Supplementary material

Search strategies

1. PubMed / MEDLINE (110 hits) Search string: ("Resuscitative Endovascular Balloon Occlusion"[Mesh] OR "REBOA"[Title/Abstract] OR "Resuscitative Endovascular Balloon Occlusion of the Aorta"[Title/Abstract] OR "aortic balloon occlusion"[Title/Abstract]) AND ("Military Personnel"[Mesh] OR "Military Medicine"[Mesh] OR "combat"[Title/Abstract] OR "military"[Title/Abstract] OR "austere"[Title/Abstract] OR "prehospital"[Title/Abstract] OR "pre-hospital"[Title/Abstract] OR "battlefield"[Title/Abstract] OR "tactical"[Title/Abstract])

2. Scopus (834 hits) Search string: TITLE-ABS-KEY ("Resuscitative Endovascular Balloon Occlusion of the Aorta" OR "REBOA" OR "aortic balloon occlusion") AND TITLE-ABS-KEY ("combat" OR "military" OR "austere" OR "prehospital" OR "pre-hospital" OR "battlefield" OR "tactical")

3. Embase (25 hits) Search string: ('resuscitative endovascular balloon occlusion of the aorta'/exp OR 'reboa':ti,ab OR 'aortic balloon occlusion':ti,ab) AND ('military medicine'/exp OR 'combat':ti,ab OR 'austere':ti,ab OR 'prehospital':ti,ab OR 'military':ti,ab OR 'battlefield':ti,ab)

4. Web of Science (167 hits) Search string: TS=("Resuscitative Endovascular Balloon Occlusion of the Aorta" OR "REBOA" OR "aortic balloon occlusion") AND TS=("combat" OR "military" OR "austere" OR "prehospital" OR "pre-hospital" OR "battlefield" OR "tactical")

5. Cochrane Library (2 hits) Search string: "REBOA" OR "Resuscitative Endovascular Balloon Occlusion of the Aorta" in Title Abstract Keyword AND "combat" OR "military" OR "austere" OR "prehospital" in Title Abstract Keyword

Supplementary Table 1 Concepts and definitions about combat zones and pre hospital REBOA

Term / Facility Level	Definition
Combat Environment	Any setting of military operations involving active conflict.
Austere Environment	Any setting with limited medical infrastructure, logistics, personnel, or equipment, where timely access to definitive surgical care is unavailable This includes combat zones, isolated regions, humanitarian response missions, and disaster areas
Casualty Collection Point (CCP)	A pre-designated forward location where casualties are gathered for triage, initial resuscitation and evacuation. It has no surgical capability and is staffed by medics or a small medical team, corresponding to Role 1 care delivered at or near the point of injury
Role 1 (Point of Injury / First Medical Care)	The first level of medical care provided at or near the point of injury It includes immediate lifesaving interventions such as hemorrhage control, airway management, and resuscitation Care is typically delivered by combat medics, corpsmen, or small medical teams Role 1 facilities do not have surgical capability The main functions are triage, stabilization, and preparation for evacuation to higher levels of care In some contemporary conflicts, Role 1 stabilization centres have been reinforced with surgical personnel and have performed procedures beyond the doctrinal Role 1 scope. Where an included study describes this, the deviation is noted in Supplementary Table 2.

