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SURGICAL MEDICAL GROUP

Management of Pelvic Fracture

Resuscitation • Ring Closure • Hemorrhage Control

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Disclosures

- No Disclosures

Management Priorities

The first minutes are organized around three simultaneous goals

1 • RESUSCITATE

Perfusion

Restore perfusion without worsening hemorrhage. Activate balanced blood-product resuscitation, warm the patient, correct calcium, and address coagulopathy.

2 • CLOSE THE RING

Stability

Apply a pelvic binder at the greater trochanters early when mechanical instability is suspected; reduce pelvic volume and fracture displacement.

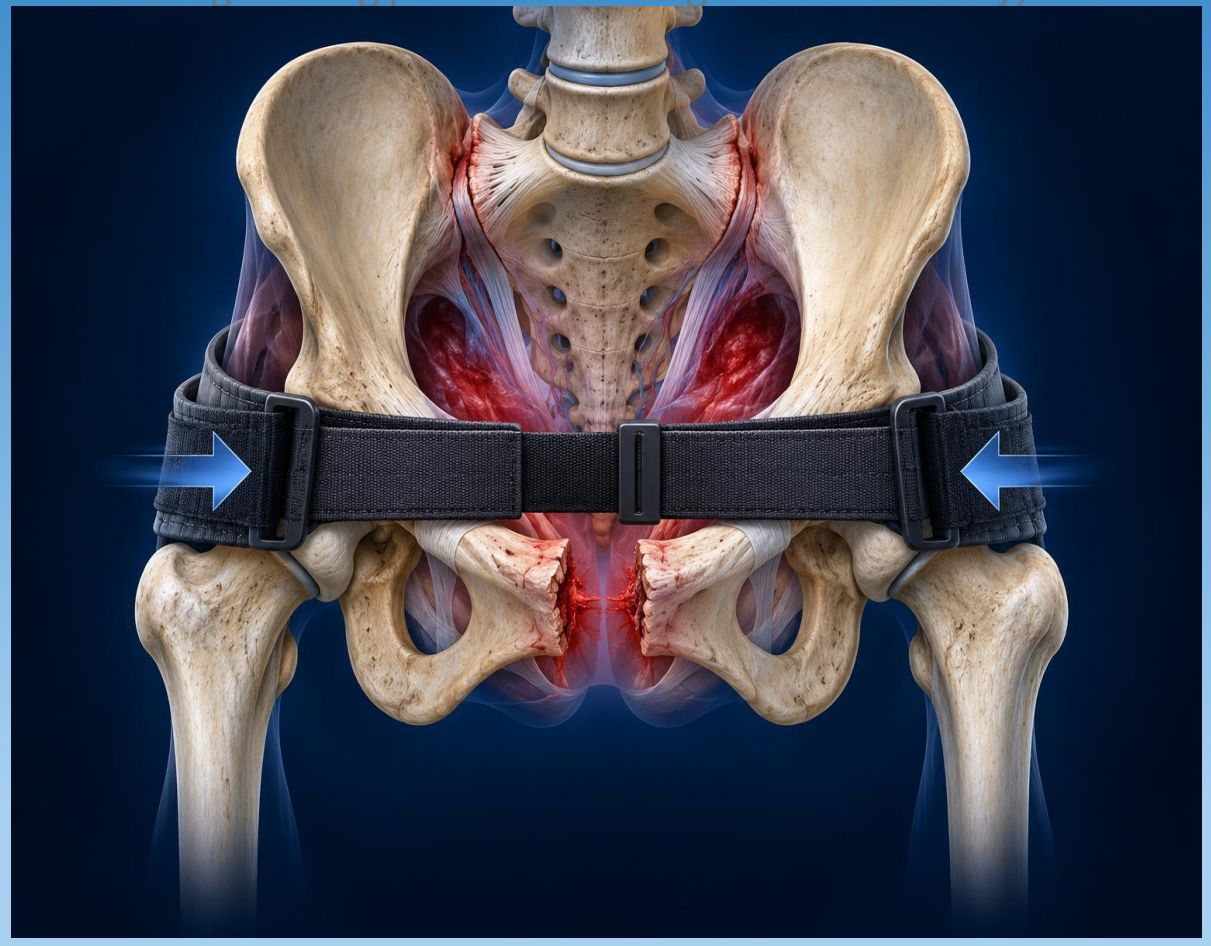
3 • CONTROL BLEEDING

Hemostasis

Identify intraperitoneal versus pelvic hemorrhage and move rapidly to PPP, angiography/embolization, laparotomy, or a hybrid sequence.

