

Early enteral nutrition in a polytraumatized patient with late duodenal perforation.

◀ case report ▶

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- **Duodenal perforations** in blunt abdominal trauma has a special severity:
 - polytraumatized patient (association of lesions)
 - difficult diagnoses
 - severe complications with high morbidity and mortality
- **Early enteral nutrition (EEN)** in severe polytraumatized patients is optimal.

- VD, F, 51 years
- Transferred from a regional hospital
- Admitted on 18.06.06 13:03
- **8 hours old road traffic accident**
- **the patient was set in the front of the car and the car had a frontal collision with a tree**
- **the patient was wearing the safety belt**

The diagnosis established by the regional hospital:

- **Polytrauma:**

- thoracic trauma with multiple ribs fractures
- abdominal blunt trauma
- retroperitoneal hematoma with minimal hemoperitoneum (ultrasound)
- macroscopic hematuria

Admission state

- Severely altered general state
- Dyspnea, polypnea (24 breaths/min)
- AP: 90/60 mmHg, HR 90 bpm
- Conscious
- Neurologic exam: temporary loss of consciousness
- Orthopedics exam (+ X-ray): left clavicle fracture, right thumb fracture and cubital distal third fracture

- Clinical exam:

- bilateral vesicular murmur present, diminished in the bases
- symmetrical abdomen, mobile with breathing, moderate diffuse pain spontaneously and at palpation, skin pallor

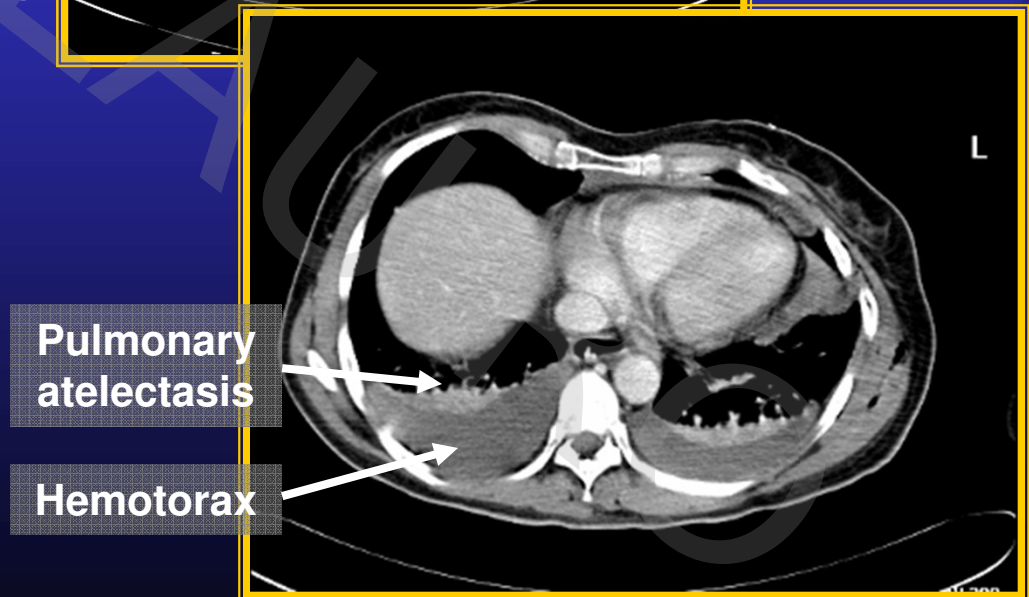
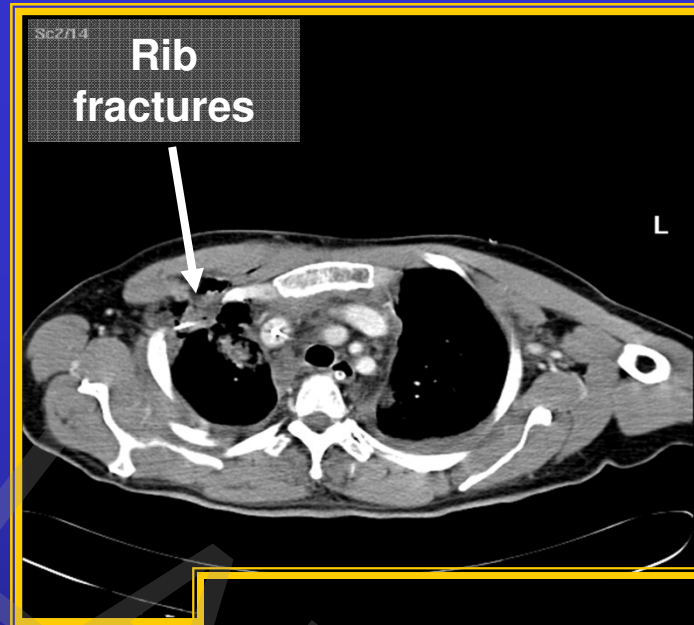
- 18.06/13:27:

