LAC+USC TRAUMA

PELVIC PACKING

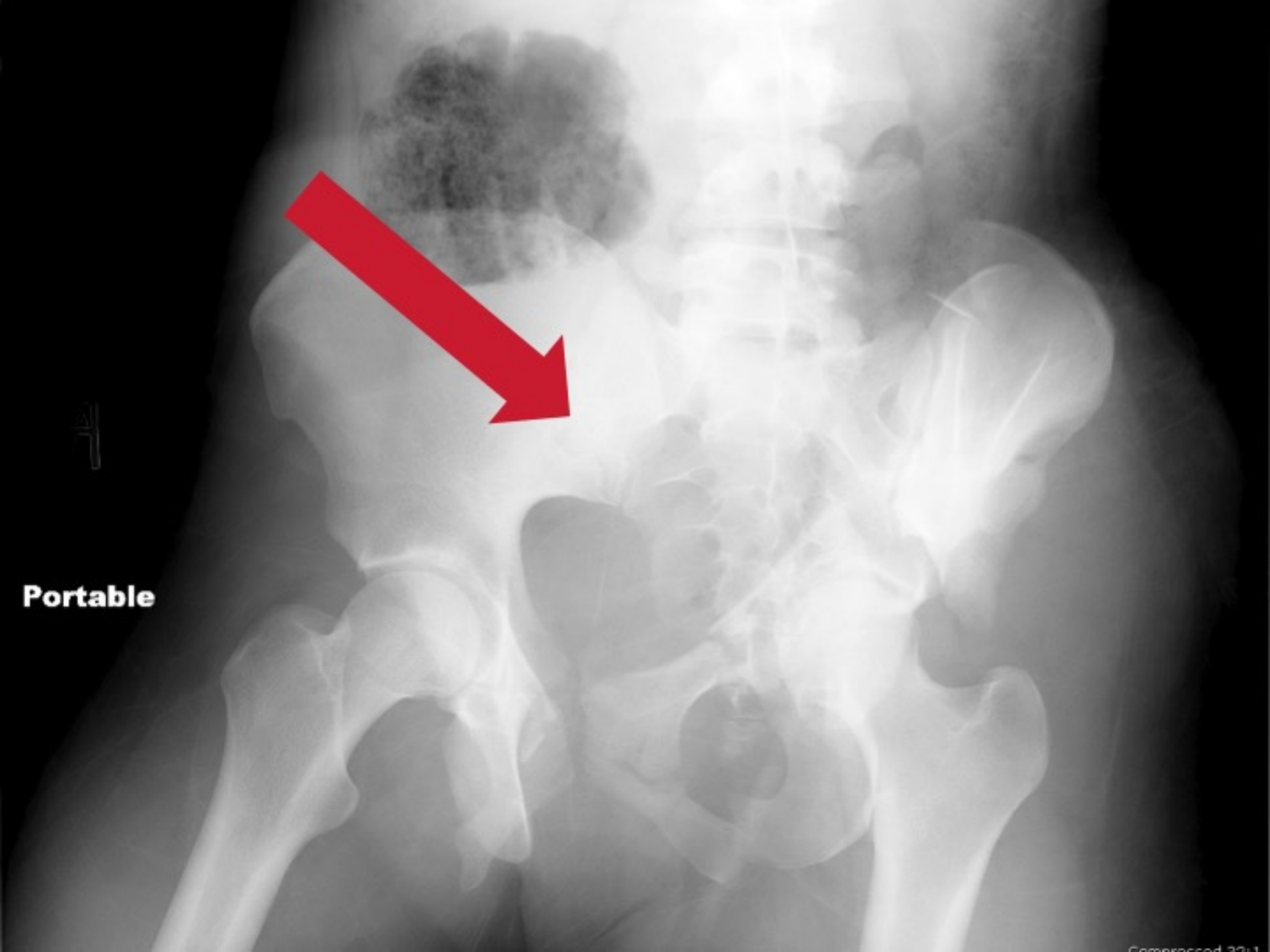
USC UNIVERSITY OF SOUTHERN CALIFORNIA

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

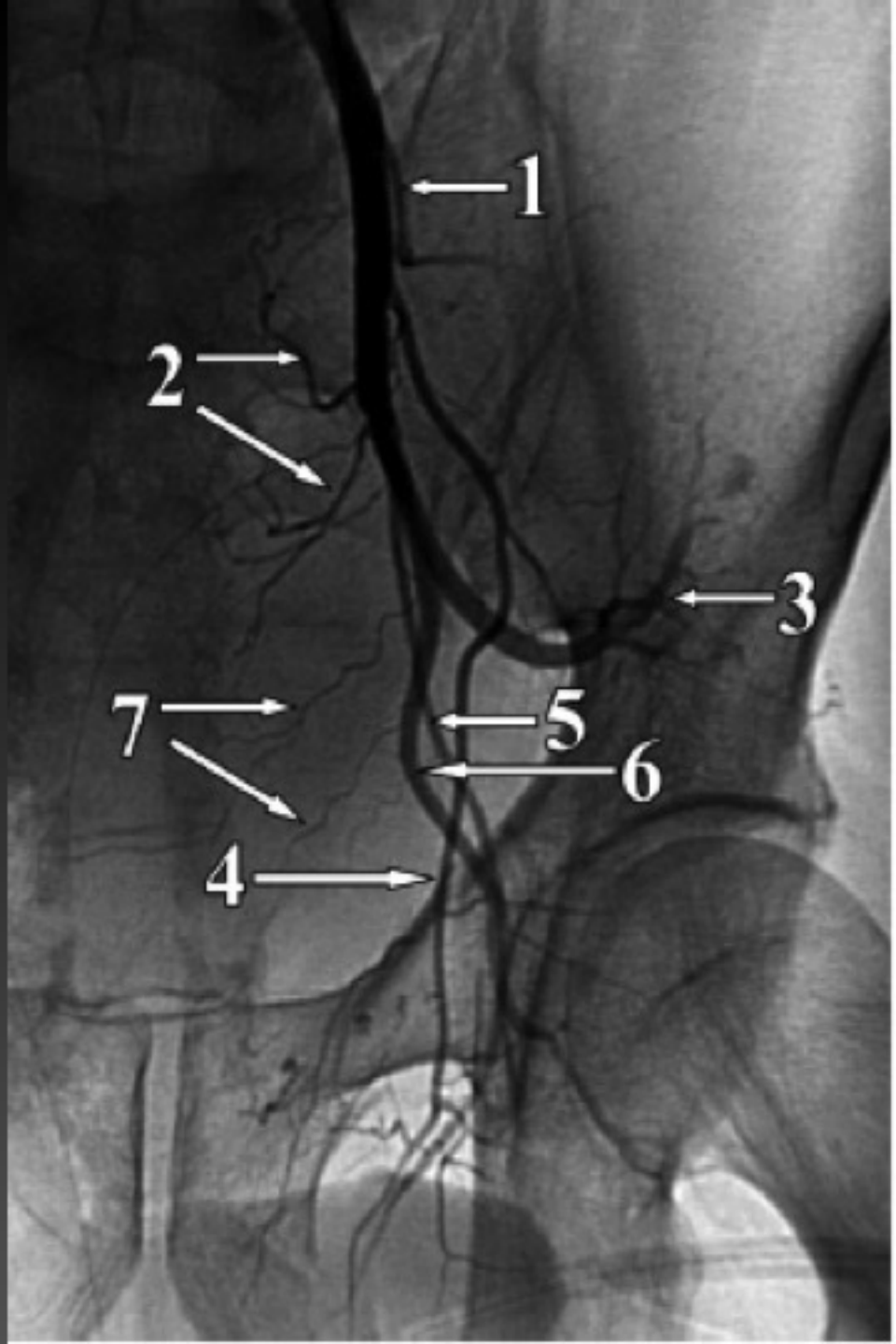
*Adam J. Starr, ‖Damian R. Griffin, *Charles M. Reinert, †William H. Frawley, *Joan Walker, *Shelley N. Whitlock, *Drake S. Borer, ‡Ashutosh V. Rao, and §Alan L. Jones

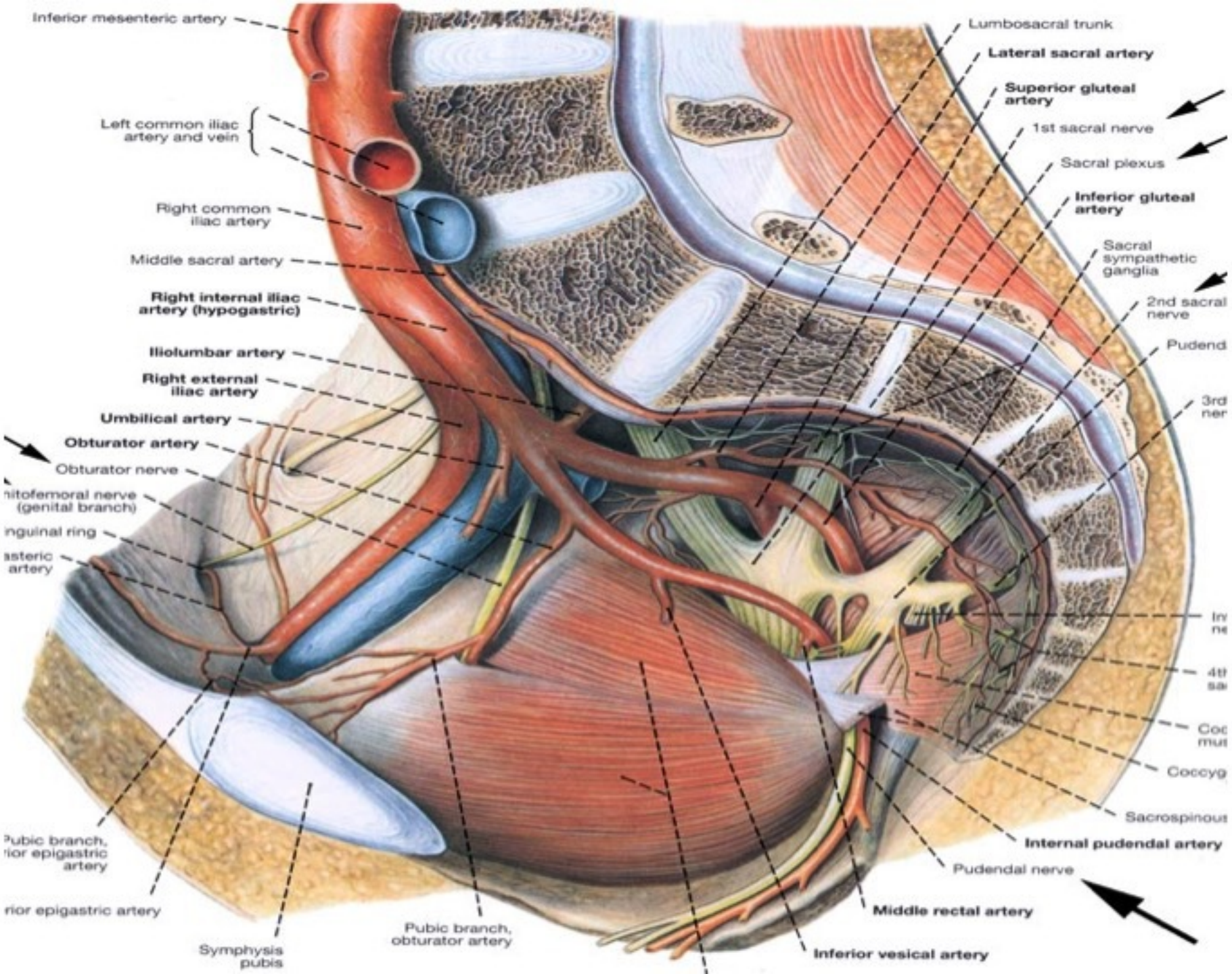
2002

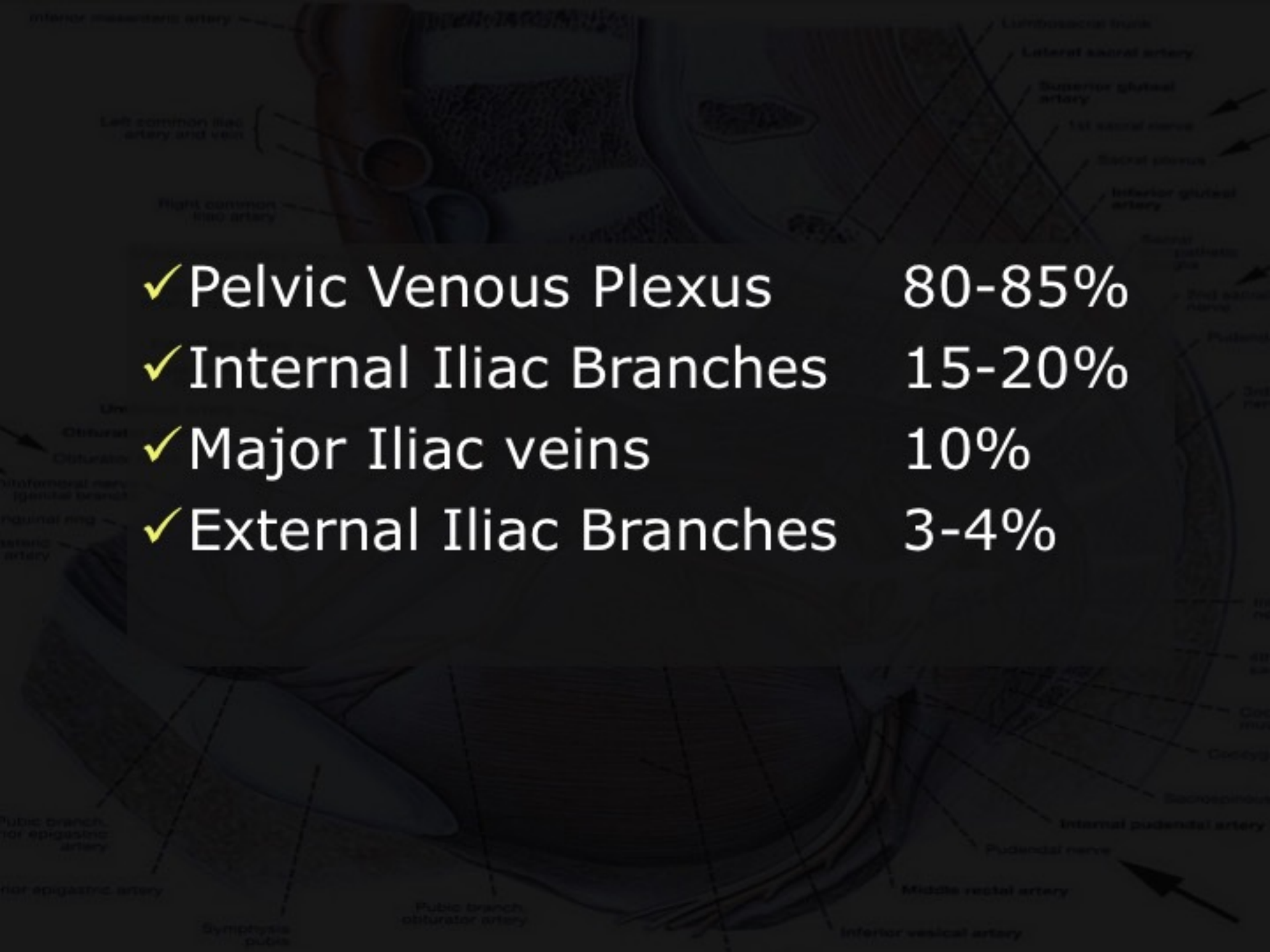
- ✓ **n=325 pelvic ring disruptions**
- ✓ **Shock strong independent predictor of mortality**
- ✓ **Pelvic fracture + hypotension mortality=57%**

