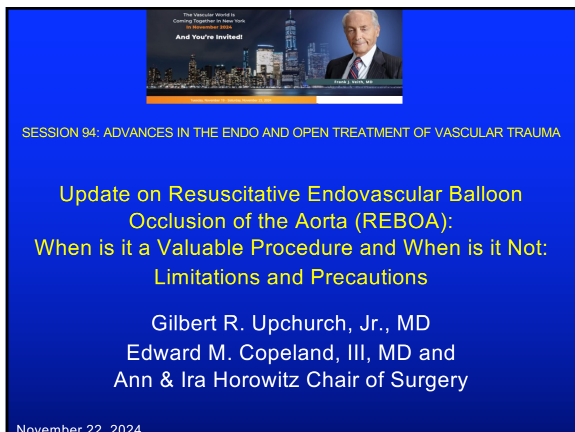
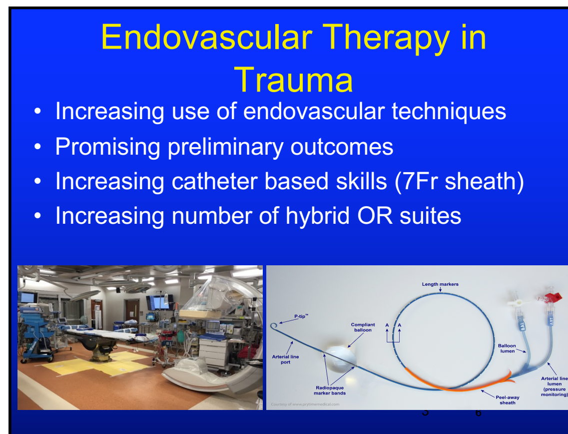


No financial disclosures or conflicts of interest



Clinical Impact of a Dedicated Trauma Hybrid Operating Room

Check for updates

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BACKGROUND: Early hemorrhage control is essential to optimal trauma care. Hybrid operating rooms offer early, concomitant performance of advanced angiographic and operative hemostasis techniques, but their clinical impact is unclear. Herein, we present our initial experience with a dedicated, trauma hybrid operating room.

STUDY DESIGN: This retrospective cohort analysis of 292 adult trauma patients undergoing immediate surgery at a Level I trauma center compared patients managed after implementation of a dedicated, trauma hybrid operating room (n = 186) with historic controls (n = 106). The primary outcomes were time to hemorrhage control (systolic blood pressure ≥ 100 mmHg without ongoing vasopressor or transfusion requirements), early blood product administration, and complication.

RESULTS: Patient characteristics were similar between cohorts (age 41 years, 25% female, 38% penetrating trauma). The hybrid cohort had lower initial hemoglobin (10.2 vs 11.1 g/dL, p = 0.001) and a greater proportion of patients undergoing resuscitative endovascular balloon occlusion of the aorta (9% vs 1%, p = 0.007). Cohorts had similar case mixes and intraoperative consultation with cardiothoracic or vascular surgery (13%). Twenty-one percent of all hybrid cases included angiography. The interval between operating room arrival and hemorrhage control was shorter in the hybrid cohort (49 vs 60 minutes, p = 0.005). From 4 to 24 hours after arrival, the hybrid cohort had fewer red cell (0.0 vs 1.0, p = 0.001) and plasma transfusions (0.0 vs 1.0, p < 0.001). The hybrid cohort had fewer infectious complications (15% vs 27%, p = 0.009) and ventilator days (2.0 vs 3.0, p = 0.011), and similar in-hospital mortality (13% vs 10%, p = 0.579).

CONCLUSIONS: Implementation of a dedicated, trauma hybrid operating room was associated with earlier hemorrhage control and fewer early blood transfusions, infectious complications, and ventilator days. (J Am Coll Surg 2021;232:560−570. © 2020 Published by Elsevier Inc. on behalf of the American College of Surgeons.)

