Early Vasopressor Use in Critical Injury Is Associated With Mortality Independent From Volume Status

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Background

- Post-trauma vasopressor (and other volume-sparing method) strategy
- Association of vasopressor use and mortality

  - lack of EB guidelines of vasopressor initiation and end point
  - benefit in certain subpopulations

- Effect of volume status on mortality in p't exposed to vasopressors early

Methods

- Case selection: admission adult (>15y/o), not having TBI, SCI, death less than 24 hrs
- Parameters: CVP level (cutpoint: 8mmHg), use of vasopressor in first 24 hrs
- End points: all-cause in-hospital mortality / pattern of vasopressor use
- Vasopressor: dopamine, epinephrine, phenylephrine, norepinephrine, arginine vasopressin
- Other factors (SBP, GCS, fluid amount, CPK, Cr.)

Results

TABLE 1. Overall Population Demographics

Total	n = 1349
Gender (male)	1,058 (78.4)
Mean age (yr)	38.9 ± 18.5
Mean ISS	22.0 ± 12.8
Mechanism (blunt)	822 (60.9)
ICU Hypo (SBP <90 mm Hg)	107 (7.9)
Hypov (+) (ICU admission CVP ≤8 mm Hg)	612 (45.4)
GCS ≤8	302 (22.4)
Vasopressor use	351 (26.0)
Multiple vasopressor use	150 (11.1)
DOP	304 (22.5)
EPI	80 (5.9)
NOREPI	87 (6.4)
AVP	59 (4.4)
PHEN	33 (2.4)
Mortality	195 (14.5)

Values are expressed as mean ± SD or n (%).

Results

Variable	Vaso (+) (n = 351)	Vaso (−) (n = 998)
Gender (male)	260 (74.1)	798 (80)
Mean age (years)	45.1 ± 20.2	36.6 ± 17.3
Mean ISS	28.4 ± 14.6	19.7 ± 11.1
Mechanism (blunt)	254 (72.4)	568 (56.9)
ICU admit hypotension (SBP <90 mm Hg)	78 (22.2)	29 (2.9)
GCS ≤8	144 (41)	158 (15.8)
Hypov (+) (CVP ≤8 mm Hg)	134 (38.2)	478 (47.9)
Mean crystalloid before ICU admission (mL)	650.6 (±1205.9)	459.5 (±936.6)
Mean PRBC before ICU admission (mL)	326.2 (±740.0)	223.6 (±644.9)
Mean crystalloid day 1 (mL)	4408.9 (±4132.5)	2514.5 (±1935.2)
Mean PRBC day 1 (mL)	1250.8 (±1258.8)	702.9 (±414.2)
Mean plasma day 1 (mL)	1288.5 (±948.2)	820.5 (±542.9)
Mean SBP day 1 (mm Hg)	109.9 (±16.8)	124.7 (±15.7)
Mean SBP day 2 (mm Hg)	121.9 (±16.9)	130.2 (±13.9)
Mean CPK day 1	4167.5 (±9905.2)	3223.4 (±4506.8)
Mean CPK day 2	5936.1 (±1577.8)	3165 (±4441.8)
Mean serum creatinine day 1	1.2 (±0.6)	1.0 (±0.6)
Mean serum creatinine day 2	1.3 (±0.6)	1.0 (0.6)
Mortality	153 (43.6)	42 (4.2)

Results

Variable	Nonsurvivors (n = 195)	Survivors (n = 1154)
Gender (male)	146 (74.9)	912 (79)
Vasopressor use	153 (78.5)	198 (17.2)
Mean age (yr)	45.9 ($\pm$21.3)	37.7 ($\pm$17.7)
Mean ISS	32.8 ($\pm$14.5)	20.1 ($\pm$11.6)
Mechanism (blunt)	146 (74.9)	676 (58.6)
ICU Admit hypotension (SBP <90 mm Hg)	43 (22.1)	64 (5.5)
Hypov (+) (CVP $\leq$8 mm Hg)	74 (37.9)	538 (46.6)
GCS $\leq$8	111 (56.9)	191 (16.6)

Results

TABLE 4. Variables Independently Associated With Death in Population Overall

Variable	OR, 95% CI	p
Vasopressor use	11.51 (7.76–17.09)	<0.01
GCS ≤8	4.10 (2.74–6.12)	<0.01
ISS ≥35	2.71 (1.74–4.22)	<0.01
Age ≥55 yr	2.30 (1.51–3.51)	<0.01

Results

TABLE 1. Overall Population Demographics

Total	n = 1349
Gender (male)	1,058 (78.4)
Mean age (yr)	38.9 ± 18.5
Mean ISS	22.0 ± 12.8
Mechanism (blunt)	822 (60.9)
ICU Hypo (SBP <90 mm Hg)	107 (7.9)
Hypov (+) (ICU admission CVP $\leq$8 mm Hg)	612 (45.4)
GCS $\leq$8	302 (22.4)
Vasopressor use	351 (26.0)
Multiple vasopressor use	150 (11.1)
DOP	304 (22.5)
EPI	80 (5.9)
NOREPI	87 (6.4)
AVP	59 (4.4)
PHEN	33 (2.4)
Mortality	195 (14.5)

Values are expressed as mean $\pm$ SD or n (%).

