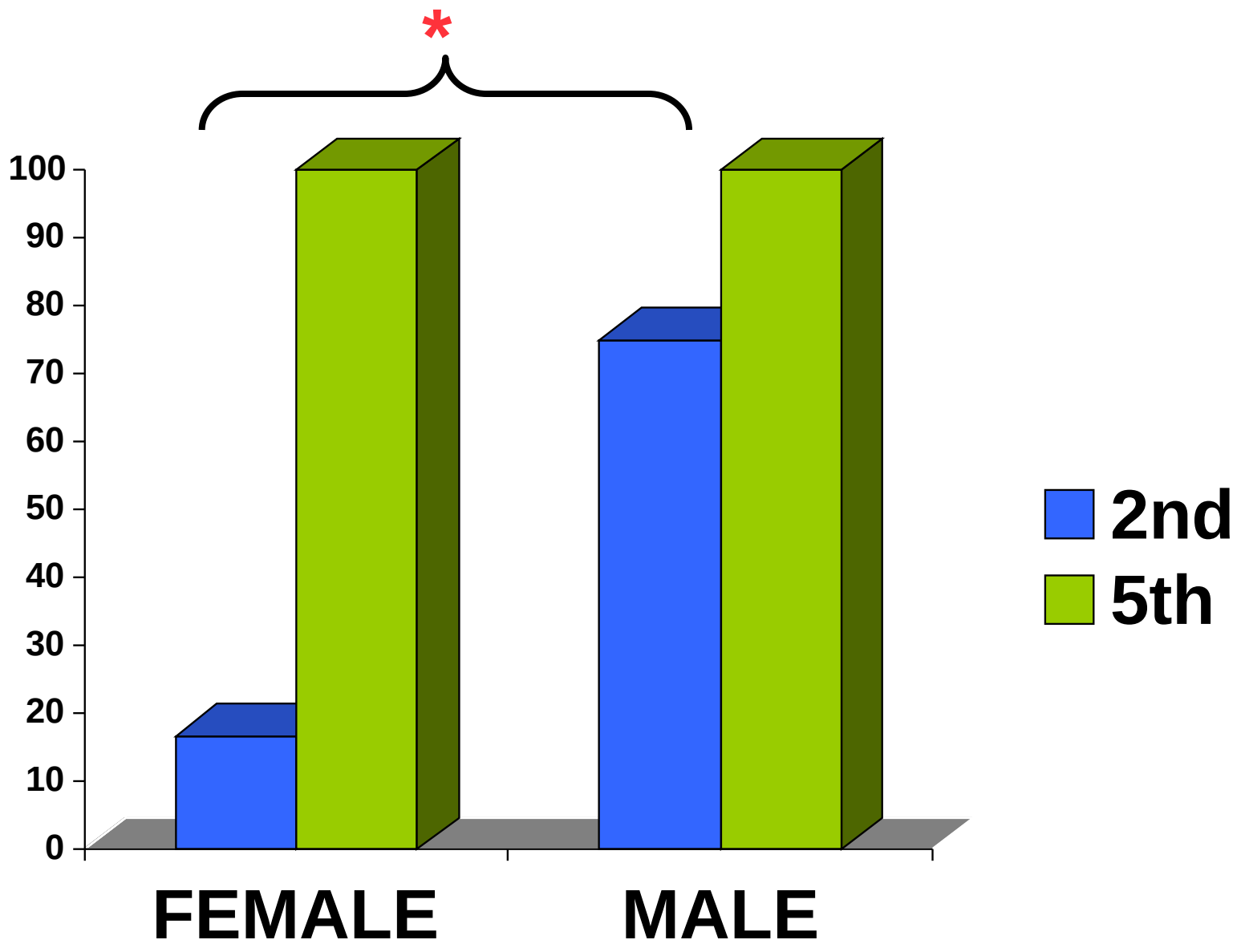
PNEUMOTHORAX COMPRESSIF

- **Décompression à l'Aiguille ?**
  - 40 % de succès



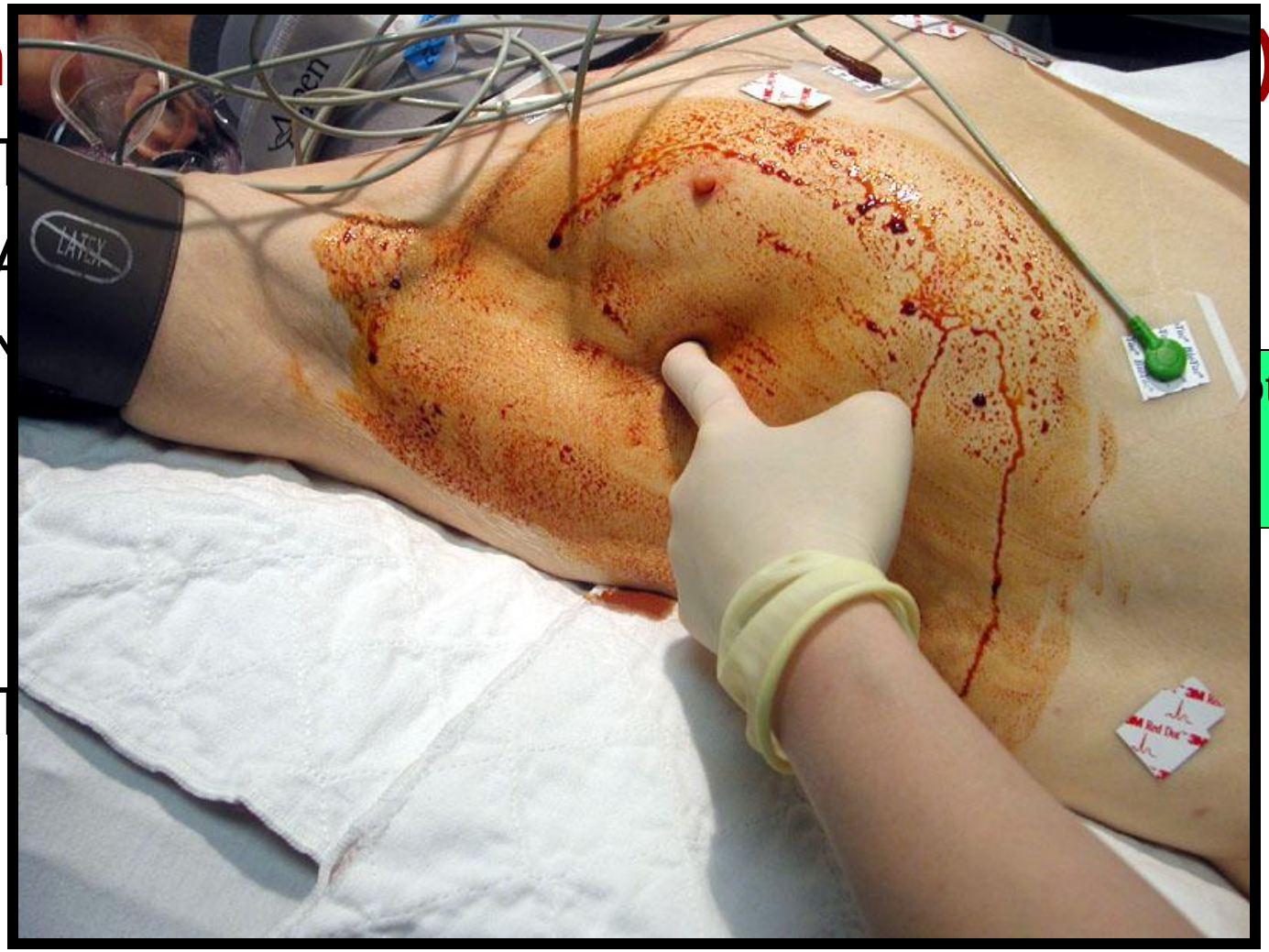
