

# PELVIC PACKING



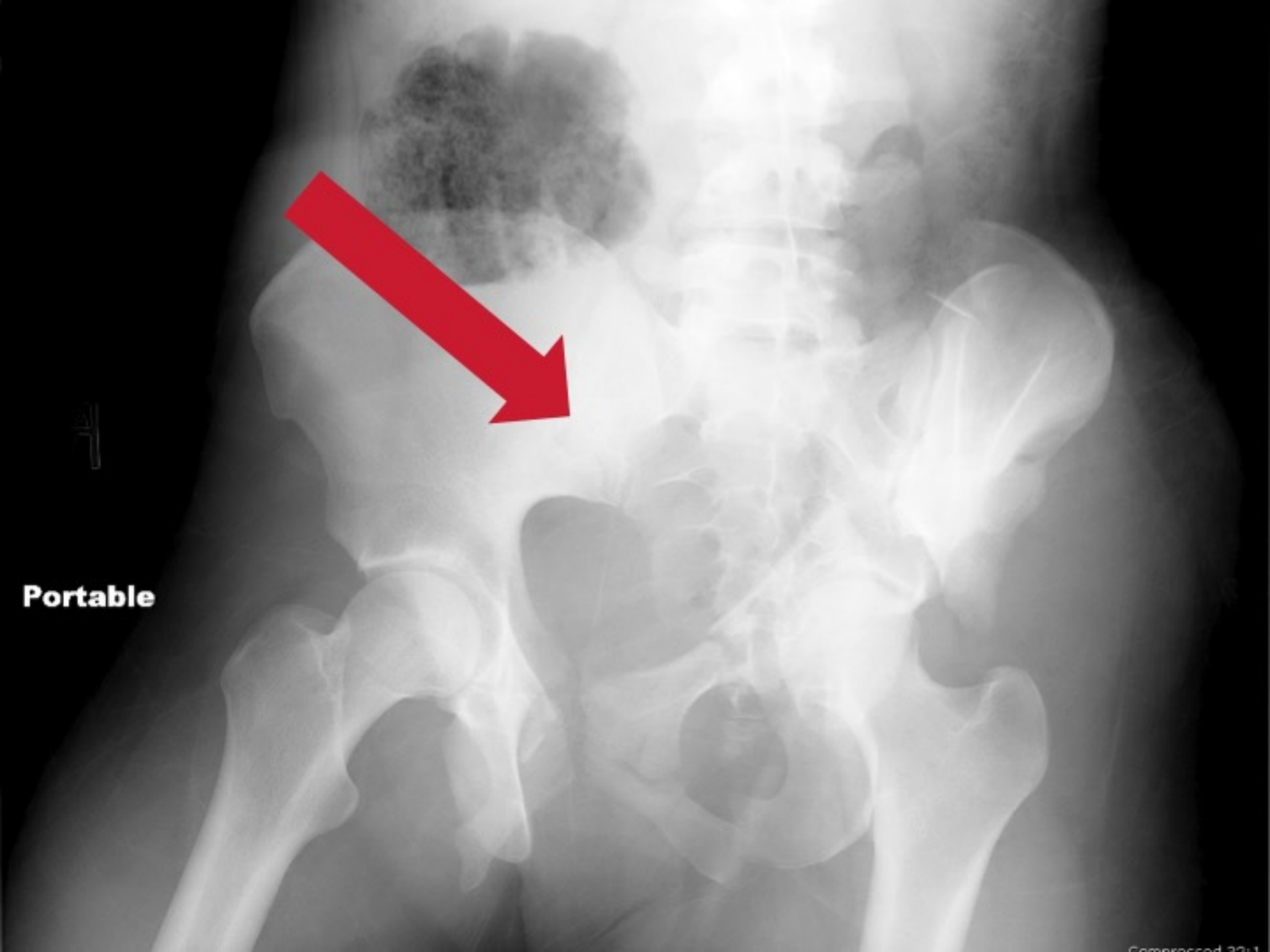
K. Inaba, MD FRCSC FACS  
Division of Trauma Surgery & Critical Care  
LAC+USC Medical Center  
University of Southern California

# DISCLOSURES

✓ None.

# **#1 Cause of Preventable Death After Injury**





**Portable**



## Preventable Deaths From Hemorrhage at a Level I Canadian Trauma Center

*Homer C. Tien, MD, Fernando Spencer, MD, Lorraine N. Tremblay, MD, PhD, Sandro B. Rizoli, MD, PhD, and Frederick D. Brenneman, MD*

**2007**

- ✓ **n=558 trauma deaths, retro**
- ✓ **Hemorrhage second only to TBI**
- ✓ **#1 cause, 75%—Pelvic Fracture**





**PELVIC FRACTURE+HYPOTENSION**



# Pelvic Ring Disruptions: Prediction of Associated Injuries, Transfusion Requirement, Pelvic Arteriography, Complications, and Mortality

\*Adam J. Starr, ||Damian R. Griffin, \*Charles M. Reinert, †William H. Frawley, \*Joan Walker,  
\*Shelley N. Whitlock, \*Drake S. Borer, ‡Ashutosh V. Rao, and §Alan L. Jones

2002

- ✓ **n=325 pelvic ring disruptions**
- ✓ **Shock strong independent predictor of mortality**



# Pelvic Ring Disruptions: Prediction of Associated Injuries, Transfusion Requirement, Pelvic Arteriography, Complications, and Mortality

\*Adam J. Starr, ||Damian R. Griffin, \*Charles M. Reinert, †William H. Frawley, \*Joan Walker, \*Shelley N. Whitlock, \*Drake S. Borer, ‡Ashutosh V. Rao, and §Alan L. Jones

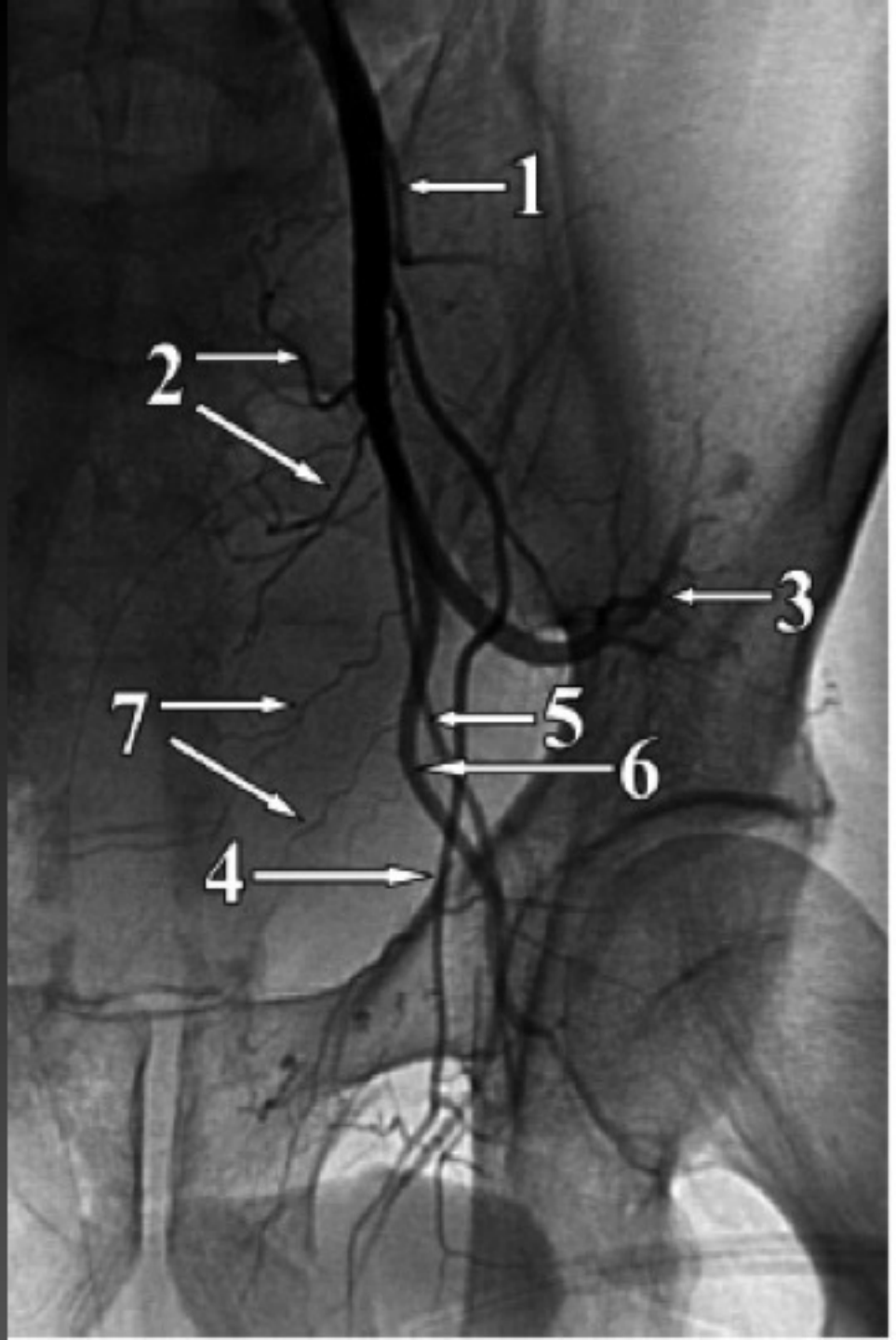
2002

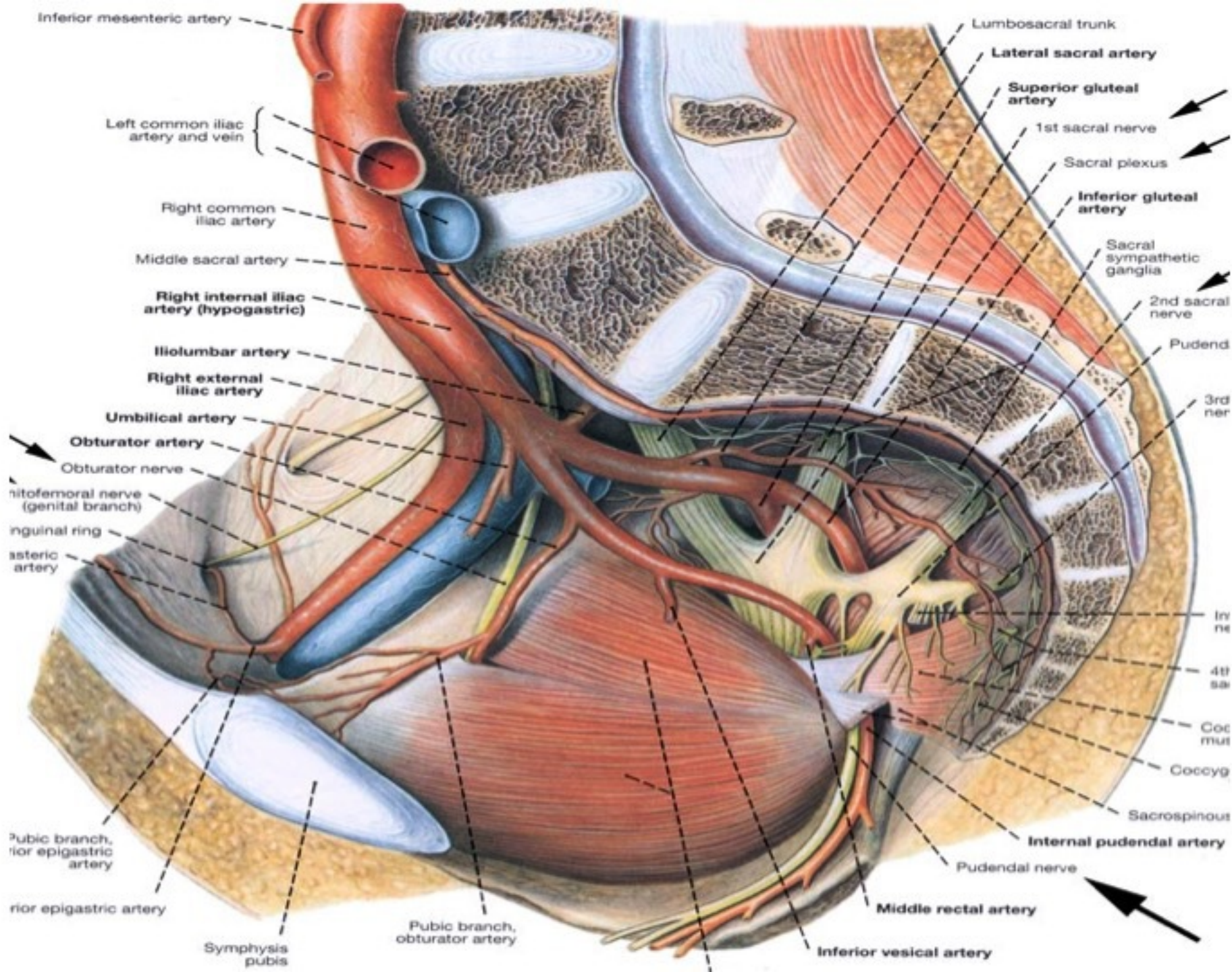
- ✓ **n=325 pelvic ring disruptions**
- ✓ **Shock strong independent predictor of mortality**
- ✓ **Pelvic fracture + hypotension mortality=57%**