- Hg: 9,6 g/dl, Ht 28,4%, leucocytes 19400/mm³, platelets 192000/mm³
- normal coagulation tests
- urea 60 mg/dl, blood glucose 234 mg/dl, TGO 95 U/L, LDH 520 U/L, Na 138 mmol/L, K 3,4 mmol/L

- **FAST:** extensive retroperitoneal hematoma, some fluid in Douglas pouch

- **CT exam:**

- sternum fracture
- multiple ribs fractures in the antero-lateral arcs, fractures of the C₂₋₄ anterior right arcs
- mediastinal hematoma
- hemopericardium
- 2,5 cm thick left hemopneumotorax



- complete postero-inferior laceration of the left kidney, with detached fragment (4th grade)
- extensive left retroperitoneal hematoma
- 3 cm thick fluid blood along the posterior peritoneal fascia, from the diaphragm to the left pelvic wall



- Surgical intervention (14.15 – 17.30)
 - median supra and subumbilical laparotomy
 - left coloparietal decolation
 - failed hemostasis of the left kidney → **left nefrectomy**
 - lavage and drainage of the retroperitoneum and of the peritoneal cavity
 - naso-gastric tube
 - **flail chest blade fixation + bilateral pleurostomy**

Postoperative evolution and therapy

- Postoperative
 - severely altered general state
 - tracheal intubation, mechanically ventilated (MV)
 - Hg 4,8 g/dl, Ht 14,8%, leucocytes 16200/mm³, platelets 37000/mm³, blood glucose 152 mg/dl, CK 640 U/L
- Therapy
 - volume replacement (Voluven®, Ringer)
 - blood mass transfusion
 - antibiotherapy (Axetine + Metronidazol / Amikacin + Tazocin)
 - sedation (Fentanyl + Dormicum)
 - PPI
 - **EEN: Fresubin®** (at **24 hours** postoperative) with 20 ml/hour on the nasogastric tube

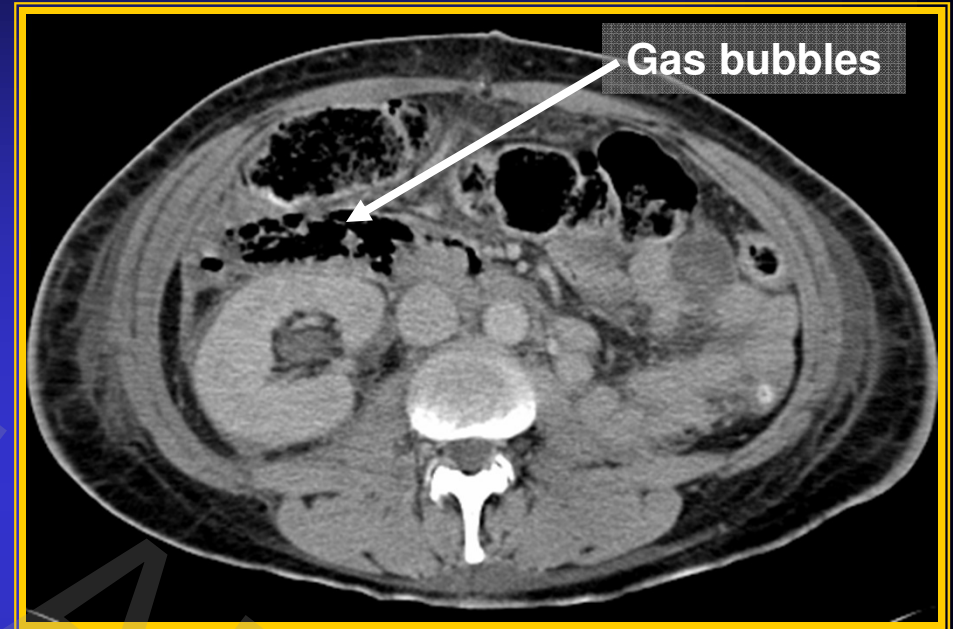
- US (21.06 – 3rd PO day):
 - 4 mm of pleural fluid on the right side
 - 1,3 cm of fluid in Morrison recess
 - no abnormalities in the retroperitoneal space
- CT exam (22.06 – 4th PO day):
 - normal CT of the head
 - minor retrosternal hematoma
 - 4 cm pulmonary contusion on the right side
 - bilateral postero-basal atelectasis
 - left kidney surgically removed, no postoperative hematoma

