DEVELOPPEMENT PROFESSIONNEL CONTINU
EN ANESTHESIE-REANIMATION
De la Région du GRAND SUD-OUEST

DAMAGE CONTROL CHIRURGICAL

Dr V. Dubuisson
Chirurgie vasculaire et générale - Pr Ducasse
vincent.dubuisson@chu-bordeaux.fr

Cours Européens
d'Enseignement en Anesthésie-Réanimation

Collège Français des
Anesthésistes – Réanimateurs

Module 3 :
Réanimation, médecine d'urgence et transfusion
23 – 24 – 25 Mai 2019, Lacanau (33)

CHU Hôpitaux de Bordeaux

université de BORDEAUX

DAMAGE CONTROL CHIRURGICAL

Dr MC Le Moine (CHU Nîmes)
Dr E Voïglio (CHU Lyon)
Pr G Boddaert (HIA Percy)
Pr E Hornez (HIA Percy)
Pr P Balandraud (HIA Toulon)

CONFLITS d'INTERETS

- Acelity

DAMAGE CONTROL CHIRURGICAL

McGraw-Hill Science & Technology Dictionary:
('dam·ij kən'trōl)
(*ordnance*) Procedures for maintaining or restoring integrity, stability, or weapon power of a ship or aircraft.

Handbook of Damage Control, NAVPERS 16191, 1945.

DAMAGE CONTROL CHIRURGICAL

Prise en charge séquentielle

Abbreviated Laparotomy and Planned Reoperation for Critically Injured Patients

JON M. BURCH, M.D.,* VICTOR B. ORTIZ, B.A.,* ROBERT J. RICHARDSON, M.D.,*
R. RUSSELL MARTIN, M.D.,† KENNETH L. MATTOX, M.D.,* and GEORGE L. JORDAN, JR., M.D.*

Stone HH – Ann Surg 1983
Burch JM – Ann Surg 1992
Rotondo MF – J Trauma 1993

DAMAGE CONTROL

Prise en charge séquentielle

- Ressuscitation
- Chirurgie écourtée
- Réanimation
- Réintervention programmée

DCR
stands for
Damage Control Resuscitation

David JS - Ann Fr Anesth Reanim 2013
Cannon JW - J Trauma Acute Care Surg 2017
Roberts DJ – Ann Surg 2017

The Nature of Irreversible Shock:
Experimental and Clinical Observations *

RICHARD C. LILLEHEI,** M.D., PH.D., JERROLD K. LONGERBEAM,*** M.D.,
JACK H. BLOCH,† M.D., WILLIAM G. MANAX, M.D.

From the Department of Surgery, University of Minnesota Medical School, Minneapolis

Annals of Surgery
October 1964

Triade létale

Moore EE - Am J Surg 1996
Rotondo MF - Surg Clin Norh Am 1997
Burch JM – Surg Clin North Am 1997
Malone DL - J Trauma 2003
Cotton BA - J Trauma 2009
Geeraedts LM - Injury 2009

Triade létale

Moore EE - Am J Surg 1996
Rotondo MF - Surg Clin Norh Am 1997
Burch JM – Surg Clin North Am 1997
Malone DL - J Trauma 2003
Cotton BA - J Trauma 2009
Geeraedts LM - Injury 2009

INDICATIONS

Table 5. KEY FACTORS IN PATIENT SELECTION FOR DAMAGE CONTROL

Conditions
High-energy blunt torso trauma
Multiple torso penetrations
Hemodynamic instability
Presenting coagulopathy and/or hypothermia
Complexes
Major abdominal vascular injury with multiple visceral injuries
Multifocal or multicavitary exsanguination with concomitant visceral injuries
Multiregional injury with competing priorities
Critical Factors
Severe metabolic acidosis (pH < 7.30)
Hypothermia (temperature < 35°C)
Resuscitation and operative time > 90 minutes
Coagulopathy as evidenced by development of nonmechanical bleeding
Massive transfusion (> 10 units packed red blood cells)

Rotondo MF – Surg Clin North Am 1997

INDICATIONS

Table 5. KEY FACTORS IN PATIENT SELECTION FOR DAMAGE CONTROL

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Massive transfusion (> 10 units packed red blood cells)

Rotondo MF – Surg Clin North Am 1997

DAMAGE CONTROL INDICATIONS

- HEMORRAGIE
- CONTAMINATION

ACIDOSE (pH < 7,20 - BE)
HYPOTHERMIE (T° < 35° C)
COAGULOPATHIE
DEFAILLANCES D'ORGANES

Moore EE – Am J Surg 1996
Rotondo MF – Surg Clin North Am 1997
Diaz JJ – J Trauma 2010
Weber DG – Br J Surg 2014