David et al. Urgence 2009

PENETRATION



PNEUMOTHORAX COMPRESSIF

- Th
  - –
  - – A
  - – N
  - –



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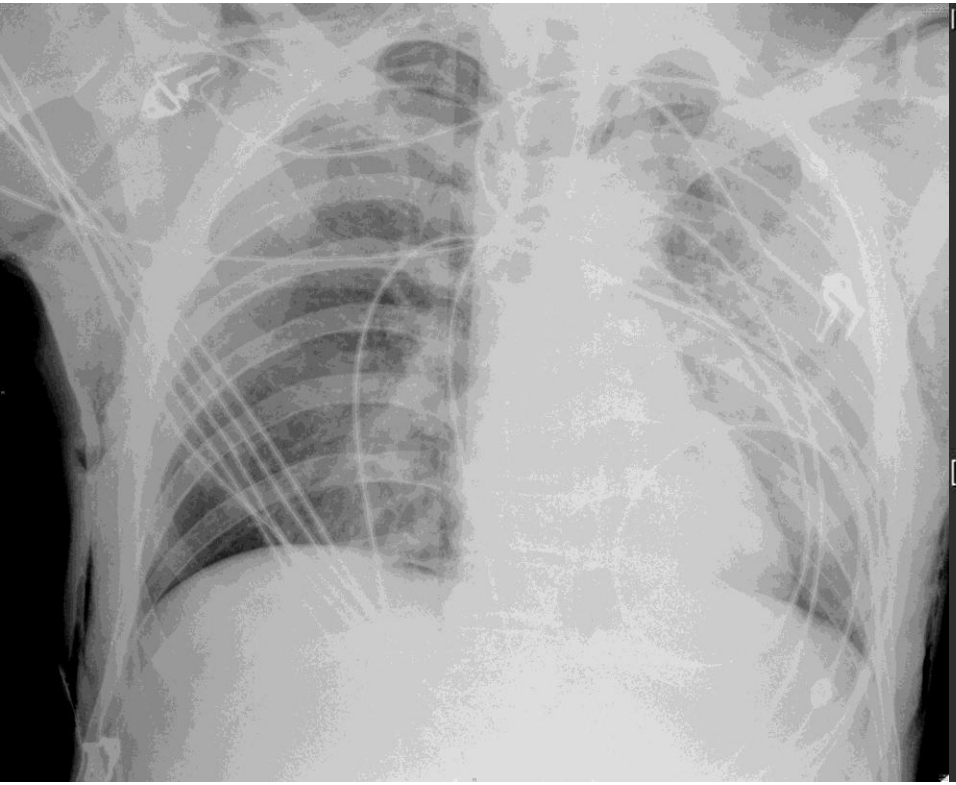
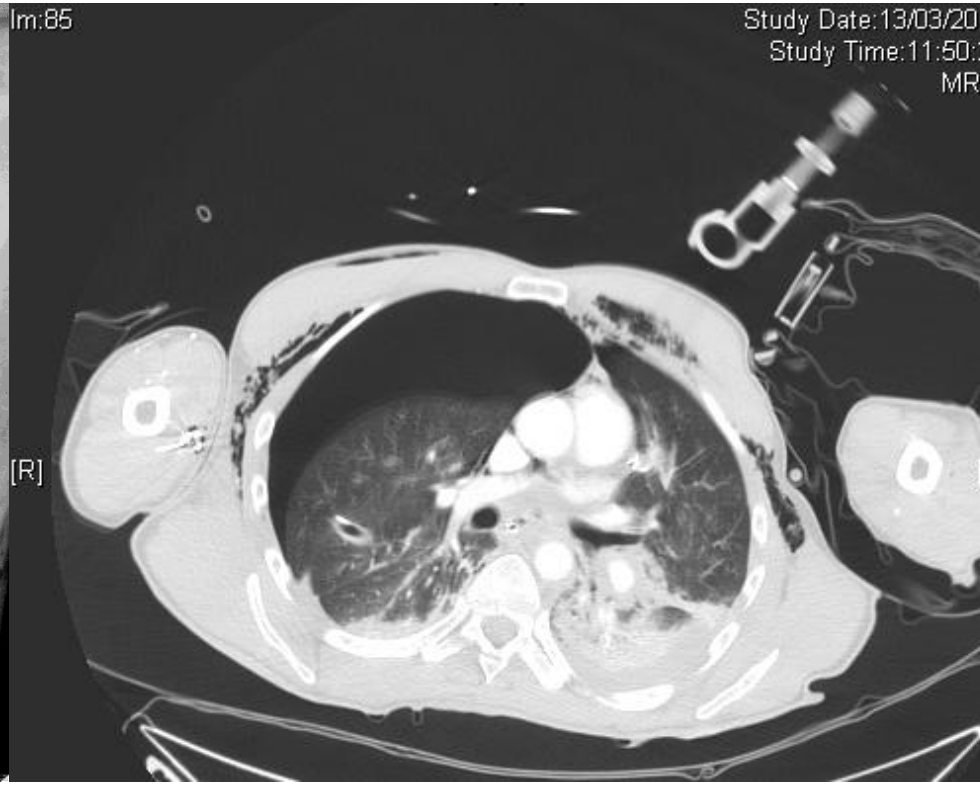
THORACOSTOMIE





Post Thoracostomie

Post Drain

DRAIN PAS INDISPENSABLE !!