REBOA vs. Aortic Cross Clamping Among Patients with Critical Trauma: A Nationwide Cohort Study in Japan

- Nationwide registry retrospective review, 2004 – 2013
- Compared REBOA with Open aortic cross clamping
- Outcomes: Mortality, emergency department mortality
- Total trauma registry patients, n = 159,157
- Patients meeting study criteria, n = 903
  - REBOA – 607, Open – 233
- Mortality: REBOA – 67%, Open – 90%
- Propensity matching (n-304)

REBOA associated with lower mortality and fewer thoracic complications.

Abe et al Critical Care 2016; 20: 400

The AAST Prospective AORTA Registry: Data on Contemporary Utilization and Outcomes of Aortic Occlusion and REBOA

- Prospective registry of patients with aortic occlusion at 8 Level 1 trauma centers
- Nov. 2013 – Feb. 2015
- N = 114, REBOA – 46, Open – 68
- Hemodynamic Improvement: REBOA 67%, Open – 62%
- Survival: REBOA – 28%, Open – 16% (p = 0.120)

" Further maturation of AAST Aortic Occlusion for Resuscitation in Trauma and Acute Care Surgery database is required to better elucidate optimal indications and outcomes"

Dubose et al J Trauma Acute Care Surg 2016; 81: 409-19

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Nationwide Analysis of Resuscitative Endovascular Balloon Occlusion of the Aorta in Civilian Trauma

Bellal Joseph, MD; Muhammad Zeeshan, MD; Joseph V. Sakran, MD, MPH; Mohammad Hamidi, MD; Narong Kulvatunyou, MD; Muhammad Khan, MD; Terence O'Keeffe, MD; Peter Rhee, MD

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Invited Commentary

The Need to Better Define the Who, What, and Where of Resuscitative Endovascular Balloon Occlusion of the Aorta

Gilbert R. Upchurch Jr, MD; R. Stephen Smith, MD, RDMS

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- 2015-2016 ACS-TQIP database
- All adult patients
  - Close to 600K
- REBOA vs Non-REBOA
- REBOA patients sicker

Table 1. Prematch Demographics and Injury Parameters of the 2 Groups

Variables	Patients, No. (%) No-REBOA Group (n = 593 678)	REBOA Group (n = 140)	P Value
Age, mean (SD), y	53 (21)	44 (20)	<.001
Male sex	379 954 (64.0)	104 (74.3)	.01
White race	436 353 (73.5)	89 (63.6)	.003
Vital signs in ED			
SBP, mean (SD), mm Hg	138.0 (27.0)	108.8 (32.7)	<.001
HR, mean (SD), bpm	88.8 (20.0)	102.0 (30.0)	<.001
GCS score, median (IQR)	15 (15-15)	14 (3-15)	<.001
Injury parameters			
Blunt MOI	565 181 (95.2)	129 (92.1)	.11
ISS, median (IQR)	15 (9-17)	29 (18-38)	<.001
h-AIS score, median (IQR)	0 (0-2)	0 (0-3)	<.001
Pelvic fractures, total	46 307 (7.8)	74 (52.9)	<.001
With intact posterior arch	29 684 (5.0)	25 (17.9)	
Incompletely disrupted posterior arch	13 061 (2.2)	33 (23.6)	
Completely disrupted posterior arch	3562 (0.6)	16 (11.4)	
Liver injuries, total	27 309 (4.6)	43 (30.7)	<.001
Grades I-III	25 528 (4.3)	37 (26.4)	
Grades IV-VI	1187 (0.2)	6 (4.3)	
Splenic injuries, total	29 090 (4.9)	47 (33.6)	<.001
Grades I-III	22 560 (3.8)	36 (25.7)	
Grades IV-V	6530 (1.1)	11 (7.9)	
Kidney injuries, total	14 248 (2.4)	22 (15.7)	<.001
Grades I-III	11 280 (1.9)	19 (13.6)	
Grades IV-V	2968 (0.5)	3 (2.1)	
Lower limb fractures, total	39 776 (6.7)	41 (29.3)	<.001
Femur	31 465 (5.3)	27 (19.3)	
Tibia	9499 (1.6)	20 (14.3)	
Fibula	20 185 (3.4)	21 (15.0)	
Vascular injuries, total	6530 (1.1)	41 (29.3)	<.001
Iliac	2375 (0.4)	29 (20.7)	
Lower extremity	5937 (1.0)	11 (7.9)	
Other	2375 (0.4)	38 (27.1)	