Why the Pelvis Bleeds

Most exsanguinating pelvic hemorrhage is venous/bony; arterial bleeding remains a critical target



Venous / bony

80–90%

Presacral and paravesical plexus, cancellous bone surfaces, sacroiliac disruption.

Arterial

10–20%

Internal iliac branches; CT contrast extravasation strongly supports AE.

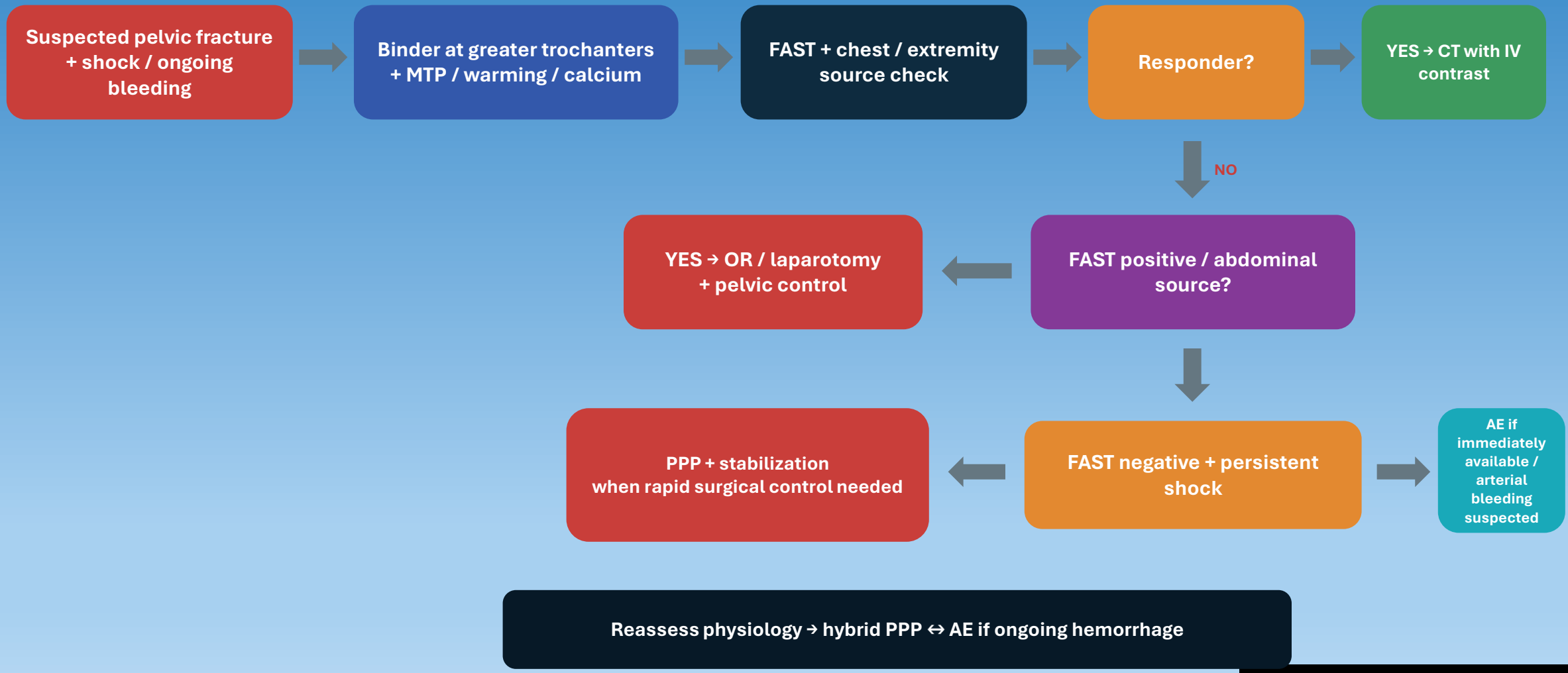
Core principle

Close the pelvic ring and tamponade low-pressure bleeding early; use AE to treat arterial hemorrhage. Persistent shock may require both.

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Immediate Pelvic Fracture Algorithm

Physiology first: do not let diagnostic steps delay hemorrhage control



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Resuscitation: Hemostatic, Warm, Calcium-Replete

Resuscitation and hemorrhage control proceed in parallel

Activate MTP early

Use balanced blood products according to local MTP; minimize crystalloid in uncontrolled hemorrhage.

Prevent the lethal triad

Active warming, rapid correction of hypocalcemia, and targeted correction of coagulopathy.

Use physiology

Trend mental status, pulse pressure, lactate/base deficit, shock index, transfusion trajectory, and response to blood.