Iliac Branches

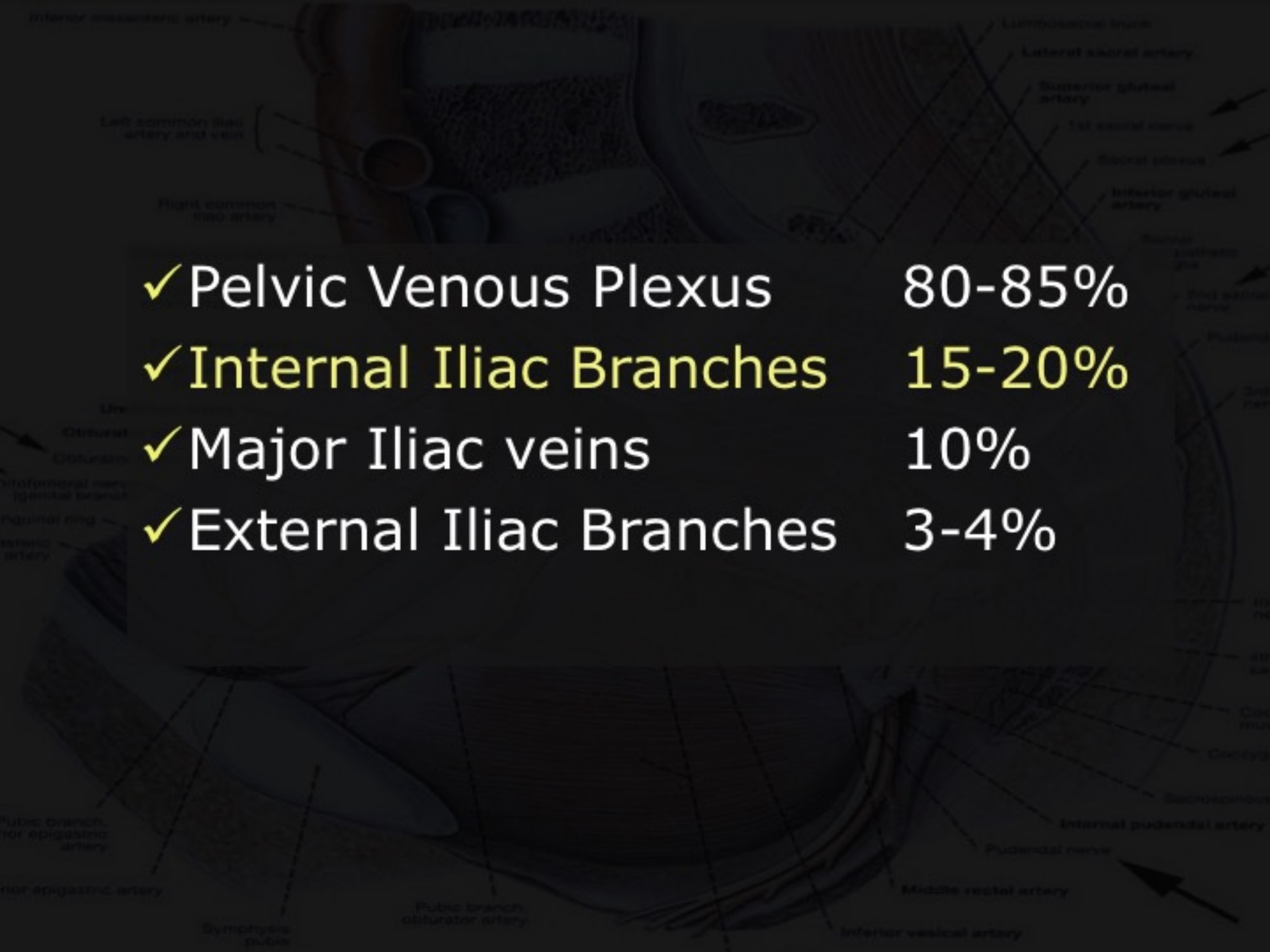
1. Iliolumbar a.
2. Lateral Sacral a.
3. Superior Gluteal a.
4. Obturator a.
5. Internal Pudendal a.
6. Inferior Gluteal a.
7. Vesicular a.



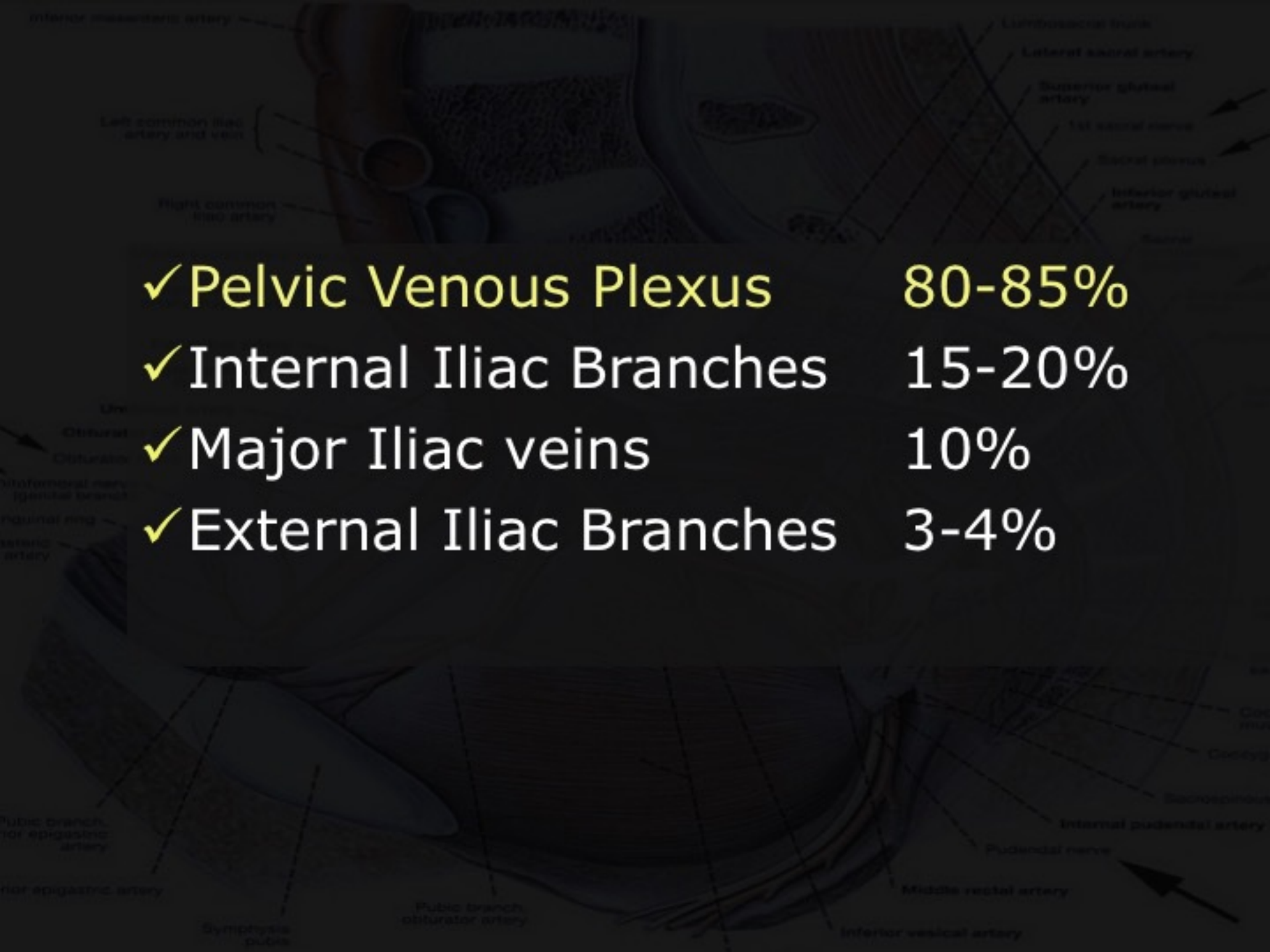

Inferior mesenteric artery
Left common iliac artery and vein
Right common iliac artery
Middle sacral artery
Right internal iliac artery (hypogastric)
Iliolumbar artery
Right external iliac artery
Umbilical artery
Obturator artery
Obturator nerve
nitofemoral nerve (genital branch)
nguinal ring
steric artery
Pubic branch, ior epigastric artery
rior epigastric artery
Symphysis pubis
Pubic branch, obturator artery
Lumbosacral trunk
Lateral sacral artery
Superior gluteal artery
1st sacral nerve
Sacral plexus
Inferior gluteal artery
Sacral sympathetic ganglia
2nd sacral nerve
Pudend
3rd ner
Coccyg
Sacrospinous
Internal pudendal artery
Pudendal nerve
Middle rectal artery
Inferior vesical artery



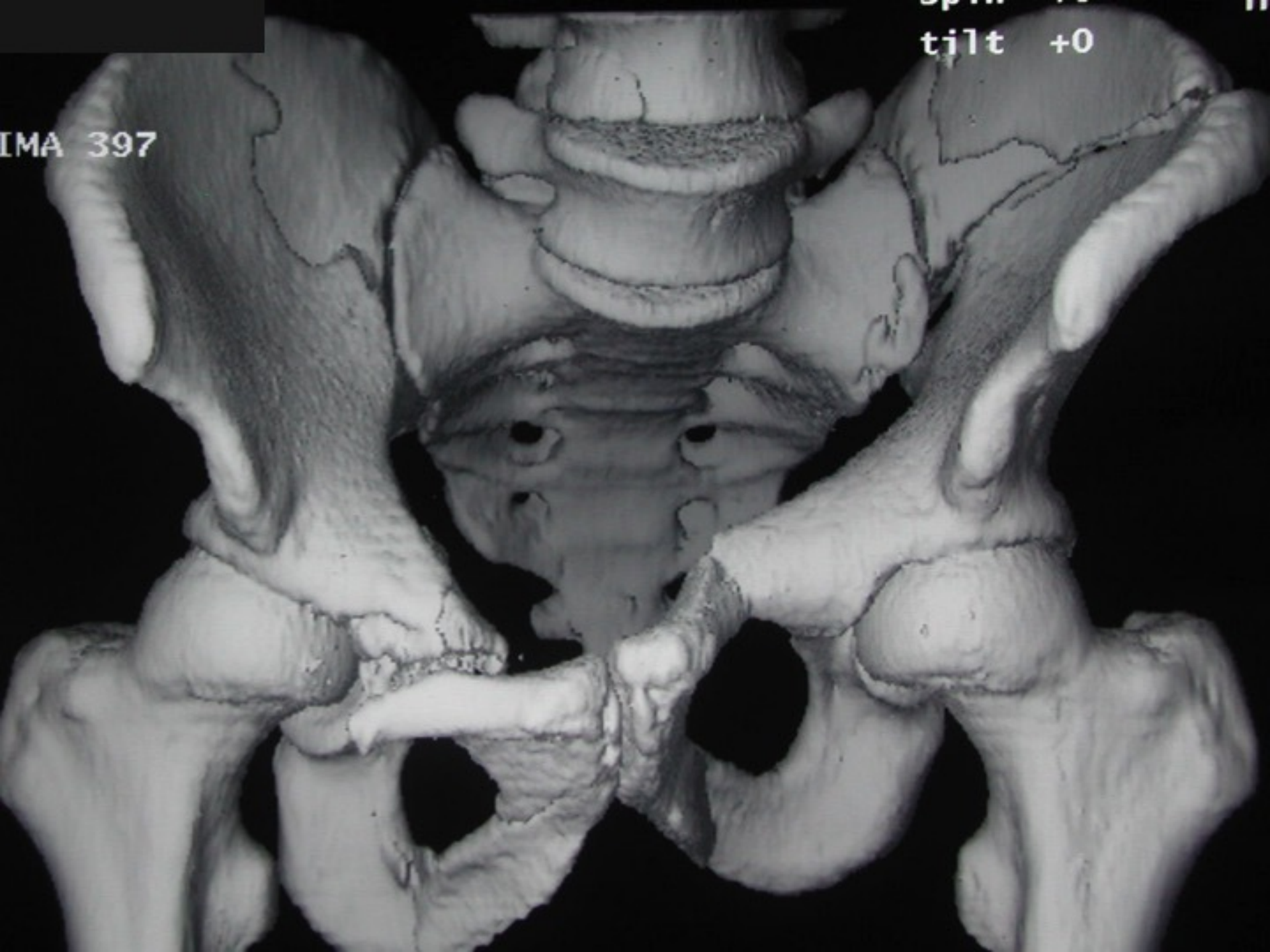
- ✓ Pelvic Venous Plexus 80-85%
- ✓ Internal Iliac Branches 15-20%
- ✓ Major Iliac veins 10%
- ✓ External Iliac Branches 3-4%