DAMAGE CONTROL INDICATIONS

- INSTABILITE HEMODYNAMIQUE - DEFAILLANCE D'ORGANES
  - Hémorragie massive
  - Choc septique
- Trauma
- Péritonite
- Pancréatite
- Ischémies digestives
- AAA rompu
- Fistules aorto-entériques
- Complications per ou post opératoires

Tadlock MD – Vasc Endovasc Surg 2010
Weber DG – Br J Surg 2014
Coccolini F – World J Emerg Surg 2017
Soop M - Br J Surg 2017
Sohn M – World J Surg 2018

DAMAGE CONTROL INDICATIONS

- INSTABILITE HEMODYNAMIQUE - DEFAILLANCE D'ORGANES
  - Hémorragie massive
  - Choc septique
- DEFAUT DE COMPETENCE
  - Lésions multiples
  - Equipement

DAMAGE CONTROL INDICATIONS

- INSTABILITE HEMODYNAMIQUE - DEFAILLANCE D'ORGANES
  - Hémorragie massive
  - Choc septique
- DEFAUT DE COMPETENCE
  - Lésions multiples
  - Equipement
- CHIRURGIE DE GUERRE – AFFLUX MASSIF
  - Nécessité de libérer RAPIDEMENT les salles d'opération
  - Flux de blessés - Marche en avant

DAMAGE CONTROL CHIRURGICAL

Geste incomplet

- Limité au contrôle des lésions
  - Hémorragie STOP THE BLEED
  - Contamination / Nécrose
  - Aérostase

Burch JM – Ann Surg 1992
Rotondo MF – J Trauma 1993
Roberts DJ – Ann Surg 2017

DAMAGE CONTROL CHIRURGICAL

Geste incomplet

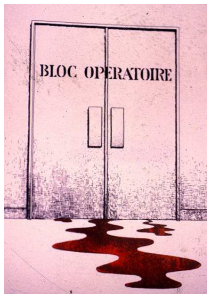
- Limité au contrôle des lésions
  - STOP THE BLEED
- Sans reconstruction
  - Couverture temporaire
  - Ré-intervention programmée
    - Reconstruction
    - Fermeture

Burch JM – Ann Surg 1992
Rotondo MF – J Trauma 1993
Roberts DJ – Ann Surg 2017

PRIORITES OPERATOIRES

PRIORITES OPERATOIRES

A
B
C
D
E



Serre C - Humour noir & hommes en blanc – Ed. Glénat

ACS Commitee on Trauma - ATLS® 10e edition 2018

ATLS ADVANCED TRAUMA LIFE SUPPORT

STOP THE BLEED

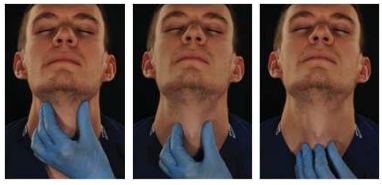
A
Airway and C-Spine Protection
B
Breathing
C
Circulation
D
Disability
E
Exposure and Environment

Fig. 1 Primary survey—ABCDE

Münzberg M - World J Surg 2015
ACS Commitee on Trauma - ATLS® 10e edition 2018

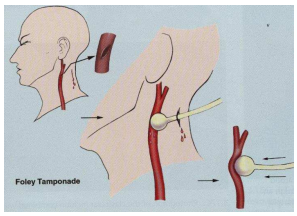
AIRWAY

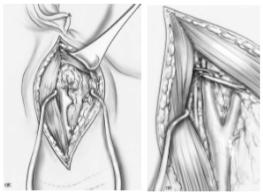
Cricothyroïdotomie



Frerk C - Br J Anaesth2015

DAMAGE CONTROL CERVICAL





Krausz AA - World J Emerg Surg 2015
Feliciano DV – World J Surg 2015

BREATHING

- Exsufflation des pneumothorax à l'aiguille


- Thoracostomie au doigt - Couverture temporaire


Pansement 3 côtés

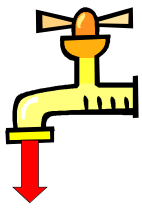
Valve d'ASHERMAN

- Drainage thoracique

Harcke HT – Mil Med 2007
Ball CJ – Can J Surg 2010
Inaba K – J Trauma Acute Care Surg 2015
ACS Commitee on Trauma - ATLS® 10e edition