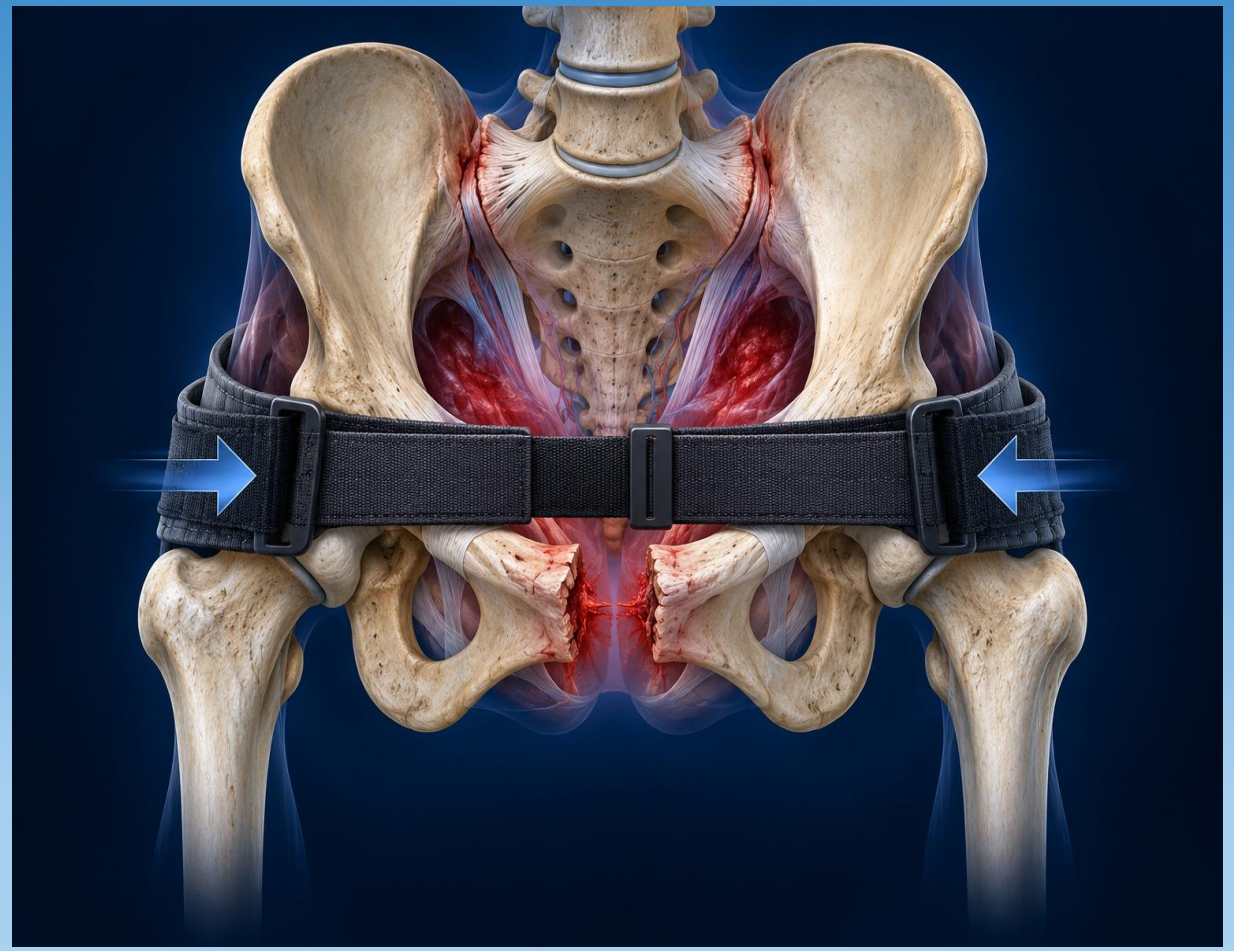
Avoid false reassurance

A transient response is ongoing hemorrhage until proven otherwise; do not wait for profound hypotension.

RESUSCITATE WHILE YOU CLOSE THE RING AND CONTROL THE BLEEDING

Ring Closure: Binder First

Mechanical stabilization is immediate, simple, and should not wait for definitive orthopedics



Correct position

Center the binder over the greater trochanters—not the iliac crests.

Goal

Reduce fracture displacement and pelvic volume; support tamponade while definitive hemorrhage control is organized.