TABLE 5. Demographics of Vaso (+) Group

Total	n = 351
Gender (male)	260 (74.1)
Mean age (yr)	45.1 ($\pm$20.2)
Mean ISS	28.4 ($\pm$14.6)
Mechanism (blunt)	254 (72.4)
ICU Hypo (SBP <90 mm Hg)	78 (22.2)
Hypov (+) (CVP $\leq$8 mm Hg)	134 (38.2)
GCS $\leq$8	144 (41)
DOP	304 (86.6)
EPI	80 (22.8)
NOREPI	87 (24.8)
AVP	59 (16.8)
PHEN	33 (9.4)
Multiple vasopressor use	150 (42.7)
Mortality	153 (43.6)

Values are expressed as mean $\pm$ SD or n (%).

Results

Variable	Hypov (+) (n = 134)	Hypov (−) (n = 217)	OR, 95% CI (When Applicable)	p
Gender (male)	102 (76.1)	158 (72.8)	0.84 (0.51–1.38)	0.49
Mean age (yr)	47 (±20.5)	44 (±20)		0.17
Mean ISS	27.5 (±13.9)	28.9 (±14.9)		0.39
Mechanism (blunt)	94 (70.1)	160 (73.7)	0.84 (0.52–1.35)	0.47
GCS ≤8	52 (38.8)	92 (42.4)	0.86 (0.55–1.34)	0.51
ICU Hypo (SBP <90 mm Hg)	25 (18.7)	53 (24.4)	0.71 (0.42–1.21)	0.21
Mean crystalloid prior to ICU admission (mL)	606 (±1224.1)	678.2 (±1196.5)		0.59
Mean PRBC before ICU admission (mL)	248.1 (±536.7)	374.5 (±838.9		0.12
Mean crystalloid day 1 (mL)	4452.1 (±4598.1)	4382.2 (±3828.9)		0.88
Mean PRBC day 1 (mL)	1231.7 (±1141.8)	1262.9 (±1329.9)		0.84
Mean plasma day 1 (mL)	1200 (±786.5)	1341.8 (±1033.1)		0.26
Net (+) day 1	117 (87.3)	167 (77)	2.06 (1.13–3.75)	0.02
DOP	116 (86.6)	188 (86.6)	0.99 (0.53–1.87)	0.98
NOREPI	36 (26.9)	51 (23.5)	1.2 (0.73–1.96)	0.48
EPI	25 (18.7)	55 (25.3)	0.68 (0.4–1.57)	0.15
AVP	21 (15.7)	38 (17.5)	0.87 (0.49–1.57)	0.65
PHEN	11 (8.2)	22 (10.1)	0.79 (0.37–1.69)	0.55
Mortality	61 (45.5)	92 (42.4)	1.13 (0.74–1.75)	0.57

Results

- ## In Vaso(+) group
  - Non-survivors had higher ISS, more likely to admit to ICU with hypotension, more likely to receive more than 1 vasopressor

TABLE 7. Variables Independently Associated With Death in Vaso (+) Group

Variable	OR, 95% CI	p
GCS ≤8	4.33 (2.68–7.02)	<0.01
Multiple vasopressor use	3.93 (2.43–6.35)	<0.01
Hypov (+) (ICU admission CVP ≤8 mm Hg)	1.29 (0.79–2.10)	0.31

Other variables entered: Gender, age ≥55 yr, blunt mechanism, ED and ICU admission hypotension (SBP <90 mm Hg), ISS >35, Chest AIS >3, CPK >5 k, DOP, EPI, AVP, PHEN, NOREPI, BMI ≥30 kg/m^2.

Discussion

- Concerns on pharmacologic support in hemorrhagic shock
  - lack of clinical studies compared with lab
  - data of iatrogenic complications of excess blood / fluid infusion
- Use of vasopressor: a cause or a result?
- Timing of using vasopressor
- Volume status in trauma resuscitation
- Assessment tool: ISS (or AIS) a good tool?

Discussion

- Relation of vasopressor use and end organ dysfunction
- Cutpoint of "hypovolemia"
- Evaluation of volume status by CVP level
  - Pre-existing cardiopulmonary dysfunction
  - Positive ventilation pressure
- Research type: prospective, blinded RCT?
- Physician reaction when not having strong evidence strategy

Discussion

- Limitation on case selection: 24 hrs
- Strategy and skill change during the study
- Not enough comparison and study on different vasopressors