PRIORITES OPERATOIRES

A
B
C
D
E



PRIORITES OPERATORIES

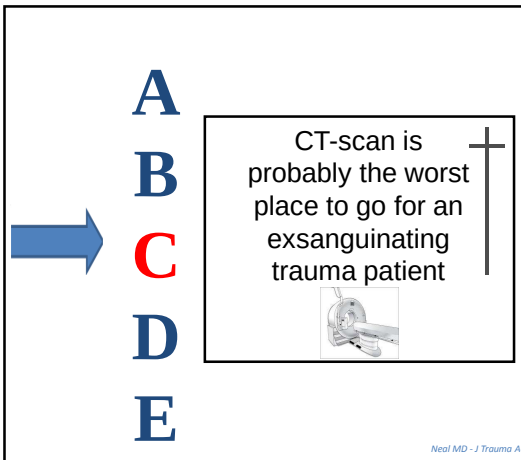
A

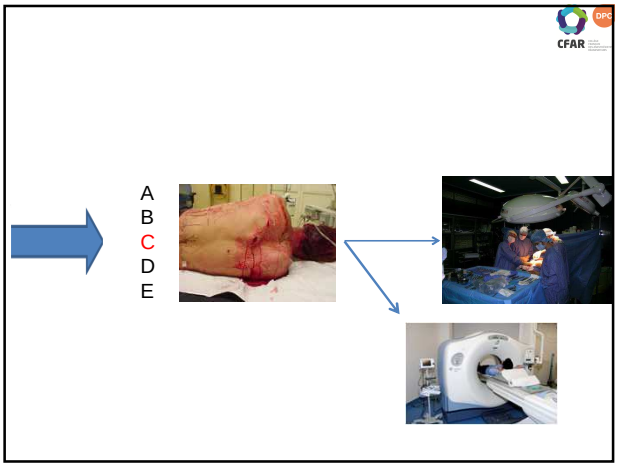
B

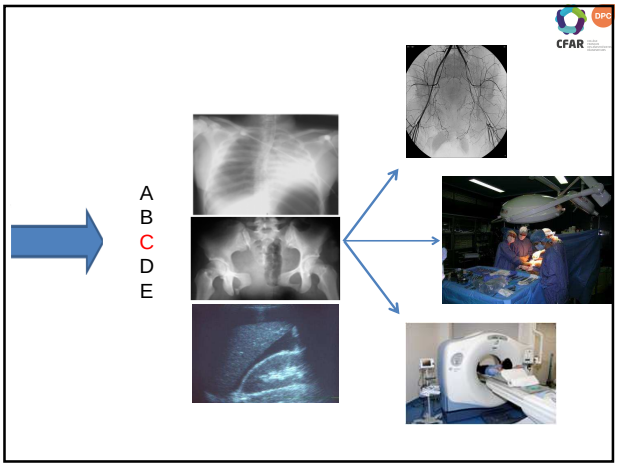
C Hémostase
- Cou
- Thorax ?
- Abdomen ?
- Pelvis ?
- Membres

D

E





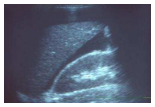


A – B – C

THORAX FIRST

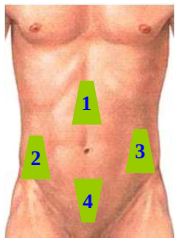
Hémothorax > 1500 ml
> 200 ml/h sur 2 à 4 h

ABDOMEN FIRST



FAST

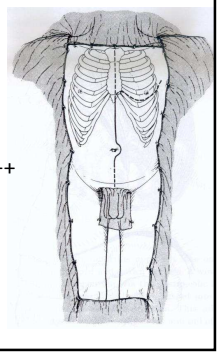
Focused Assessment with Sonography for Trauma



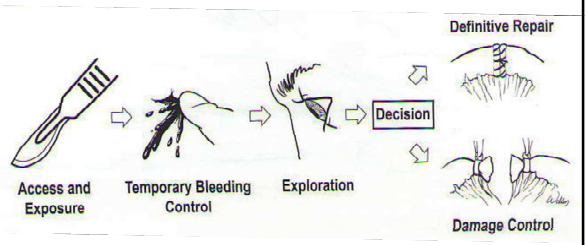
Scalea TM - J Trauma 1999

DAMAGE CONTROL CHIRURGICAL
GAGNER DU TEMPS !

- Voies d'abord antérieures
- Communication avec l'anesthésiste +++
- Hypothermie



DAMAGE CONTROL CHIRURGICAL
STRATEGIE

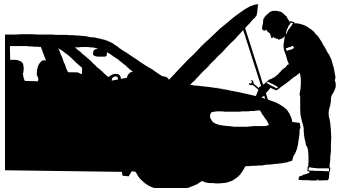


Mattox KL – Hirshberg A - 2005

DAMAGE CONTROL THORACIQUE

C

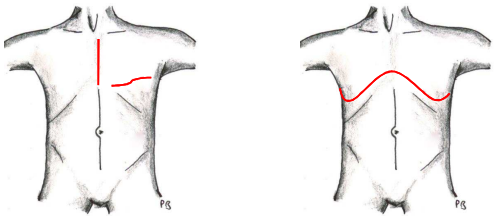
Circulation



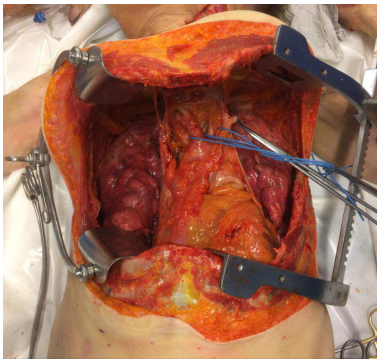
DAMAGE CONTROL THORACIQUE

• Hémothorax > 1500 ml > 200 ml/h 2 à 4 h • Tamponnade cardiaque • Plaie trachéobronchique	**Emergency T.**
• Patient in extremis • Hémorragie extra-thoracique	**Damage control T.**
• Arrêt circulatoire	**Resuscitative T.**