Ann. Fr. Med. Urgence (2011) 1:131-133
DOI 10.1007/s13341-011-0037-4

Thoracostomie en urgence

Emergency thoracostomy

J.-S. David · C. Demaret · P.-Y. Gueugniaud

Reçu le 15 novembre 2010 ; accepté le 19 janvier 2011

Résumé Dans les suites d'un traumatisme sévère, un épanchement pleural compressif peut être responsable d'un arrêt cardiaque ou d'une détresse vitale, respiratoire ou circulatoire. Il importe alors au praticien de pouvoir rapidement décomprimer la plèvre du patient. Cette décompression sera au mieux réalisée par une thoracostomie, en particulier lors d'un arrêt cardiaque ou d'un échec de décompression à l'aiguille. La thoracostomie est faite sur le quatrième ou cinquième espace intercostal, au niveau de la ligne axillaire antérieure. Après incision cutanée, les muscles intercostaux sont franchis à l'aide d'une pince de Kocher, afin de réaliser un toucher pulmonaire au doigtz. ***Pour citer cette revue : Ann. Fr. Med. Urgence 1 (2011).***

Mots clés Thoracostomie · Traumatisme thoracique · Arrêt cardiaque · Pneumothorax

Abstract A tension pneumothorax or a pleural effusion causing mediastinal shift may result from severe trauma and may produce a cardiac arrest or life-threatening respiratory or circulatory disturbance. It is then incumbent on the doctor to be able to decompress the pleural space rapidly. The best way to effect this decompression is by thoracostomy, especially in a cardiac arrest situation or where needle decompression has not been successful. Thoracostomy is performed in the fourth or fifth intercostal space in the anterior axillary line. After making a cutaneous incision, the intercostal muscles are opened with a Kocher forceps, followed by the insertion of a finger into the pleural space. ***To cite this journal: Ann. Fr. Med. Urgence 1 (2011).***

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Samu de Lyon, hôpital Édouard-Herriot, hospices Civils de Lyon, F-69437 Lyon cedex, et université Claude Bernard Lyon 1, F-69921 Oullins, France

Key words Thoracostomy · Chest Trauma · Cardiac arrest · Pneumothorax

Les traumatismes thoraciques sont fréquemment rencontrés en traumatologie et peuvent être responsables d'une détresse respiratoire sévère. Il est ainsi possible d'observer des épanchements uni- ou bilatéraux, gazeux ou liquidiens, suffisamment importants pour entraîner une détresse respiratoire avec anoxie ou une défaillance circulatoire (notion de tamponnade gazeuse) pouvant conduire au décès du patient. La particularité des épanchements pleuraux post-traumatiques compressifs est qu'ils sont faciles à évacuer et représentent une cause curable d'arrêt cardiaque post-traumatique, en particulier par la réalisation d'une thoracostomie [1].

Incidence des épanchements pleuraux compressifs

Dans un travail publié en 2006 et portant sur une série de 978 patients décédés et autopsiés, il a été observé que la lésion principale était thoracique chez 79 d'entre eux et que pour 26 de ces patients, le décès était en relation avec un pneumothorax (PNO) compressif. De plus, 15 de ces patients auraient vécu suffisamment longtemps pour bénéficier d'un geste thérapeutique [2]. Mistry et al., en 2009, ont rapporté sur une série de 37 patients en arrêt cardiaque traumatique, la réalisation de 18 décompressions thoraciques par thoracostomie (17) ou à l'aiguille (1). Un PNO était observé chez dix patients et était sous tension chez six d'entre eux. Parmi les quatre patients qui avaient repris une activité cardiocirculatoire, trois avaient un PNO sous tension [3].

Thoracostomie

Le PNO compressif nécessite une prise en charge rapide, par exsufflation à l'aiguille ou thoracostomie. La décompression à l'aiguille est facile à réaliser mais peu efficace et ne permettant qu'une décompression partielle du PNO, en particulier quand le diamètre de l'aiguille et/ou sa longueur sont


syngo LEONARDO 3D
HEH
Ex: 1
Se: 503/10
Im: 12/16
Cor: 1.0
512 x 512
B40f
1.0x
R
L
120.0 kV
0.0 s
L:317
DFOV: 25.0 x 25.0cm