Role 2 (Forward Surgical Unit)	The first echelon of care with surgical capability. These are small, mobile medical facilities positioned close to the front line. They can perform damage control resuscitation (DCR) and damage control surgery (DCS) to control hemorrhage and contamination before evacuation Role 2 units may be configured as Role 2 Light Manoeuvre (R2LM) or Role 2 Enhanced (R2E): Role 2 Light Manoeuvre: Highly mobile, limited holding capacity (up to 4–8 patients), one operating table, and minimal diagnostics Role 2 Enhanced: Larger facility with two or more surgical teams, blood transfusion capability, limited laboratory and radiology services, and short-term post-operative care Both types often operate from tents, containers, or mobile platforms and may include Special Operations Surgical Teams (SOST) or Role 2 Afloat facilities aboard ships
Role 3 Facility	A deployed field hospital providing comprehensive surgical, medical, and critical care capabilities It includes multiple operating rooms, intensive care units, diagnostic imaging (CT, X-ray, ultrasound), and laboratory support Role 3 facilities are located within secure bases and serve as the main referral centers within the theater of operations They are equivalent to small civilian trauma hospitals.
Role 4 Facility	A tertiary care military hospital located outside the combat zone, providing definitive care, subspecialty surgery, long-term critical care, and rehabilitation
Stabilization Point (SP)	A small forward medical element located between the point of injury and the Role 2 surgical facility It provides advanced resuscitation and stabilization (airway, transfusion, hemorrhage control) to bridge

	delays in evacuation when surgery is not immediately available SPs typically have no surgical capability
Aeromedical Evacuation	The transport and continued care of patients in rotary-wing (helicopter) or fixed-wing aircraft by trained medical personnel. In-flight care may include blood transfusion, airway management, or REBOA placement, allowing continuous treatment during transfer to higher echelons of care
Role 2 Afloat	A ship-based surgical unit providing Role 2-level care at sea It performs damage control surgery, resuscitation, and stabilization aboard naval vessels during combat or humanitarian missions
Hospital Ship / Role 3 Afloat	A fully equipped naval hospital capable of providing Role 3 or Role 4–level care, including advanced surgery, intensive care, and prolonged hospitalization
Field Hospital / Mobile Surgical Unit	A modular, deployable hospital used in humanitarian or disaster response missions It can perform damage control surgery, provide critical care, and support mass casualty management
Civilian Hospital	A fixed, permanent healthcare facility with full capacity for surgery, imaging, laboratory testing, and intensive care These hospitals often serve as the final destination for evacuated military or disaster casualties
Prehospital REBOA	REBOA deployed before arrival at a definitive surgical facility It may be performed at the point of injury, within stabilization points, forward surgical units, or during ground or air evacuation, to temporarily control life-threatening torso hemorrhage and stabilize the patient for transport

Supplementary Table 2 Critical Appraisal of the Included Studies

Study (Author, Year)	Study Design	Assessment Tool	1	2	3	4	5	6	7	8	9	10	Total Score
Akrish 2025	Case Report	Joanna Briggs Institute	1	1	1	1	1	1	1	1	N/A	N/A	8 / 8
Brown 2020	Case Report	Joanna Briggs Institute	0	1	1	1	1	1	1	1	N/A	N/A	7 / 8
Knipp 2020	Case Report	Joanna Briggs Institute	1	1	1	1	1	1	1	1	N/A	N/A	8 / 8
Reva 2020	Case Series	Joanna Briggs Institute	U	1	1	U	U	1	1	1	1	1	7 / 10
Gumeniuk 2024	Case Series	Joanna Briggs Institute	U	1	1	U	U	1	1	1	1	1	7 / 10
Northern 2018	Case Series	Joanna Briggs Institute	U	1	1	U	U	1	1	1	1	1	7 / 10
de Schoutheete 2018	Case Series	Joanna Briggs Institute	1	1	1	U	U	1	1	1	1	1	8 / 10
Taheri 2024	Observational	Newcastle–Ottawa Scale	1	0	1	1	0	1	1	1	N/A	N/A	6 / 9