Cultures

Trachea: E. coli (20.06 – 2 nd PO day)	Tazobactam, Amikacin, Imipenem, Cefoperazonă
Uroculture (20.06 – 2 nd PO day)	negative
Hemoculture (24.06 – 6 th PO day): S. Aureus	Metilmicină, Teicoplanin, Vancomicină, Linezolid

- 25.06 (7th PO day): paradoxical breathing

- 27.06 (9th PO day): jaundice
TB: 6 mg/dl
extracted pleurostomy
APACHE II: 34
SIRS: 4

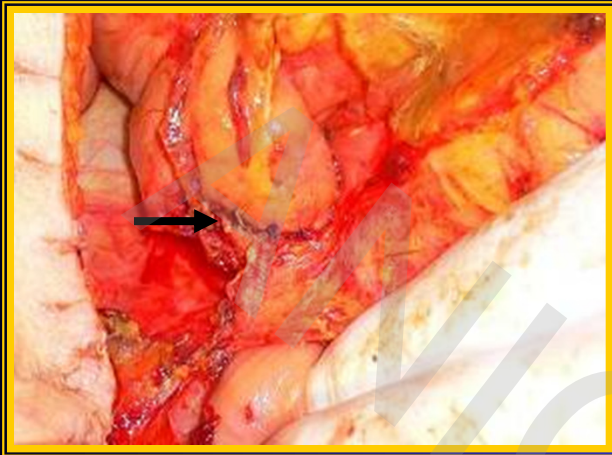


- 28.06 (10th PO day) CT exam:
bilateral pulmonary condensation
2,5 cm thick collection in the left kidney space
GAS BUBBLES IN FRONT OF THE RIGHT KIDNEY

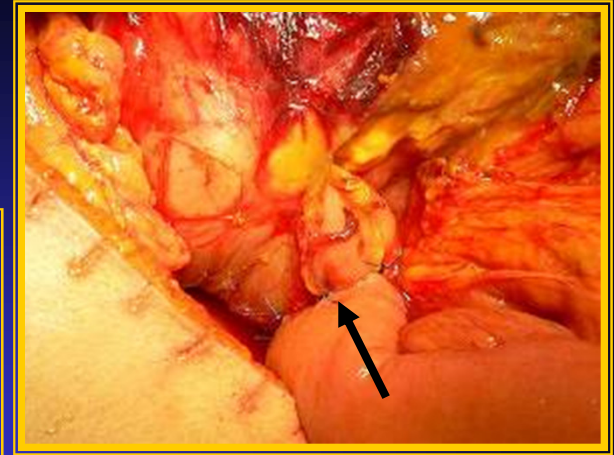
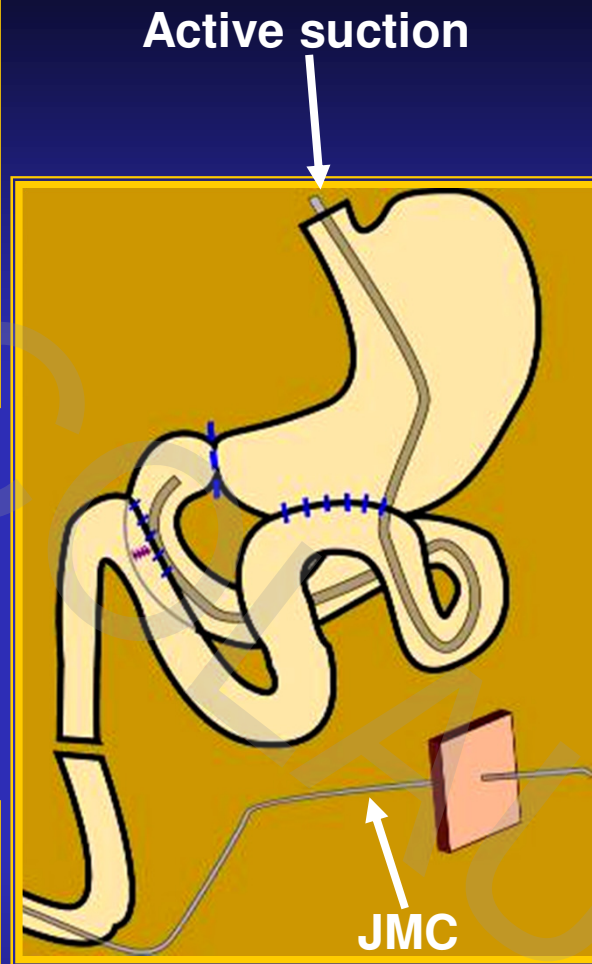
Reoperation

