How To Reduce Door-To-Reperfusion Time With Severe Arterial Trauma

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1/6 of all helicopter rescued patients in the Swiss Alps are treated in our hospital

Our patients: penetrating trauma

Blunt vs. penetrating arterial trauma

Our patients: blunt trauma

89% (32)
80% (8)
11% (4)
20% (32)

1996-2007
2007-2016
**Time is Muscle!**

*Translation Into Practice*

**Perkins et al**: Meta-analysis of prognostic factors for amputation following surgical repair of lower extremity vascular trauma.

*Br J Surg. 2015*

- Duration of ischaemia exceeding 6 h:
  - 24% vs. 5% amputation rate; OR 4.40

*Lang et al*: Characteristics and clinical outcome in patients after popliteal artery injury.

*Journal of Vasc. Surg. 2015*

- "Prolonged ischemia time", "failure of revascularisation"

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**Door-to-reperfusion time as a risk factor**

**Strongest risk factor in extremity trauma:**

- Mangled Extremity Severity Score (MESS):
  - Skeletal / soft tissue injury (1-4)
  - Limb ischemia (1-3, doubled >6h)
  - Shock (0-2)
  - Age (0-2)

- MESS > 7: 100% predictable value for amputation


*Clin Orthop Relat Res. 1990*

*Dua et al*: Outcome Predictors of Limb salvage in Traumatic Popliteal Artery Injury

*Br J Surg. 2015*

**Why time to reperfusion is important...**

- Historical case with delayed reperfusion (>24 h)

- D.H, 62 years, male ski accident
  - fix. ext.
  - fasciotomy
  - referred from "St. Elsewhere"

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**Why time to reperfusion is important...**

- multiple tissue debridement
soft tissue repair by local muscle flap and split skin graft

after 4 months

Arterial injury in extremity trauma: Priorities

- Questions:
  - preop. investigations?
  - priority?
    - artery or bone?
    - shunt for preliminary revascularisation?
  - staged procedure?
    - preliminary bone fixation by fix.ex.?

Vascular injury in extremity trauma: own results

A 20 years retrospective analysis (1996-2016):

Arterial injury in extremity trauma

N 76
Mean age 39.0 ± 19.0
Study endpoints: Limb salvage

Functional outcome (1-6)

Vascular injury in extremity trauma: own results

MESS: 5.5 ± 2.5

Total time of ischemia: 5.0 ± 3.0 h

Arterial reconstruction:

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Revisions: 11 (14%)

Limb salvage: 96%
Functional outcome: 5.4 ± 0.5
**Vascular injury in extremity trauma: own results**

**Time measurements 2007-2016 (N=40)**

- **Accident** → **1 h 36** → **Admission**
- **Admission** → **1 h 36** → **OR**
- **OR** → **1 h 30** → **Revascularisation**

**Suspected arterial injury in et : Our "old" strategy**

1. Bring the patient from ER to OR!
2. „One-step-procedure“ by a team approach of vasc. and trauma surgeon
   - 2.1. (preliminary) reduction of joint dislocations and fractures
   - 2.2. Re-evaluation of arterial perfusion
   - 2.3. On-table-angiography if necessary
3. (preliminary) bone fixation, direct revascularisation as early as possible (no shunts), fasciotomy
4. Radical (and repeated) debridement of necrotic tissue
5. Early bone coverage by vital tissue

**Suspected arterial injury in et : Our "old" strategy**

- Skier, 55

**Rapid reduction and internal fixation (120 min.)**

**Shift in preop. CT-scan diagnosis**

- **Sliding Gantry CT Scan**
  - CT Scan "comes to the patient"
  - patient remains on same table
  - 3 min. one-step-diagnosis
Suspected arterial injury in et : actual strategy

- 0. Angio-CT-Scan (Sliding gantry in ER)
- 1. Bring the patient from ER to OR!
- 2. „One-step-procedure“ by a team approach of vasc. and trauma surgeon
  - 2.1. (preliminary) reduction of joint dislocations and fractures
  - 2.2. Re-evaluation of arterial perfusion
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Conclusion

„What we learned“

- **Teach** the ER-Team!
- **Time** is important!
- **Team** approach from the beginning!
- fasciotomy, multiple **Tissue** debridements to prevent infection!