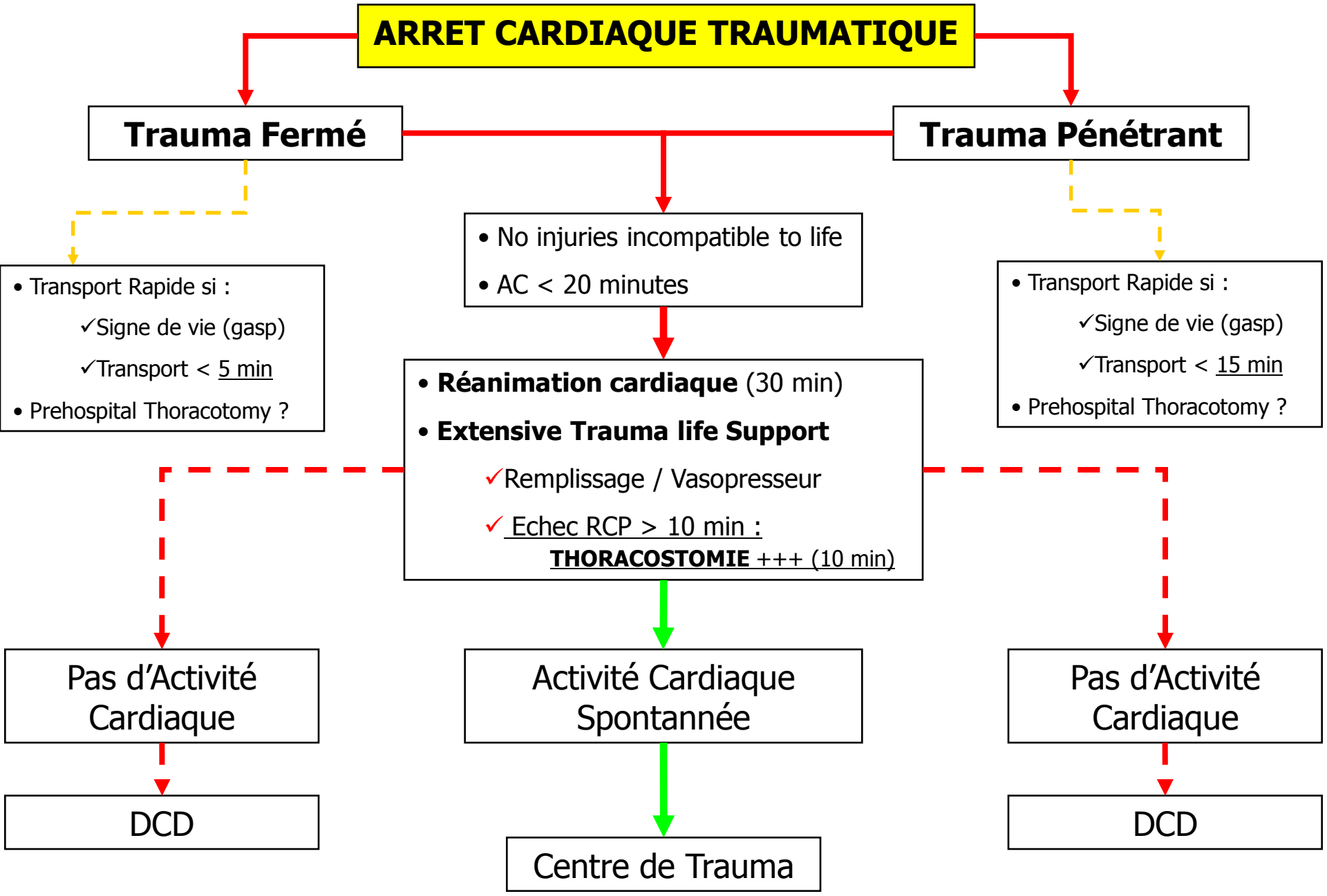
ossible

ABORD DU THORAX

- Sternotomie
- Thoracotomie Antéro-Latérale G
- Thoracotomie Transverse : « clam Shell »

