報告者:R1 張正霆
指導者:VS 王瑞芳
1000910

Journal reading

Early prediction of acute traumatic coagulopathy

Biswadev Mitra, Peter A. Cameron, Alfredo Mori, Amit Maini, Mark Fitzgerald, Eldho Paul, Alison Street

Introduction

- Acute traumatic coagulopathy (ATC)
  - Present in up to 25% of major trauma patients on hospital presentation

- Aim
  - Develop a tool to be able to prospectively select a group of trauma patients with a high proportion having ATC

Materials & Methods

- The Alfred Hospital, Melbourne, Victoria

- Major trauma patients
  - ISS > 15
  - Requiring urgent surgery
  - Requiring Intensive Care Unit (ICU) admission
  - Death

Materials & Methods

- Endpoint
  - INR > 1.5 (ref. range 1.0–1.3)
  - aPTT > 60 s (ref. range 25–38 s)
  - Mortality
  - Mechanically ventilated hours
  - Hospital length of stay

Materials & Methods

- Between 1st Aug. 2006 and 31st Jul. 2008

- Validation
  - All trauma patients presenting to The Alfred Emergency & Trauma Centre between Jan. 2009 and Dec. 2009 and meeting trauma call-out criteria
  - Measuring the area under a receiver operating characteristic (ROC) curve

Results

Variable	Coagulopathic (n=151)	Not coagu- lopathic (n=1529)	OR (95% CI)*	p
Demographics				
Age (years)	46.8 ± 22.2	45.5 ± 20.8	1.00 (0.99–1.01)	0.47
Male gender	107 (70.9%)	1143 (74.7%)	0.82 (0.56–1.18)	0.30
Blunt trauma	143 (94.7%)	1480 (96.8%)	1.69 (0.78–3.63)	0.18
Entrapment	43 (28.5%)	225 (14.7%)	2.31 (1.58–3.38)	<0.001
Vital signs				
GCS	13 (4–15)	13 (14–15)	0.85 (0.81–0.88)	<0.001
HR (b/min)	99.6 ± 35.9	89.8 ± 22.0	1.02 (1.01–1.02)	<0.001
RR (b/min)	18.6 ± 11.1	19.1 ± 6.4	0.99 (0.96–1.01)	0.40
SBP (mm Hg)	90.7 ± 49.4	122.8 ± 34.7	0.98 (0.97–0.99)	<0.001
Temperature (°C)	29.7 ± 13.1	33.8 ± 9.4	0.97 (0.96–0.98)	<0.001
Procedures				
Pre-hospital time	81.0 ± 38.1	70.6 ± 32.7	1.01 (1.00–1.01)	<0.001
IV fluids	119 (78.8%)	851 (56.0%)	2.95 (1.97–4.42)	<0.001
CPR	11 (7.3%)	9 (0.6%)	13.2 (5.40–39.5)	<0.001
Chest decompression	48 (31.8%)	62 (4.0%)	11.0 (7.2–16.9)	<0.001
Intubation	52 (34.4%)	102 (6.7%)	7.3 (5.0–10.8)	<0.001
Injured body region				
Head/neck	122 (80.8%)	1232 (80.6%)	1.01 (0.66–1.55)	0.95
Face	50 (33.1%)	380 (24.8%)	1.50 (1.01–2.54)	0.03
Chest	119 (78.8%)	1003 (65.6%)	1.95 (1.30–2.92)	0.001
Abdomen	87 (68.6%)	459 (30.0%)	3.17 (2.25–4.45)	<0.001
Extremities/pelvis	111 (73.5%)	891 (58.3%)	1.99 (1.36–2.99)	<0.001
External	83 (55.0%)	994 (65.0%)	0.66 (0.47–0.95)	0.01

Results

- The COAST score

Variable	Value	Score
Entrapment	Yes	1
Systolic blood pressure	<100 mm Hg	1
	<90 mm Hg	2
Temperature	<35 °C	1
	<32 °C	2
Chest decompression	Yes	1
Abdominal or pelvic content injury	Yes	1
Highest total possible		7