Do not delay

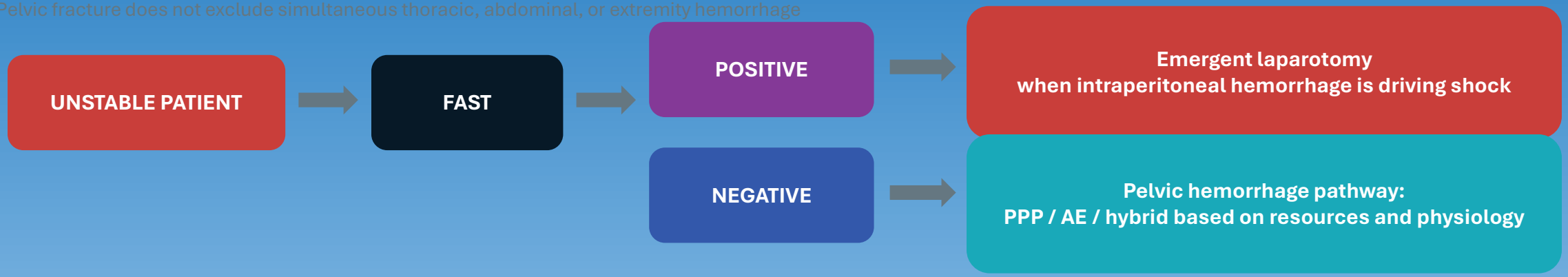
If the patient is unstable, binder placement belongs in the initial resuscitation sequence.

Ring closure is the first step to definitive hemorrhage control.

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Find the Bleeding Compartment

Pelvic fracture does not exclude simultaneous thoracic, abdominal, or extremity hemorrhage



FAST limitation

A negative FAST does not reliably exclude intra-abdominal bleeding in major pelvic trauma; stable patients require contrast CT.

System discipline

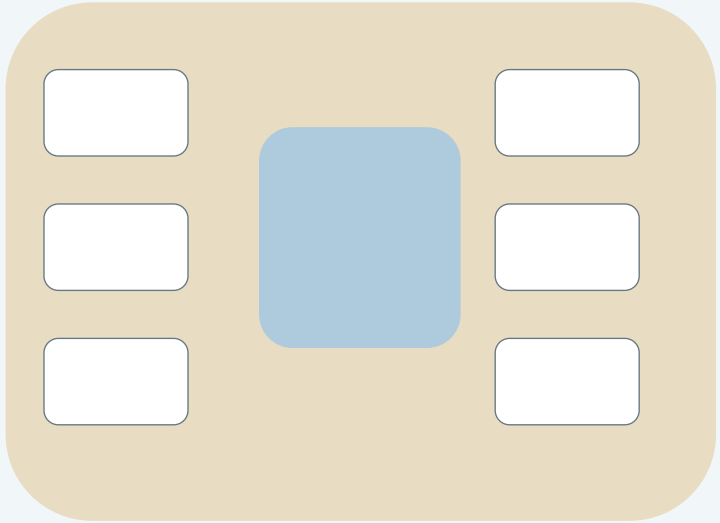
Rapidly evaluate chest, abdomen, pelvis, and long bones. Treat the source most immediately responsible for shock.

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Preperitoneal Pelvic Packing (PPP)

Fast surgical control for low-pressure pelvic hemorrhage, especially when IR is delayed

PPP CONCEPT



3 packs / side
into the preperitoneal space

Best use

Persistent pelvic-fracture shock when rapid operative control is needed or angiography would cause significant delay.

Pair with stabilization

Packing is most effective as part of a pathway that includes pelvic ring stabilization.

After PPP

Persistent instability or arterial blush → pelvic angiography/embolization.

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Angiography / Embolization

The arterial solution: targeted hemorrhage control after non-pelvic and low-pressure sources are addressed

WHEN TO GO

AE

Hemodynamic instability or ongoing pelvic bleeding after other sources are excluded; CT arterial contrast extravasation; persistent bleeding after PPP.

WHAT IT TREATS

Artery

Arterial hemorrhage—often internal iliac branch injury. Angioembolization is highly effective for arterial bleeding.

WHEN TO REPEAT

Reassess

Ongoing hemorrhage after initial embolization can justify repeat angiography once other bleeding compartments are reassessed.

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PPP and AE Are Complementary