Supplementary Table 3 Baseline Characteristics of Included Studies

Study	N	Design	Country/ Military Entity	Population	Facility Type / Level of Care	Prehospital Environment Context	Time from Injury to First Evaluation	Intervention	Catheter French
Akrish 2025	1	Case report	Ukraine	Military	Stabilization Point (no surgical capability)	Active war zone / Austere stabilization point	60 minute(s)	pREBOA-PRO™	7 Fr
Brown 2020	1	Case report	United States	Military	En-route aeromedical evacuation (rotary-wing)	Combat theater / Austere aeromedical platform	27 minute(s)	ER-REBOA™	7 Fr
de Schoutheete 2018	3	Case series	Belgium	Military	Casualty Collection Point (prehospital)	Austere pre-hospital combat environment / Front line	20 minute(s) (Mean)	ER-REBOA™	7 Fr
Gumeniuk 2024	5	Case series	Ukraine	Military	Role 1 stabilization centre / forward surgical team	Active war zone / Austere limited-resource	50 to 180 minute(s)	COBRA-OS / ER-REBOA™	4 Fr / 7 Fr

						environment			
Knipp 2020	2	Case report	Not Reported	Military	Role 2 MTF	Combat theater / Far-forward austere environment	Case 1: 120 minute(s) Case 2: Not Reported	ER-REBOA™	4 Fr / 7 Fr
Northern 2018	20	Retrospective case series	Not Reported	Military	Forward surgical team (SOST; Role 2 equivalent)	Recent combat operations / Austere environment	15 to 90 minute(s)	ER-REBOA™	Not Reported
Reva 2020	3	Case series	Russia	Military	Role 2 field hospital / medical detachment	Zone of combat operations / Austere field conditions	140 to 270 minute(s)	REBOA (Unspecified devices)	7 Fr / 10 Fr
Taheri 2024	15/17	Retrospective registry-based study	Not Reported	Military	Role 2 MTF (15 of 17 cases eligible)	Deployed combat settings / Resource-limited environments	Not Reported	REBOA (Unspecified devices)	Not Reported

Supplementary Table 4 Outcomes

Parameter	Akrish 2025	Brown 2020	de Schoutheete 2018	Gumeniuk 2024	Knipp 2020	Northern 2018	Reva 2020	Taheri 2024
Mechanism	Artillery fire	Gunshot wound	Improvised Explosive; device explosion; gunshot	Blast injury/ gunshot wound	Grenade blast / Gunshot Wound	Explosion / Gunshot Wound	Blast / blunt trauma	Explosive / firearm
Injury location	Abdomen	Head	Face; neck; thorax; abdomen; extremities	Abdomen; pelvis; retroperitoneum; major vascular structures	Extremities; large soft tissue defect; groin; pelvis; abdomen; chest	Abdomen; pelvis; groin	Chest; abdomen; pelvis; extremities	Abdomen; Thorax; Extremities
Type of injury	Blast/Penetrating	Penetrating	Explosion	Blast / penetrating	Blast/ Penetrating	Penetrating/ Blast	Polytrauma	Penetrating / Blunt
Injury Severity Scores	Not Reported	Not Reporte	20 - 66	Not Reported	Not Reported	Not Reported	Not Reported	24 - 41 (IQR)

		d						
Volume Resuscitation	2 units PRBC, 2 units Plasma, 500 cc Normal Saline, 100 cc Gelaspan	1 unit PRBC, 2 units LTOWB	Case 1: 2 units FWB, Case 2: 4 units FWB, Case 3: 2 units FWB	Crystalloids, Colloids	Blood Products	Not Reported	Case 1: 8 units RBC, 300ml FFP; Case 2: 6 units RBC, 4 units FFP; Case 3: 4 units RBC, 1500ml FFP	Not Reported
Bleeding source	Abdomen and amputated extremity	Head	Multifactorial	Multifactorial	Multifactorial	Multifactorial	Splenic rupture; pelvic bleeding	Abdominal sources
Heart Rate Pre insertion	Not Reported	Not Reported	Case 1: 124 - 140 bpm, Case 2: 130 bpm, Case 3: 140 bpm	Not Reported	Not Reported	110 - 153 bpm (range)	Case 1: 110 bpm, Case 2: >120 bpm, Case 3: Cardiac arrest	Not Reported