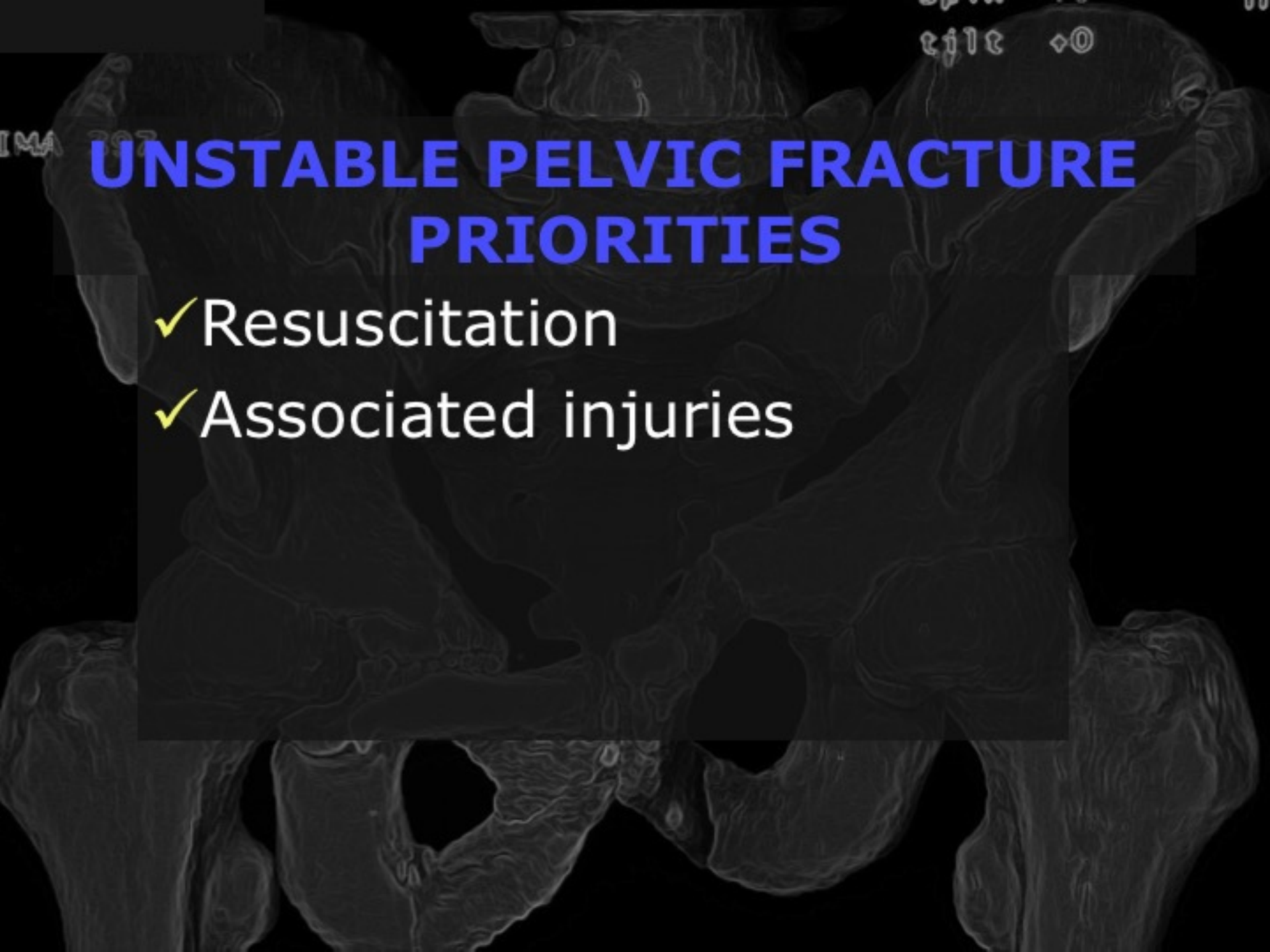
- ✓ Pelvic Venous Plexus 80-85%
- ✓ Internal Iliac Branches 15-20%
- ✓ Major Iliac veins 10%
- ✓ External Iliac Branches 3-4%



✓ Pelvic Venous Plexus	80-85%
✓ Internal Iliac Branches	15-20%
✓ Major Iliac veins	10%
✓ External Iliac Branches	3-4%