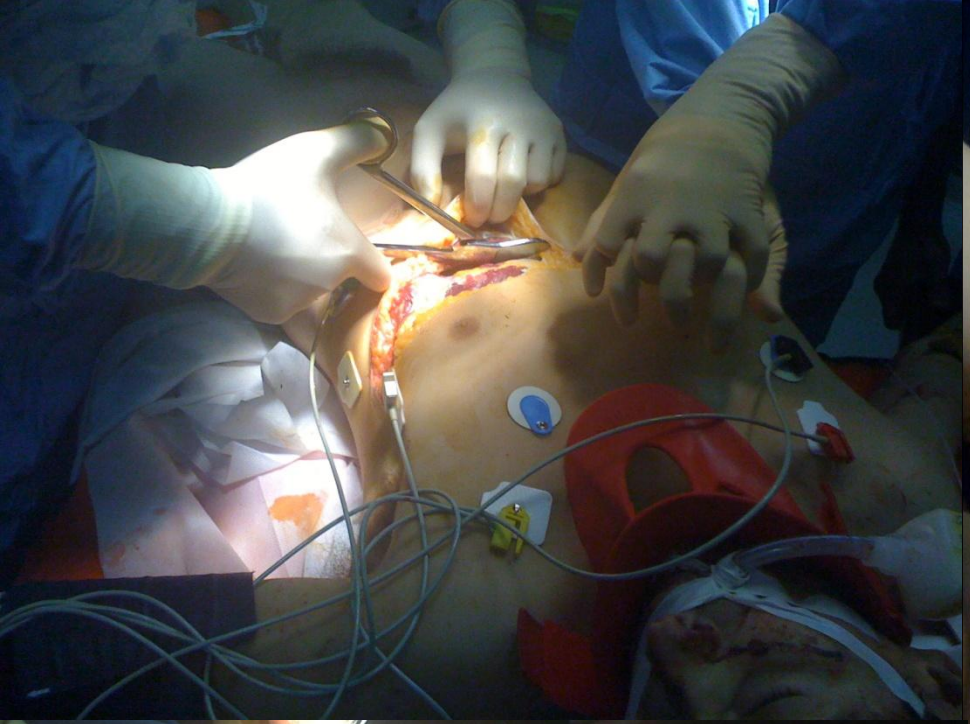
- Ponction Péricardique : Tr Pénétrant

THORACOSTOMIE : URGENTISTE (CHIRURGIEN)
THORACOTOMIE : CHIRURGIEN (URGENTISTE ?)


ARRET CARDIAQUE TRAUMATIQUE
Trauma Fermé
Trauma Pénétrant
• Transport Rapide si :
✓Signe de vie (gasp)
✓Transport < 5 min
• Prehospital Thoracotomy ?
• No injuries incompatible to life
• AC < 20 minutes
• Réanimation cardiaque (30 min)
• Extensive Trauma life Support
✓Remplissage / Vasopresseur
✓ Echec RCP > 10 min :
THORACOSTOMIE +++ (10 min)
• Transport Rapide si :
✓Signe de vie (gasp)
✓Transport < 15 min
• Prehospital Thoracotomy ?
Pas d'Activité Cardiaque
Activité Cardiaque Spontannée
Pas d'Activité Cardiaque
DCD
Centre de Trauma
DCD

THO RSE

- **Permet Th e**
  - Contrô
  - Draina
  - Massa
  - Clamp
- **Meilleurs**
  - Traumati *ma* 1992)
  - Surtout s 1988)
- **Descriptio**
  - Préhospi
  - Au bloc o



EN PREHOSPITALIER ?

- Coats et al. *J Trauma* 2001
  - Trauma pénétrants : 39 sur 6 ans
  - 10 % Survie
  - Facteur de survie :
    - AC devant l'équipe
    - Arme Blanche, plaie cardiaque, tamponnade
- Deakin CD. *Resuscitation* 2007 (Case report)
- Corral et al. *Resuscitation* 2007 (Case report)
- Matsumoto et al. Resuscitation 2009

CONCLUSION

- **Mortalité ACT = Mortalité ACM**
- **Mortalité AC après Tr fermé > Tr pénétrant**
- **PEC = RCP « classique » + PEC Trauma (RV, garrot)**
- **Thoracostomie bilatérale systématique si échec RCP**
- **Ponction Péricarde : Tr Pénétrant**
- **Thoracotomie Intra-H : timing AC ?, délai transp ?**
- Thoracotomie SMUR : Tr pénétrant ? Délai > 15 min ?