- 29.06 (11th PO day) at surgery:
 - bile in the retroperitoneu
 - Kocher maneuver
 - Cattel maneuver
 - **D₂ duodenal perforation** with a diameter of 2 cm, proximal to the inferior duodenal angle (2nd degree in AAST/MOOR classification)

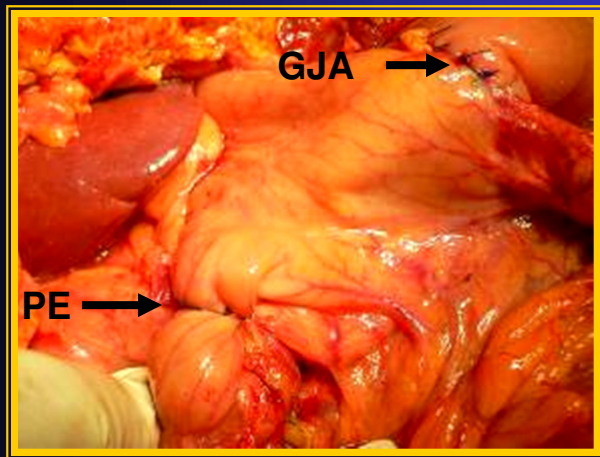
- 3-0 non-absorbable D₁ postpiloric pure string closure (Rosanov)
- **two layers** transversal duodenorrhaphy
- **side-to-side precolic posterior** gastrojejunostomy
- serosal jejunal patch **of the duodenorrhaphy**
- fine needle catheter jejunostomy (FNCJ)
- **naso-gastro-jejuno-duodenal tube (in D₂) for active suction**