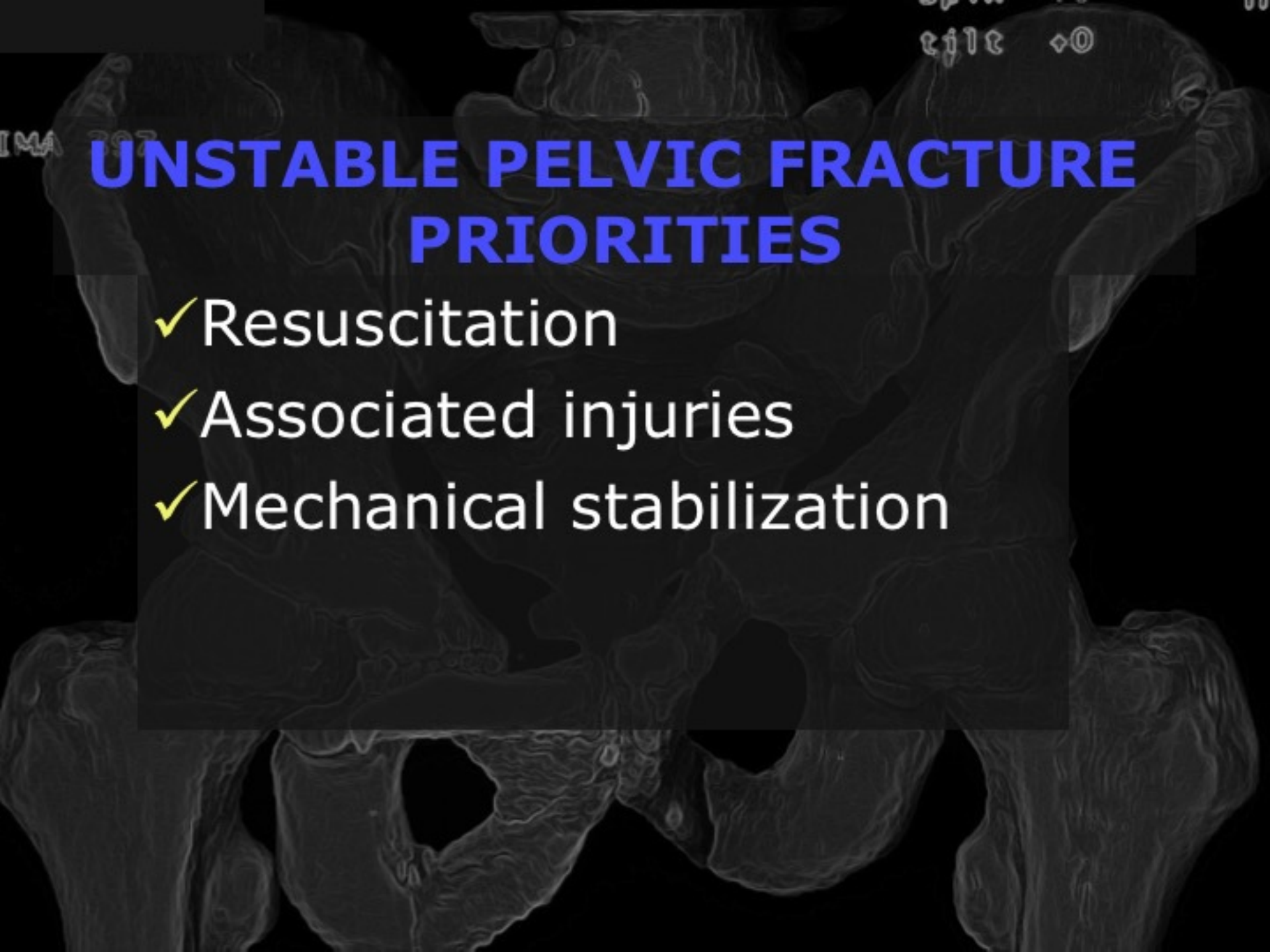

tilt +0
IMA 397


UNSTABLE PELVIC FRACTURE
PRIORITIES



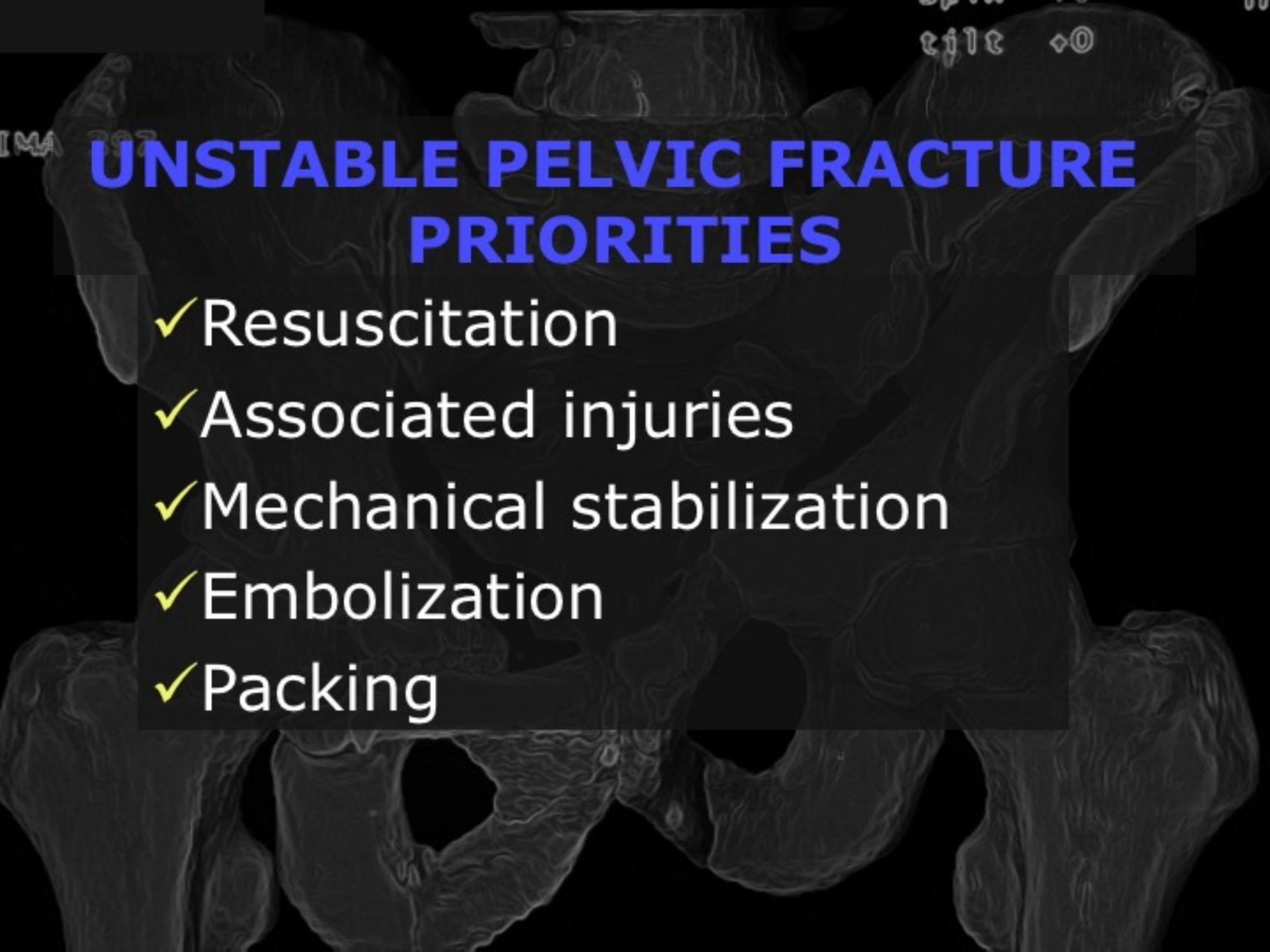
UNSTABLE PELVIC FRACTURE PRIORITIES

- ✓Resuscitation
- ✓Associated injuries



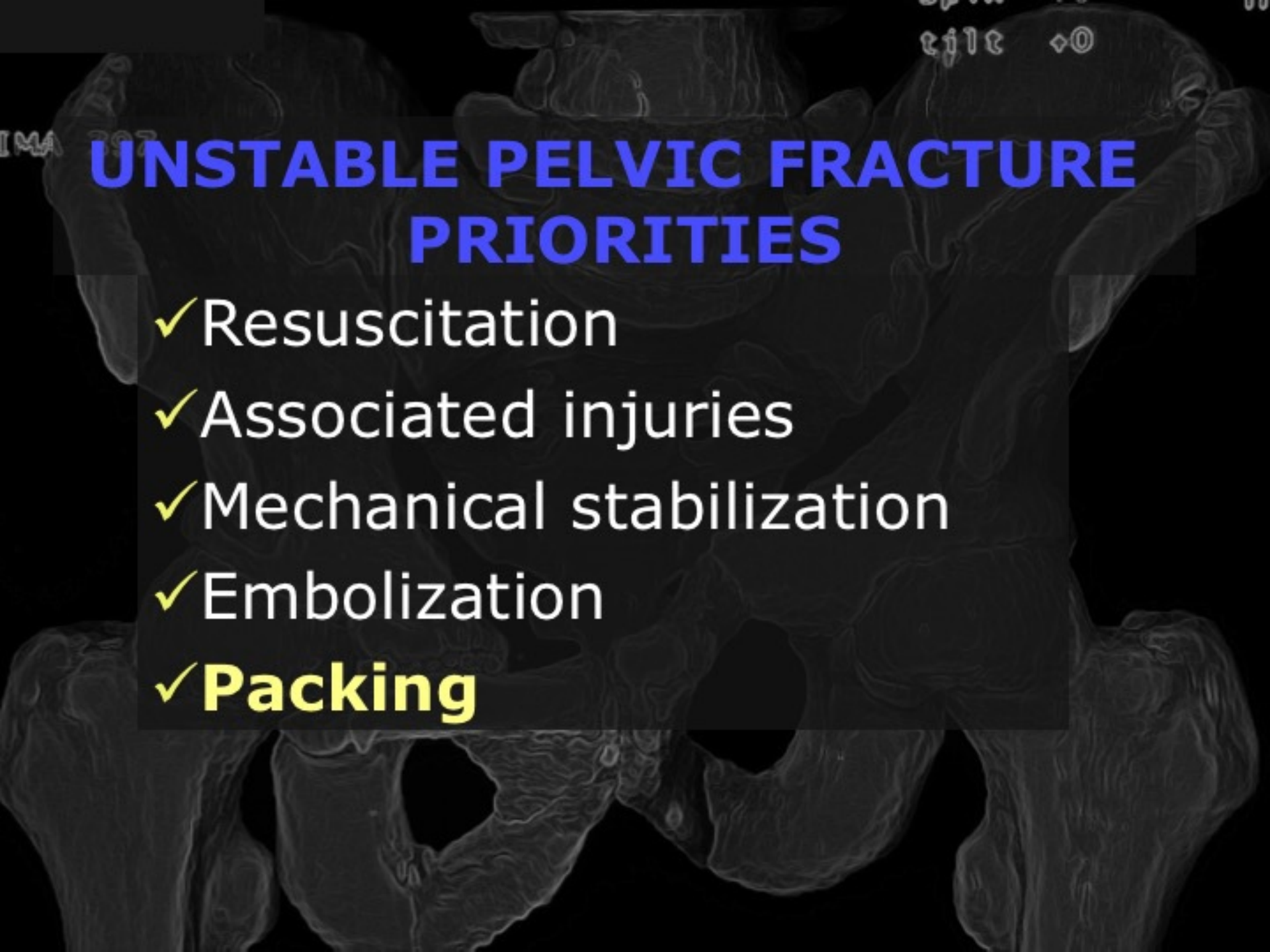
UNSTABLE PELVIC FRACTURE PRIORITIES

- ✓Resuscitation
- ✓Associated injuries
- ✓Mechanical stabilization



UNSTABLE PELVIC FRACTURE PRIORITIES

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

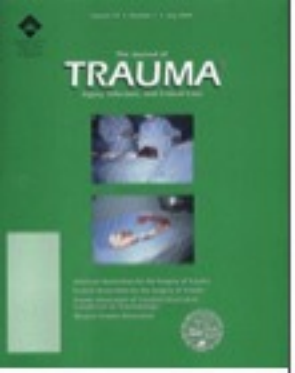

UNSTABLE PELVIC FRACTURE PRIORITIES
✓Resuscitation
✓Associated injuries
✓Mechanical stabilization
✓Embolization
✓Packing

PACKING

- ✓ PRE-PERITONEAL
- ✓ DIRECT TRANS-PERITONEAL

PACKING

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

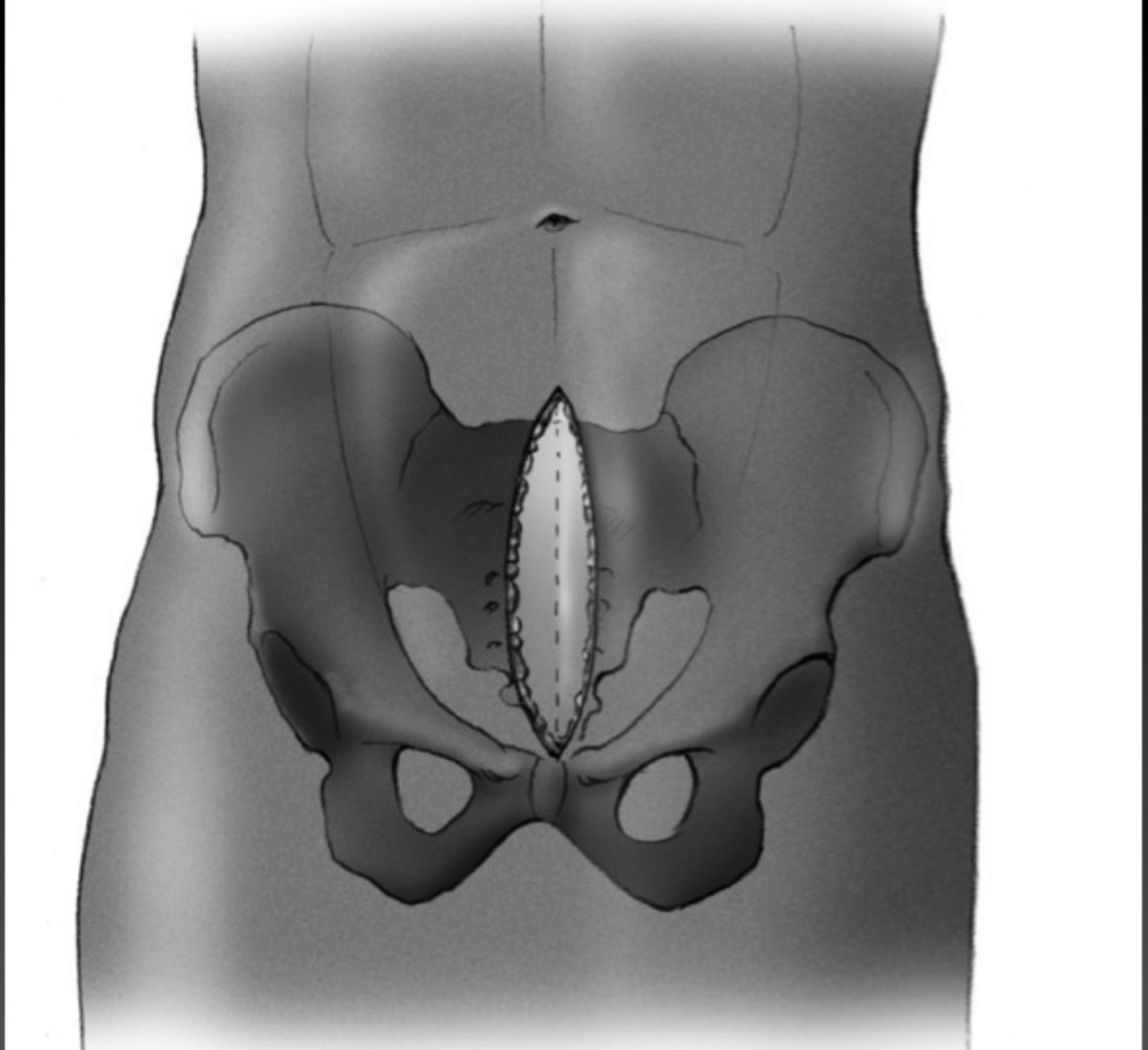


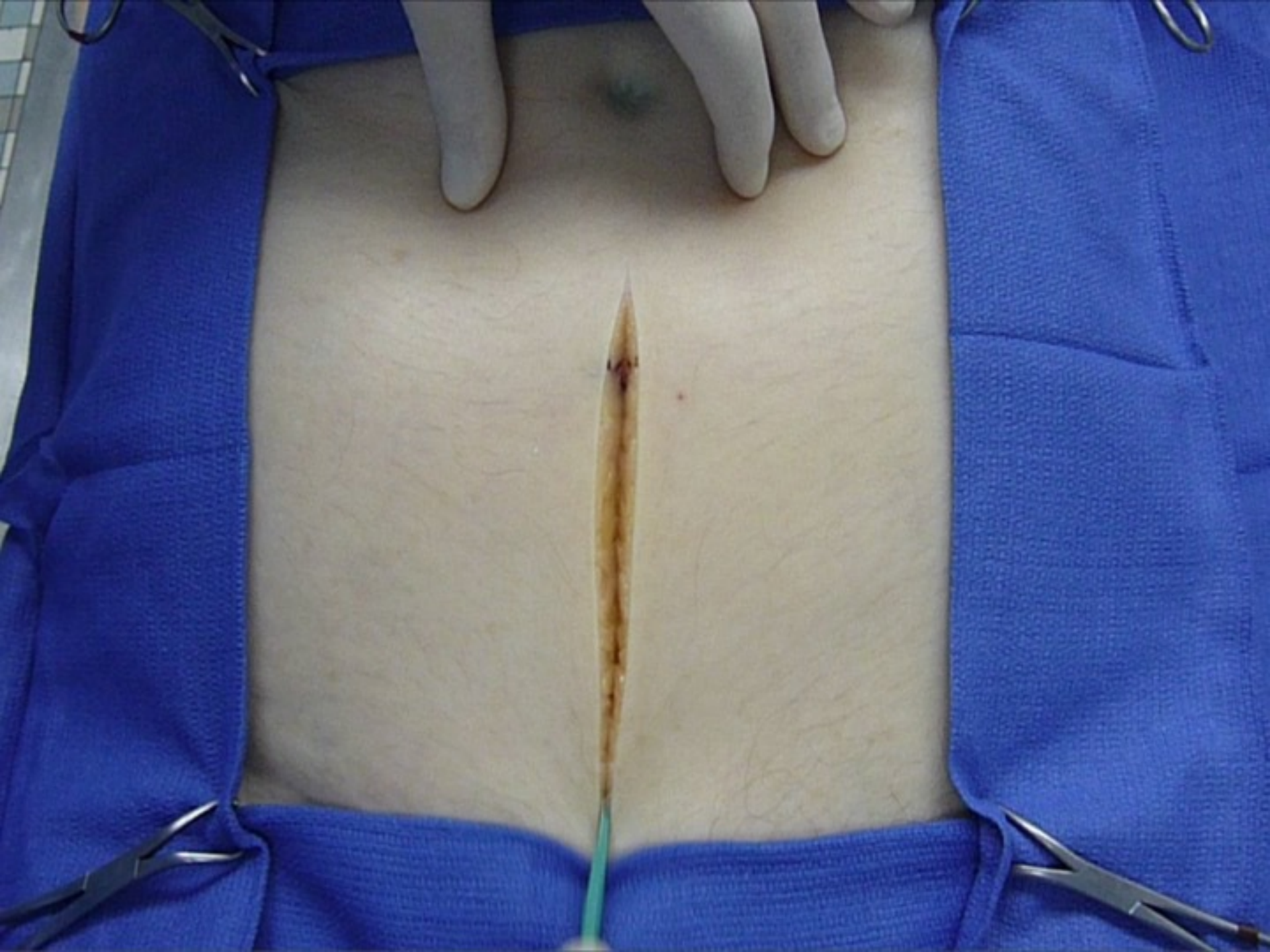
2005

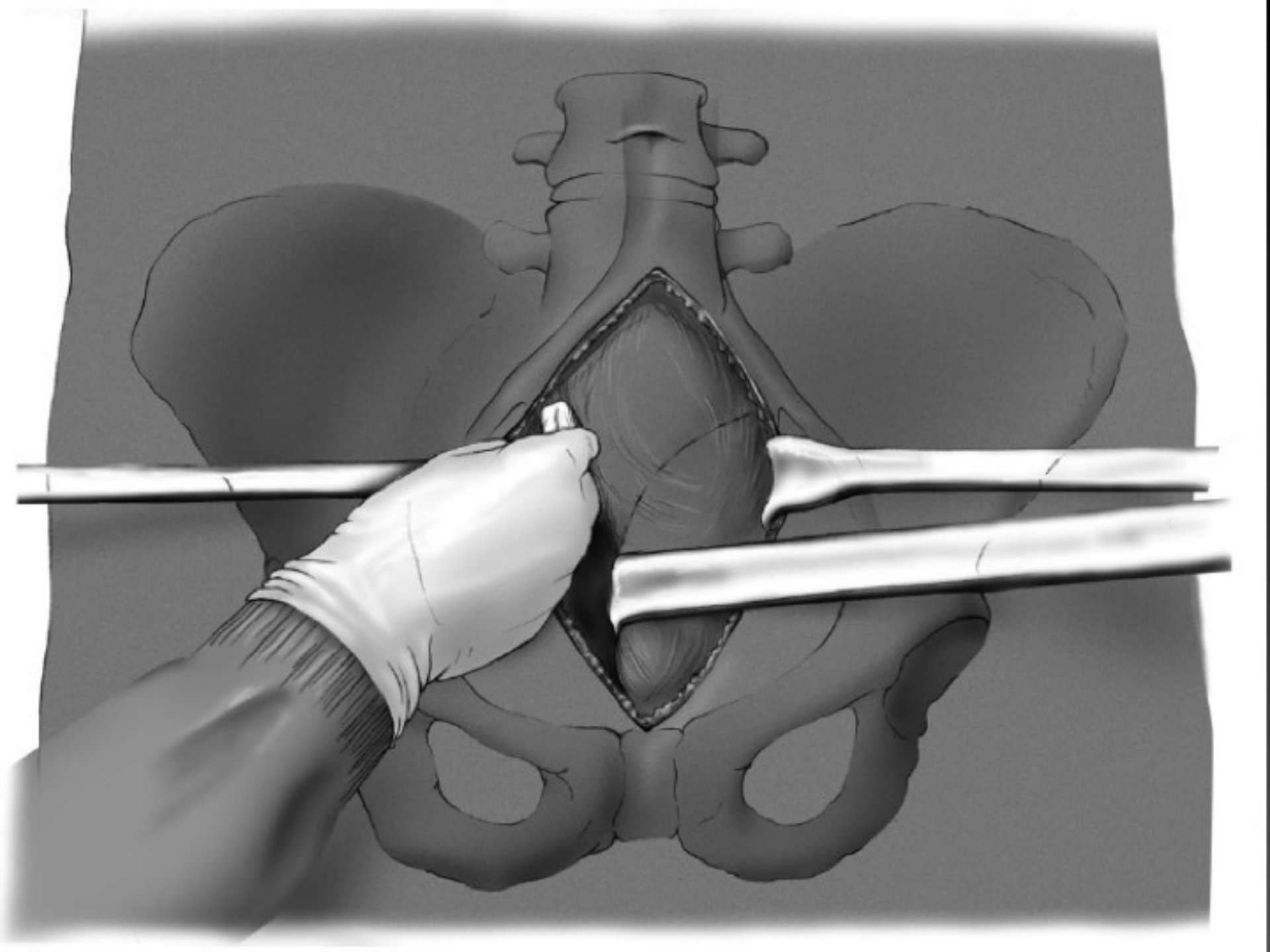
Retroperitoneal Packing as a Resuscitation Technique for Hemodynamically Unstable Patients with Pelvic Fractures: Report of Two Representative Cases and a Description of Technique