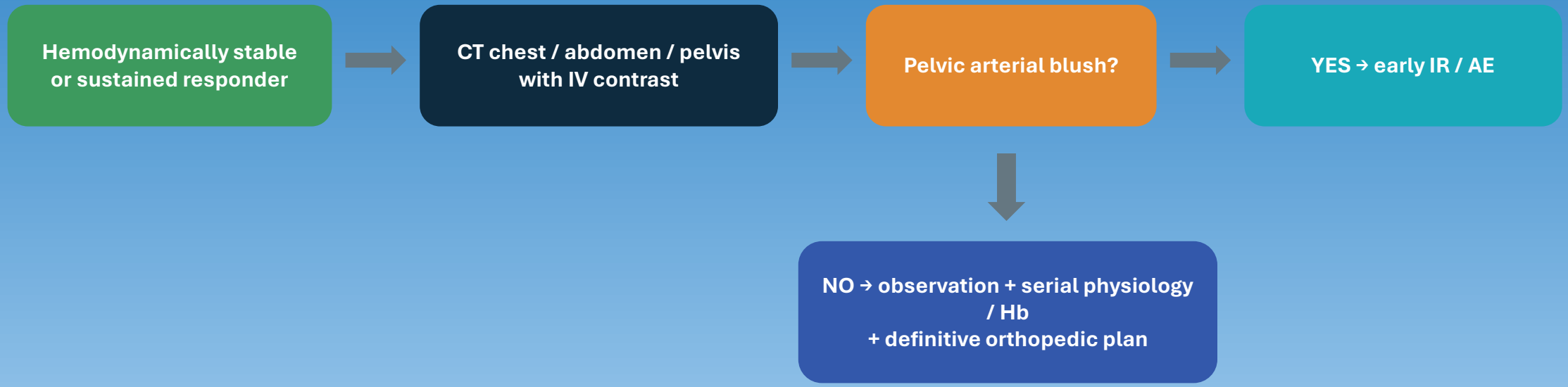
Choose the fastest effective modality for the bleeding source—and combine them when necessary

PPP	ANGIOEMBOLIZATION
Venous / bony dominant	Arterial dominant
Rapid OR access	Immediate IR access
Profound instability / non-response	Responder or transient responder suitable for IR
Useful when IR delay is dangerous	CT blush / arterial target
Persistent bleeding → AE	Persistent shock → reassess / PPP

HYBRID PPP → AE: CONTROL LOW-PRESSURE BLEEDING FIRST, THEN ARTERIAL BLEEDING

The Stable / Stabilized Patient

Contrast CT defines injury pattern, arterial bleeding, and associated injuries



Important

Fracture pattern alone does not reliably predict arterial bleeding or the need for angiography.

Escalate

Any recurrent hypotension, increasing transfusion requirement, or worsening perfusion returns the patient to the hemorrhage-control pathway.

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Resource-Based Decision Making

The correct pathway depends on what can be delivered now—not what exists somewhere in the hospital

FULL CAPABILITY

Hybrid

Trauma OR + PPP expertise + IR immediately available → use physiology and bleeding source to sequence therapy.

IR DELAYED

PPP

Persistent shock → do not wait for the angio suite. Proceed to rapid operative hemorrhage control / PPP as indicated.

LIMITED CENTER

Transfer

Binder + blood resuscitation + rapid source assessment; initiate transfer early when definitive hemorrhage control cannot be provided.

Escalation Triggers

Build the protocol around objective signs of failed resuscitation

Persistent hypotension

Shock despite binder and blood products

Transient response

Improves, then deteriorates again

Rising transfusion need

Ongoing blood requirement / MTP

CT arterial extravasation

Strong indication for angiographic evaluation

Shock index >0.9

Shock Index (SI = Heart Rate ÷ Systolic Blood Pressure): A shock index **>0.9** in trauma should raise concern for significant hemorrhage, occult hypoperfusion, and increased transfusion requirements.

Failure after intervention

Reassess every bleeding compartment; repeat / hybrid control

THE PATIENT'S PHYSIOLOGY OVERRIDES THE ALGORITHM

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Master Algorithm: Resuscitation → Ring Closure → Hemorrhage Control

A single pathway for the trauma bay, OR, IR suite, and transfer decision

1 RESUSCITATION	2 RING CLOSURE	3 HEMORRHAGE CONTROL
MTP / blood products	Binder at trochanters	FAST / exclude other sources
Warm patient	Reduce pelvic volume	PPP for rapid low-pressure control
Calcium / coagulation	Maintain stabilization	AE for arterial bleeding
Trend perfusion	Coordinate orthopedics	Laparotomy if abdominal source
Avoid crystalloid excess	Protect skin / reassess	Hybrid / repeat if ongoing

DO ALL THREE IN PARALLEL — THEN REASSESS AFTER EVERY INTERVENTION

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Evidence Anchors

Key society guidance supporting the management pathway

EAST

• Binder decreases fracture displacement and pelvic volume.

• Hemodynamic instability / ongoing pelvic bleeding after other sources are excluded → consider angiography/embolization.

• CT arterial extravasation may warrant AE regardless of hemodynamic status.

WSES

• Fundamental principles: hemostatic resuscitation, bony stabilization, and management of extrapelvic bleeding.

• PPP is effective early hemorrhage control in hypotensive pelvic ring disruption and should be combined with stabilization.