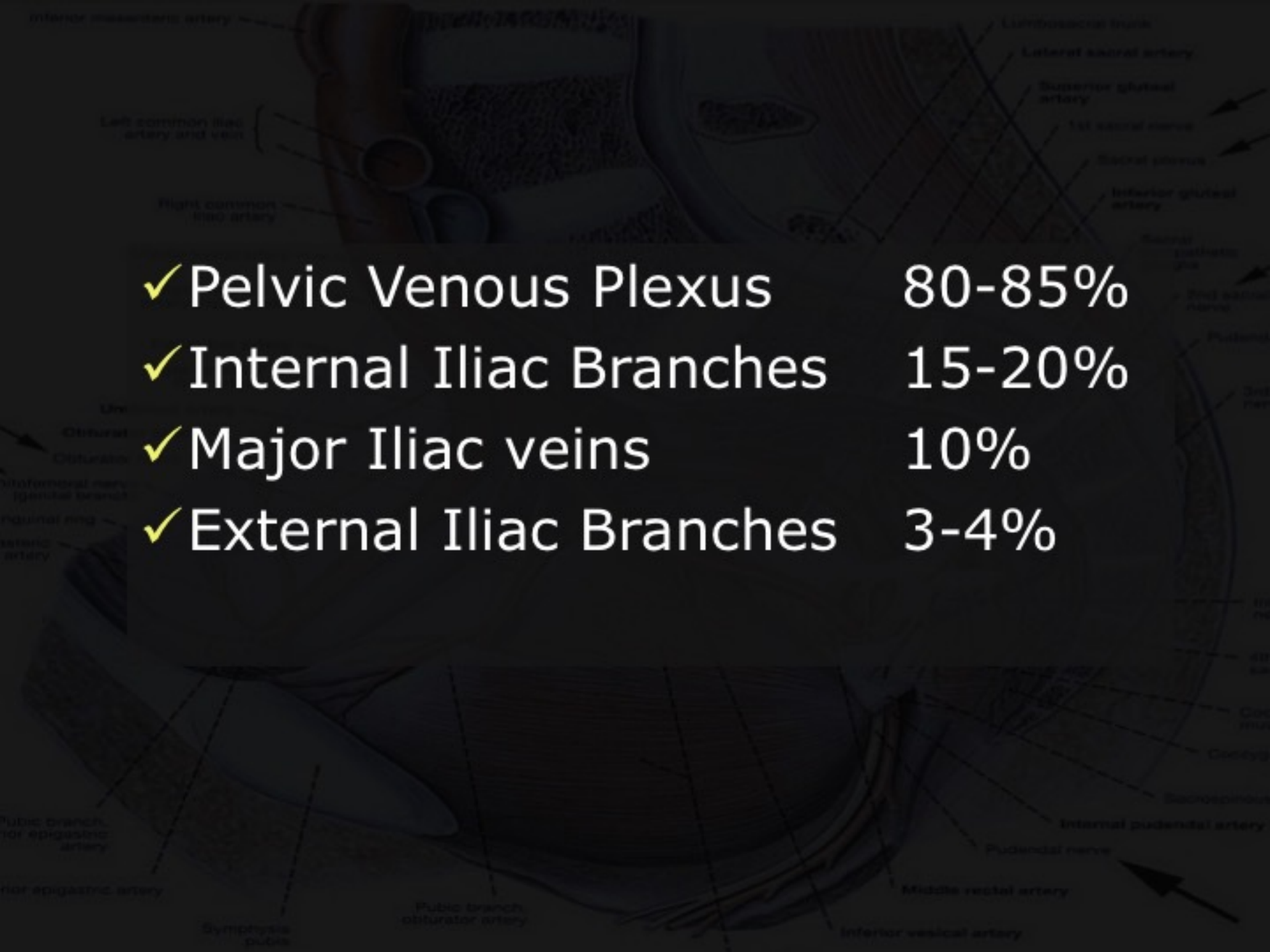
# Iliac Branches

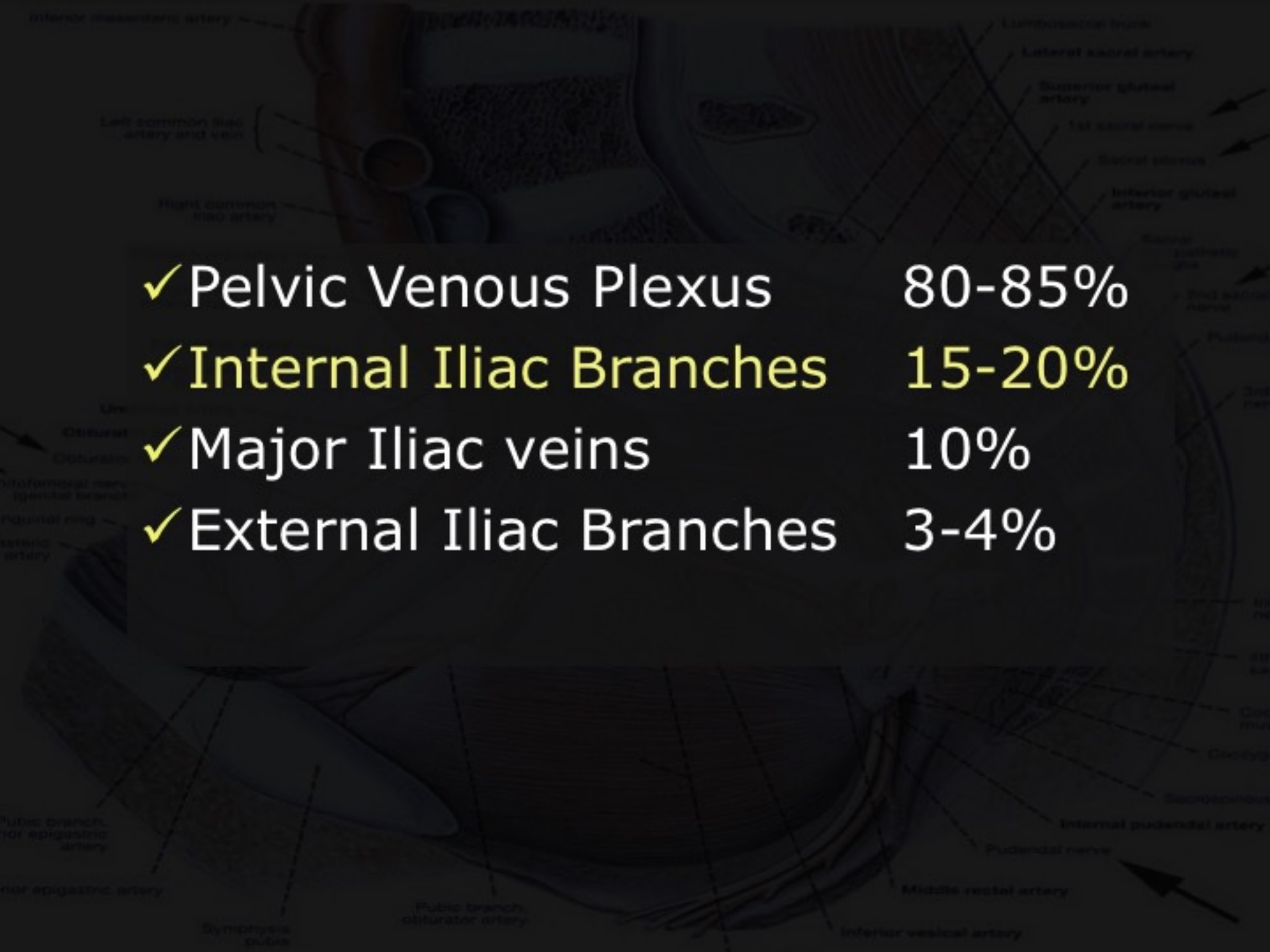
1. Iliolumbar a.
2. Lateral Sacral a.
3. Superior Gluteal a.
4. Obturator a.
5. Internal Pudendal a.
6. Inferior Gluteal a.
7. Vesicular a.