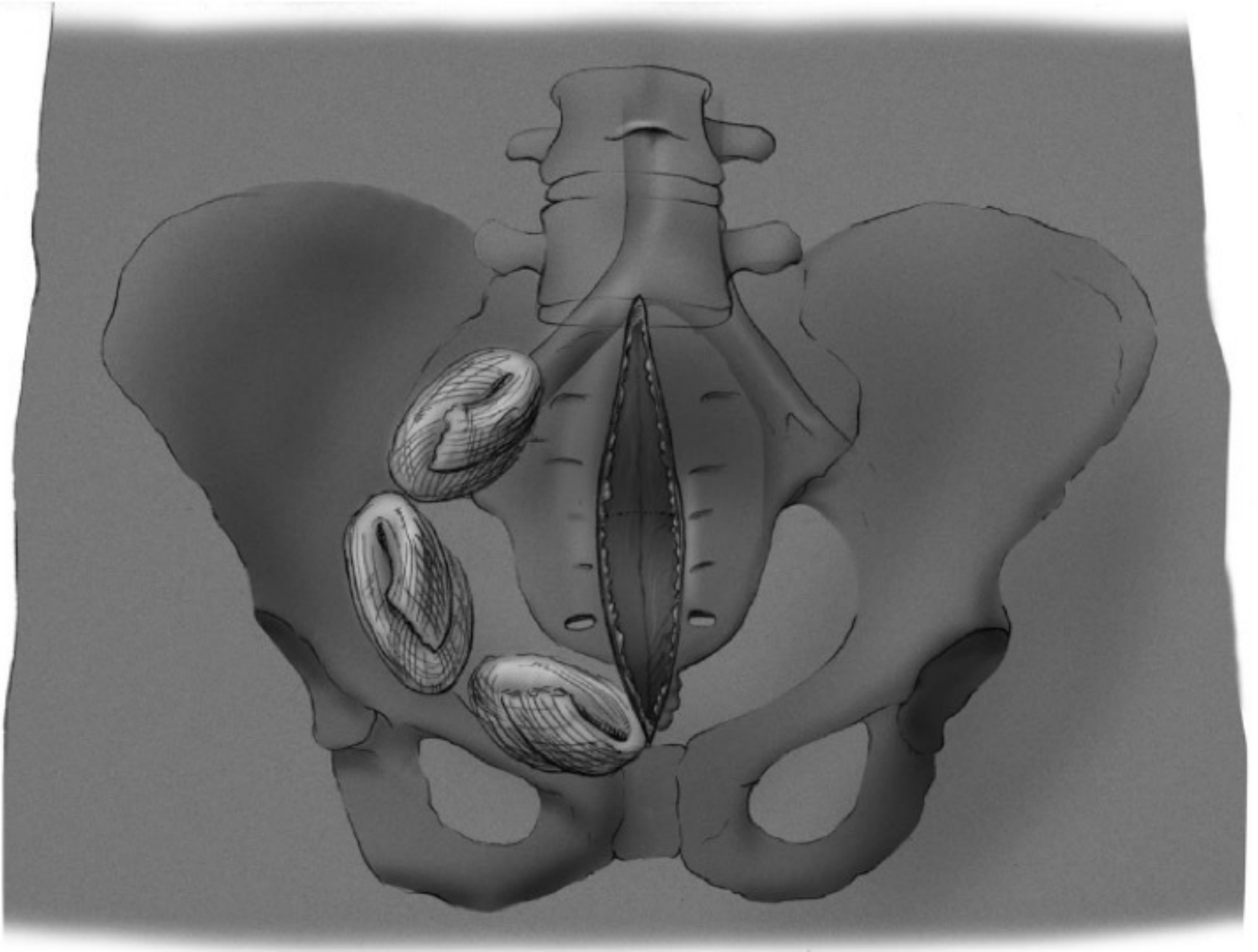
Wade R. Smith, MD, Ernest E. Moore, MD, Patrick Osborn, MD, Juan F. Agudelo, MD, Steven J. Morgan, MD, Anand A. Parekh, MRCS(Eng), Clay Cothren, MD

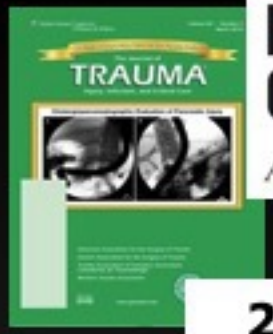
- ✓Technically straightforward
- ✓Fast
- ✓Basic equipment only
- ✓Bridge to embolization







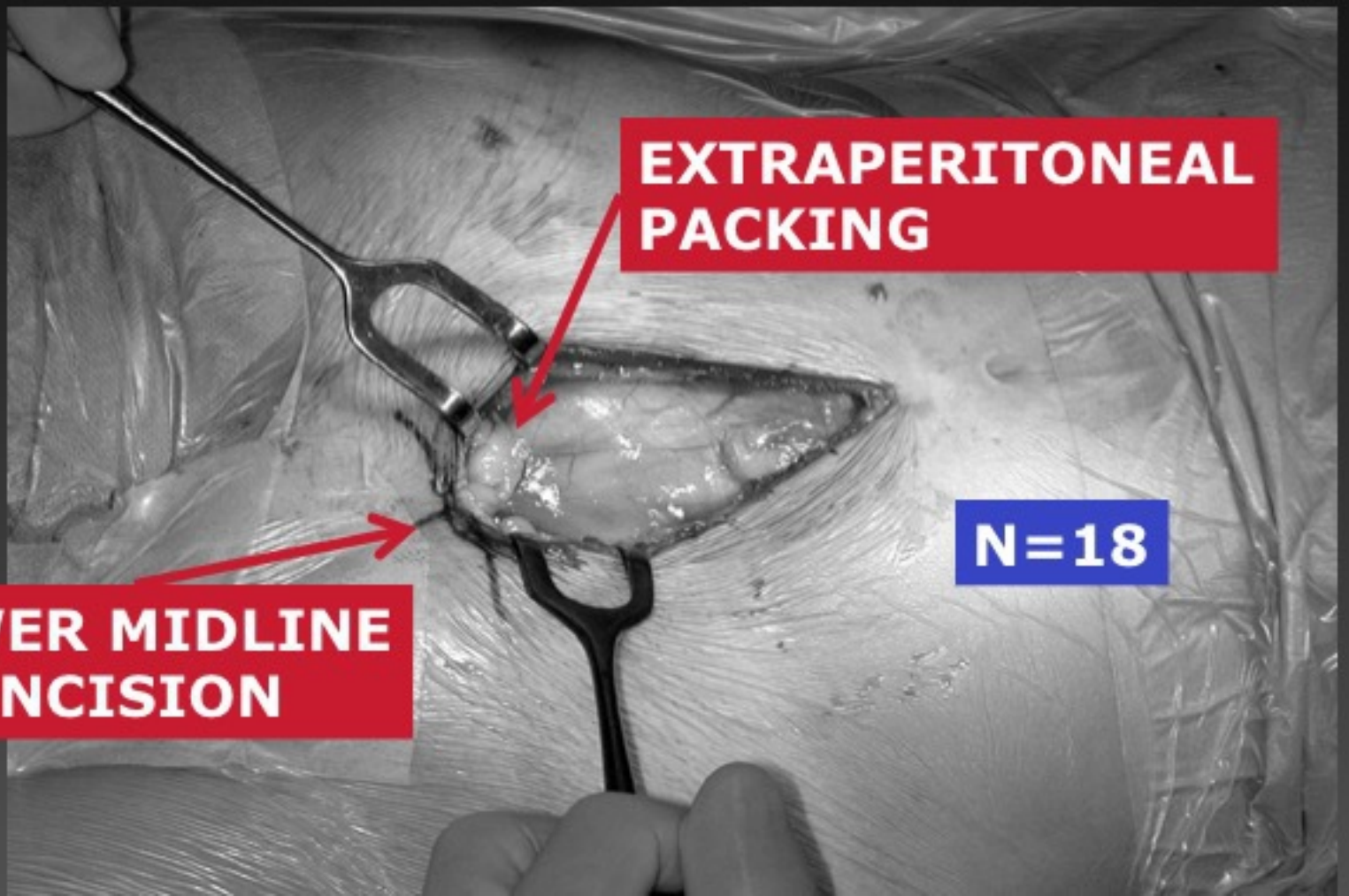


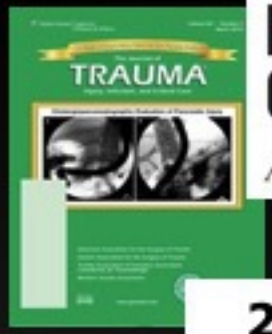


Extraperitoneal Pelvic Packing: A Salvage Procedure to Control Massive Traumatic Pelvic Hemorrhage

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

2007





Extraperitoneal 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

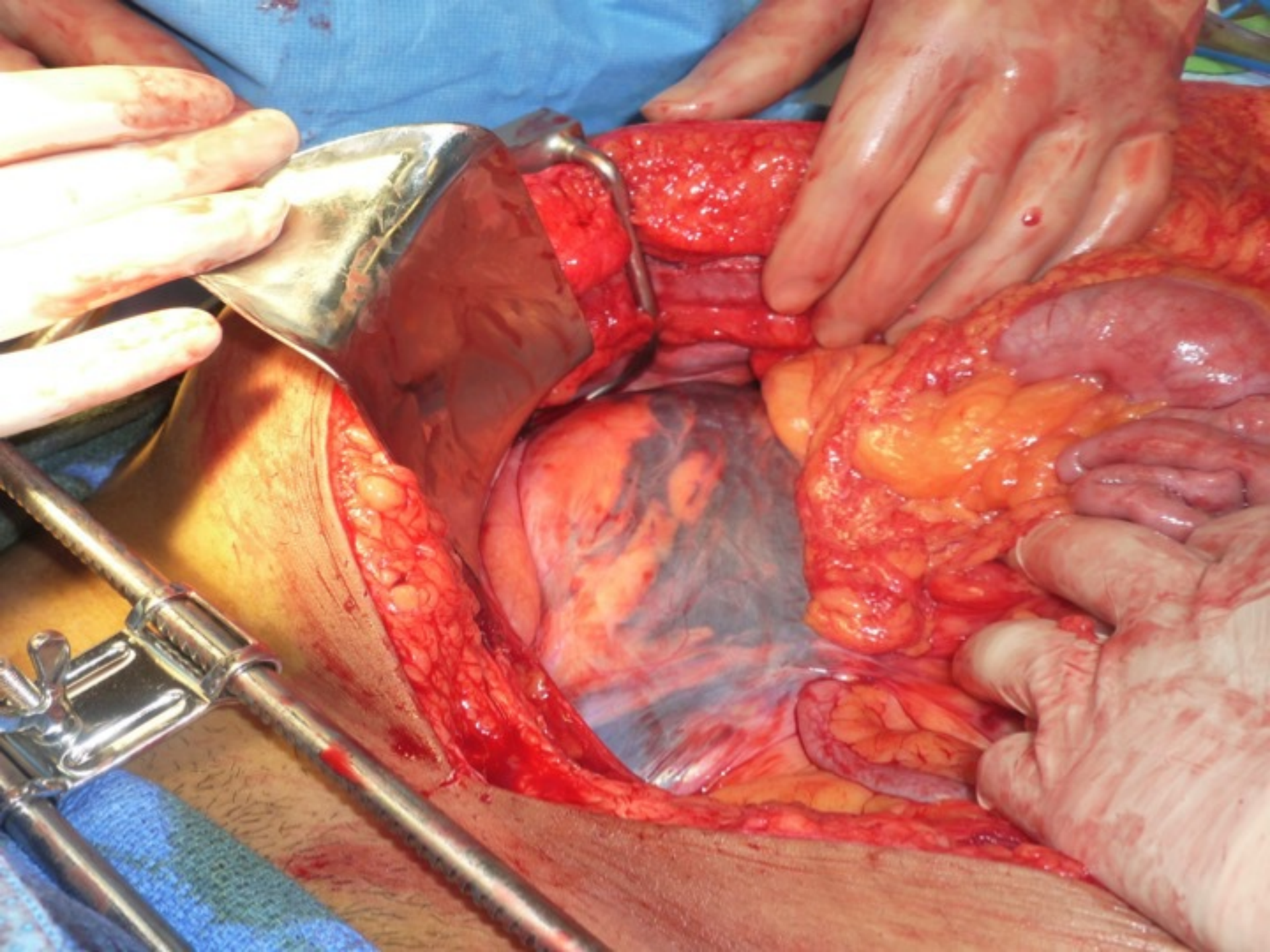
- ✓ PRE-PERITONEAL
- ✓ **DIRECT TRANS-PERITONEAL**