Resuscitation (2007) 75, 525—529

ELSEVIER

CASE REPORT

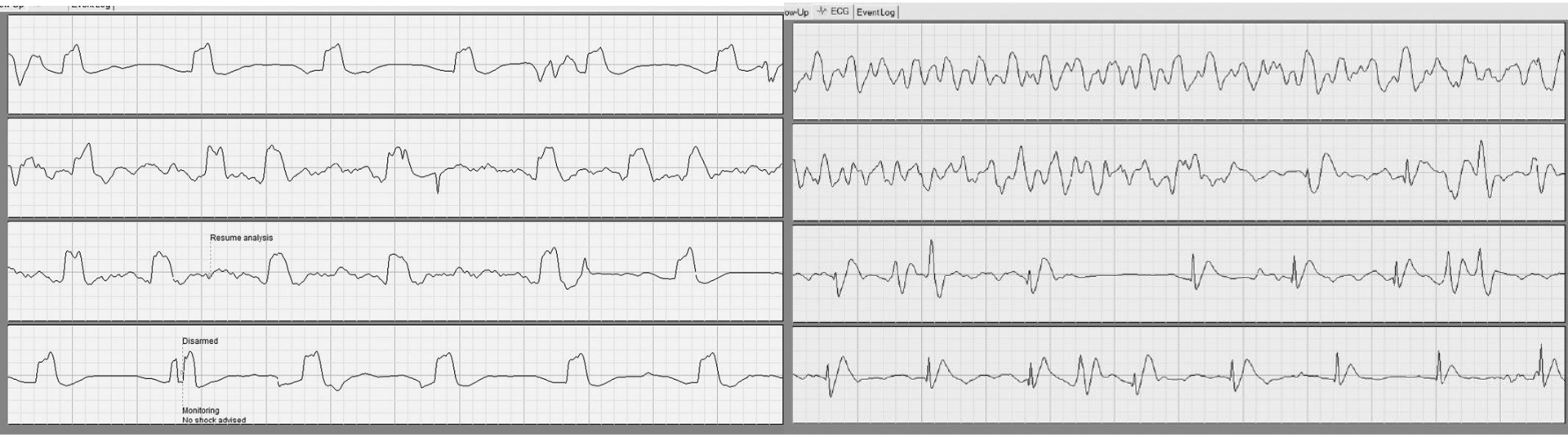
RESUSCITATION

www.elsevier.com/locate/resuscitation

From agonal to output: An ECG history of a successful pre-hospital thoracotomy☆

Charles D. Deakin*

Plaie par arme blanche thorax, AC : RCP, ADN/RV, Thoracotomie : HT + Tamponnade puis suture plaie du cœur, puis … IOT puis pancuronium/propofol … Réveil sans pb !



Rythme agonique

Rythme sinusal

Anesthésiste-Réa

Resuscitation (2007) 75, 530–533

ELSEVIER

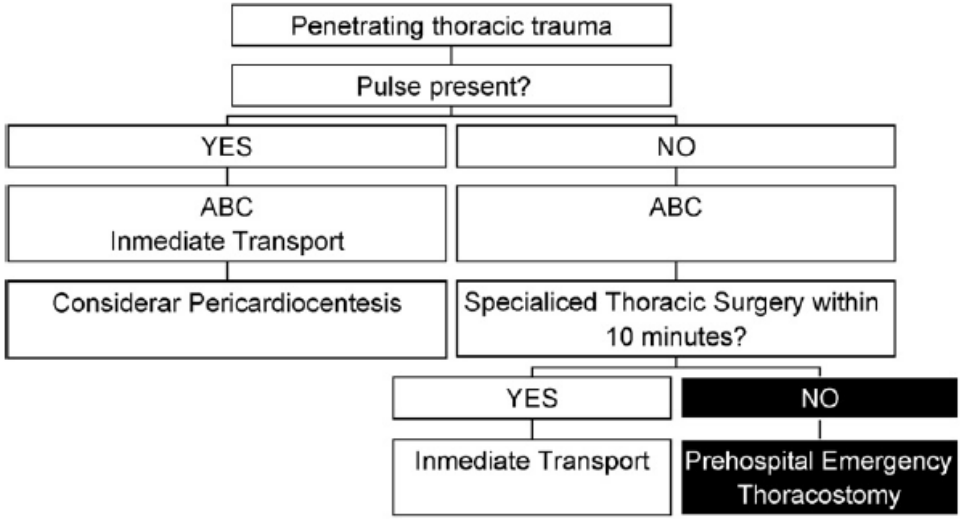
RESUSCITATION

www.elsevier.com/

CASE REPORT

A successful emergency thoracotomy performed in the field☆

Ervigio Corral[a,*], Jacobo Silva[b], Rosa M. Suárez[c], José Nuñez[d], Ceferina Cuesta[e]



6 Cas dont 2 RACS
Plaies Multiples Thorax par Couteau
HD instable puis AC
8 min AC puis renfort
Thoraco = Tamponnade puis RACS
Réveil sans PB

Urgentiste

GModel
RESUS-4064; No. of Pages 5
ARTICLE IN PRESS
Resuscitation xxx (2009) xxx–xxx
Contents lists available at ScienceDirect
Resuscitation
journal homepage: www.elsevier.com/locate/resuscitation

Clinical paper

Role of resuscitative emergency field thoracotomy in the Japanese helicopter emergency medical service system☆

Hisashi Matsumoto[a,*], Kunihiro Mashiko[a], Yoshiaki Hara[a], Noriyoshi Kutsukata[a], Yuichiro Sakamoto[a], Kenkichi Takei[a], Katsuhiro Kanemaru[a], Yoshiteru Tomita[a], Nobuyuki Saito[a], Takanori Yagi[a], Shinichiro Tetsu[a], Hiroaki Iida[a], Yukiko Masuda[a], Hiroyuki Koami[a], Hiroyuki Yokota[b]

[a] Shock and Trauma Center, Chiba Hokusoh Hospital, Nippon Medical School, Japan
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Emergency thoracotomy
Blunt trauma
Resuscitation
Helicopter emergency medical service
Dispatch system