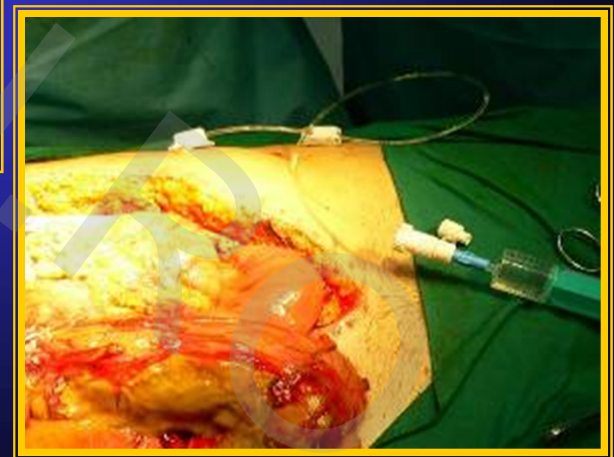
Dudenorrhaphy



Serosal jejunal patch



Pyloric exclusion and GJA

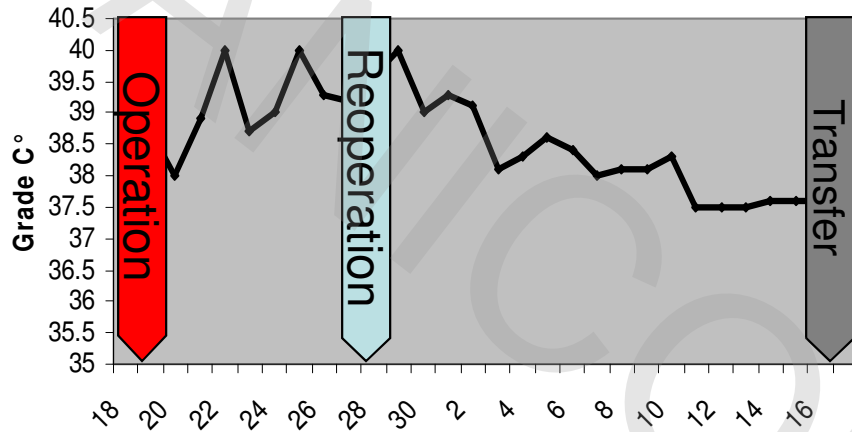


FNCJ

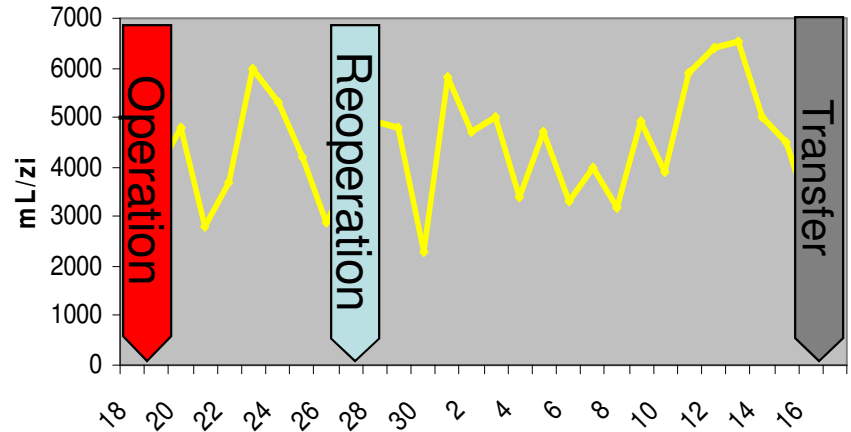
Postoperative evolution

- Difficult early postoperative evolution
 - **MV (8 days)**
 - severe sepsis: $L > 15000/\text{mm}^3$, fever 38,5 – 40 °C
 - anemia: Hg 6,3 – 7,5 g/dl
 - active suction (8 days): 1000 – 3000 ml/days
 - **EEN with Fresubin®: 20/40/60 ml/h**
- General state ameliorates in the 7th postoperative day: conscious, detubated in the 8th postoperative day and cessation of continuous suction
- Transfer in the surgery ward in the 18th postoperative day