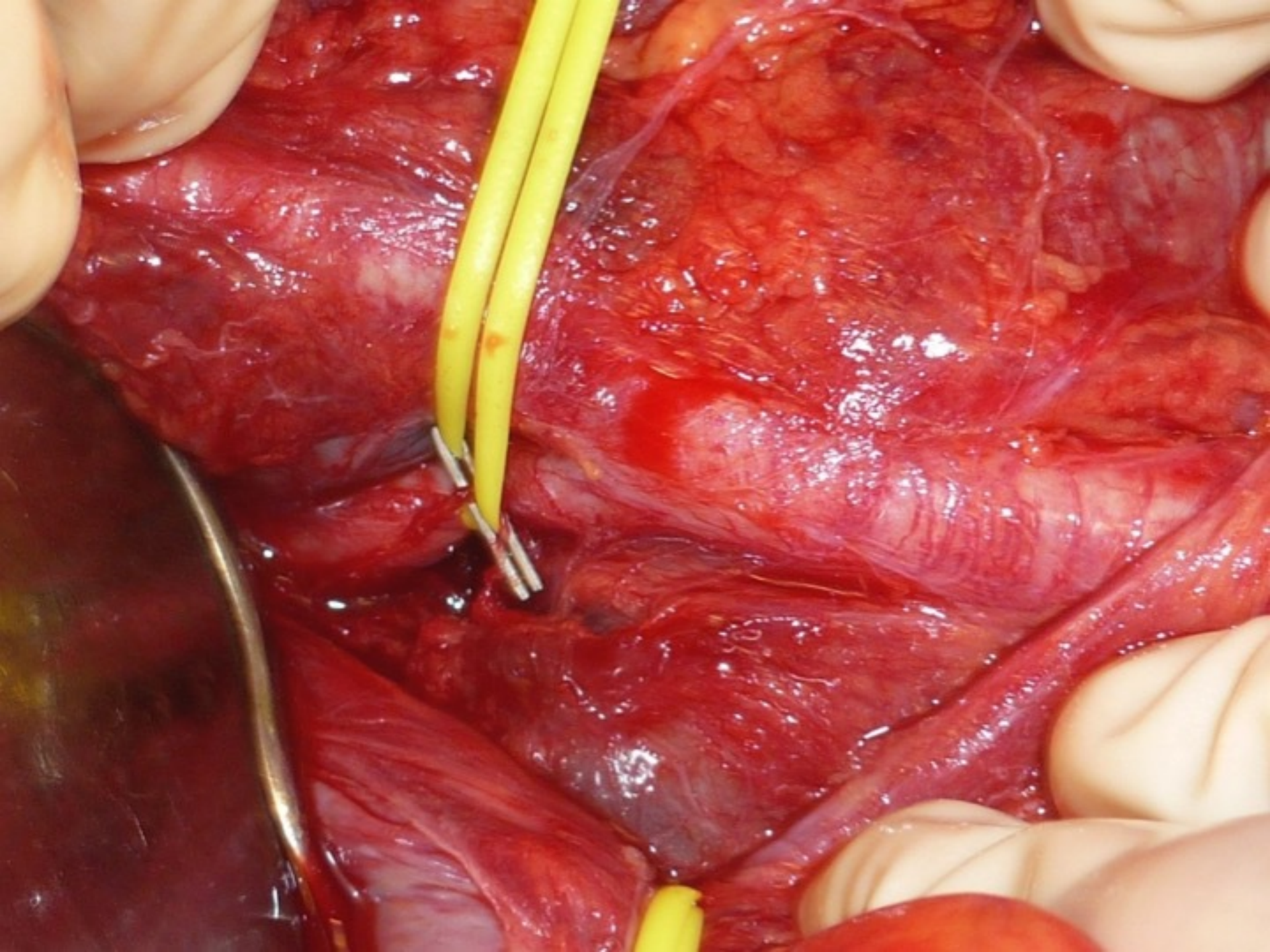
2010

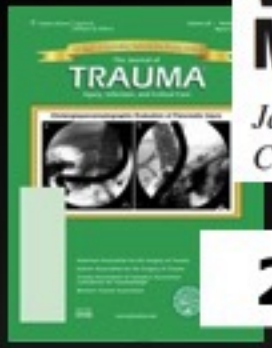
Bilateral Internal Iliac Artery Ligation as a Damage Control Approach in Massive Retroperitoneal Bleeding After Pelvic Fracture

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**



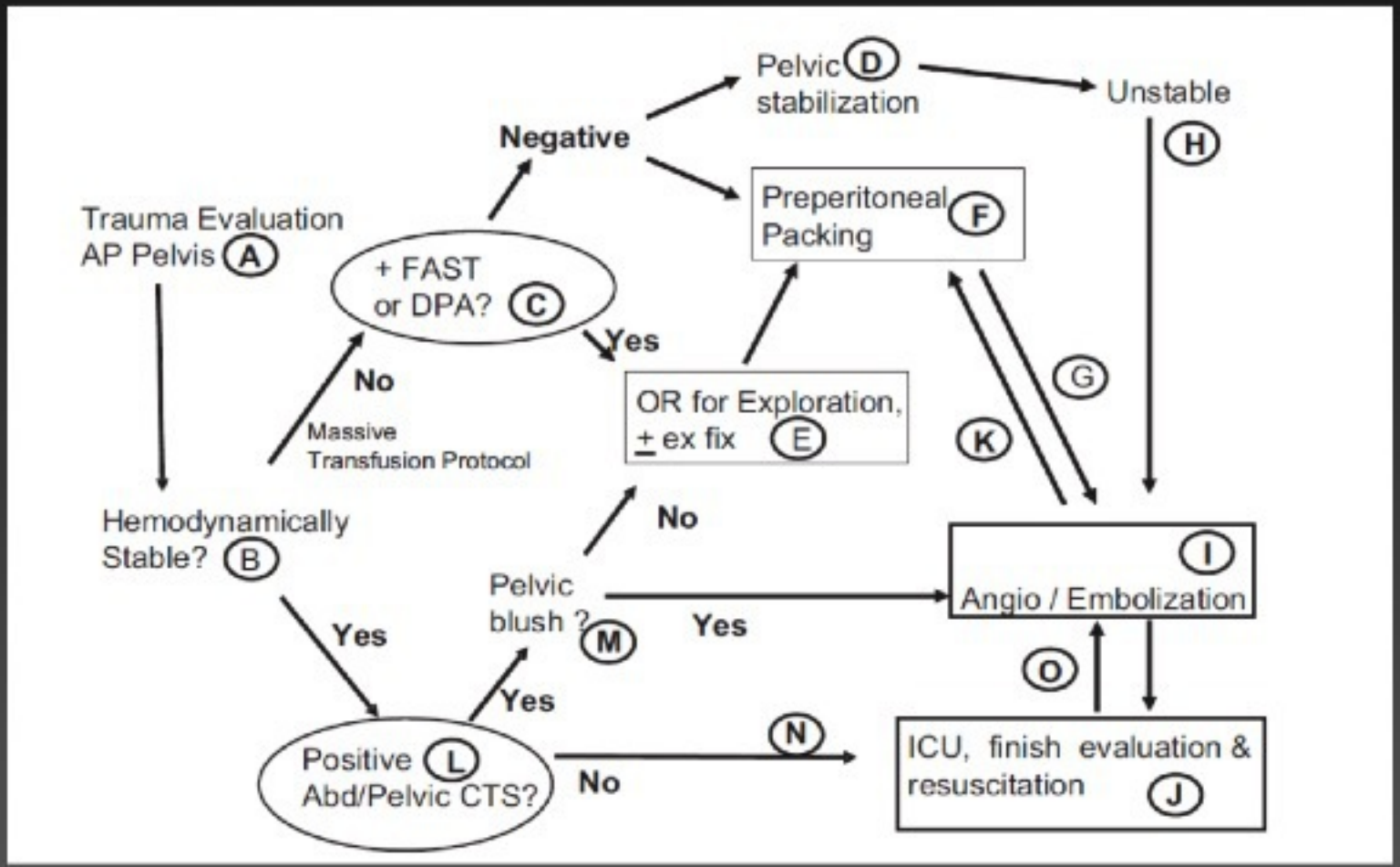




Western Trauma Association Critical Decisions in Trauma: Management of Pelvic Fracture With Hemodynamic Instability