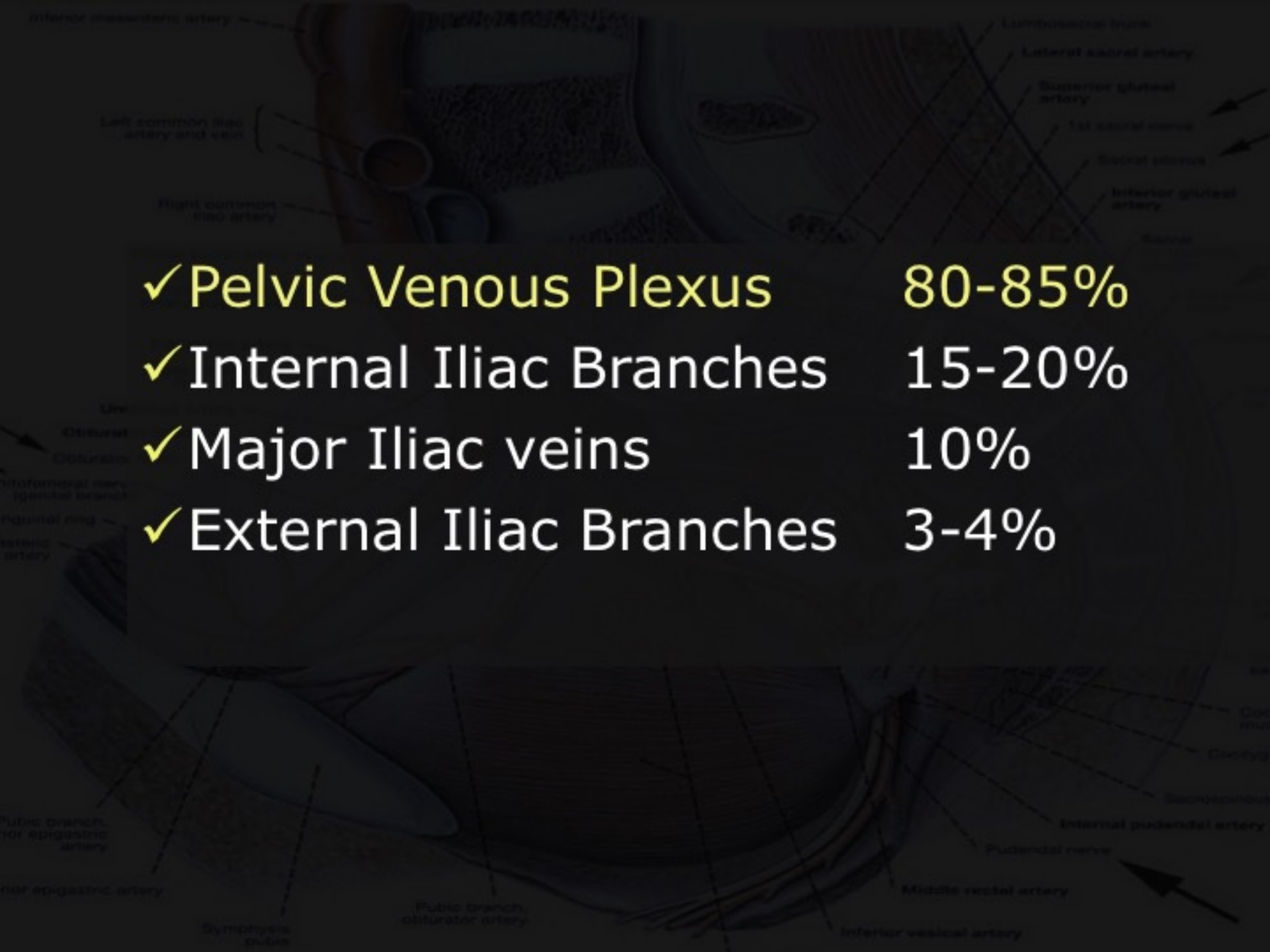




- 
- The background of the slide features several anatomical diagrams. At the top, a diagram shows the abdominal and pelvic regions with labels for the inferior mesenteric artery, left common iliac artery and vein, and right common iliac artery. To the right, a diagram of the sacrum and pelvis shows the lumbar sacral trunk, lateral sacral artery, superior gluteal artery, 1st sacral nerve, sacral foramen, inferior gluteal artery, and sacral plexus of the sacral plexus. On the left side, a diagram shows the umbilical vein, external iliac artery, and external iliac vein. At the bottom, a diagram shows the pubic branch of the inferior epigastric artery, the inferior epigastric artery, the symphysis pubis, the pubic branch of the obturator artery, the internal pudendal artery, the pudendal nerve, the middle rectal artery, and the inferior vesical artery.
- ✓ Pelvic Venous Plexus 80-85%
  - ✓ Internal Iliac Branches 15-20%
  - ✓ Major Iliac veins 10%
  - ✓ External Iliac Branches 3-4%

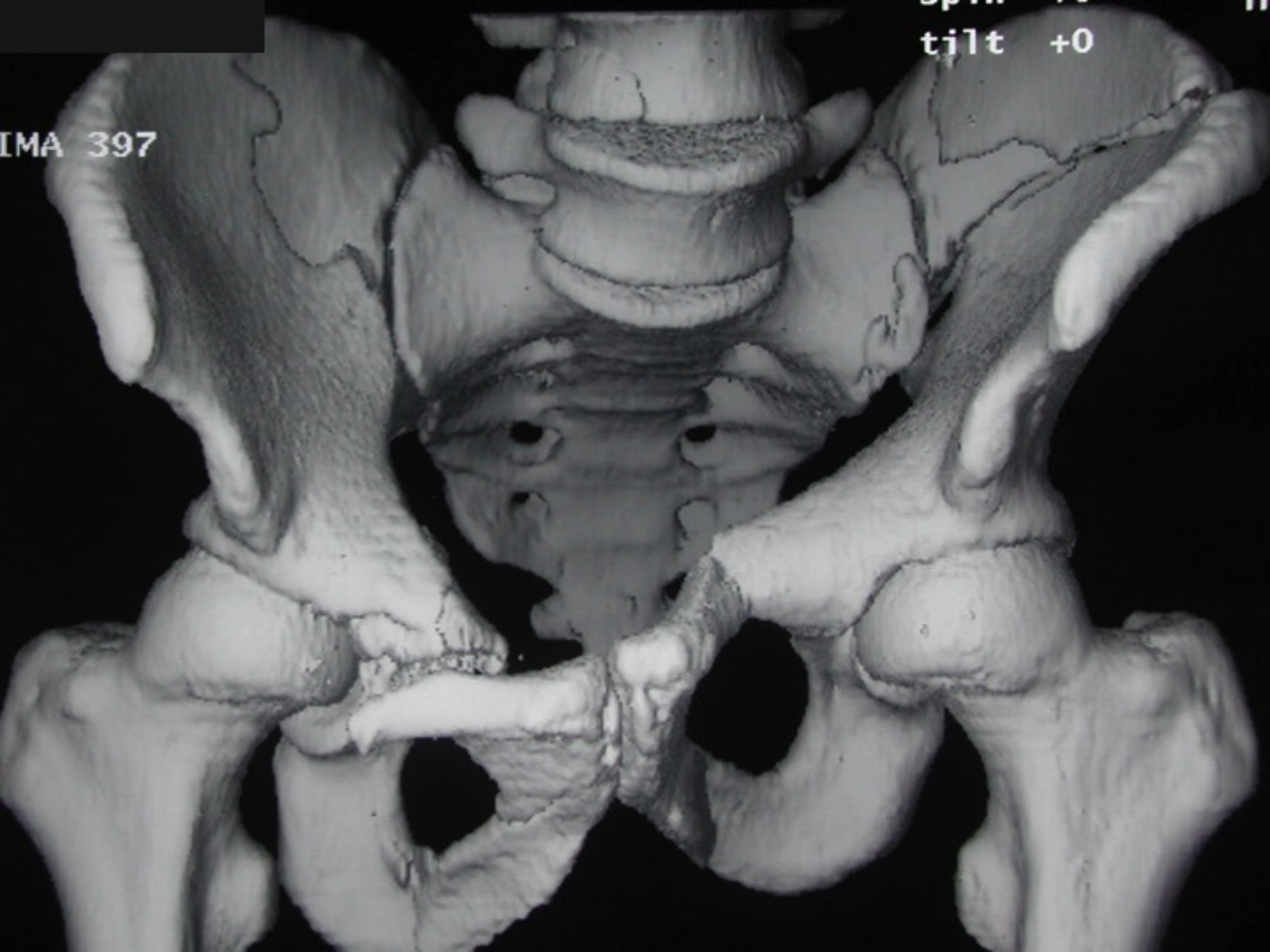
- 
- The background of the slide features several anatomical diagrams. At the top, a diagram of the pelvic region shows the internal iliac artery and its branches, including the superior and inferior gluteal arteries, and the lateral sacral artery. Below this, a diagram of the perineum shows the internal pudendal artery and its branches, including the middle and inferior rectal arteries. To the right, a diagram of the sacrum shows the sacral plexus of nerves and the sacral foramina. At the bottom, a diagram of the pubic region shows the pubic branch of the inferior epigastric artery and the pubic branch of the obturator artery. The diagrams are labeled with various anatomical structures, including the inferior mesenteric artery, left common iliac artery and vein, right common iliac artery, lumbar sacral trunk, lateral sacral artery, superior gluteal artery, 1st sacral nerve, sacral foramen, inferior gluteal artery, sacral plexus of nerves, 2nd sacral nerve, pudendal nerve, 3rd sacral nerve, ureter, distal colon, internal iliac artery, external iliac artery, inferior epigastric artery, pubic branch of inferior epigastric artery, inferior epigastric artery, symphysis pubis, pubic branch of obturator artery, middle rectal artery, inferior vesical artery, internal pudendal artery, and pudendal nerve.
- ✓ Pelvic Venous Plexus 80-85%
  - ✓ Internal Iliac Branches 15-20%
  - ✓ Major Iliac veins 10%
  - ✓ External Iliac Branches 3-4%



- 
- The background of the slide features two anatomical diagrams of the pelvic region. The top diagram is a cross-section showing the internal iliac artery and its branches, including the superior and inferior gluteal arteries, the lateral sacral artery, and the first sacral nerve. The bottom diagram is a more detailed view of the pelvic floor and perineal region, showing the internal pudendal artery, the pudendal nerve, the middle rectal artery, the inferior vesical artery, and the pubic branch of the obturator artery. The diagrams are rendered in a dark, semi-transparent style, allowing the text to be the primary focus.
- ✓ Pelvic Venous Plexus 80-85%
  - ✓ Internal Iliac Branches 15-20%
  - ✓ Major Iliac veins 10%
  - ✓ External Iliac Branches 3-4%

IMA 397

tilt +0





# UNSTABLE PELVIC FRACTURE PRIORITIES





# UNSTABLE PELVIC FRACTURE PRIORITIES

- ✓ Resuscitation
- ✓ Associated injuries





# **UNSTABLE PELVIC FRACTURE PRIORITIES**

- ✓ Resuscitation
- ✓ Associated injuries
- ✓ Mechanical stabilization

A 3D CT scan of a human pelvis, showing the bony structures in a light gray color against a dark background. A fracture is visible in the right ilium. The text 'UNSTABLE PELVIC FRACTURE PRIORITIES' is overlaid in large, bold, blue capital letters. Below the title, a list of five priorities is shown, each preceded by a yellow checkmark. The background image includes some faint, semi-transparent text from a medical software interface, such as 'IMA 397' and 'file 40' in the top left corner.

# UNSTABLE PELVIC FRACTURE PRIORITIES

- ✓ Resuscitation
- ✓ Associated injuries
- ✓ Mechanical stabilization
- ✓ Embolization
- ✓ Packing

A 3D CT scan of a human pelvis, showing the bony structures in a light gray color against a dark background. A fracture is visible in the right ilium. The text 'UNSTABLE PELVIC FRACTURE PRIORITIES' is overlaid in blue. A list of priorities is overlaid in white and yellow. The word 'Packing' is highlighted in yellow.

# UNSTABLE PELVIC FRACTURE PRIORITIES

- ✓ Resuscitation
- ✓ Associated injuries
- ✓ Mechanical stabilization
- ✓ Embolization
- ✓ **Packing**

# PACKING

- ✓ PRE-PERITONEAL
- ✓ DIRECT TRANS-PERITONEAL



# PACKING

- ✓ **PRE-PERITONEAL**
- ✓ DIRECT TRANS-PERITONEAL

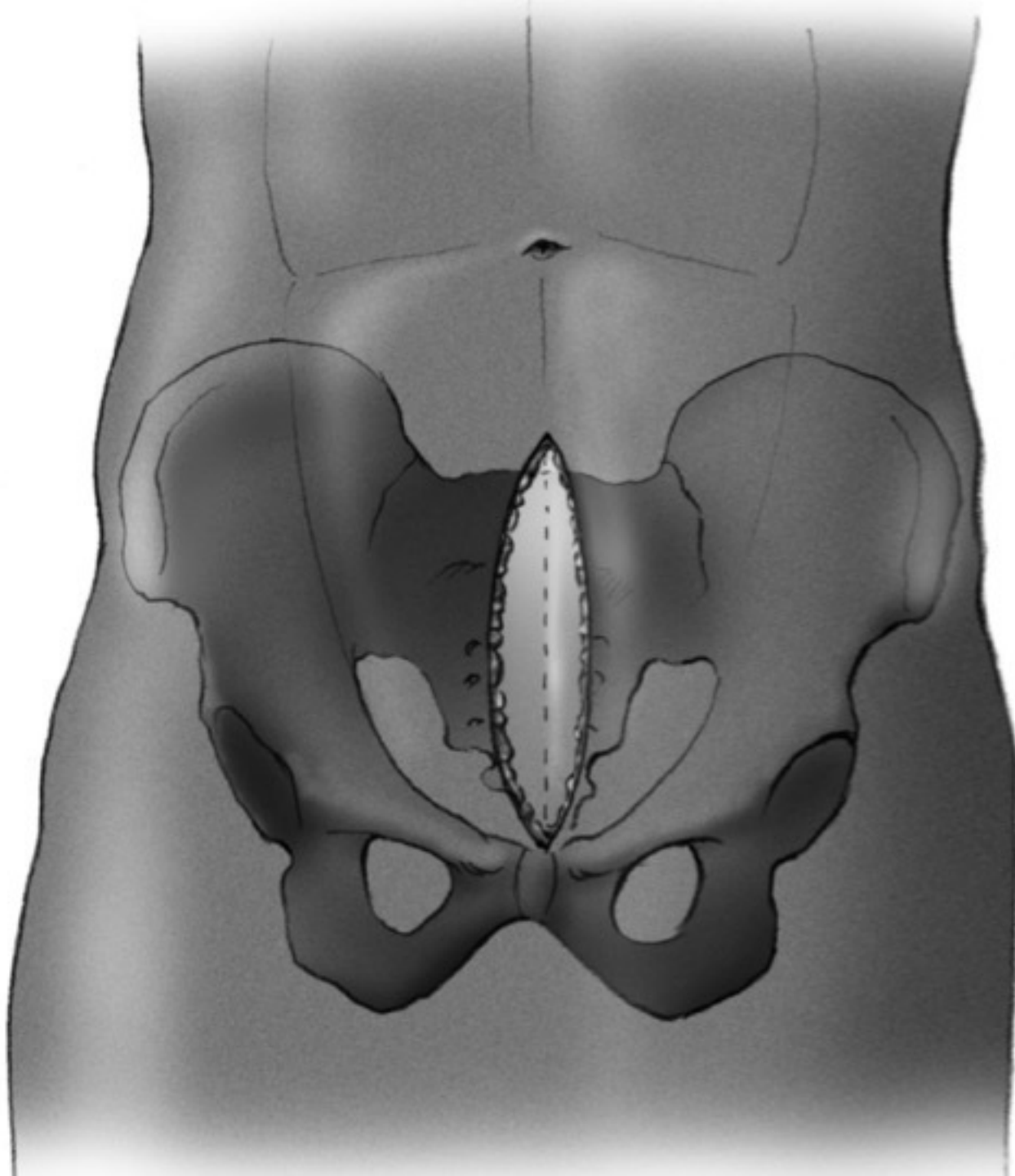


**2005**

# **Retroperitoneal Packing as a Resuscitation Technique for Hemodynamically Unstable Patients with Pelvic Fractures: Report of Two Representative Cases and a Description of Technique**