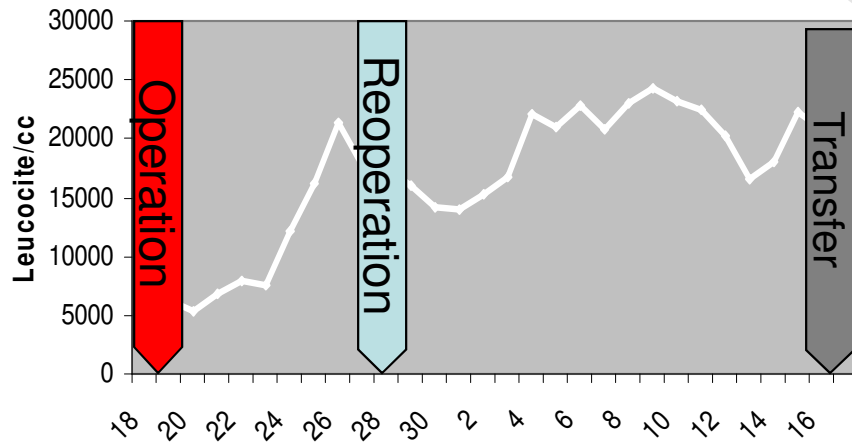
Fever



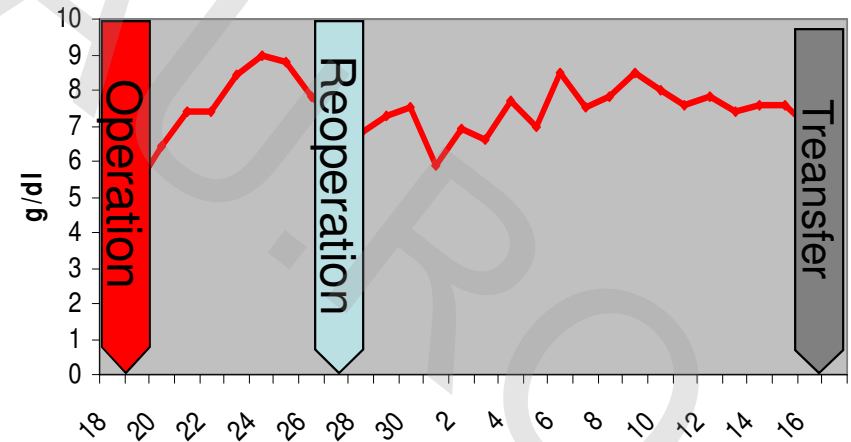
Diuresis



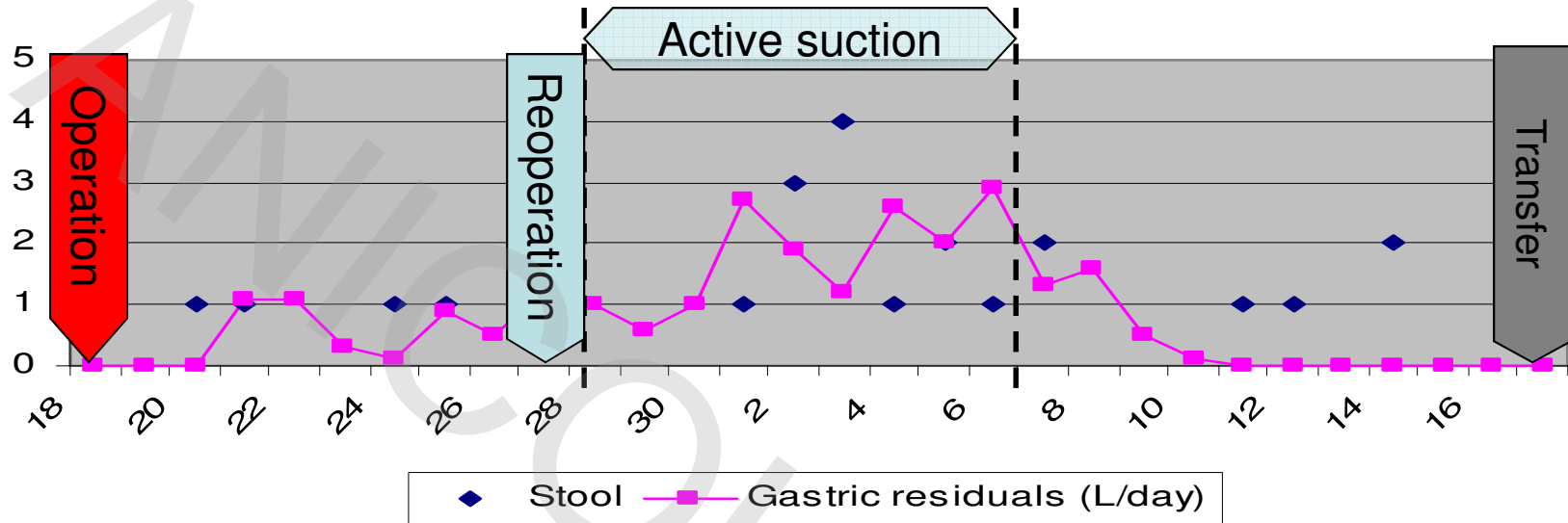
Leukocytosis



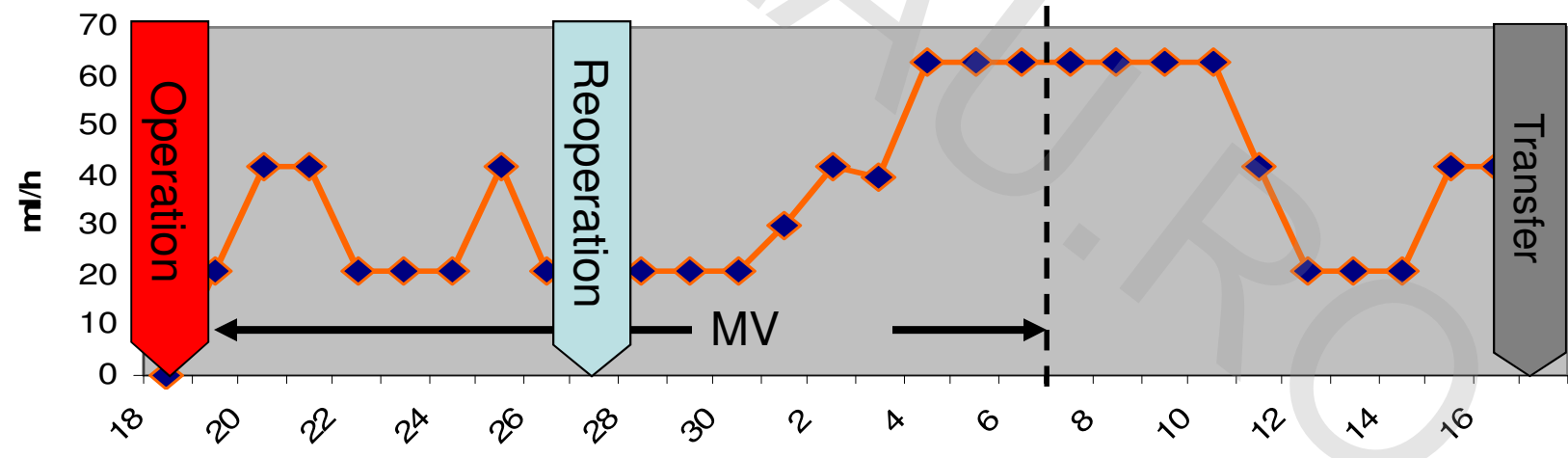
Hemoglobin



Gastric residuals and stool frequency



Fresubin rate



Discussions

- Severe multiple injured patient: ISS=50, APACHE II=34, SIRS=4
 - **blunt toraco-abdominal trauma**
 - anterior flail chest
 - left kidney laceration
 - retroperitoneal hematoma
 - **late D₂ perforation**
 - **EEN**

- Polytrauma
- Severe hemorrhage
- Pulmonary contusion
- Anterior flail chest + sternum fracture (> 3 ribs)