Results – COAST score

- Cut-off score of ≥ 3
  - Sensitivity of 64.2%
  - Specificity of 94.6%
  - Accuracy (correctly classified) of 91.6%
  - An area under the ROC curve of 0.77 (95% CI: 0.72–0.82)

Results – COAST score

Variable	Derivation (n=1680)	Validation (n=1225)	p
Demographics			
Age (years)	45.6 ± 21.0	47.4 ± 21.8	0.02*
Male gender	1250 (74.4%)	914 (74.6%)	0.90‡
Blunt trauma	1623 (96.6%)	1170 (95.5%)	0.13‡
ISS	21 (17–27)	24 (18–29)	<0.001†
Vital signs			
GCS	13 (14–15)	13 (14–15)	0.03†
HR (b/min)	90.7 ± 23.7	91.0 ± 23.6	0.73*
RR (b/min)	19.1 ± 6.9	19.2 ± 5.7	0.64*
SBP (mm Hg)	119.9 ± 37.8	127.8 ± 33.0	<0.001*
Temperature (°C)	33.4 ± 9.8	36.3 ± 1.2	<0.001*
Outcome			
Mortality	115 (6.8%)	115 (9.4%)	0.01‡
Mechanically ventilated hours	27 (88–243)	121 (37–343)	0.93†
Hospital LOS (days)	7 (3–13)	8 (4–15)	0.65†

Area under ROC curve = 0.8328
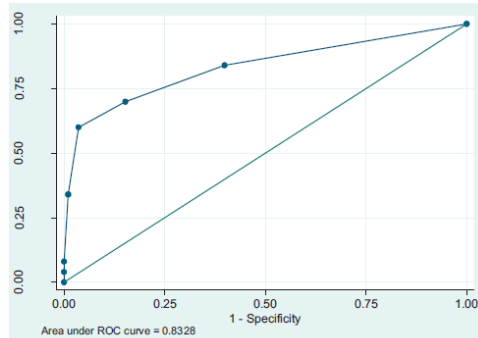
Results – COAST score

Variable	Correctly predicted by COAST score ≥3 (n=60)	Missed patients (n=40)	p
Urgent surgery	33 (55.0%)	10 (25.0%)	0.02‡
PRBC in 4 h (units)	12 (6–15)	9 (7–18)	0.12†
FFP in 4 h (units)	5 (2–7)	5 (2–9)	0.84†
Mechanically ventilated hours	94 (0–279)	60 (0–214)	0.62†
ISS	41 (25–48)	25 (17.5–29)	<0.001†
NISS	50 (41–66)	28 (22–39)	<0.001†
RTS	5.3 ± 2.0	7.3 ± 1.2	<0.001†
TRISS	0.53 ± 0.32	0.84 ± 0.18	<0.001*
Hospital LOS (days)	8 (1–28)	10 (7–20)	0.48†
Mortality	32 (53.3%)	11 (27.5%)	<0.001‡

Discussion –
ATC vs. massive blood transfusion

ATC

- Tissue trauma
- Shock
- Haemodilution
- Hypothermia
- Acidaemia
- Inflammation

- May present with significant localized bleeding, without requiring a massive BT

MASSIVE BT

- Any single measure of shock

Discussion – indicators

- Entrapment
  - An independent risk factor for increased mortality post trauma

  - Increases severity of overall tissue injury

  - Exposes patients to prolonged hypothermia

  - Exacerbates with dilutional effect of higher volumes of pre-hospital fluids

Discussion – indicators

- Hypothermia
  - Causes significant dysfunction in the enzymatic processes of the coagulation cascade

  - Compromises platelet activation and adhesion

Discussion – indicators

- Hypotension (shock)
  - Associates with a threefold increase in the development of coagulopathy