DAMAGE CONTROL THORACIQUE



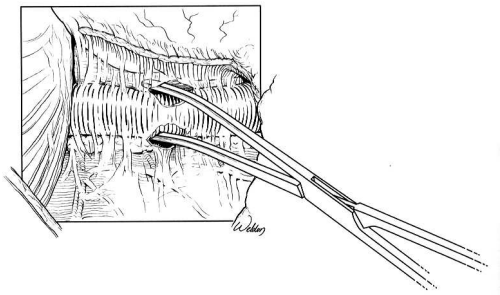
DAMAGE CONTROL THORACIQUE



DAMAGE CONTROL THORACIQUE

CLAMPAGE

de l'aorte thoracique descendante

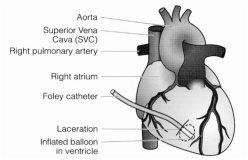


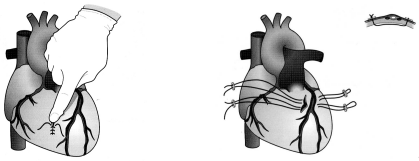
RESUSCITATIVE ENDOVASCULAR BALLOON OCCLUSION OF THE AORTA

Hughes CW - Surgery 1954
Stannard A - J Trauma Acute Care Surg 2011
Biffl WL - J Trauma Acute Care Surg 2015
Morrison JJ – J Trauma Acute Care Surg 2016
Sadek S – Resuscitation 2016
Brenner M – JAMA Surg 2017