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

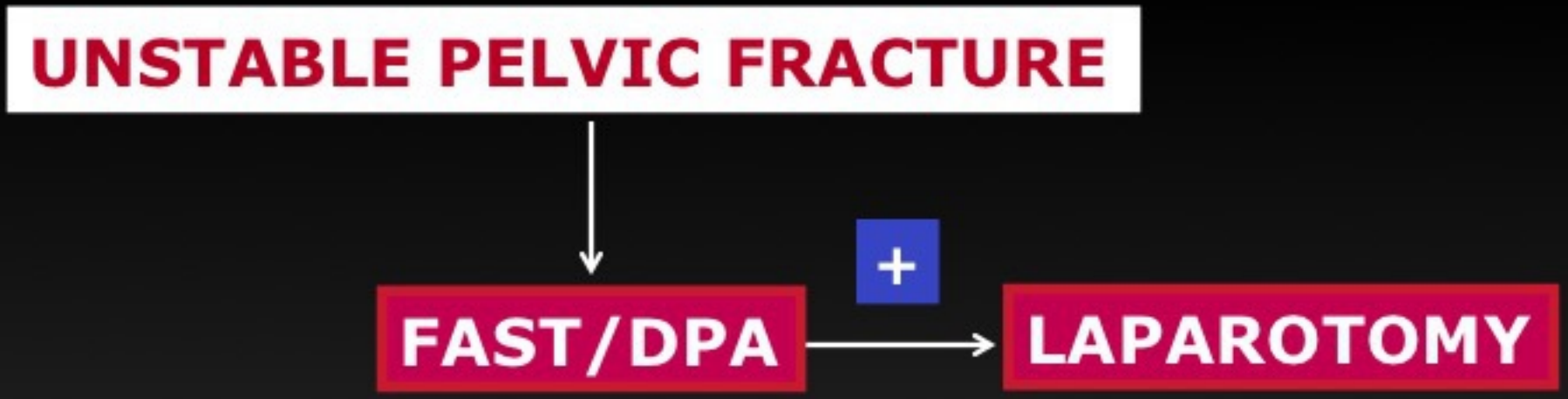
2008

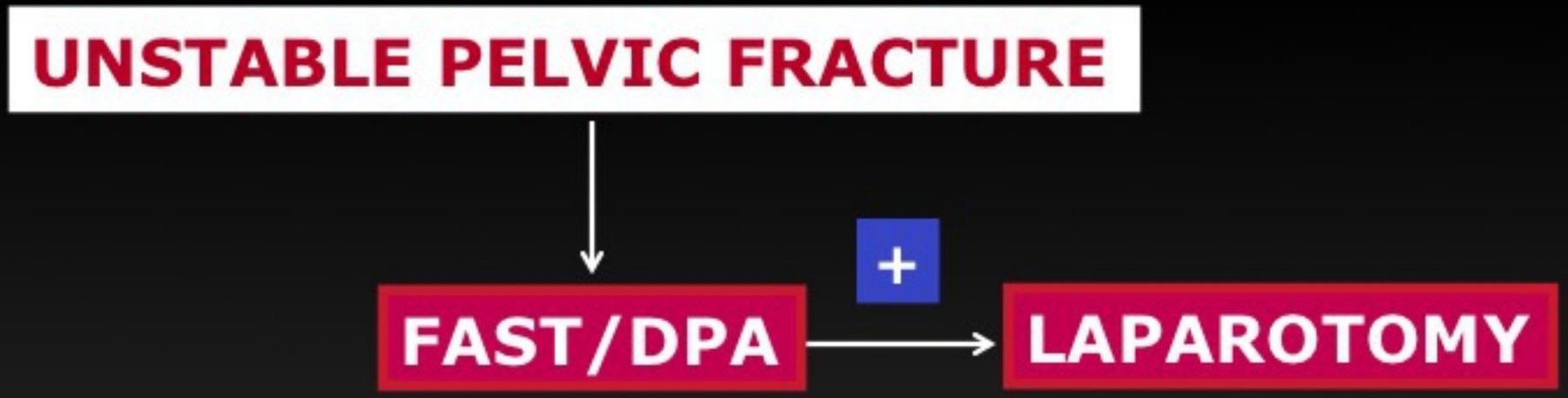


UNSTABLE PELVIC FRACTURE

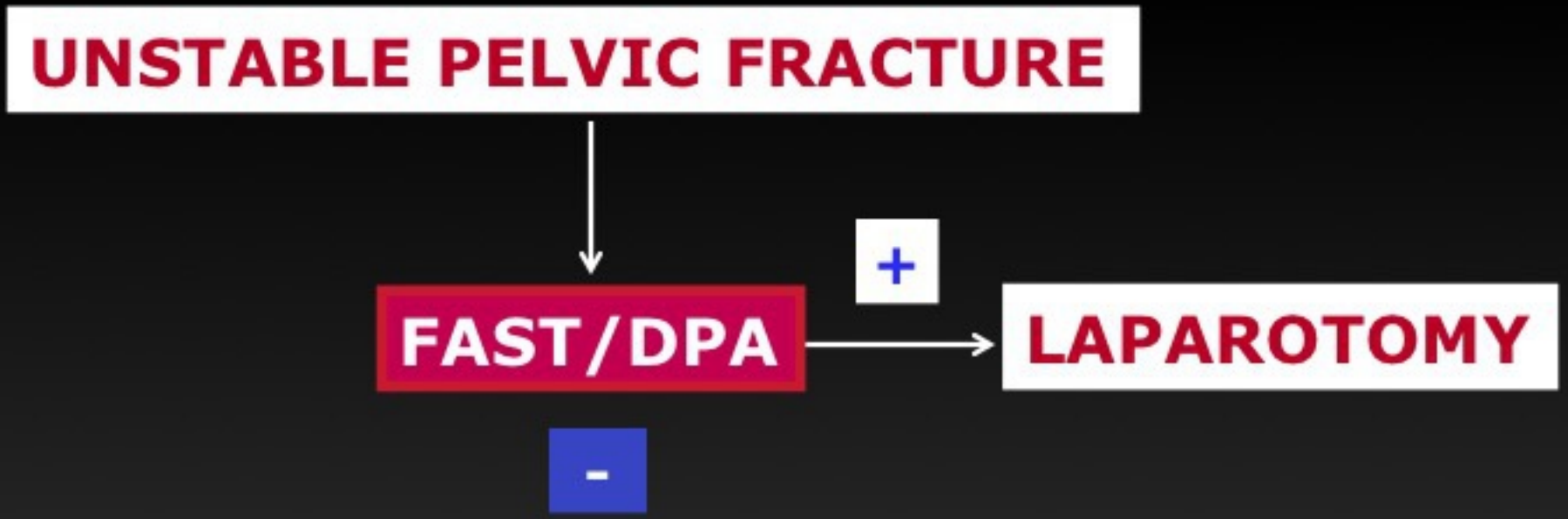
UNSTABLE PELVIC FRACTURE

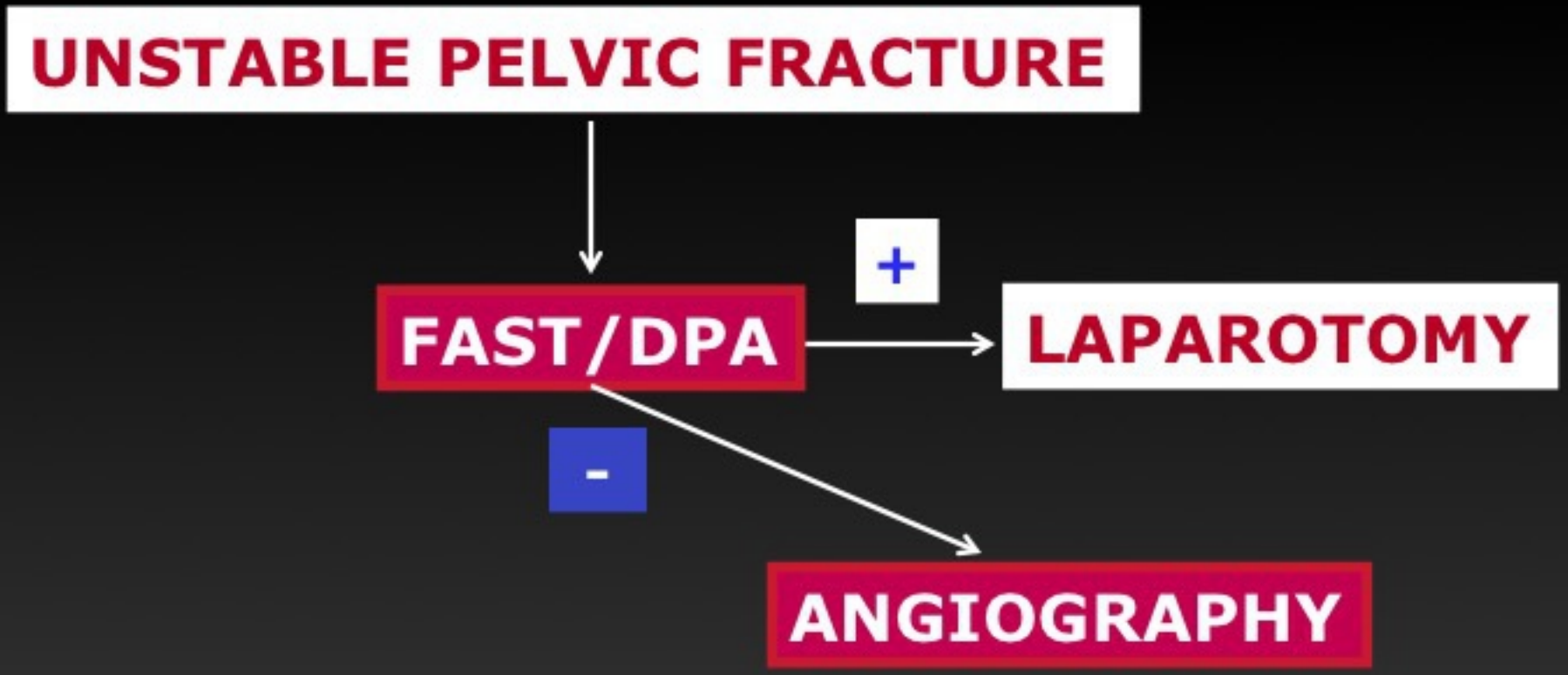
FAST/DPA

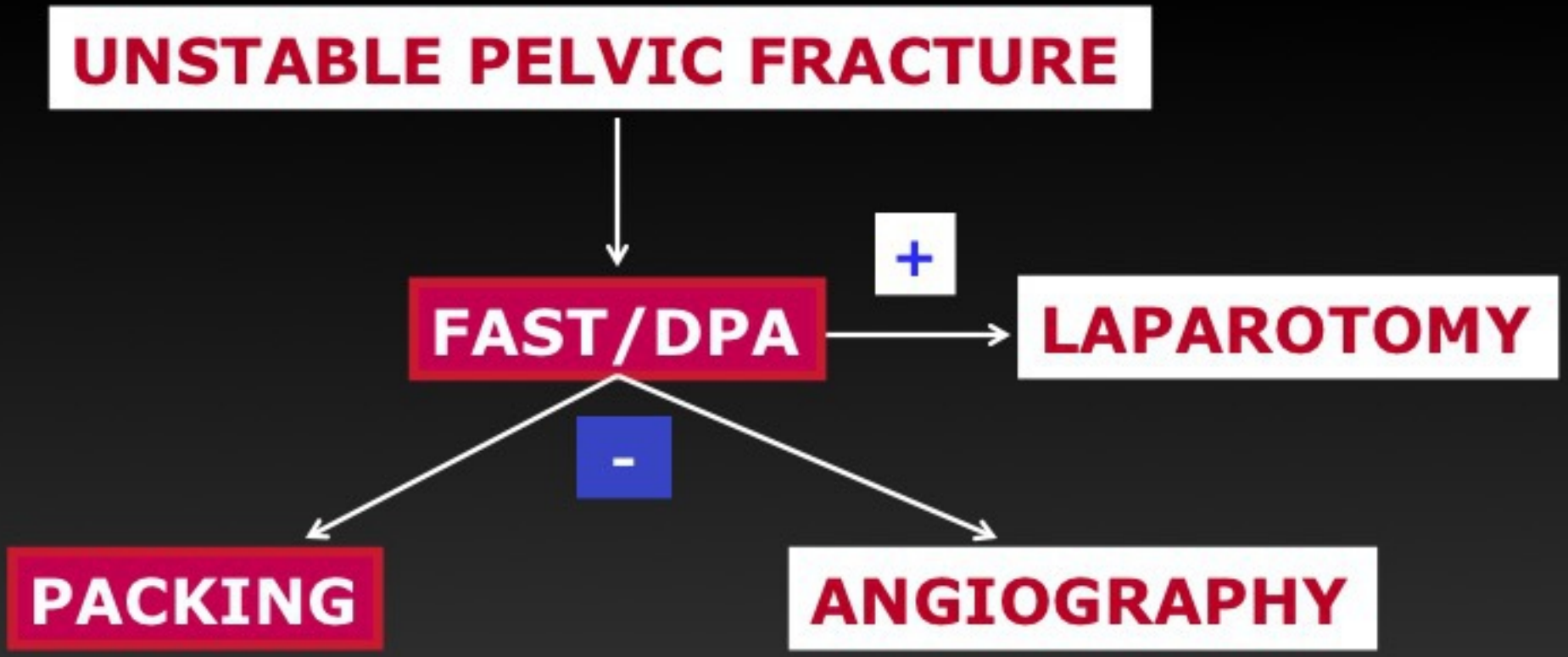

UNSTABLE PELVIC FRACTURE
FAST/DPA
+
LAPAROTOMY

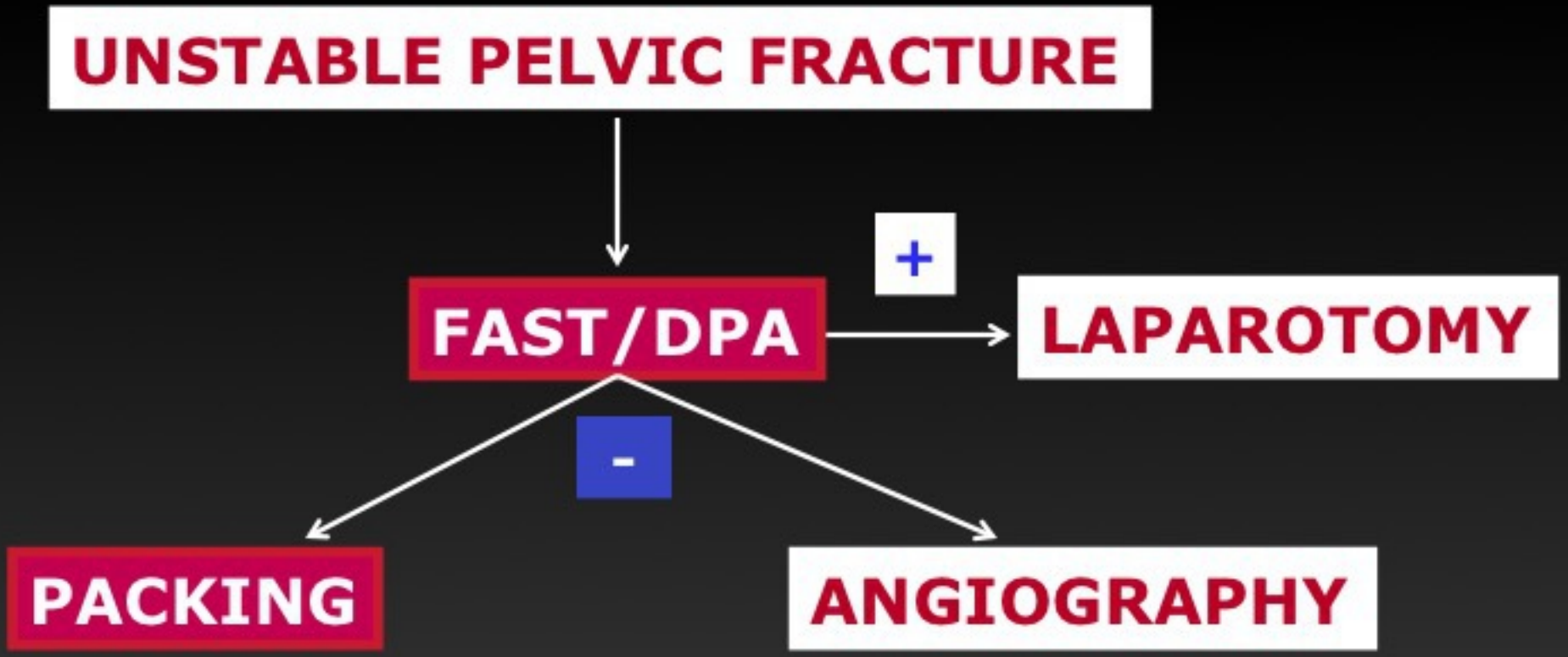


- ✓1/3 intra-abdominal injury
- ✓+/- Direct packing and BIIA ligation
- ✓+/- Pre-peritoneal with post-op angiography