  - May activate anticoagulant and hyperfibrinolytic pathways

Discussion – indicators

- Tissue injury of different body regions
  - Severe abdominal injury – massive haemorrhage

  - Severe chest injury – haemorrhage, neutrophil and protein C pathway activation

Discussion

Variable	Value	Score
Entrapment	Yes	1
Systolic blood pressure	<100 mm Hg	1
	<90 mm Hg	2
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Discussion – drawback

- May impact the resuscitation process

- Requires enhancement from laboratory/bedside tests due to its relatively low sensitivity

Discussion – limitations

- Use INR and aPTT in the diagnosis of ATC
  - Thrombelastography (TEG) to be a better test

- Local epidemiology must be considered

- May improve detection of intra-abdominal bleeding

Conclusions

- COAST score identified a subgroup of patients with ATC, who have a high mortality and are likely to benefit from management strategies directed at ATC

Mild therapeutic hypothermia is associated with favourable outcome in patients after cardiac arrest with non-shockable rhythms

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Christoph Testori, Fritz Sterz, Wilhelm Behringer, Moritz Haugk, Thomas Uray, Andrea Zeiner, Andreas Janata, Jasmin Arrich, Michael Holzer, Heidrun Losert

Mild therapeutic hypothermia

- 32–34 °C for 24 h

- Improve survival and neurological outcome after ROSC from sudden cardiac arrest

- Previous studies only included patients with primary shockable cardiac rhythms

Methods

- Retrospective cohort study

- All adult patients who were admitted to the ED of a tertiary-care hospital with cardiac arrest between Jan. 1992 and Oct. 2009

- Endpoint
  - Best neurological outcome within a 6-month observational period
  - overall mortality at 6 months

Results
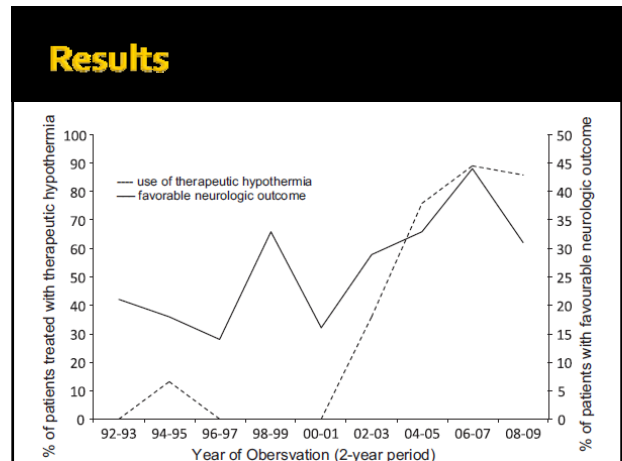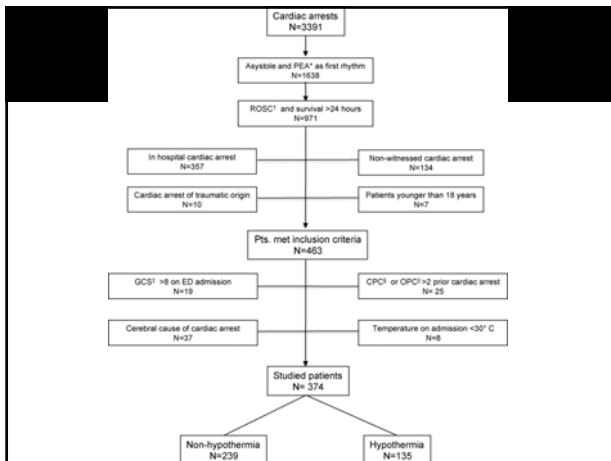
Discussion

- Suggest hypothermia as the therapy of choice for all comatose cardiac arrest survivors irrespective of the first monitored rhythm

- Limitations
  - Selection bias
  - Final decision was left to attending physician
  - Excluded all patients died during the first 24 h after ROSC
  - Patients who are not treated with hypothermia had a trend towards hyperthermia

Thank you.