Surgical stabilization

+

MV

[Wilson RF, Steiger Z. Thoracic Trauma: Chest Wall and Lung. In Management of Trauma: Pitfalls and Practices. Sub ed. Wilson RF, Walt AJ; Md. Williams & Wilkins, 1996, Baltimore, pg 319]

Duodenal perforation

- **DUODENAL TRAUMA:**
 - **3-5 %** of abdominal trauma
 - **20-25%** blunt abdominal trauma (crushing the duodenum between spine and steering wheel or seat belt)
 - 1/1000 hospital-admitted blunt trauma
 - **morbidity 40-60%**
 - **mortality 20% (5-47%)**
- The daily volume of fluid passing through the duodenum ranges between 5-10 L + digestive enzymes and bile ⇒ profound inflammatory response in perforation
- injury at the junction of D₂ (free) / D₃ (fixed)

*[Degiannis E, Boffard K. Br J Surg, 2000, 87: 1473.
Bernard A et al. J Trauma, 2004, 57: 1108]*

- **Intervention:**

- Kocher and Cattell maneuver

- **SIMPLE CLOSURE** (two layers)

- ± tube decompression / “small bowel serosal patch” / duodeno-jejunosomy

- + **Duodenal diversion (DD):** antrectomy + Bilioth II ± TV (Donovan & Hagen 1966)

- + **Pyloric exclusion (PE):** pyloric closure + side-to-side GJA (Vaughn GD 1977)

- Pyloric closure + gastrostomy + jejunostomy (Buck JR, 1992)

- **Pancreatico-duodenectomy** (exceptional)

[Ginzburg E, Carrillo EH. Am Surg, 1997, 63: 952.

Degiannis E, Boffard K. Br J Surg, 2000, 87: 1473.

Jansen M et al. Injury, 2002, 33: 611]

Enteral nutrition (EN)

- ↓ **post-traumatic hypercatabolism** (3rd week) ► anabolism
► ↑ immune competence
- **maintains mucosal integrity and immunity of the gastro-intestinal tract:**
 - reduces the accumulation of pathogenic bacteria in the intestinal lumen
 - normal gut-barrier function
- ↓ **septic complications and secondary MOF after trauma**

*[Sigalet DL et al. Can J Surg, 2004, 47:109.
Keel M, Trentz O. Injury, 2005, 36: 691]*

- **early postoperative EN (EEN):**
 - at 12-24 hours after injury/operation
 - ISS > 21

[Kudsk AK, et al. Ann Surg, 1996, 224:531]

- **EEN and IED advantages:**
 - lower incidence of infections
 - shorter hospital stay
 - ↓ length of ICU stay
 - no effects on mortality
 - no effects on non-infectious complications

[Marik PE, Zaloga GP. Crit Care Med, 2001, 21: 2264]

[Peter JV et al. Crit Care Med, 2005, 33: 213-220]

**IED = immune-enhancing diet

Route of administration

- **Gastric tube** or gastro-duodenal multi-channel tube
- Laparotomy + EN \geq 10 days
 - **Fine needle catheter jejunostomy**
- EN > 10 days + head severe injury
 - PEG/PEJ
- Sepsis ► intestinal atony (\pm catecholamines) ► insufficient caloric intake via EN ► + **PN***

[Bastian L, Weismann A. BJN, 2002, 87: 9133]

*PN = parenteral nutrition

ESPEN 2006 guidelines for EN in critically ill patients

- All patients who are not expected to be on a full oral diet within three days
- The expert committee recommends that haemodynamically stable critically ill patients who have a functioning gastrointestinal tract should be fed early (< 24 hours) using an appropriate amount of nutrition
- Exogenous energy supply (kcal):
 - **20-25 kcal/kg body weight/day** during the acute initial phase of critical illness
 - **25-30 kcal/kg body weight/day** during the anabolic recovery phase

Case particularities

- 1) Anterior flail chest: blade fixation + MV (19 days)
- 2) Left nephrectomy

➤ **EEN**

- 3) Late D₂ perforation (10th PO day)
 - duodenorrhaphy + leak prevention:
 - pyloric exclusion
 - active aspiration
 - fine needle catheter jejunostomy

➤ **EEN**

- 4) Osteosynthesis

Instead of conclusions

- **Delayed blunt duodenal perforation** (duodenal compression by safety belt → parietal hematoma → ischemia → necrosis)
- In our case, with multiple injuries, **duodenal exclusion** was the therapy of choice
- We consider that **EEN** played an important role in the outcome of this case