SBP Pre insertion	45 mmHg	70 mmHg	Case 1: Not measurable, Case 2: 60 mmHg, Case 3: Not measurable	60 - 80 mmHg (range)	Patient A: 60 mmHg SBP, Patient B: Not Reported	50 - 90 mmHg (range)	Case 1: 50 - 60 mmHg (range), Case 2: Non-measurable, Case 3: Cardiac arrest	Not Reported
SBP Post insertion	136 mmHg	135 mmHg	Case 1: Improved, Case 2: 90 mmHg, Case 3: Improved	100 - 130 mmHg (range)	Patient A: improved, Patient B: 110 - 120 mmHg SBP (range)	103 - 210 mmHg (range)	Case 1: 120 mmHg, Case 2: 130 mmHg, Case 3: 85 mmHg	Not Reported
Glasgow Coma Scale	Not Reported	3	Not Reported	Not Reported	Patient A: Not Reported, Patient B: 15	7 - 15 (range)	Not Reported	Not Reported
Location of insertion	Common femoral artery	Common femoral	Common femoral artery	Common femoral artery	Common femoral artery	Common femoral artery	Common femoral artery	Not Reported

		artery						
Vascular Access Technique	Percutaneous	Percutaneous	Case 1: Percutaneous, Case 2: Open surgical cutdown, Case 3: Open surgical cutdown	Percutaneous (n = 2) / Open surgical cutdown (n = 3)	Percutaneous (n = 2)	Percutaneous (n = 14) / Open surgical cutdown (n = 6)	Case 1: Percutaneous, Case 2: Percutaneous, Case 3: Open surgical cutdown	Not Reported
Aortic Zone Initial Deployment	Zone I	Zone I	Zone I (n = 3)	Zone I (n = 5)	Patient A: Zone III / Patient B: Zone I	Zone I (n = 17)/ Zone III (n = 3)	Zone I (n = 3)	Not Reported
Occlusion time	55 minute(s)	First Occlusion: 11 minute(s), Second	Case 1: 30 minute(s), Case 2: 30 minute(s), Case 3: 34 minute(s)	15-50 minute(s) (range)	Patient A: 30 minute(s), Patient B: 36 minute(s)	7-34 minute(s) (range)	Case 1: 25 minute(s), Case 2: 16 minute(s), Case 3: 40 minute(s) in	Not Reported

		Occlusion: 12 minute(s)					Zone I + 25 minute(s) in Zone III	
Temporary Hemorrhage Control Adjuncts	Tourniquet / wound packing	Hemostatic dressing	Not Reported	Pelvic tamponade and retroperitoneal packing	Tourniquets and packing	Not Reported	Pelvic tamponade; Blood transfusion	Not Reported
Surgical management / definitive hemorrhage control	Exploratory laparotomy	Decompressive craniectomy	DCS	Laparotomy	Damage control laparotomy; Exploratory Laparotomy;	Laparotomy	Laparotomy Splenectomy External fixation of pelvis	Exploratory laparotomy

Complications	Not Reported	Not Reported	Thrombosis (2/3)	Femoral artery thrombosis (1/5)	Acute limb ischemia and below knee amputation (1/2)	Balloon rupture (n = 1, after deployment in Zone III)	Thrombosis of the contralateral common femoral artery, not REBOA-related (1/3) / Severe reperfusion syndrome and acute renal failure, not REBOA-related (1/3)	Not Reported
Pharmacological Adjuncts	Tranexamic acid 2g	2 doses Epinephrine (1mg)	Tranexamic acid (1 g), Antibiotics, Vasoactive drugs	Tranexamic acid, Ceftriaxone, Vasopressors	Norepinephrine	Not Reported	Not Reported	Not Reported

Mortality	0	1/1 (100%)	0/3 survival to transfer; outcome after handover not reported	1/5 20%	0	0	1/3 (33.3%)	3/17 (17.6%)	