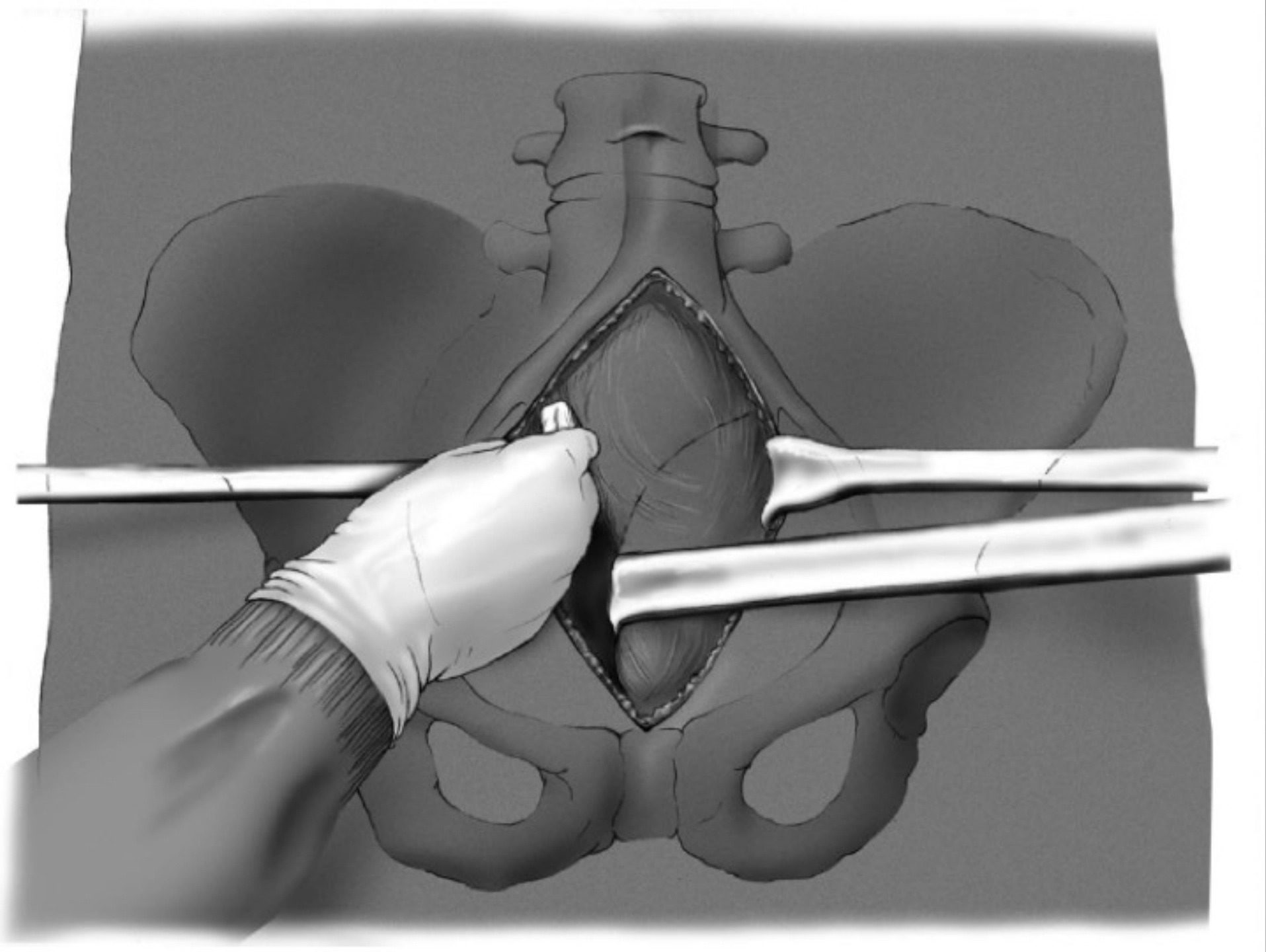
*Wade R. Smith, MD, Ernest E. Moore, MD, Patrick Osborn, MD, Juan F. Agudelo, MD, Steven J. Morgan, MD, Anand A. Parekh, MRCS(Eng), Clay Cothren, MD*

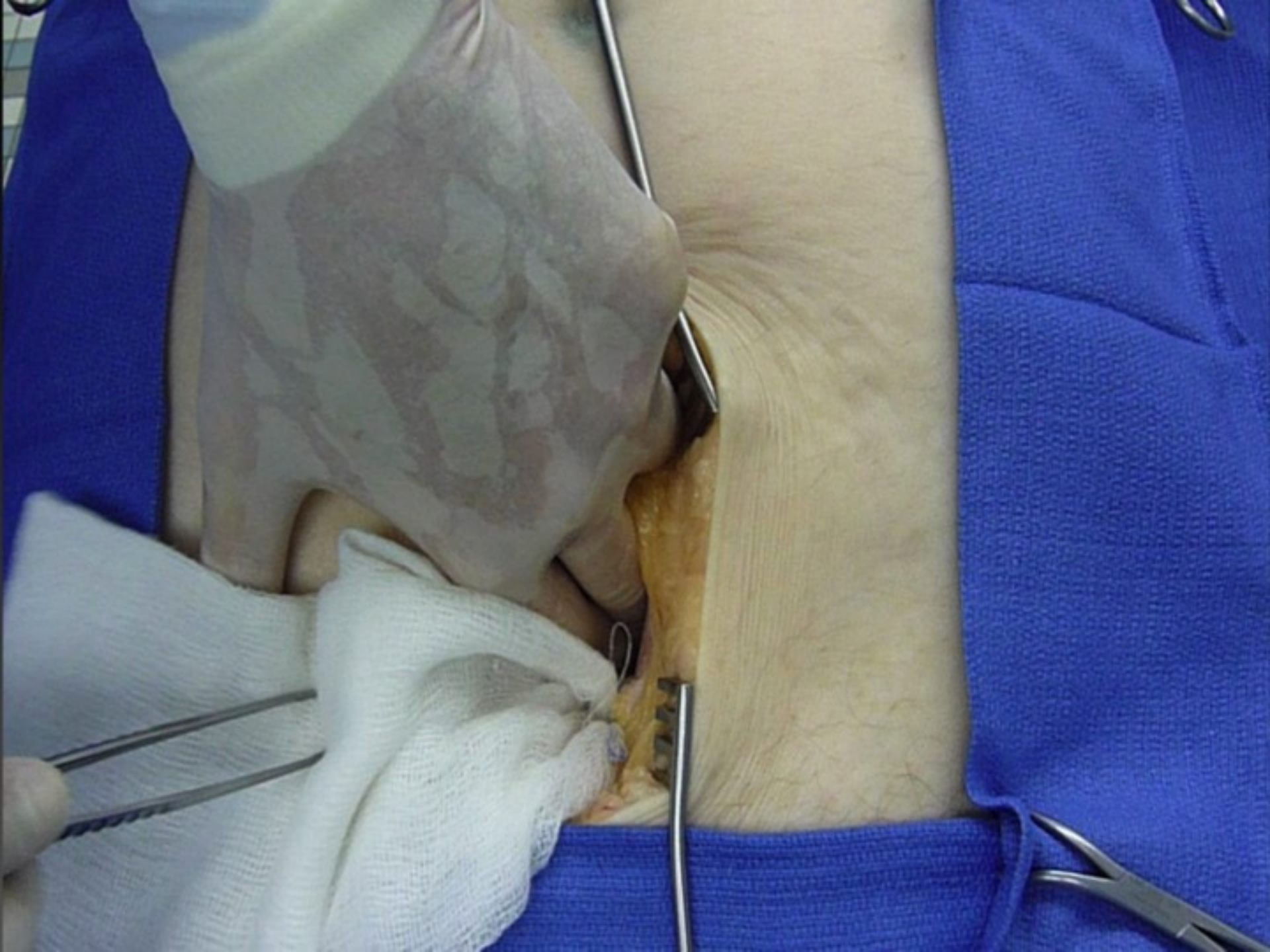
- ✓ **Technically straightforward**
- ✓ **Fast**
- ✓ **Basic equipment only**
- ✓ **Bridge to embolization**