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- Performed post-match (2:1) comparison of 2 groups
- Groups well matched

Table 2. Postmatch Demographics and Injury Parameters of the 2 Groups

Variables	Patients, No. (%) No-REBOA Group (n = 280)	REBOA Group (n = 140)	P Value
Age, mean (SD), y	43 (19)	44 (20)	.88
Male sex	203 (72.5)	104 (74.3)	.76
White race	180 (64.3)	89 (63.6)	.37
Vital signs in the ED			
SBP, mean (SD), mm Hg	106.5 (28.7)	108.8 (32.7)	.65
HR, mean (SD), bpm	104 (27)	102 (30)	.74
GCS score, median (IQR)	13 (3-15)	14 (3-15)	.88
Injury parameters			
Blunt MOI	257 (91.8)	129 (92.1)	.87
ISS, median (IQR)	28 (17-35)	29 (18-38)	.91
h-AIS score, median (IQR)	0 (0-3)	0 (0-3)	.98
Pelvic fractures, total	144 (51.4)	74 (52.9)	.65
With intact posterior arch	45 (16.1)	25 (17.9)	
Incompletely disrupted posterior arch	68 (24.3)	33 (23.6)	
Completely disrupted posterior arch	31 (11.1)	16 (11.4)	
Liver injuries, total	89 (31.8)	43 (30.7)	.79
Grades I-III	76 (27.1)	37 (26.4)	
Grades IV-VI	13 (4.6)	6 (4.3)	
Splenic injuries, total	90 (32.1)	47 (33.6)	.81
Grades I-III	67 (23.9)	36 (25.7)	
Grades IV-V	22 (7.9)	11 (7.9)	
Kidney injuries, total	39 (13.9)	22 (15.7)	.82
Grades I-III	35 (12.5)	19 (13.6)	
Grades IV-V	5 (1.8)	3 (2.1)	
Lower limb fractures, total	78 (27.9)	41 (29.3)	.69
Femur	48 (17.1)	27 (19.3)	
Tibia	45 (16.1)	20 (14.3)	
Fibula	32 (11.4)	21 (15.0)	
Vascular injuries, total	76 (27.1)	41 (29.3)	.11
Iliac	53 (18.9)	29 (20.7)	
Lower extremity	20 (7.1)	11 (7.9)	
Other	11 (3.9)	38 (27.1)	

JAMA Surgery | Original Investigation

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- Almost universally REBOA patients did worse
- Worse in:
  - AKI
  - Lower leg amputations
  - 24 hour mortality
  - Overall mortality
- Liver injury patients did better

Figure. Survival Curve Analysis

The probability of survival over time in the group that received resuscitative endovascular balloon occlusion of the aorta (REBOA) vs the no-REBOA group (P < .01).

Invited Commentary

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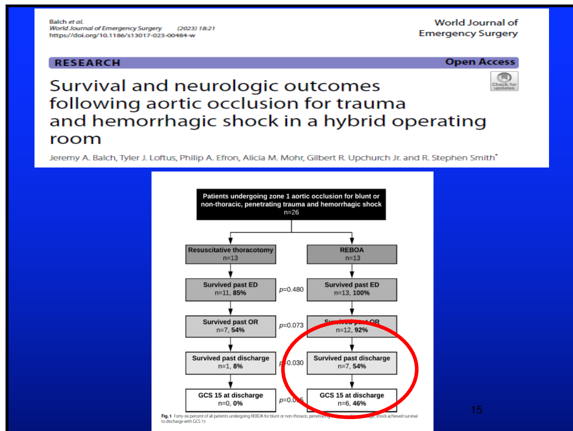
CONCLUSION

Need for concerted effort to clearly define when and in which patient population REBOA has benefits



REBOA

CONCLUSION

Initial results with REBOA show improved survival in blunt sub-diaphragmatic (liver) injury

REBOA technology is improving and will be more widely applicable than ED Thoracotomy
(What is **Good**)

Current survival results are mixed
(What is **Not So Good**)

Further study is essential!