JTS 2026

Unstable pelvic fracture + negative FAST + persistent instability after binder and blood resuscitation → hemorrhage-control procedure at the level of care where diagnosed when capability exists.

Guidelines should be adapted to local resources, transfer times, blood-bank capability, IR response, and surgeon availability.

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Pelvic Fracture Hemorrhage: Three Things Save Time

1 RESUSCITATE

Blood, warmth, calcium, coagulation

2 CLOSE THE RING

Binder early at the greater trochanters

3 CONTROL HEMORRHAGE

PPP • AE • OR • hybrid strategy

Reassess after every intervention. Persistent shock means persistent bleeding until proven otherwise.

Paul Wisniewski, DO • September 7, 2026

Advanced Procedure: Zone 3 REBOA

Temporary aortic occlusion as a bridge—not definitive hemorrhage control



INDICATION

Profound, noncompressible pelvic hemorrhage with hemodynamic collapse or refractory shock when immediate definitive control is being mobilized.

TARGET

Zone 3 = infrarenal aorta, above the aortic bifurcation. This is the preferred aortic occlusion zone for isolated pelvic hemorrhage.

KEY SEQUENCE

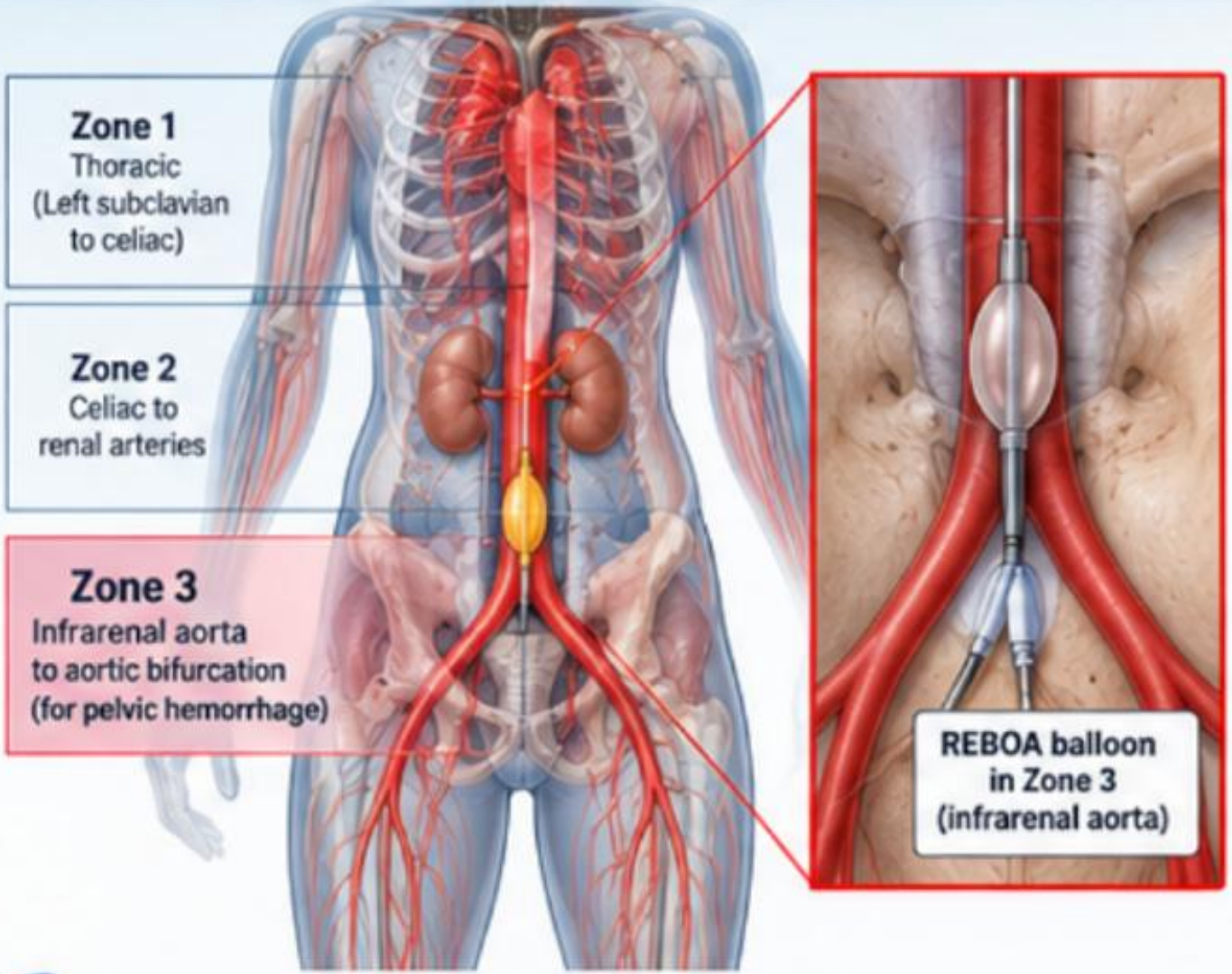
Common femoral arterial access → advance balloon to Zone 3 using device-specific landmarks / imaging → controlled inflation → immediate transition to PPP, AE, or operative control.