DAMAGE CONTROL THORACIQUE

PLAIE DU COEUR

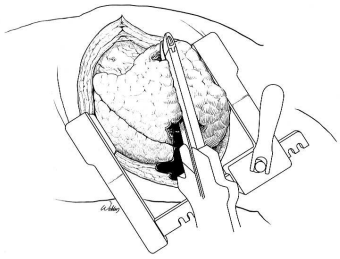




DAMAGE CONTROL THORACIQUE

TRACTOTOMIE

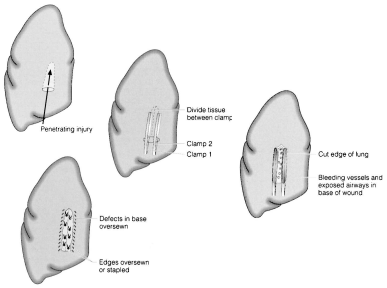
à la pince linéaire coupante



DAMAGE CONTROL THORACIQUE

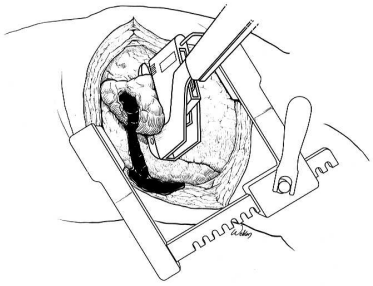
TRACTOTOMIE

avec 2 pinces hémostatiques



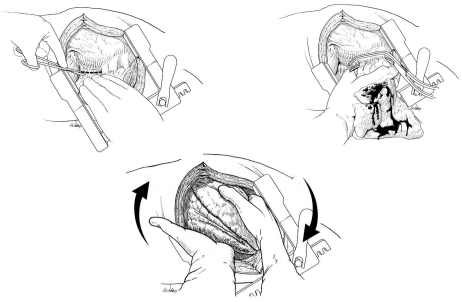
DAMAGE CONTROL THORACIQUE

WEDGE RESECTION



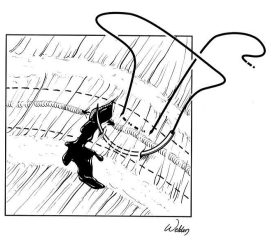
DAMAGE CONTROL THORACIQUE

CLAMPAGE

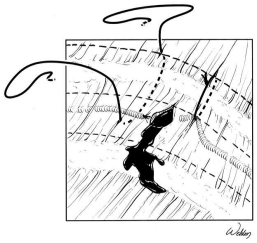


DAMAGE CONTROL THORACIQUE

HEMOSTASE DE LA PAROI



Points en X



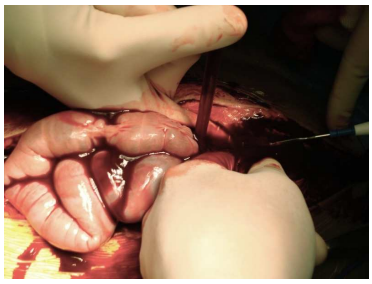
Points appuyés sur les côtes

DAMAGE CONTROL THORACIQUE

Points en X

Points appuyés sur les côtes

DAMAGE CONTROL ABDOMINAL



DAMAGE CONTROL ABDOMINAL

STOP THE BLEEDING

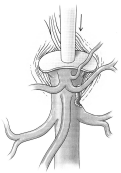
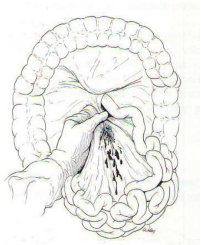
La boite à outils :

- Pression directe manuelle ou digitale
- Packing (foie, pelvis)
- Clamps (aorte, Pringle…)
- Sondes de Foley
- Splénectomie
- Néphrectomie

HEMOSTASE ABDOMEN
STOP THE BLEEDING

La boite à outils :

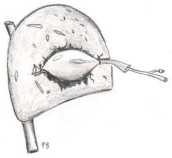
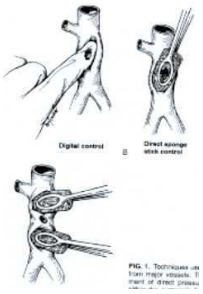
- Pression directe
  - Manuelle ou instrumentale

HEMOSTASE ABDOMEN
STOP THE BLEEDING

La boite à outils :

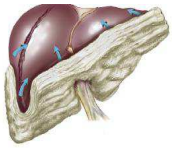
- Pression directe
  - Manuelle ou instrumentale

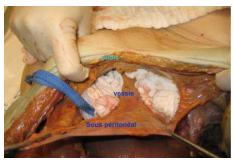



HEMOSTASE ABDOMEN
STOP THE BLEEDING

La boite à outils :

- Pression directe
  - Manuelle ou instrumentale
  - Packing

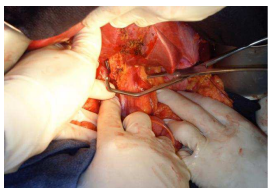




DAMAGE CONTROL ABDOMINAL
STOP THE BLEEDING

Hémorragie persistante après packing

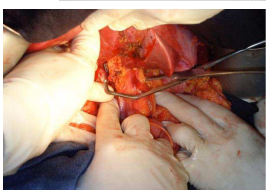
1. Packing mal fait ?
   On le refait…
2. Saignement artériel ?



HEMOSTASE ABDOMEN
STOP THE BLEEDING

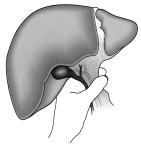
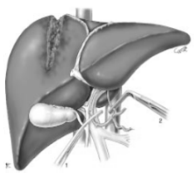
La boite à outils :

- Pression directe
  - Manuelle ou instrumentale
  - Packing (foie, pelvis)
- Clamps (aorte, Pringle…)

DAMAGE CONTROL ABDOMINAL
STOP THE BLEEDING

Manœuvre de Pringle

- Moins de 15 mn
- Intermittent
- Permet une réparation
- Clampage sélectif de l'artère hépatique

HEMOSTASE ABDOMEN
STOP THE BLEEDING

La boite à outils :

Ambroise Paré *(1510-1590)*

- Pression directe
  - Manuelle ou instrumentale
  - Packing (foie, pelvis)
- Clamps (aorte, Pringle…)
- Ligature

HEMOSTASE ABDOMEN
STOP THE BLEEDING

La boite à outils :

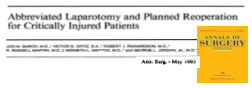
- Pression directe
  - Manuelle ou instrumentale
  - Packing (foie, pelvis)
- Clamps (aorte, Pringle…)
- Ligature
- Exérèse

Splénectomie

Néphrectomie

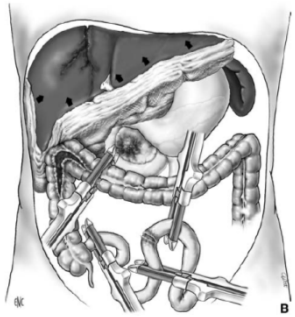
DAMAGE CONTROL ABDOMINAL

- Contrôle de l'hémorragie
- Contrôle des contaminations



DAMAGE CONTROL ABDOMINAL
CONTRÔLE DES CONTAMINATIONS

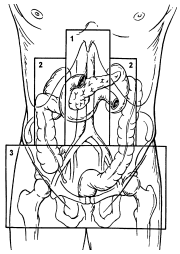
Pas d'anastomose digestive
Pas de stomie