← Active suction



← FNCJ



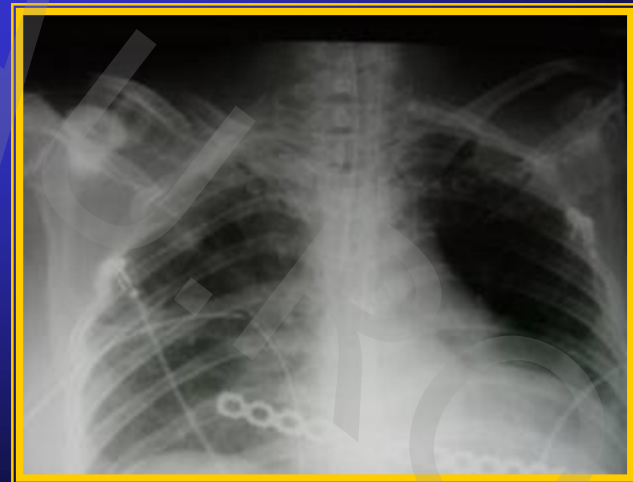
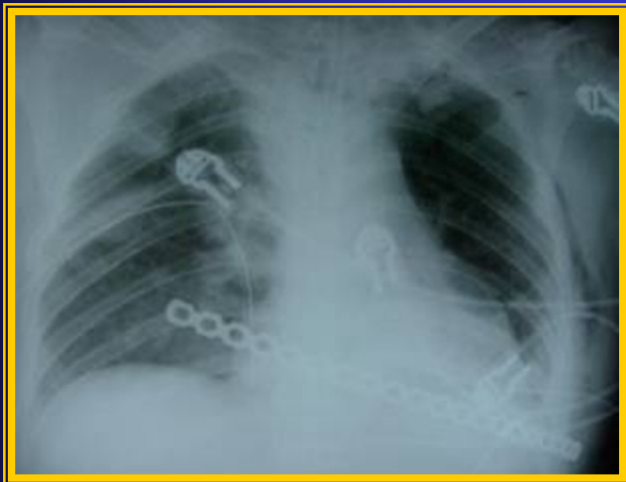
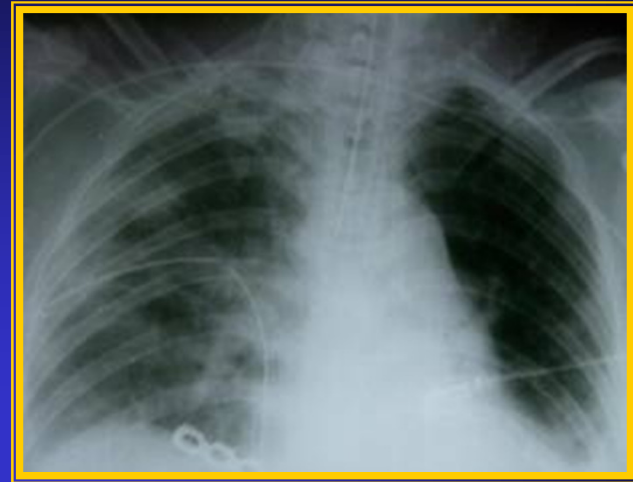
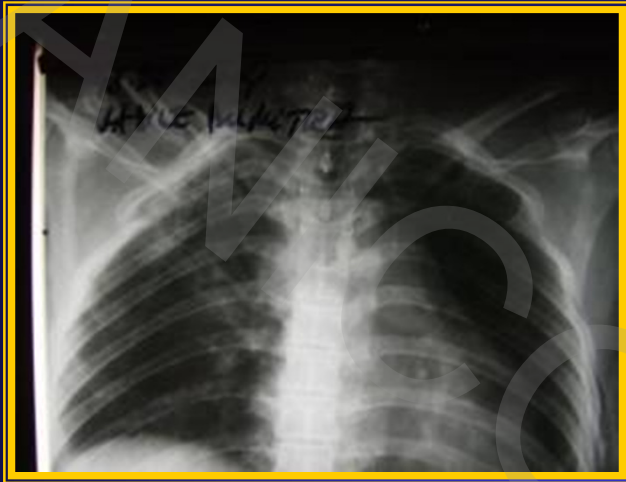
“LESS SURGERY IS PROBABLY BEST
SURGERY IN DUODENAL INJURIES”

[Cogbill TH]

“WHEN THE GUT WORKS, USE IT”

“GOD CREATED MAN WITH A MOUTH, A
STOMACH AND GUT – NOT A TPN LINE”

[Schein M]



- Use EN in all patients who can feed via the enteral route
- There is no significant difference in the efficacy of jejunal vs. gastric feeding in critically ill patients
- Avoid additional parenteral nutrition in patients who tolerate EN and can be fed to the target values
- Consider careful parenteral nutrition in patients intolerant to EN