CONTROVERSIES IN TBI CARE: PEDIATRICS AND ADULTS

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TRAUMATIC BRAIN INJURY

30% of all trauma-related deaths

Major cause of mortality after trauma

sTBI | GCS ≤ 8 after resuscitation

- Mechanical force leading to irreversible damage to brain tissue
- Triggers alterations in cerebral metabolism | CBF regulation

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INITIAL ASSESSMENT

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32 Y.O. MALE MVC

Rear Seat Passenger
Unrestrained
GCS 7
HR 122
BP 92/54
RR 8
SpO2 88% RA

6 Y.O. FEMALE MVC

Rear Seat Passenger
Unrestrained
GCS 7
HR 115
BP 78/55
RR 14
SpO2 88% RA

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32 Y.O. MALE MVC

Laceration to the right side of the scalp | moderate blood

Scattered small lacerations

Found lying on center console

6 Y.O. FEMALE MVC

Laceration to the right side of the scalp | moderate blood

Open Fracture – Right Ankle

Starring to windshield

Found in front seat passenger seat

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M A R C H

MASSIVE HEMORRHAGE

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32 Y.O. MALE MVC

Hypotensive

AMS

6 Y.O. FEMALE MVC

Hypotensive

AMS

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M A R C H

AIRWAY

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32 Y.O. MALE MVC

GCS 7

RR 8

Sp02 88% RA

6 Y.O. FEMALE MVC

GCS 7

RR 14

Sp02 88% RA

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AIRWAY

Airway positioning

BVM use | Airway Adjuncts – NPA / OPA

Supraglottic Airway and Endotracheal intubation

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INTUBATION

BERNARD ET AL.

- Improved neurological status at 6 mos.
- No improvement in survival

HALTMEIER, ET AL

- Prehospital intubation = longer transport times
- Higher in hospital mortality
- Systematic Review

CHOFFAT, ET AL

- Prehospital intubation
- Better 14 d mortality with higher injury severity scores

DENNINGHOFF, ET AL

- Prehospital intubation
- GCS 4 – 12 | more favorable neuro outcomes
- Lower mortality
- 80% transported by HEMS

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INTUBATION

PEDIATRICS

- Less prehospital experience
- Tube movement
- Over-ventilation

RSI

- Availability
- RSI meds blunts sympathetic surge?
- Less impact on ICP?

VIDEO LARYNGOSCOPY

- Availability
- View

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M A R C H

RESPIRATIONS

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VENTILATION

Normoxia

Avoidance of profound hypoxia (<70%) or single desat <90%

TBI mediated acute lung injury / ARDS

Normocapnia

EtCO2 35-45

AVOID Hyperventilation

Continuous Capnography

Supplemental Oxygen

Continuous Pulse Oximetry

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M A R C H

CIRCULATION

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32 Y.O. MALE MVC

Optimize Physiology with TBI?

Hypotension = increased mortality

SBP ≥ 100

SBP ≥ 110 above 70 yrs.

Higher?

EPIC Study (AZ) – Higher BP value | decreased mortality

6 Y.O. FEMALE MVC

Optimize Physiology

SBP > 75th percentile for age

Vaviliala, et al

Suttipongkaset, et al

Retrospective data reviews

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CIRCULATION

IVF to treat hypotension and limit to the shortest duration possible

Treat hypotensive patients with isotonic fluids and/or blood products as available

May give hypertonic fluids if GCS < 8 and concern for elevated ICP

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M A R C H

HEAD INJURY

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GLASGOW COMA SCALE

Math is hard..

Motor score most similar level of prognostic information compared to the complete GCS score

Measured q 30 min

Measure after ABC assessment

Pediatric-GCS importance

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GLASGOW COMA SCALE

Response	Glasgow coma scale	Pediatric Glasgow coma scale	Score
Eye opening	Spontaneous	Spontaneous	4
	To command	To sound	3
	To pain	To pain	2
	None	None	1
Verbal response	Oriented	Age-appropriate vocalization/interaction	5
	Confused	Cries spontaneously	4
	Inappropriate words	Cries to pain	3
	Incomprehensible sounds	Moans to pain	2
	None	None	1
Motor response	Obeys commands	Spontaneous movements	6
	Localizes pain	Localizes pain	5
	Withdraws	Withdraws to pain	4
	Abnormal flexion	Decorticate posture	3
	Abnormal extension	Decerebrate posture	2
	None	None	1

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HEAD POSITION

Neutral Head Positioning

HOB 30º

Proper Cervical Collar Placement

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TXA - CRASH - 3

29 Countries | 175 Hospitals | 12,000+ patients

Randomized, placebo-controlled trial

TBI GCS <13 or ICH on CT

3 hrs. from injury

Primary Outcome – no difference in death @ 28 days

Subgroup – mild/moderate TBI benefit? 1.7% absolute reduction

CRASH-3 TRIAL COLLABORATORS. EFFECTS OF TRANEXAMIC ACID ON DEATH, DISABILITY, VASCULAR OCCLUSIVE EVENTS AND OTHER MORBIDITIES IN PATIENTS WITH ACUTE TRAUMATIC BRAIN INJURY (CRASH-3): A RANDOMISED, PLACEBO-CONTROLLED TRIAL. *LANCET*. 2019;394(10210):1713-1723.

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TXA ADMINISTRATION

Traumatic Injury

Adult	Pediatric
Shock index > 1	Age 0-9; Shock Index > 1.2
HR >120	Age 10-15; Shock Index > 1
GCS ≤ 12 or Hypotension	GCS ≤ 12 or Hypotension
2gm slow IVP	15mg /kg slow IVP

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SEIZURE PREVENTION - AEDS

Adults and Pediatrics

Goal to decrease early post-traumatic seizures

No large studies on improved survival or neurologic outcome

Commonly given via practice habit

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ADULTS – SIGNS OF ELEVATED ICP

- Headache
- Change in vision
- AMS
- Vomiting
- Weakness
- Cushing's Triad

PEDIATRICS – SIGNS OF ELEVATED ICP

- Irritability
- Vomiting
- Full Fontanel
- Sunset Eyes
- Decreased LOC
- Cushing's Triad

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TREATMENT OF ELEVATED ICP

Pain Management

Avoid hyperventilation unless signs of active herniation

-extrapolated to pediatrics

Target ETCO2 30-35 if utilizing hyperventilation

Hyperosmolar therapy

No current data to support prehospital use

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PREHOSPITAL TRANSPORT & DESTINATION

Low quality evidence – HEMS vs. Ground EMS

- Faster Transport Times
- Crew Configuration & Expertise
- Transport to Definitive Care Facility

Importance of Regionalization of Trauma Systems

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32 Y.O. MALE MVC

BVM with supplemental O2

BP deteriorated, PRBCs + TXA given IO

Transported by ground to local Level 2 trauma center

6 Y.O. FEMALE MVC

Intercepted by HEMS

RSI with intubation by HEMS crew

PRBCs + TXA given IO

Transported to Regional Level 1 Pediatric Trauma Center

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THANK YOU!

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