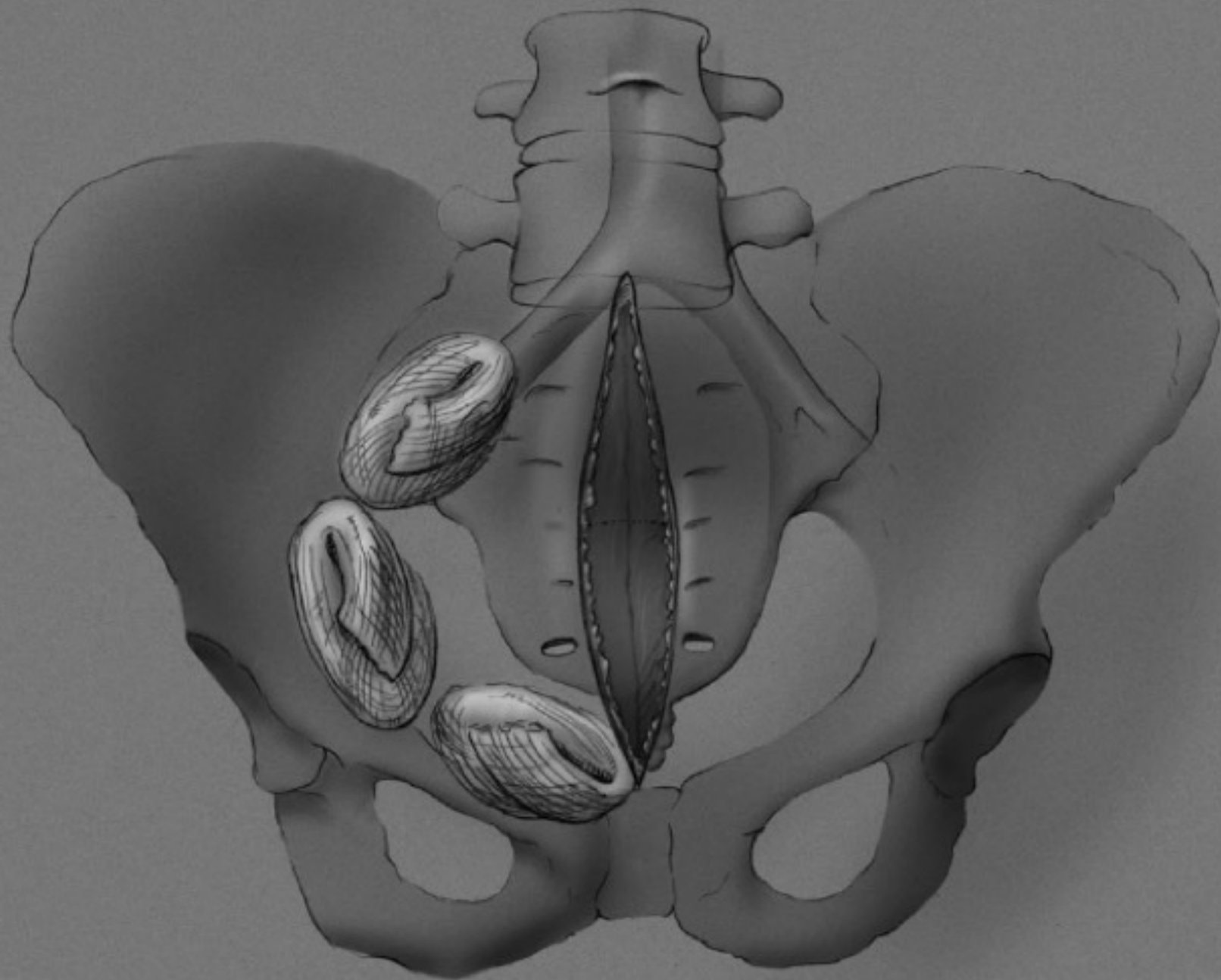








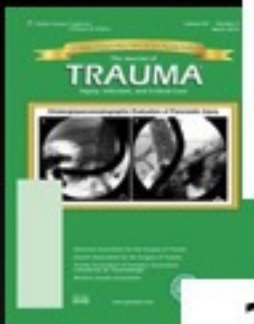








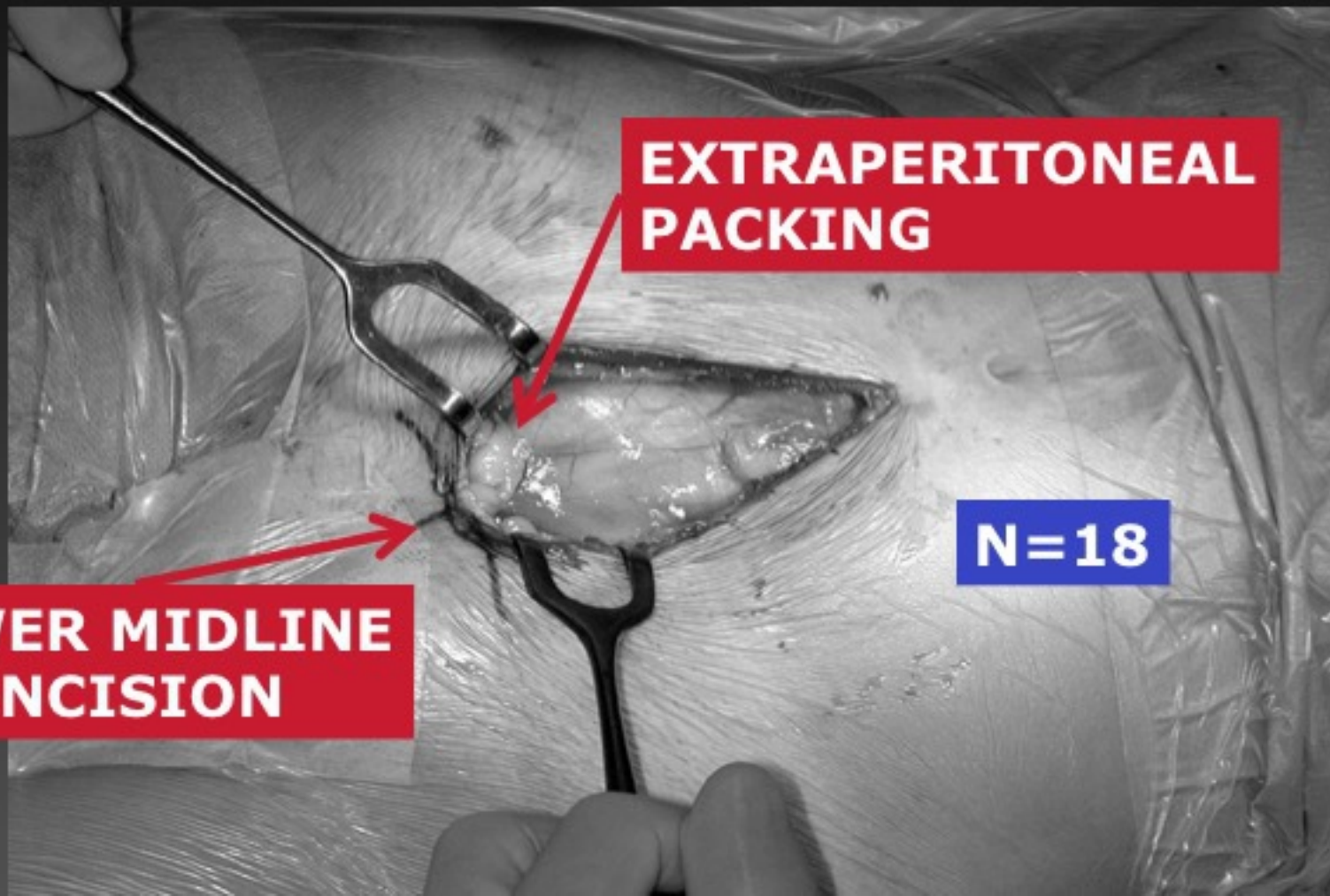




# Extraperitoneal Pelvic Packing: A Salvage Procedure to Control Massive Traumatic Pelvic Hemorrhage

Anna Tötterman, MD, Jan Erik Madsen, MD, PhD, Nils Oddvar Skaga, MD, and Olav Røise, MD, PhD

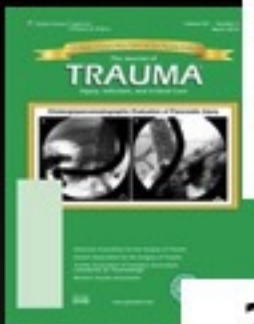
2007



**EXTRAPERITONEAL  
PACKING**

**N=18**

**LOWER MIDLINE  
INCISION**



# Extraperitoneal Pelvic Packing: A Salvage Procedure to Control Massive Traumatic Pelvic Hemorrhage

*Anna Tötterman, MD, Jan Erik Madsen, MD, PhD, Nils Oddvar Skaga, MD, and Olav Røise, MD, PhD*