DAMAGE CONTROL ABDOMINAL
EXPLORATION

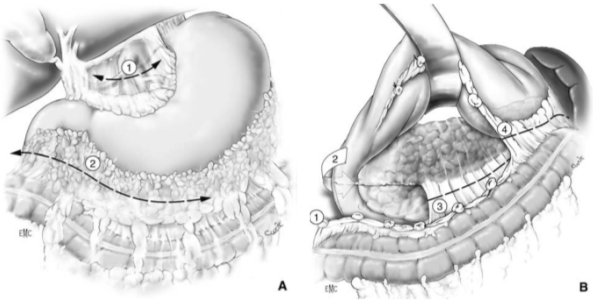
« key to success »

- Systématique
- Méthodique
  - Complète
- Pénétrants / Non pénétrants
- Rapide



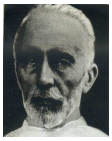
DAMAGE CONTROL ABDOMINAL
EXPLORATION

Arrière cavité des épiploons - Pancréas

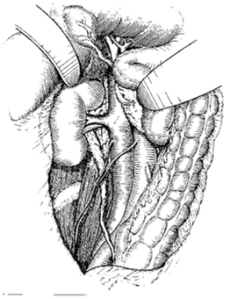


DAMAGE CONTROL ABDOMINAL
EXPLORATION
Pancréas - Duodénum

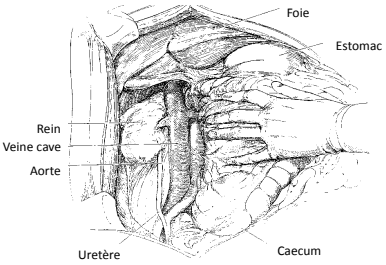
Manœuvre de Kocher



(1841-1917)



DAMAGE CONTROL ABDOMINAL
EXPLORATION
Manœuvre de Catell-Braasch

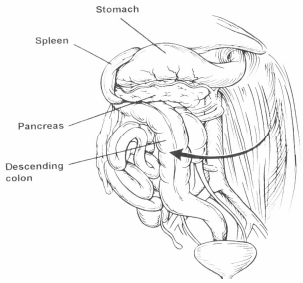


Cattell RB – Surg Gynecol Obstet 1960

DAMAGE CONTROL ABDOMINAL
EXPLORATION
Manœuvre de Mattox

Explore la gauche:

- Diaphragme
- Rate
- Estomac (face post)
- Colon et gouttières
- Rein G
- Aorte et branches



Mattox KL – Surg Clin North Am 1990

DAMAGE CONTROL ABDOMINAL
EXPLORATION
Manœuvre de Mattox

Explore la gauche:

- Diaphragme
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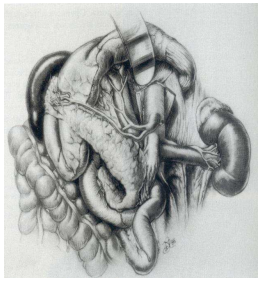


Mattox KL – Surg Clin North Am 1990

DAMAGE CONTROL ABDOMINAL
Pancréas corps/queue : on coupe

•Lésion distale avec rupture canalaire (grade III)

Préférer **résection pancréatique distale** si possible avec conservation splénique

Subramanian A
Surg Clin North Am 2007

Diminution mortalité, morbidité et durée d'hospitalisation

Morbi mortalité de la chirurgie secondaire ++

Laborde Y – J Chir 1982
Meier DE – J Pediatr Surg 2001
Lin BC – J Trauma 2004
Wood JH – J Pediatr Surg 2010

DAMAGE CONTROL ABDOMINAL
Pancréas tête / Duodénum : on réfléchit

- **grade IV et V**

- Suture duodénale et drainage externe
- exclusion pylorique
- Duodénopancréatectomie céphalique en 1 ou 2 temps

DAMAGE CONTROL ABDOMINAL
Appareil urinaire

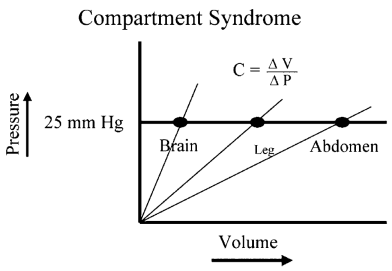
- Drainages – Dérivations
  - Sonde U
  - Sondes uréterales
- Suture plaie(s) vésicale(s)

COUVERTURE TEMPORAIRE

Réintervention programmée
Lésions pariétales
Volume viscéral

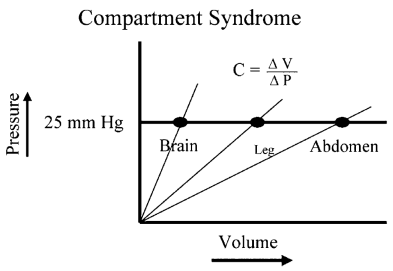
Schein M - Br J Surg 1986
Brock WB - Am Surg 1995
Borker DE - J Trauma 2000

