Timing and Algorithms in Polytrauma Management - Current Concepts

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Definition of Polytrauma

- Injury of 2 body cavities
- Injury of 1 body cavity + at least 2 long bones
- Spine and unstable pelvis equivalent to cavity "organ"

Injury-Severity Score ≥ 17
In Germany

20,000 deaths due to polytrauma
Three main causes for trauma-associated mortality
1. „sudden death“

- Injury to the medulla oblongata
- Rupture of the aorta with mass bleeding
2. „early mortality“

- during the first hours
„Golden hour in shock“
"Letal trias" of pathophysiology in polytraumatized patients
3. „delayed mortality“

- within 2-3 weeks after trauma
  - sepsis
  - failure of organs
Main failure cause

Misinterpretation of the situation
Treatment of a polytraumatized patient requires a lot of experience
Algorithms serve as guidelines
First view - 1 min
Check up
Treatment of single injuries
Shock therapy
5 min
Organisation
Transportation

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Preclinical time management

First view: 1 min
Shock treatment: 5 min
Check up: 10-15 min
Closed head injuries, chest and abdominal injuries have the highest risk of death in all ages.
Chest injury

Abdominal injury

Pelvic injury
Decrease of mortality

40% → 1970

10% ← 2000
Advanced Trauma Life Support (ATLS)

- For acute management of severely injured patients
- Gold standard since the 1990s in most European countries
„Get the Right patient to the Right hospital in the Right time“
The risk of mortality is the highest during the time close to the injury and decreases with further time.
“Damage Control” Concept

4 subsequent phases
- primary diagnosis
- acute management of polytraumatized patients
1. Life saving acute measurements

„ground zero recognition phase“
2. Emergency surgery

- Surgical control of bleeding

“OR-phase”
Life before limb
3. „Intensive care unit phase ICU“
4 „reconstructive phase“
Emergency room management

- „primary survey“
- „life-saving surgery“
- „secondary survey“
- „delayed primary surgery“
POLYTRAUMA

„Primary survey“ (ATLS®)
- Sicherung der Vitalfunktionen
- Sonographie („FAST“), Rx Thorax und Becken

stabil → „Secondary survey“
- „Kopf-bis-Fuss“ Untersuchung
- Polytrauma Spiral-CT

instabil → „Damage control“
- Lebenserhaltende Nottingriffe

„Re-assessment“ (ATLS®)!

stabil

Verzögerte Primäreingriffe
- Chirurgische Versorgung von nicht-akut lebensbedrohlichen Verletzungen
- Débridement von Weichteilverletzungen
- Externe Frakturfixation

Intensivstation
- Wiederherstellung der physiologischen Parameter
Life saving operation
and „damage control“

„A-B-C-D-E“ algorithm-
ATLS protocol
A: „Airway maintenance with cervical spine protection“
B: „Breathing and ventilation“
C: „Circulation with hemorrhage control“
D: „Disability – brief neurological evaluation“
E: „Exposure with environmental control“
Early Total Care (ETC)

- surgery within 48 hours
- early definitive fracture fixation (IMN, plate, Ex Fix)
- one time strategy!
Disadvantages of ETC

- increased blood loss
- possible higher rate of pulmonary complications, ARDS
- hypoxia and hypotension as risk factors for secondary brain damage
Damage control orthopedic surgery (DCOS)

- primarily temporary stabilization (Ex Fix) of long bone fractures
- secondary definitive osteosynthesis (IMN, plate)
Two columns of "damage control"

- acute decompression of body cavities
- control of blood loss
primary diagnostics
10 questions in primary treatment of severe blunt thoracic injuries

1. Hypovolemia?
2. Respiratory insufficiency?
3. Tension pneumothorax?
4. Pericardial tamponade?

Identification and treatment before further diagnostics

immediately life threatening
5. Serial rib fracture ?
6. Pneumothorax ?
7. Hematothorax ?
8. Diaphragmatic rupture ?
9. Rupture of the aorta?
10. Heart contusion ?
Immediate decision

Life threatening
Critical condition

- Massive hematotherax
- Pneumothorax
- Instable thorax
- Pericardial tamponade
- Upper airways obstruction

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Immediate decision

Respiration
Circulation
Tension
pneumothorax
Emergency treatment

Restoration and protection of all vital functions
Blunt abdominal trauma

- Clinical examination
- Ultrasound
- Spiral CT-scan

Immediate laparotomy?
Abdominal trauma
Types of injury

Blunt abdominal trauma
(contusion, hit, kick)

- 25% spleen
- 15% liver
- 13% retroperitoneal hematoma
- 12% kidney
Liver contusion
12% kidney injury
25% spleen rupture
secondary survey

reevaluation

spiral-CT - scan
„Day-1-surgery“

- decrease „Antigenic load“
Frequent additional injuries

➢ Head injuries
The closed head injury is the most frequent cause of death in children.

Nutz et al. Unfallchirurg 1986
Kisson et al. (am. Med. Assoc.) 1990
Frequent additional injuries

- Spine injuries
Frequent additional injuries

- Fractures of the extremities
2-4 day after trauma

„second hit“

only „second looks“
5-10 day after trauma

„time window of opportunity“

definitive fracture care
"OR-phase"

crash-laparotomy
„OR-phase“
day-1-surgery  anus praeter
day-1-surgery  „OR-phase“
2-4 day "second look"
2-4 day

"second look"
5-10-day "time window of opportunity"
„rehabilitation“

- mobilisation and weight baring
- reconstructive procedures
Thank you for your attention
Greetings from Giessen / Germany