SAFETY

REBOA is an advanced resuscitative adjunct requiring trained operators, protocolized monitoring, and the shortest feasible occlusion time. Ischemia/reperfusion and access complications are major concerns.

REBOA in Zone 3 for Pelvic Hemorrhage

Technique, Anatomy, and Key Points



Key Points

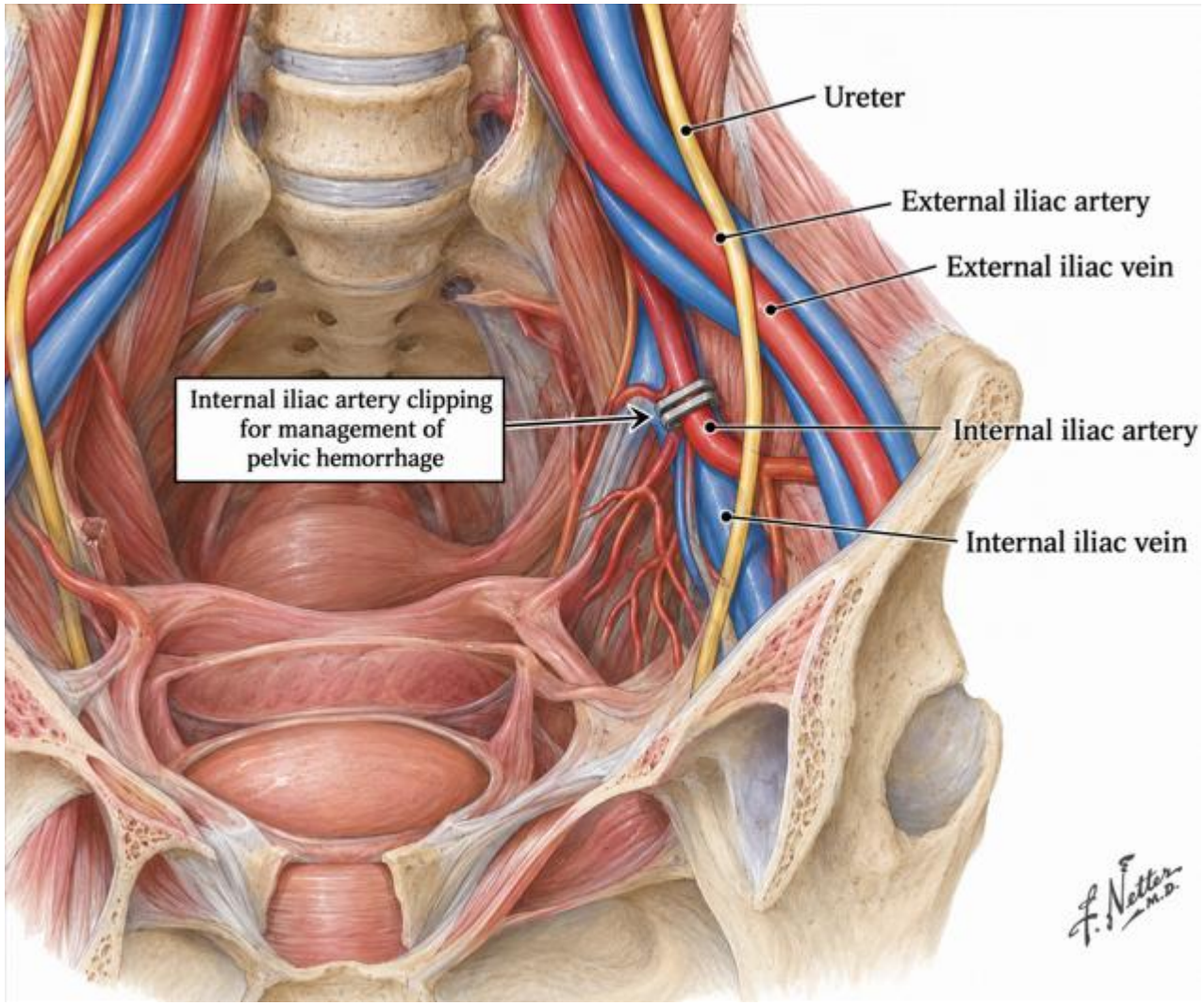
- **Access:** Common femoral artery (usually ultrasound-guided).
- **Target:** Infrarenal aorta (Zone 3) – above aortic bifurcation, below renal arteries.
- **Indication:** Life-threatening pelvic hemorrhage not controlled with resuscitation and pelvic ring closure.
- **Balloon inflation:** Partial or intermittent to minimize ischemia.
- **Avoid prolonged occlusion** (aim < 30–60 minutes).
- **Confirm position:** Fluoroscopy or external landmarks.
- **Monitor:** Distal perfusion, hemodynamics, and reperfusion injury.

