

Impact of Predictive Hemodynamic Monitoring on Intra-operative Hypotension and Postoperative Complications in Multi-level Spinal Fusion Surgery

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Background / aims

- IOH and complications
 - Common (~30%)
 - Serious
- At least partially preventable
 - Less-well studied
 - Suggested high correlation with in-hospital complications
- Can AI-enabled predictive hemodynamic monitoring (PHM) reduce IOH and/or complications?
 - Focus on elective multi-level posterior instrumented spine fusion

Methods

- Study design: Prospective longitudinal comparative cohort
- Patient sample: Adult undergoing elective multi-level posterior thoracolumbar fusion with arterial line blood pressure monitoring.
- Outcome measures: MAP per minute, post-operative complications

Intra-operative hemodynamic and fluid data			
	PHM Mean (SD)	Non-PHM Mean (SD)	p-value
Duration of HYPOTension(MAP<65mm Hg), mins	8.13 (10.66)	13.48 (19.07)	0.029
Duration of HYPERTension (MAP≥100mmHg), mins	2.28 (3.82)	5.06 (9.32)	0.029
<u>Intra-operative</u>			
Intravenous Fluids, mL	2779.99 (751.02)	2644.08 (858.7)	0.184
Colloids, mL	457.45 (326.87)	357.14 (293.57)	0.047
pRBC transfused, mL	116.79 (231.42)	96.04 (200.87)	0.348
Cell Saver Infused, mL	206.14 (235.5)	192.45 (237.14)	0.123
Fresh Frozen Plasma, mL	7.19 (49.3)	0	0.161
Vasopressors, mcg	530.27 (453.16)	912.21 (2671.44)	0.294
<u>Post-operative</u>			
Intravenous Fluids, mL	183.32 (165.22)	251.37 (194.2)	0.179
Colloids, mL	15.96 (80.83)	57.5 (362.54)	0.161
pRBC transfused, mL	59.57 (174.53)	48 (125.87)	0.383
Fresh Frozen Plasma, mL	23.83 (163.37)	0	0.169
Urine Output, mL	819.11 (542.50)	619.77 (475.46)	0.022
Urine Output, mL/Kg/Hr	2.29 (1.74)	1.69 (1.32)	0.020

Summary of complications

	PHM N (%)	Non-PHM N (%)	p-value
Surgical Site Infection	1 (2%)	9 (13%)	0.027
Deep Vein Thrombosis	1 (2%)	1 (1%)	0.644
Pulmonary Embolism	0	0	
AMI / Troponin elevation	8 (17%)	10 (14%)	0.440
AMI	1 (2%)	2 (3%)	0.647
Troponin	7 (15%)	10 (14%)	0.565
Acute Renal Injury	6 (13%)	13 (19%)	0.284
Urine Output<0.5mL/Kg/Hr	2 (4%)	8 (7%)	0.153
Any Gastro-intestinal complication	18 (38%)	29 (41%)	0.443
Ileus	4 (9%)	8 (11%)	0.428
Ileus requiring intervention	12 (26%)	15 (21%)	0.382
Nausea & Vomiting requiring intervention	0 (%)	10 (14%)	0.004
Post-Operative Cognitive Dysfunction	3 (6%)	13 (19%)	0.049
Any Pulmonary complication			
Acute Respiratory Failure	6 (13%)	6 (9%)	0.332
Pneumonia or Atelectasis	3 (6%)	2 (3%)	0.317

Results

- 47 PHM, 70 Non-PHM cases, comparable demographic and operative variables
- PHM:
 - Less IOH (8.13 vs 13.8 mins, p=0.029)
 - Less intra-operative hypertension (0.46, range, 0-5 mins vs 1.38, range 0 to 17 mins, p=0.032)
 - Less SSI (2% vs 13%, p=0.027), PONV (0 vs 14%, p=0.004), POCD (6% vs 19%, p=0.049)
 - Shorter LOS (4.62 vs 5.99 days, p=0.017)

Discussion

- PHM
 - Identification and prevention of IOH
 - Showed reduction in incidence of complications
- Limitations:
 - Single spine center
 - Relatively small sample size
 - Standard (non-individualized) definition for IOH
 - More extensive surgery (requiring arterial line)