ABSTRACT

Objective: We investigated whether emergency thoracotomy (ET) performed in pre-hospital settings contributed to saving the lives of blunt trauma patients with impending or recent cardiac arrest.
Methods: Eighty-one consecutive cardiac arrest patients with blunt trauma were performed ET before or after arrival at the emergency department (ED). These were reviewed retrospectively and were classified into the following three groups: (1) an emergency field thoracotomy was performed (EFT group, $n = 34$); (2) a doctor dispatched to the scene, but the thoracotomy was performed in the ED (EDT-a group, $n = 10$); and (3) no doctor dispatched to the scene, and the thoracotomy was performed in the ED (EDT-b group, $n = 37$). The patients in the EFT and EDT-a groups were managed within the Japanese helicopter emergency medical service system with a doctor dispatched to the scene.
Result: The time between the arrival of the EMT at the scene and the start of the thoracotomy was significantly shorter in the EFT group than in the EDT-b group (19.2 ± 7.9 min vs. 30.7 ± 6.8 min, $p < 0.001$). In the EFT group, the "ICU admission" rate was significantly higher among the patients who experienced cardiac arrest after the EMT arrival than among the patients who experienced cardiac arrest before the EMT arrival (70% vs. 8%, $p = 0.001$). Unfortunately, however, there were no survivors in this series.
Conclusion: These findings indicate that "early access" to a doctor's expertise and the performance of an "emergency field thoracotomy" might be two important factors for improving the possibility of saving the lives of blunt trauma patients with impending or recent cardiac arrest.

1. Introduction

Saving the life of a patient who suffers cardiac arrest after experiencing a severe blunt trauma is extremely difficult, and this is true throughout the world. In Japan, this difficulty is considered to be partially attributable to the conventional emergency medical service system (EMS). If another EMS scheme for dispatching physicians to the scenes of accidents were to be established, new data and thorough discussions would be required with regard to interventions for pre-hospital trauma management.

In the United States, a resuscitative emergency department thoracotomy (EDT) for cardiac arrest patients who have sustained blunt trauma is only indicated in limited cases because the overall survival of these patients is extremely poor.[1,2] Also, while the helicopter emergency medical service (HEMS) is quite advanced in the US, on-board physicians are rare. Instead, on-scene primary care is provided by paramedics and rapid transport to an emergency care hospital is the main mission. This system differs from the HEMS concept that we are trying to realize in Japan, which resembles the European HEMS system,[3–6] and this difference should be taken into account when assessing emergency care for cardiac arrest patients who have sustained blunt trauma.

The Japanese government is currently promoting a "doctor-helicopter" system.[7] In this system, a helicopter that has been specially configured for EMS care and an on-board physician and nurse are rushed to the accident scene. Since 2003, we have been using this HMES system to take a proactive approach to performing emergency thoracotomies at the accident scene when such a procedure is required for the treatment of patients experiencing cardiac arrest after they have sustained blunt trauma; we refer to this procedure as an emergency field thoracotomy (EFT). The aim of the present study was to investigate whether EFT contributes to

☆ A Spanish translated version of the summary of this article appears as Appendix in the online version at doi:10.1016/j.resuscitation.2009.08.010.
* Corresponding author at: Shock and Trauma Center, Chiba Hokusoh Hospital, Nippon Medical School, Kamakari 1715, Inba, Chiba Pref., 270-1964, Japan.
Tel.: +81 476 99 1111; fax: +81 476 99 1904.
E-mail address: hmatsu@nms.ac.jp (H. Matsumoto).

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doi:10.1016/j.resuscitation.2009.08.010

- 81 Trauma Fermés
- 34 Thoraco PH
- Thoraco AL Gauche
- Tous mort …

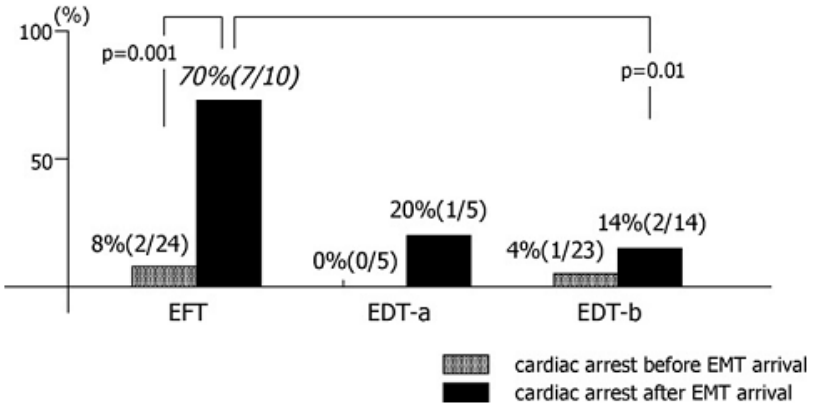

Fig. 3. Rate of ICU admission after removal of aortic clamp.