Eastern Association for the Surgery of Trauma
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Virtual Case Conference Series

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ECMO IN BURN PATIENTS

March 17, 2026

Case Series: Expert Q&A Review

Presented by the EAST Burn Surgery Committee

FACULTY

Case Presenters

Case 1	**Cherry Song, MD** Burn Fellowship, UTMB Galveston · Surgical Critical Care Fellowship, University of Kentucky · Burn Surgeon, Cooperman Barnabas Medical Center, Livingston, NJ
Case 2	**Patrycja Popowicz, MD** Burn Fellowship, VCU Health, Richmond, VA · Surgical Critical Care Fellowship, Duke University, Durham, NC

Expert Panelists & Moderators

Expert Panelist	**Monty Littlejohn, MD** Acute Care Surgery & Burn Surgeon, Geisinger Health, Scranton, PA · Co-Chair, EAST Burn Surgery Committee
Expert Panelist	**Taryn Travis, MD** Assistant Professor of Surgery, Plastic & Reconstructive Surgery, George Washington University, Washington, DC · Co-Chair, EAST Burn Surgery Committee

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This document summarizes the clinical Q&A discussion from two ECMO Burn Cases presented during the March 17, 2026 EAST Virtual Case Conference. Patient identifiers have been removed. Intended for educational use only.

Case 1 — VA-ECMO for Massive Pulmonary Embolism

Large TBSA flame burn patient underwent staged excision and grafting. During physical therapy on post-op day 4 of the third procedure, the patient collapsed with PEA arrest requiring 90 minutes of ACLS to achieve ROSC. Bedside POCUS showed right heart strain; TEE confirmed massive PE with RV dilation and hypokinesis. Alteplase 50 mg was given. Given hemodynamic instability, VA-ECMO was cannulated at the bedside. The patient was decannulated on day 4 with full right heart recovery and was discharged to rehab on anticoagulation.

Q: Why wasn't surgical thrombectomy or catheter-directed intervention pursued instead of ECMO?

Feasibility was the limiting factor — the event occurred in the hydrotherapy room, not the OR, and the pressor burden made transport high-risk. The team felt ECMO offered the best chance of survival.

- No institutional enthusiasm for systemic thrombolytics during the code (not standard at this center at the time)
- Alteplase had already been given; the decision then shifted to ECMO for hemodynamic support

Q: Can VTE prophylaxis cause excessive post-op bleeding, and how should that be balanced?

Expert opinion: if a patient bleeds post-operatively, that is a hemostasis problem — not a reason to withhold VTE prophylaxis. The solution is improved intraoperative hemostasis, not reducing anticoagulation.

- Once-daily enoxaparin (used pre-event) is likely subtherapeutic in most burn patients
- Twice-daily enoxaparin with anti-Xa level monitoring is the emerging standard; most participating centers confirmed this
- This institution initiated an IRB-approved protocol post-event to adjust Lovenox dosing by anti-Xa level; program is ongoing
- The ABA Pharmacy SIG is a resource for institutions seeking to standardize protocols and build institutional support

Q: Can ECMO be run without systemic anticoagulation — especially after thrombolytics?

Yes. VV- and VA-ECMO can be maintained without systemic anticoagulation when flows are adequate and bleeding risk is high.

- In this case, anticoagulation was withheld until hemoglobin recovered to ~9 g/dL after transfusion
- The thrombolytic itself provides a window of anticoagulant effect post-administration
- Restart threshold should be individualized: circuit thrombosis risk vs. active hemorrhage

Q: The post-ECMO CT chest did not show PE. Does that change the diagnosis?

No. A negative CT after thrombolysis is expected — the clot dissolves. This should not prompt doubt in the diagnosis.

- Intraoperative TEE findings (RV dilation, hypokinesis) at the time of arrest are highly specific in the right clinical context
- Rapid hemodynamic recovery after lysis and ECMO further supports PE as the cause
- Pushback from the institution based on negative imaging should be anticipated and addressed proactively

Q: Was TEG/ROTEM used to guide resuscitation of coagulopathy on ECMO with open wounds?