HYPERPRESSION ABDOMINALE



Fabian TC, Surg Clin North Am 2007

HYPERPRESSION ABDOMINALE



Pression de Perfusion Abdominale

PPA= PAM-PIA

Cheatham ML , J Trauma 2000
Fabian TC, Surg Clin North Am 2007
Balogh ZJ , Int Care Med 2010
Carr JA , J Am Coll Surg 2013

HYPERPRESSION ABDOMINALE

Intensive Care Med (2006) 32:1722–1732
DOI 10.1007/s00134-006-0349-5

EXPERT PANEL

Manu L. N. G. Malbrain
Michael L. Cheatham
Andrew Kirkpatrick
Michael Sugrue
Michael Parr
Jan De Waele
Zsolt Balogh
Ari Leppäniemi
Claudia Olvera
Rao Ivatury
Scott D'Amours
Julia Wendon
Ken Hillman
Kenth Johansson
Karel Kolkman
Alexander Wilmer

Results from the International Conference of Experts on Intra-abdominal Hypertension and Abdominal Compartment Syndrome. I. Definitions

- Grade I: IAP 12–15 mmHg
- Grade II: IAP 16–20 mmHg
- Grade III: IAP 21–25 mmHg
- Grade IV: IAP > 25 mmHg

20 mmHg = 27,2 cmH₂O

Kirckpatrick AW – Intensive Care Med 2013

SYNDROME DU COMPARTIMENT ABDOMINAL

Intensive Care Med (2006) 32:1722–1732
DOI 10.1007/s00134-006-0349-5

EXPERT PANEL

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Julia Wendon
Ken Hillman
Kenth Johansson
Karel Kolkman
Alexander Wilmer

Results from the International Conference of Experts on Intra-abdominal Hypertension and Abdominal Compartment Syndrome. I. Definitions

SCA = Pression vésicale > 20 mmHg + nouvelle défaillance d'organe

Hyper Pression Abdominale

Kirckpatrick AW – Intensive Care Med 2013

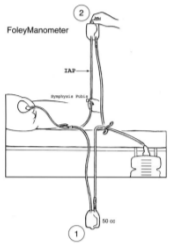
Intensive Care Med (2004) 30:357–371
DOI 10.1007/s00134-003-2107-2

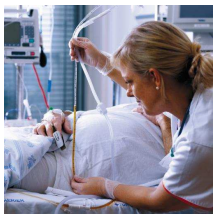
REVIEW

Manu L. N. G. Malbrain

Different techniques to measure intra-abdominal pressure (IAP): time for a critical re-appraisal

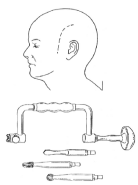
2004

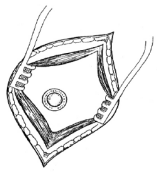




DISABILITY

Evacuation d'un extra-dural
Décompression de la moelle

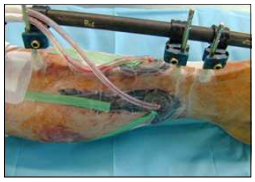




EVERYTHING ELSE…

- Parage des plaies
- Alignement des fractures
- Revascularisation des membres
  (aponévrotomies +++)
- Chirurgie maxillo-faciale
- ORL, Ophtalmo…

TRAUMATISME PERIPHERIQUE



DAMAGE CONTROL VASCULAIRE

3 STEPS

1. Damage control surgery
2. Physiologic restoration
3. Definitive vascular repair

The Golden Hour

- Amputation
- Ligation
- Shunt

Nessen SC et al.
War Surgery in Afghanistan and Iraq: A Series of Cases, 2003-2007
2008

DAMAGE CONTROL : SHUNT

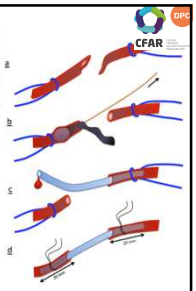
Diminution du délai de revascularisation
Diminution du taux d'amputation 21 vs 13% (p=ns)
Taux de thrombose = 4-18%

Chambers LW et al.
Tactical surgical intervention with temporary shunting of peripheral vascular trauma sustained during Operation Iraqi Freedom: one unit's experience.
J Trauma. 2006

REVIEW

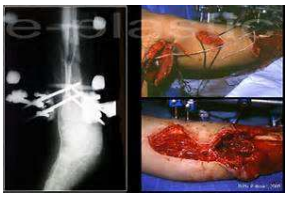
Temporary vascular shunt for damage control of extremity vascular injury: A toolbox for trauma surgeons