**2007**

**✓ 80% had positive  
angiography post-packing**





# PACKING

✓ PRE-PERITONEAL

✓ **DIRECT TRANS-PERITONEAL**



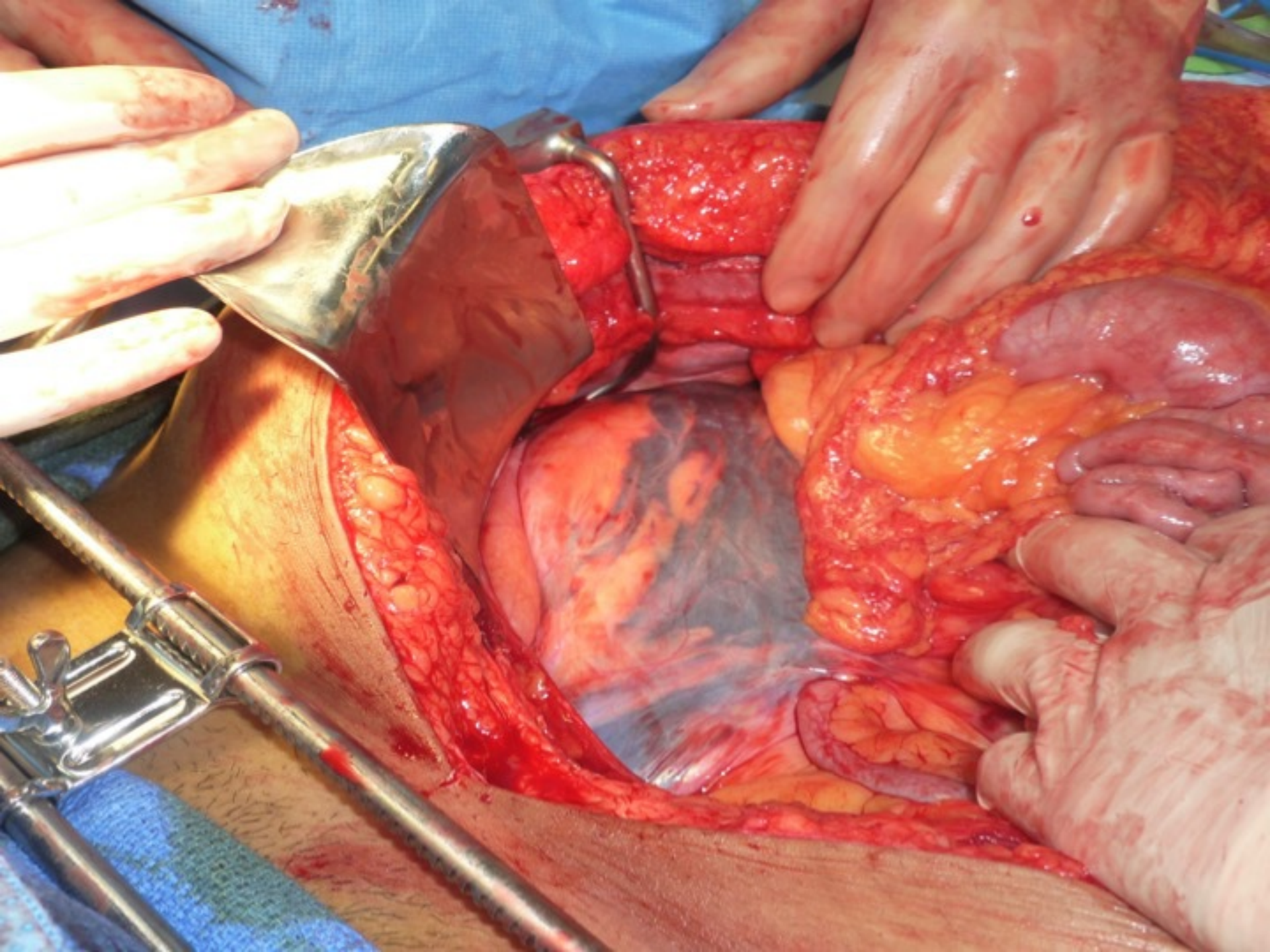


**2010**

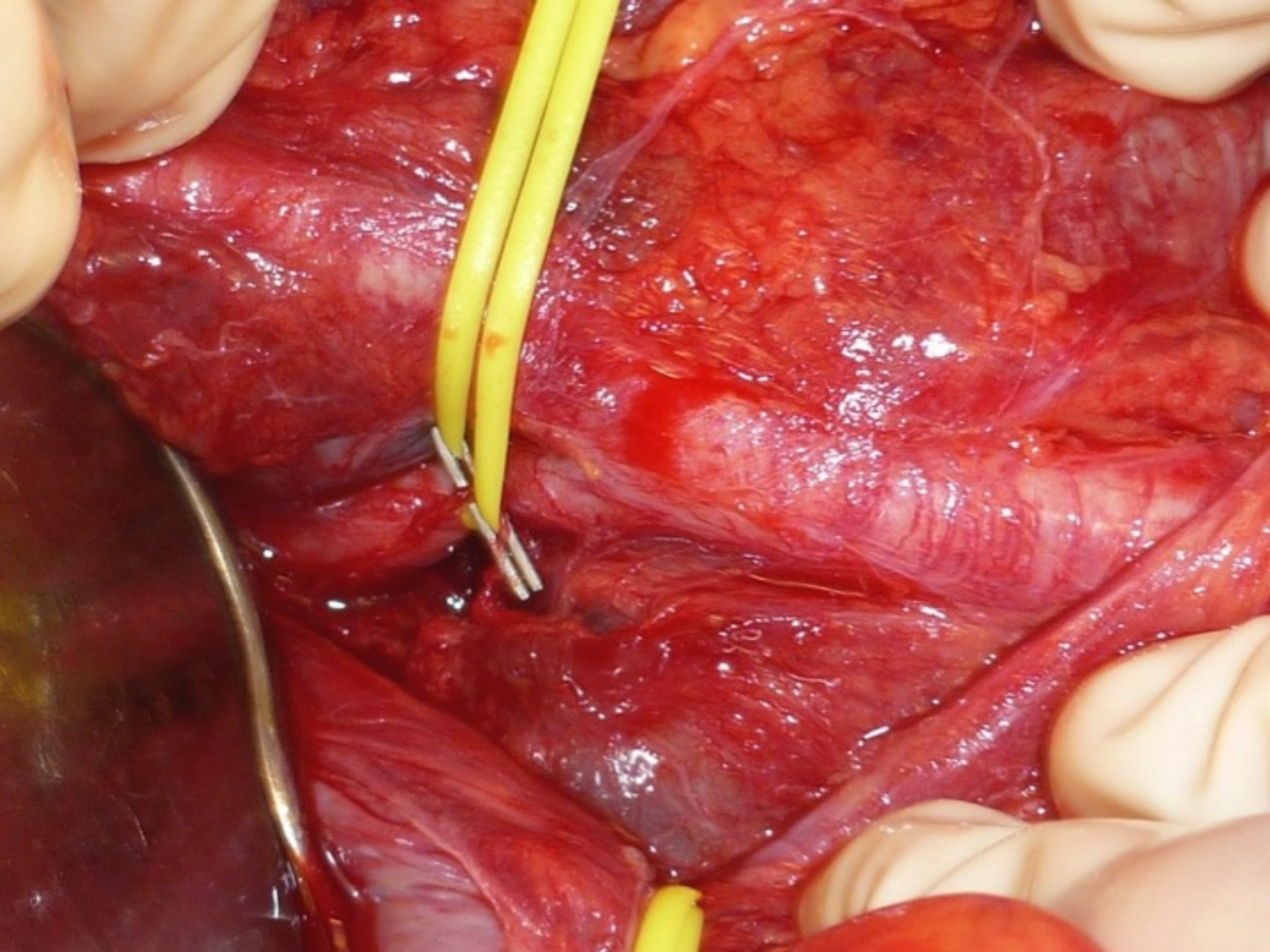
# Bilateral Internal Iliac Artery Ligation as a Damage Control Approach in Massive Retroperitoneal Bleeding After Pelvic Fracture

*Joseph DuBose, MD, Kenji Inaba, MD, Galinos Barmparas, MD, Pedro G. Teixeira, MD, Beat Schnüriger, MD, Peep Talving, MD, PhD, Ali Salim, MD, and Demetrios Demetriades, MD, PhD*

- ✓ **Laparotomy**
- ✓ **Control intra-abdominal sources of bleeding (1/3)**
- ✓ **Expose and ligate both IIAs**
- ✓ **Direct pelvic packing**
- ✓ **Damage control closure**







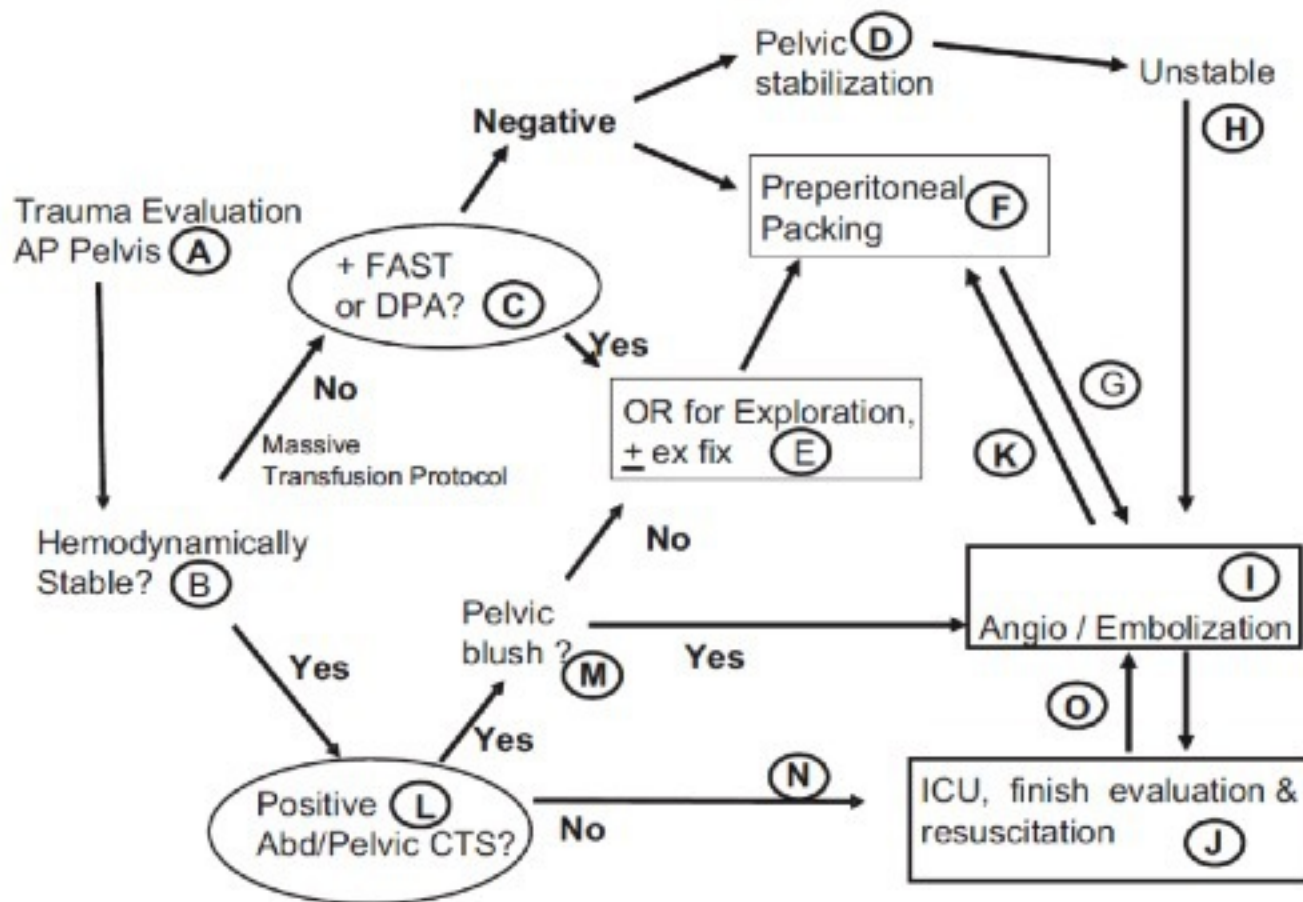
RIGHT



# Western Trauma Association Critical Decisions in Trauma: Management of Pelvic Fracture With Hemodynamic Instability

James W. Davis, MD, FACS, Frederick A. Moore, MD, FACS, Robert C. McIntyre, Jr., MD, FACS, Christine S. Cocanour, MD, FACS, Ernest E. Moore, MD, FACS, and Michael A. West, MD, FACS