No — access was restricted to a single machine in the cardiothoracic OR, making real-time use impractical.

- Viscoelastic testing is ideal for guiding component therapy in ECMO patients with active bleeding
- Where unavailable, empiric resuscitation guided by CBC, coagulation labs, and fibrinogen must be used
- This case highlights the need for broader access to point-of-care coagulation testing in burn centers

Q: How did a burn center without an ECMO program successfully cannulate and manage this patient?

A coincidental alignment of resources: a perfusionist was already in-house for a scheduled CT case, and vascular and CT surgery were available.

- The NICU team was trained in ECMO at two facilities, so they would have managed the circuit at the sister hospital anyway
- Given everyone was present, cannulating in place was safer than attempting transfer of an unstable patient
- Pre-arranged transfer agreements with ECMO-capable facilities remain essential — but emergent local cannulation is appropriate when the team is available

KEY TAKEAWAYS

- Twice-daily enoxaparin with anti-Xa monitoring is the emerging standard for VTE prophylaxis in burn patients; once-daily dosing is likely insufficient.
- Post-op bleeding is a hemostasis problem — it should not be used to justify withholding or reducing VTE prophylaxis.
- POCUS (bedside echo/TEE) is critical for rapid PE diagnosis during cardiac arrest when CT is not feasible.
- ECMO can be safely initiated without systemic anticoagulation post-thrombolysis; restart based on hemostasis status.
- A negative CT after alteplase does not exclude PE — clot dissolution is the expected mechanism of recovery.
- TEG/ROTEM should be accessible in burn centers managing ECMO patients; lack of access is a systems gap.
- Emergent in-house cannulation is appropriate when trained personnel are coincidentally available; maintain transfer agreements as the primary safety net.

Case 2 — VV-ECMO for Inhalation Injury with Refractory Hypoxemia

A patient was found asleep in a house fire. EMS noted carbonaceous sputum, hoarseness, singed nasal hairs, and SpO_2 81% (improving to 95% on 15L NRB). No cutaneous burns. Transported to the nearest Level I trauma center due to airway concern. In the ED, progressive stridor developed; RSI and oral intubation failed due to anterior airway, edematous supraglottis, high BMI, and short neck (SpO_2 dropped to 50%). Emergent cricothyrotomy was performed. Bronchoscopy confirmed Grade IV inhalation injury. Despite lung-protective ventilation, high PEEP, paralysis, and inhaled NO, the patient developed worsening respiratory and metabolic acidosis and was cannulated to VV-ECMO. Post-cannulation, the patient developed multifocal embolic infarcts, obstructive hydrocephalus, and refractory intracranial hypertension despite bilateral EVDs and decompressive craniectomy. The family elected comfort care; the patient became an organ donor.

Q: How was the difficult airway managed, and what happened when oral intubation failed?

A structured difficult airway protocol was followed with the most experienced provider and a fully stocked difficult airway cart at bedside.

- RSI administered; laryngoscopy revealed anterior airway, Mallampati 3–4, profoundly edematous supraglottis
- Bougie-assisted intubation from above was unsuccessful; SpO_2 dropped to 50%
- Emergent cricothyrotomy: vertical skin incision → blunt dissection → horizontal tracheal incision → tracheal spreader → bougie → 6.0 ETT; confirmed with $ETCO_2$ and bronchoscopy
- Taken to OR; tube exchanged to 8.0 armored ETT at the second tracheal ring with Prolene stay sutures
- Formal tracheostomy was considered but deferred — anatomy made it technically prohibitive (high BMI, short neck)

Q: What lung-protective strategies were used before ECMO cannulation?