E. Hornez*, G. Boddaert, U.D. Ngabou, S. Aguir, Y. Baudoin, N. Mocellin, S. Bonnet



« The systematic performance of **extremity fasciotomy** is highly recommended by the entire scientific community, not only for the lower limb but also for the upper limb (Fig. 5) and should be performed after insertion of the TVS [20,21]. »

DAMAGE CONTROL ORTHOPEDIQUE



- Traitements conservateurs ou différés
- Attelles
- Fixateurs externes
- Parage
- Thérapie à pression négative

DAMAGE CONTROL : APONEVROTOMIES

Prohylactic fasciotomies should be performed liberally

Systematic indications
Ischemia > 4-6h
Combined arterial and venous injury
Shunt
Crush injuries

Hartsock LA et al. *Microsurgery* 1998

Heckman MM et al. *J Orthop Trauma* 1993

DAMAGE CONTROL : APONEVROTOMIES

Prohylactic fasciotomies should be performed liberally

Systematic indications
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Crush injuries

Hartsock LA et al. *Microsurgery* 1998

Heckman MM et al. *J Orthop Trauma* 1993

Et après ?

- On poursuit la réanimation au bloc
- Embolisation
- Scanner
- Réanimation

ET APRES ?

- On poursuit la réanimation au bloc
- Embolisation
- Scanner
- Réanimation

DAMAGE CONTROL ABDOMINAL

STOP THE BLEEDING

EMBOLISATION après DCS

Injury, Int. J. Care Injured 41 (2010) 44–49

Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

Management of ongoing arterial haemorrhage after damage control laparotomy: Optimal timing and efficacy of transarterial embolisation

Being-Chuan Lin [a,*], Yon-Cheong Wong [b], Kun-Eng Lim [c], Jen-Feng Fang [a], Yu-Pao Hsu [a], Shih-Ching Kang [a]

[a] Division of Trauma & Emergency Surgery, Department of Surgery, Chang Gung Memorial Hospital, Chang Gung University, 5, Fu-Hsing Street, Kwei-Shan, Tao-Yuan Hsien 333, Taiwan
[b] Department of Radiology, Chang Gung Memorial Hospital, Chang Gung University, Tao-Yuan Hsien, Taiwan
[c] Department of Radiology, Buddist Tzu Chi Xindian General Hospital, Xiandian, Taipei County, Taiwan

REINTERVENTION PROGRAMMEE

- Normothermie, coagulation et pH normalisés
  - 6° à 72° heure
- Ablation des tamponnements
- Exploration complète
- Reconstruction
  - Anastomoses digestives
  - Stomies
  - Ostéosynthèses
  - Couverture définitive

Hirshberg A – Surg Clin North Am 1997
Ordonez C – World J Surg 2012
Weinberg JA – J Trauma 2009
Anjaria DJ – J Trauma Acute Care Surg 2014
Biffl WL – Nutrition 2002

The American Journal of Surgery

journal homepage: www.americanjournalofsurgery.com

The effect of damage control laparotomy on major abdominal complications: A matched analysis

Mitchell J. George*, Sasha D. Adams, Michelle K. McNutt, Joseph D. Love, Rundel Albarado, Laura J. Moore, Charles E. Wade, Bryan A. Cotton, John B. Holcomb, John A. Harvin

European Journal of Trauma and Emergency Surgery
https://doi.org/10.1007/s00068-018-0968-x

ORIGINAL ARTICLE

"Second-look" laparotomy: warranted, or contributor to excessive open abdomens?

Natasha Hansraj[1] · Amelia M. Pasley[1] · Jason D. Pasley[1] · Donald G. Harris[1] · Jose J. Diaz[1] · Brandon R. Bruns[1]

Received: 29 December 2017 / Accepted: 31 May 2018

Decreasing the Use of Damage Control Laparotomy in Trauma: A Quality Improvement Project

John A Harvin, MD, FACS, Lillian S Kao, MD, MS, FACS, Mike K Liang, MD, FACS, Sasha D Adams, MD, FACS, Michelle K McNutt, MD, FACS, Joseph D Love, DO, FACS, Laura J Moore, MD, FACS, Charles E Wade, PhD, Bryan A Cotton, MD, MPH, FACS, John B Holcomb, MD, FACS

2017

STOP THE BLEED

DEVELOPPEMENT PROFESSIONNEL CONTINU
EN ANESTHESIE-REANIMATION
De la Région du GRAND SUD-OUEST

DAMAGE CONTROL CHIRURGICAL

Dr V. Dubuisson
Chirurgie vasculaire et générale - Pr Ducasse
vincent.dubuisson@chu-bordeaux.fr

Cours Européens d'Enseignement en Anesthésie-Réanimation

Collège Français des Anesthésistes – Réanimateurs

Module 3 :
Réanimation, médecine d'urgence et transfusion
23 – 24 – 25 Mai 2019, Lacanau (33)