2008



# UNSTABLE PELVIC FRACTURE

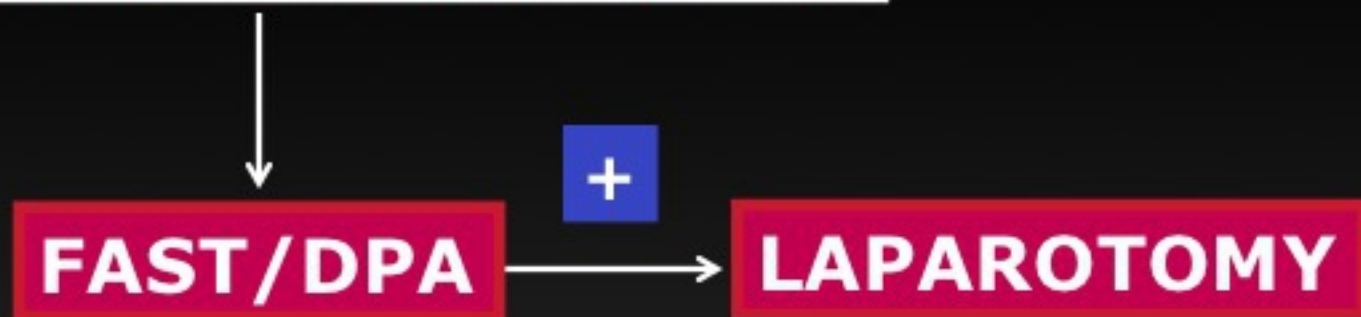


**UNSTABLE PELVIC FRACTURE**



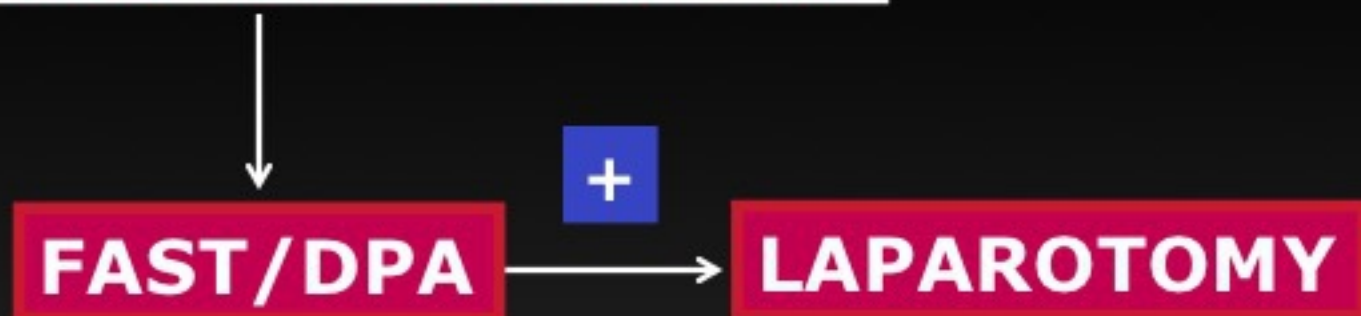
**FAST/DPA**

# UNSTABLE PELVIC FRACTURE



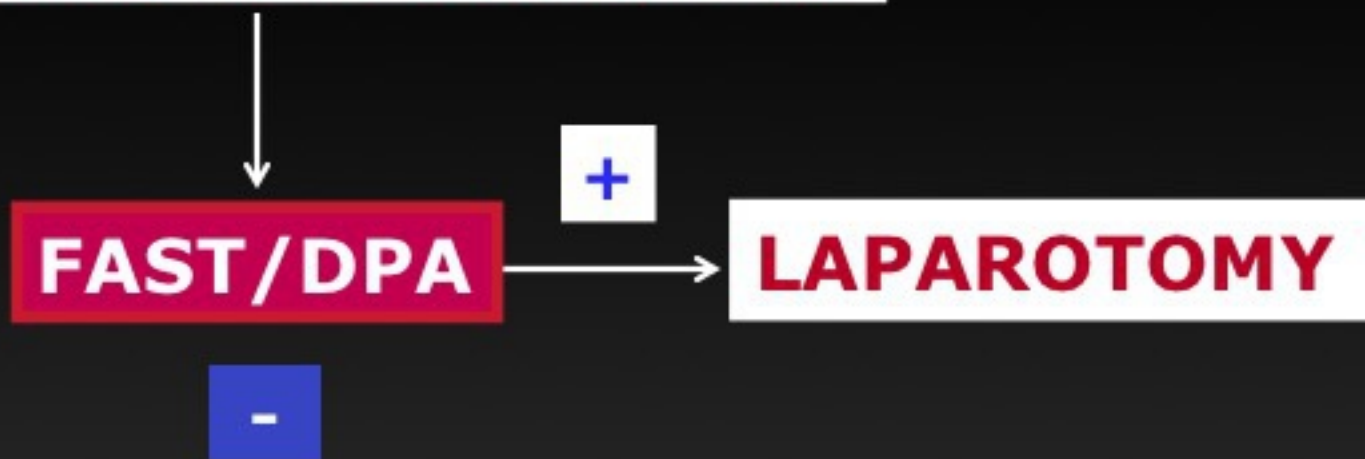


## UNSTABLE PELVIC FRACTURE

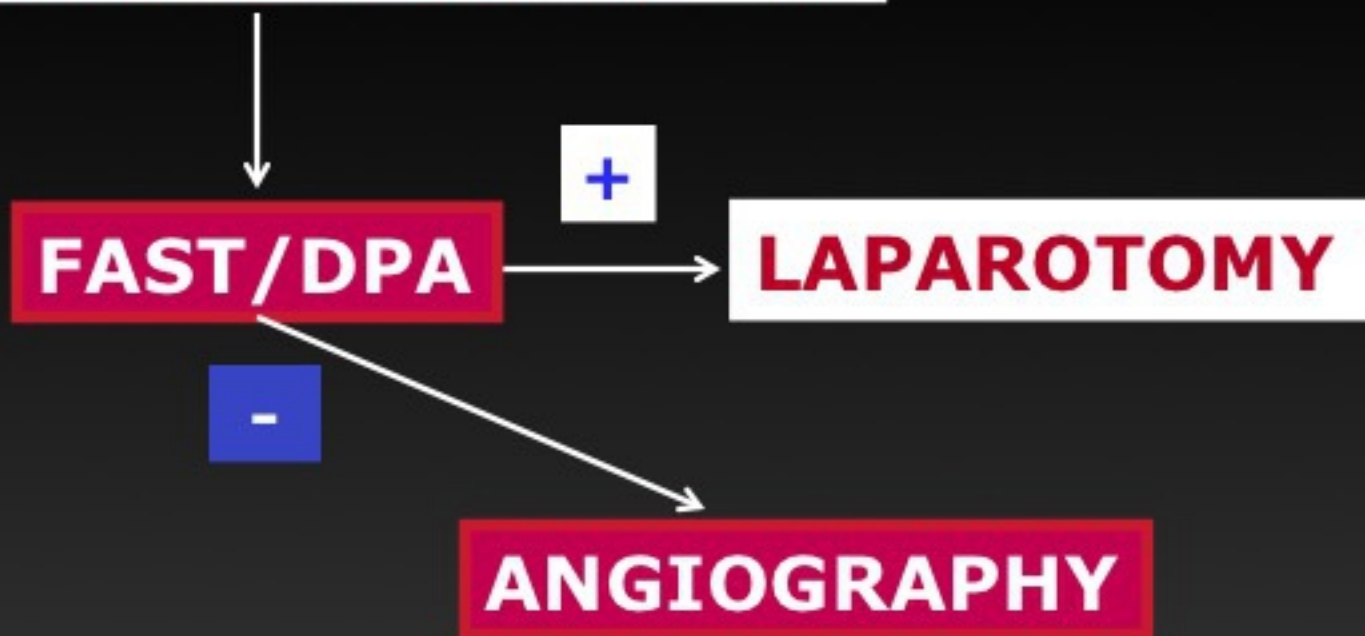


- ✓ 1/3 intra-abdominal injury
- ✓ +/- Direct packing and BIIA ligation
- ✓ +/- Pre-peritoneal with post-op angiography

**UNSTABLE PELVIC FRACTURE**



# UNSTABLE PELVIC FRACTURE



# UNSTABLE PELVIC FRACTURE

**FAST/DPA**

```
graph TD; A[UNSTABLE PELVIC FRACTURE] --> B[FAST/DPA]; B -- "+" --> C[LAPAROTOMY]; B -- "-" --> D[PACKING]; B -- "-" --> E[ANGIOGRAPHY];
```

The flowchart starts with 'UNSTABLE PELVIC FRACTURE' in a white box. An arrow points down to 'FAST/DPA' in a red box. From 'FAST/DPA', three arrows branch out: one to the right labeled with a blue '+' sign leading to 'LAPAROTOMY' in a white box; one down and to the left labeled with a blue '-' sign leading to 'PACKING' in a red box; and one down and to the right labeled with a blue '-' sign leading to 'ANGIOGRAPHY' in a white box.

+

**LAPAROTOMY**

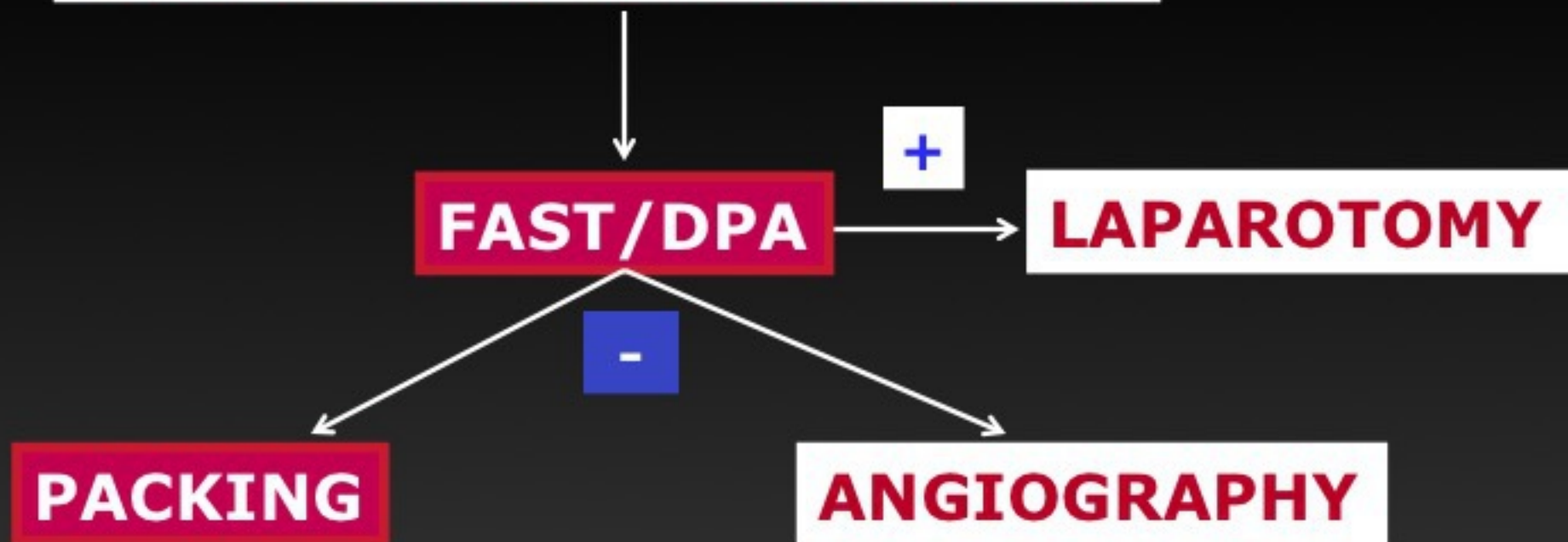
-

**PACKING**

**ANGIOGRAPHY**



# UNSTABLE PELVIC FRACTURE



- ✓ No Interventional Radiology
- ✓ Too unstable to go to IR

# UNSTABLE PELVIC FRACTURE

**FAST/DPA**

+

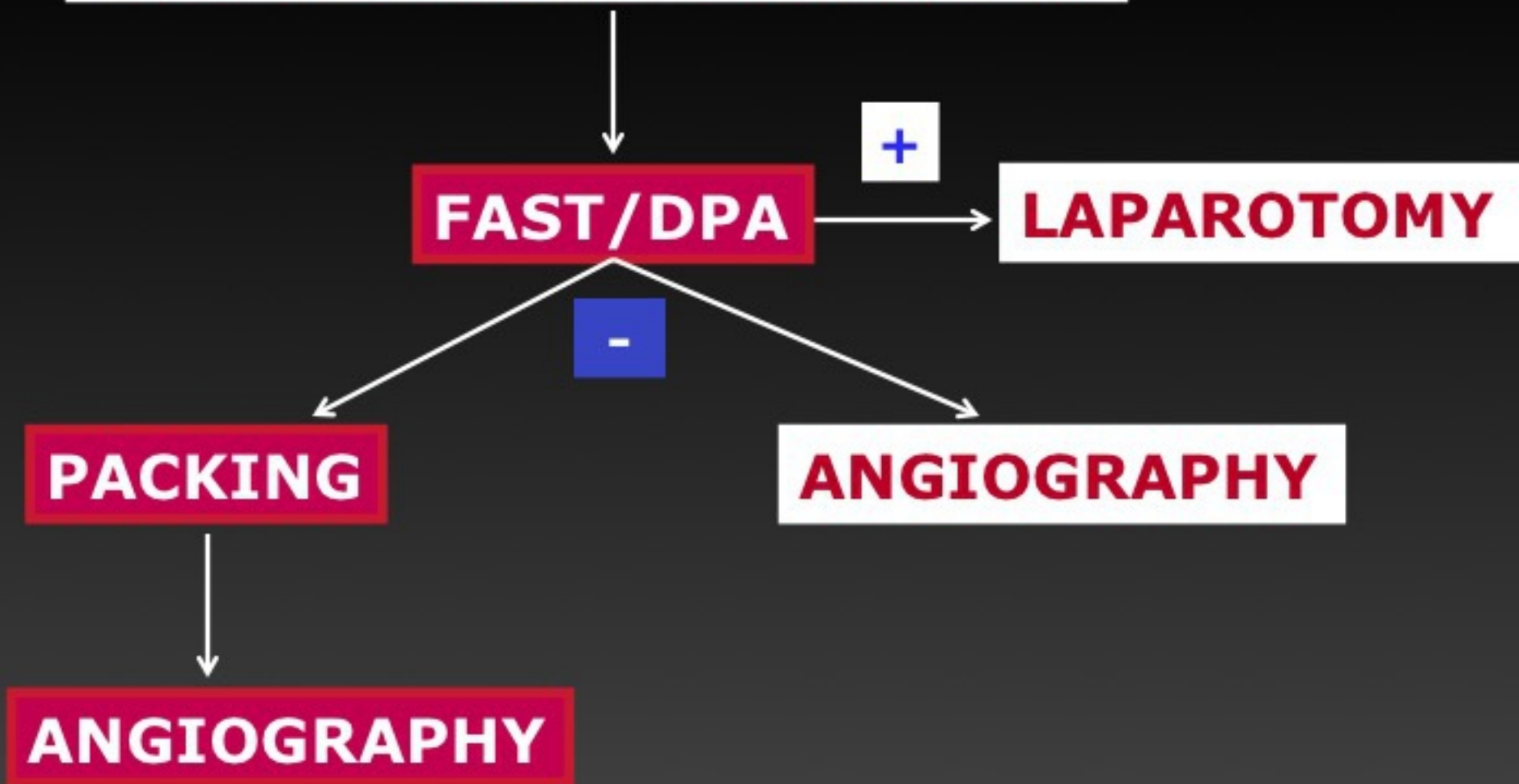
**LAPAROTOMY**

-

**PACKING**

**ANGIOGRAPHY**

**ANGIOGRAPHY**





# Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) as an Adjunct for Hemorrhagic Shock