Deterioration occurred rapidly (within 6–10 hours of arrival), limiting the full escalation ladder. Strategies used:

- High PEEP (documented at 18 cmH_2O), low tidal volumes to IBW, minimized plateau pressures
- FiO_2 maintained at 100% for 6 hours given elevated carboxyhemoglobin (31.9%)
- Inhaled nitric oxide for pulmonary vasodilation
- Neuromuscular blockade to optimize synchrony and reduce O_2 consumption
- Cyanide antidote administered for suspected concomitant cyanide toxicity
- Prone positioning was avoided due to the fresh cricothyrotomy and airway security risk
- Diuresis and esophageal manometry-guided PEEP were not employed — no fluid overload and time was limited

Q: What are the indications and contraindications for VV-ECMO?

Indications (published criteria):

- PaO_2/FiO_2 <50 for >3 hours despite optimized ventilation + adjuncts (proning, paralysis, inhaled NO, recruitment)
- PaO_2/FiO_2 <80 for >6 hours despite above
- Severe hypercapnia: pH <7.20–7.25, $PaCO_2$ >60 for >6 hours at max vent settings
- Reversible cause: ARDS, pneumonia, inhalation injury, pulmonary hemorrhage, status asthmaticus, bronchopleural fistula

Contraindications (institution-dependent):

- Irreversible pulmonary failure (no bridge-to-recovery or transplant pathway)
- Prolonged high-setting mechanical ventilation >7 days prior to ECMO
- Pre-existing life-limiting conditions; advanced age (threshold ~70–75, varies by institution)
- Absolute contraindication to anticoagulation — relative only; VV-ECMO can be run without systemic anticoagulation if flows are maintained
- Cardiogenic shock — VA-ECMO is more appropriate

Q: What is the stroke risk with VV-ECMO versus VA-ECMO?

- VV-ECMO: ~1–2% ischemic stroke risk
- VA-ECMO: up to 10% ischemic stroke risk (arterial cannulation, aortic recirculation)
- In this case, multifocal embolic infarcts occurred on VV-ECMO — an uncommon but recognized complication
- Spared watershed territories suggested embolic rather than hypoperfusion etiology
- Workup should include carotid duplex, echo with bubble study, and neurology/neurosurgery consultation

Q: What ventilator strategy should be used once a patient is on VV-ECMO?

Goal is lung rest — minimize ventilator-induced lung injury while the circuit handles gas exchange.

- Low tidal volumes (3–4 mL/kg IBW), low driving pressures, plateau pressure <25 cmH_2O
- PEEP sufficient to maintain recruitment without overdistension
- Some centers use near-apneic ('dead space') ventilation
- Mode (pressure vs. volume control) is institution-specific — either is acceptable if targets are met

Q: Where should burn ECMO patients be managed — burn ICU or the CTICU/ECMO unit?

Current practice is mixed. Most centers in this session send patients to the CTICU, with burn team traveling to provide wound care.

- Argument for CTICU: perfusionist, specialized ECMO nursing, and circuit expertise are already there
- Argument for burn ICU: easier to transport one perfusionist and a machine than an entire burn nursing team
- This is an active institutional debate; the trend may shift as burn centers gain more ECMO experience
- Regardless of location, formal collaboration between burn surgery and ECMO teams is essential from the outset

KEY TAKEAWAYS

- Difficult airway in inhalation injury: have a pre-assembled cart and a clear surgical airway plan before RSI — do not attempt RSI without cricothyrotomy capability immediately available.
- Grade IV inhalation injury with rapid oxygenation failure warrants early ECMO team notification — do not wait until all other options are exhausted.
- VV-ECMO carries ~1–2% stroke risk (vs. up to 10% with VA-ECMO), but embolic events remain a real complication requiring active surveillance.
- On VV-ECMO, shift to ultra-lung-protective ventilation (low tidal volumes, low driving pressures) to allow lung rest.
- Prone positioning may be contraindicated in inhalation injury patients with fresh cricothyrotomies or tenuous airways.
- ECMO location should be decided prospectively with input from burn surgery, ECMO, and critical care teams; ad hoc decisions create care gaps.
- Cyanide toxicity should be considered and empirically treated in all structure-fire patients with hemodynamic instability or severe metabolic acidosis.