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Advanced Procedure: Internal Iliac Artery Ligation

Damage-control option for life-threatening pelvic arterial hemorrhage when AE is unavailable or impractical



WHEN TO CONSIDER

Massive pelvic hemorrhage encountered at laparotomy, particularly when rapid angiographic embolization is not available and arterial inflow control is required.

ANATOMIC PRIORITY

Identify the common iliac bifurcation, external iliac artery, internal iliac artery, adjacent iliac vein, and ureter. Confirm preserved external iliac / femoral flow.

TECHNIQUE CONCEPT

Obtain careful control of the internal iliac artery; permanent ligation or temporary occlusion may be used in damage-control settings. Bilateral control has been reported when hemorrhage is diffuse.

CAUTION

This is not a routine first-line maneuver. Iliac venous injury, pelvic ischemic complications, gluteal ischemia, and recurrent hemorrhage must be considered; PPP and/or subsequent AE may still be required.

Works Cited — Pelvic Fracture Hemorrhage

Guidelines and contemporary evidence supporting resuscitation, stabilization, PPP, AE, and REBOA

1. Coccolini F, Stahel PF, Montori G, et al. Pelvic trauma: WSES classification and guidelines. World J Emerg Surg. 2017;12:5. doi:10.1186/s13017-017-0117-6.

2. Cullinane DC, Schiller HJ, Zielinski MD, et al. Eastern Association for the Surgery of Trauma practice management guideline for hemorrhage in pelvic fracture. J Trauma. 2011;71(6):1850–1868.

3. Spahn DR, Bouillon B, Cerny V, et al. The European guideline on management of major bleeding and coagulopathy following trauma: sixth edition. Crit Care. 2023;27:80.

4. Joint Trauma System. Pelvic Fracture Care Clinical Practice Guideline. 17 Feb 2026. Joint Trauma System / Defense Health Agency.

5. Costantini TW, et al. Contemporary management of pelvic fracture bleeding: an evidence-based review and practical algorithm. J Trauma Acute Care Surg. 2025.

6. Li H, Ai T, Huang GB. Internal iliac artery ligation as a damage control method in hemodynamically unstable pelvic fractures: a systematic review. Chin J Traumatol. 2024;27(5):288–294. doi:10.1016/j.cjtee.2024.07.004.

7. Effectiveness and safety of bilateral internal iliac artery ligation with pre-peritoneal pelvic packing for life-threatening pelvic trauma. Injury. 2023;54(2):598–603. doi:10.1016/j.injury.2022.11.003.

Works Cited — Advanced Hemorrhage Control

REBOA and internal iliac artery control

8. WSES pelvic trauma guideline: Zone 3 REBOA may be considered in hemodynamically unstable patients with suspected pelvic bleeding as a bridge to definitive treatment (Grade 2B).

9. Zone 3 resuscitative endovascular balloon occlusion of the aorta: Deflating doubts, one trauma at a time. J Vasc Surg Cases Innov Tech. 2026;12(1):102069.

10. DuBose JJ, et al. Bilateral internal iliac artery ligation as a damage-control approach in massive retroperitoneal bleeding after pelvic fracture. J Trauma. 2010.

11. Murji A, et al. Internal iliac artery ligation—a contemporary simplified approach. Am J Obstet Gynecol. 2021;225(3):339–340. doi:10.1016/j.ajog.2021.05.003.

12. EAST. Pelvic Fracture Hemorrhage—Update and Systematic Review. Practice Management Guideline. Eastern Association for the Surgery of Trauma.

13. WSES guideline evidence: pelvic fracture-related hemodynamic instability should prompt consideration of PPP; packing should be paired with pelvic stabilization and followed by AE when arterial bleeding persists.

14. EAST guideline evidence: pelvic fracture with hemodynamic instability or ongoing bleeding after exclusion of non-pelvic sources should prompt pelvic angiography/embolization; CT arterial contrast extravasation may warrant AE regardless of hemodynamic status.