*Adam Stannard, MRCS, Jonathan L. Eliason, MD, and Todd E. Rasmussen, MD*

2011

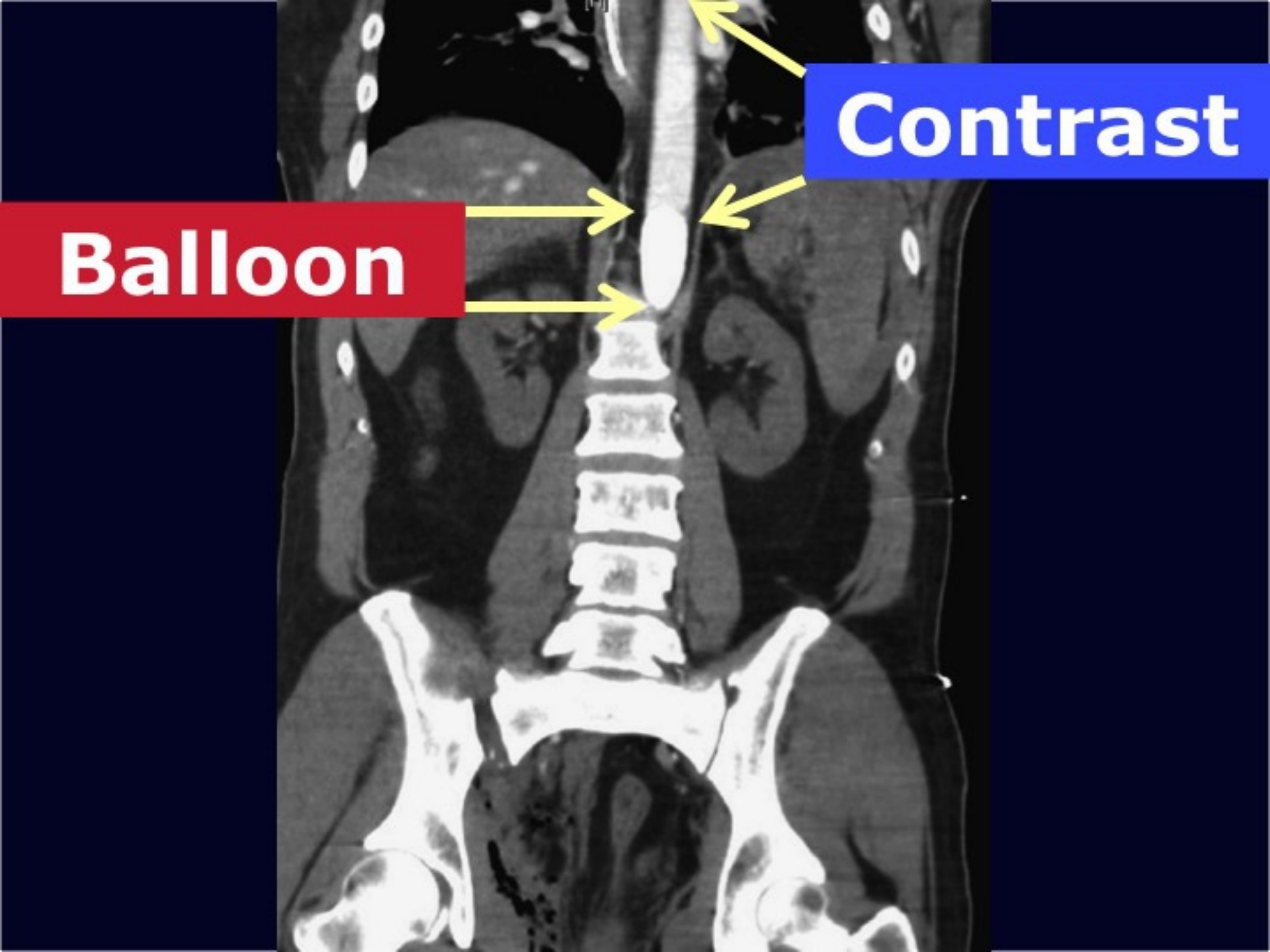


**Resuscitative Endovascular  
Balloon Occlusion of the Aorta**

**Balloon**







**Balloon**

**Contrast**

4866835  
1/20/1946  
68 YEAR  
F

CT/ER CAP WITH CONTRAST  
Body 3.0 Sagittal CE  
10/12/2014 7:01:34 PM  
R0585CP-1  
OMNIPAQUE  
LOC: -12.50  
THK: 3  
HFS

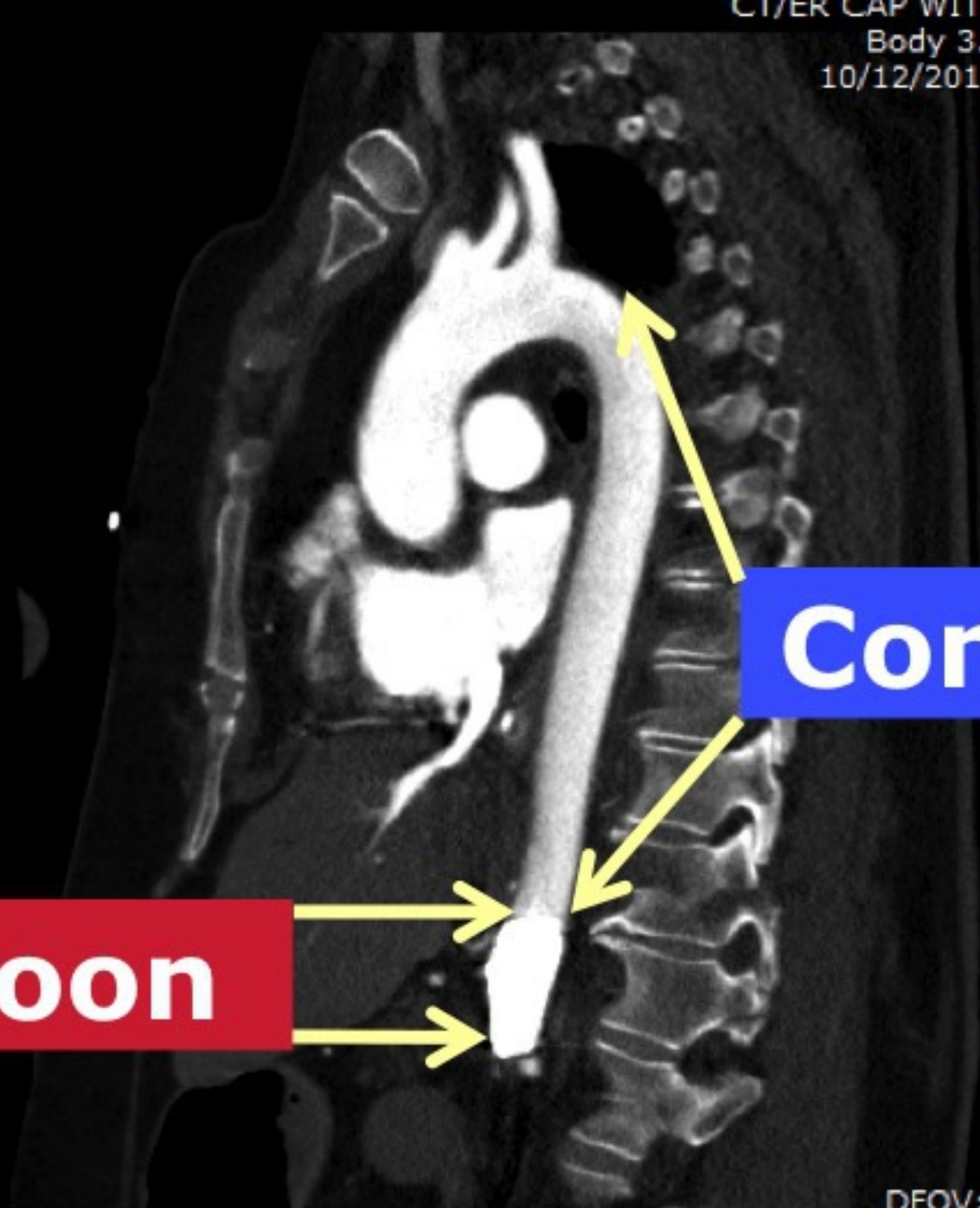
A

**Contrast**

**Balloon**

RD: 373.05  
Tilt: 0  
mA: 174  
KVp: 120  
Acq no: 3

Z: 1  
C: 317  
W: 931  
DFOV: 37.3x37.3cm  
Compressed 8:1



# UNSTABLE PELVIC FRACTURE

**FAST/DPA**

+

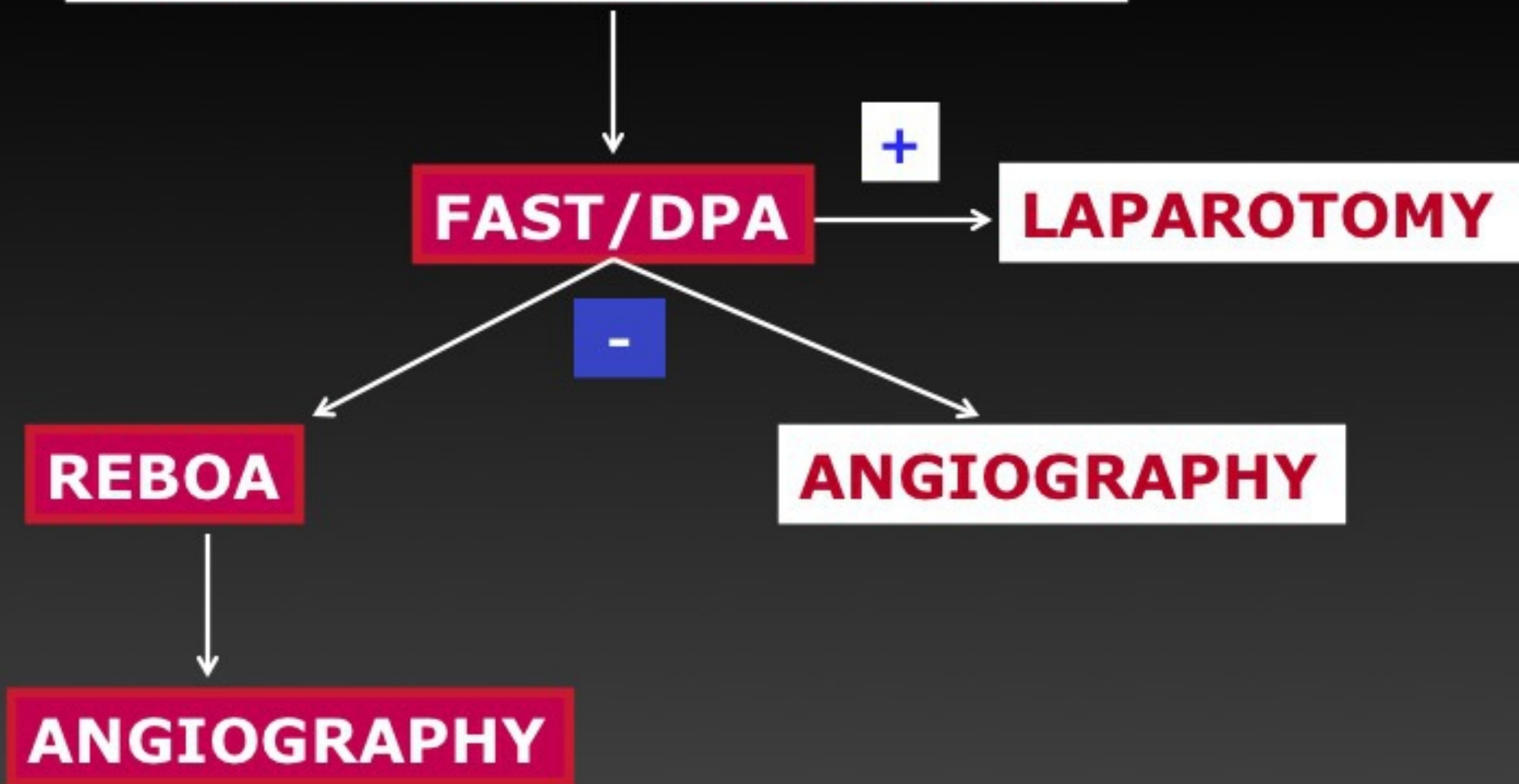
**LAPAROTOMY**

-

**REBOA**

**ANGIOGRAPHY**

**ANGIOGRAPHY**



## TAKE HOME

- ✓ Pelvic bleeding common cause of preventable mortality
- ✓ Primary packing is one option if severely hypotensive or no IR
- ✓ Pre or Direct Intra-Peritoneal
- ✓ If direct, pack and ligate BIIA
- ✓ If Pre, follow with Angiography
- ✓ REBOA may bridge to Angiography