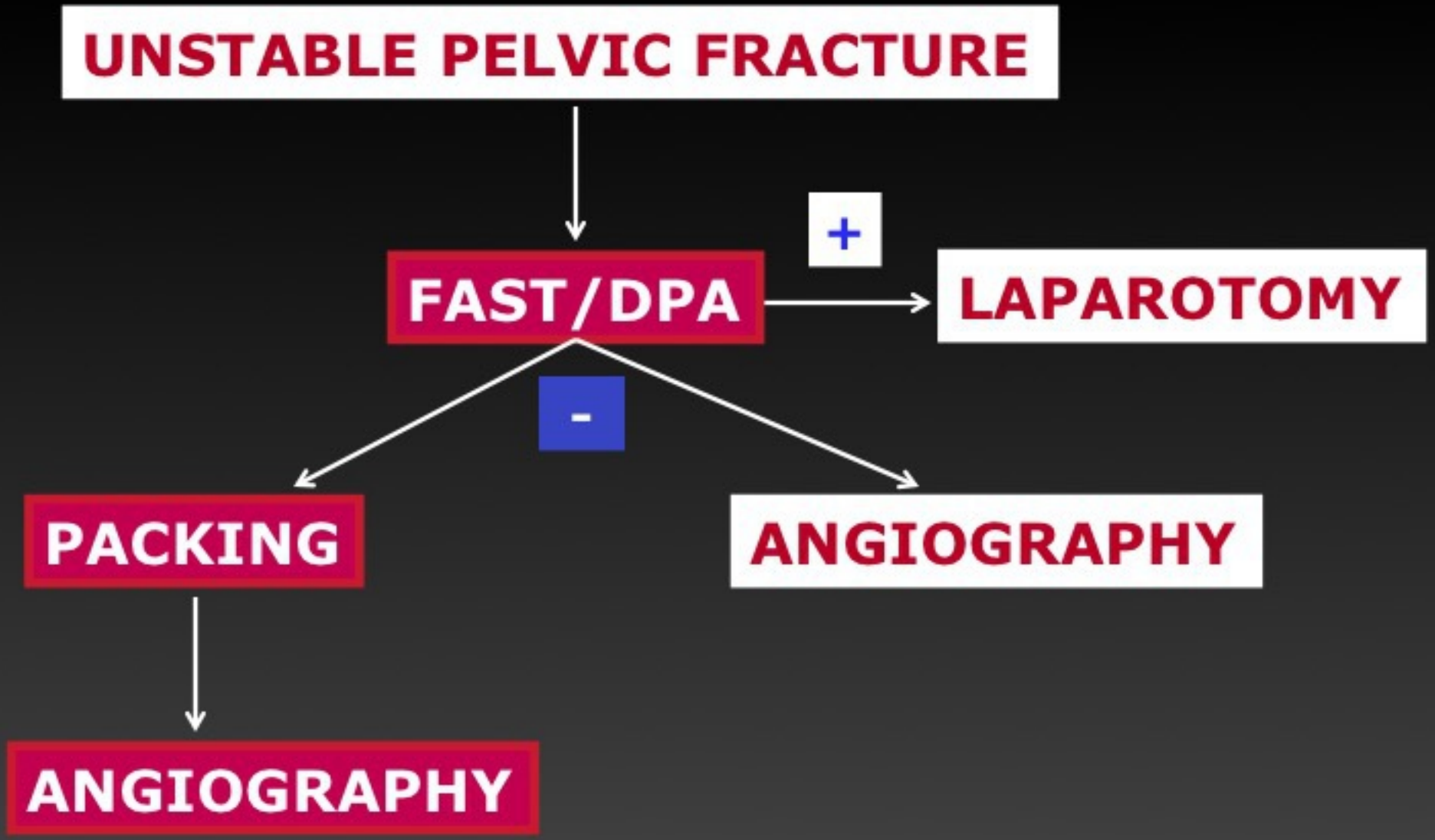

UNSTABLE PELVIC FRACTURE
FAST/DPA
+
LAPAROTOMY
-

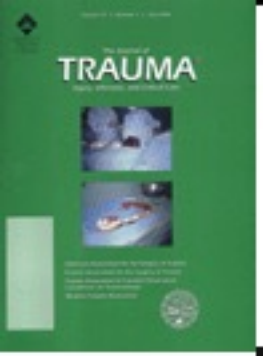

UNSTABLE PELVIC FRACTURE
FAST/DPA
+
LAPAROTOMY
-
ANGIOGRAPHY


UNSTABLE PELVIC FRACTURE
FAST/DPA
+
LAPAROTOMY
-
PACKING
ANGIOGRAPHY



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

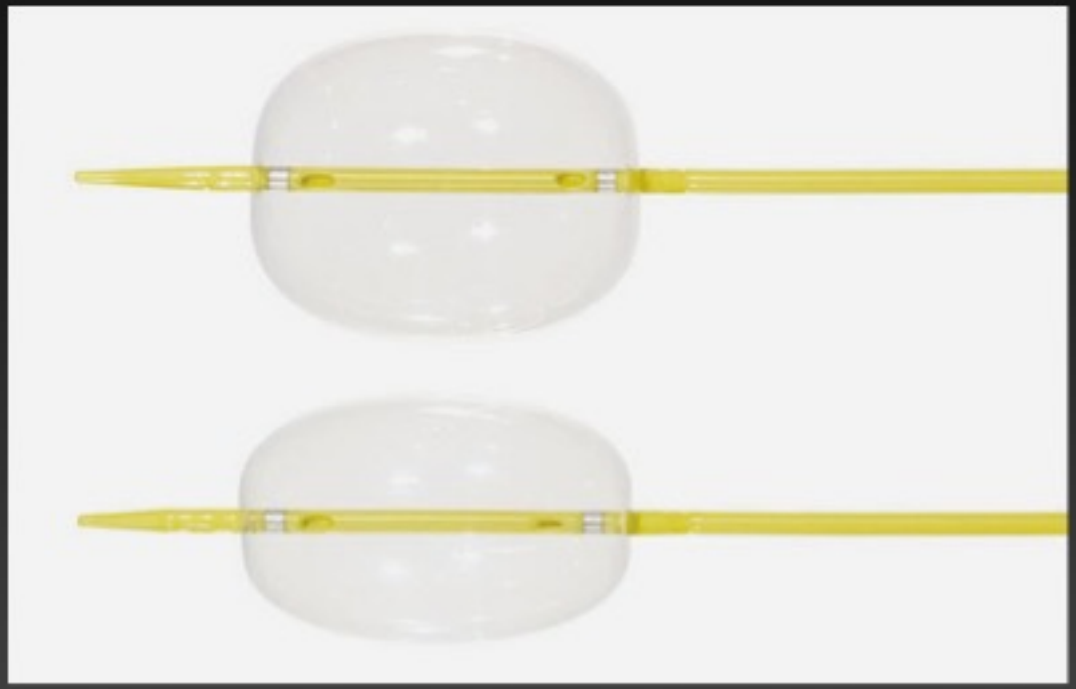

UNSTABLE PELVIC FRACTURE
FAST/DPA
+
LAPAROTOMY
-
PACKING
ANGIOGRAPHY
ANGIOGRAPHY



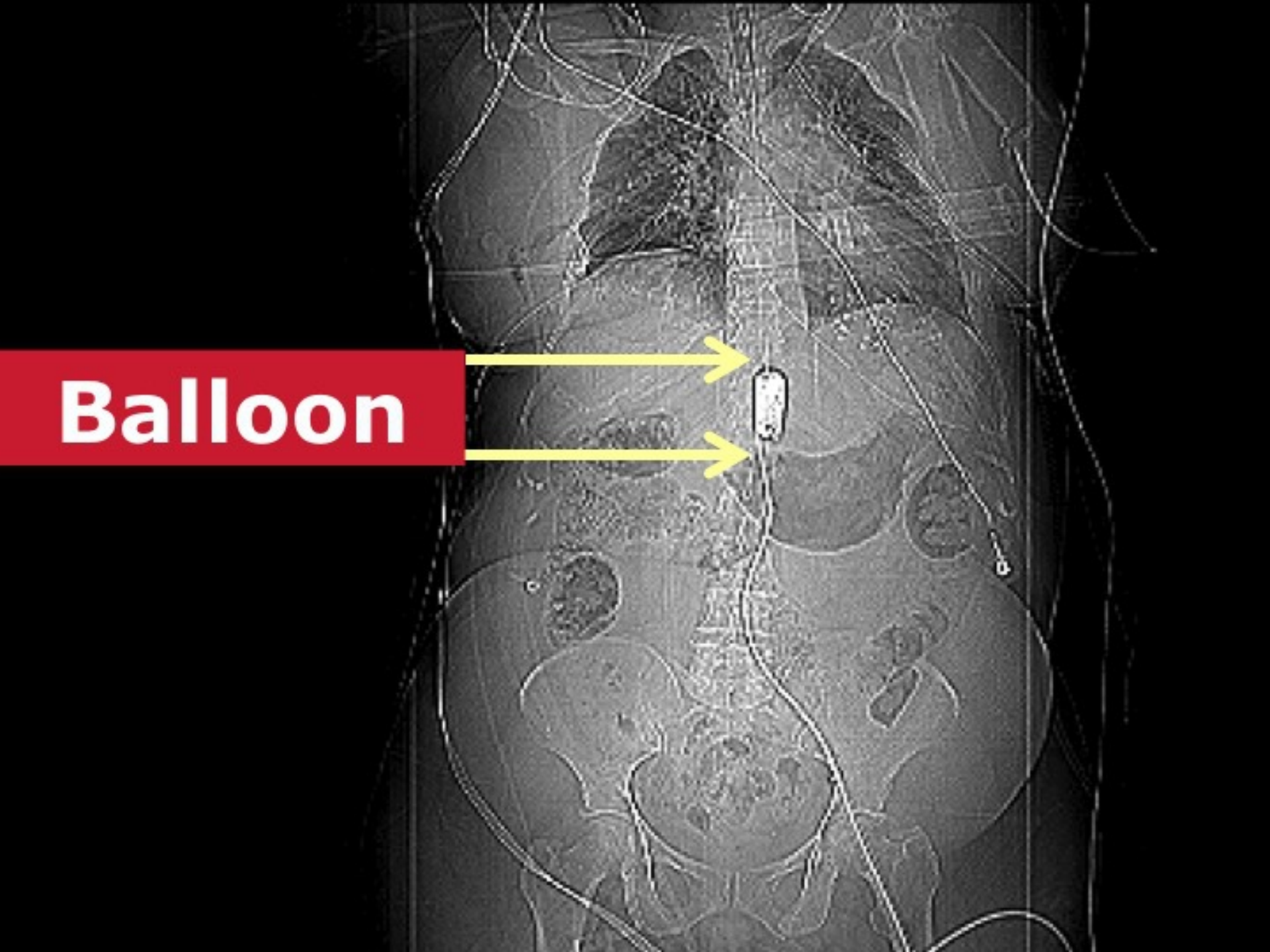
Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) as an Adjunct for Hemorrhagic Shock

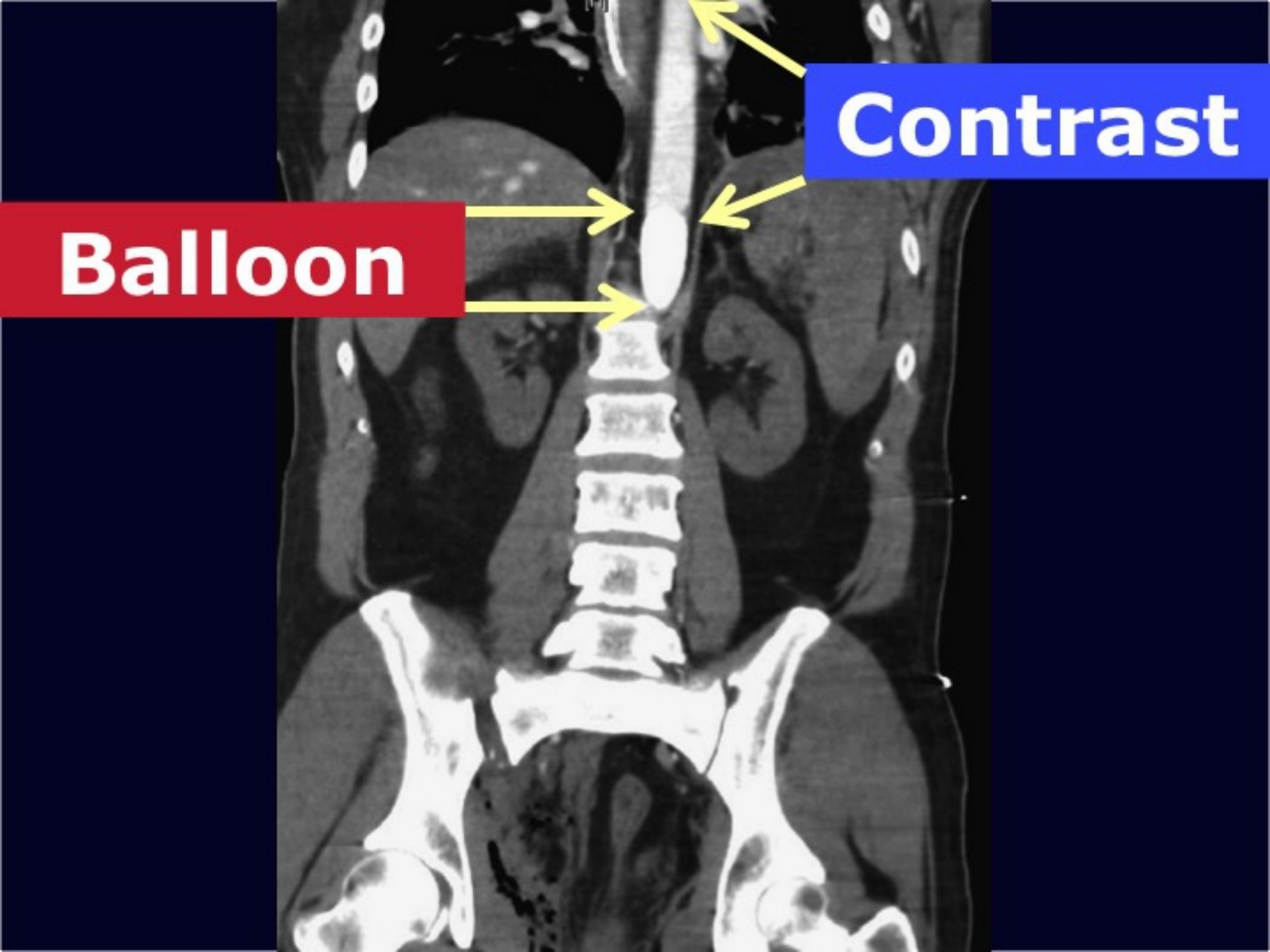
Adam Stannard, MRCS, Jonathan L. Eliason, MD, and Todd E. Rasmussen, MD

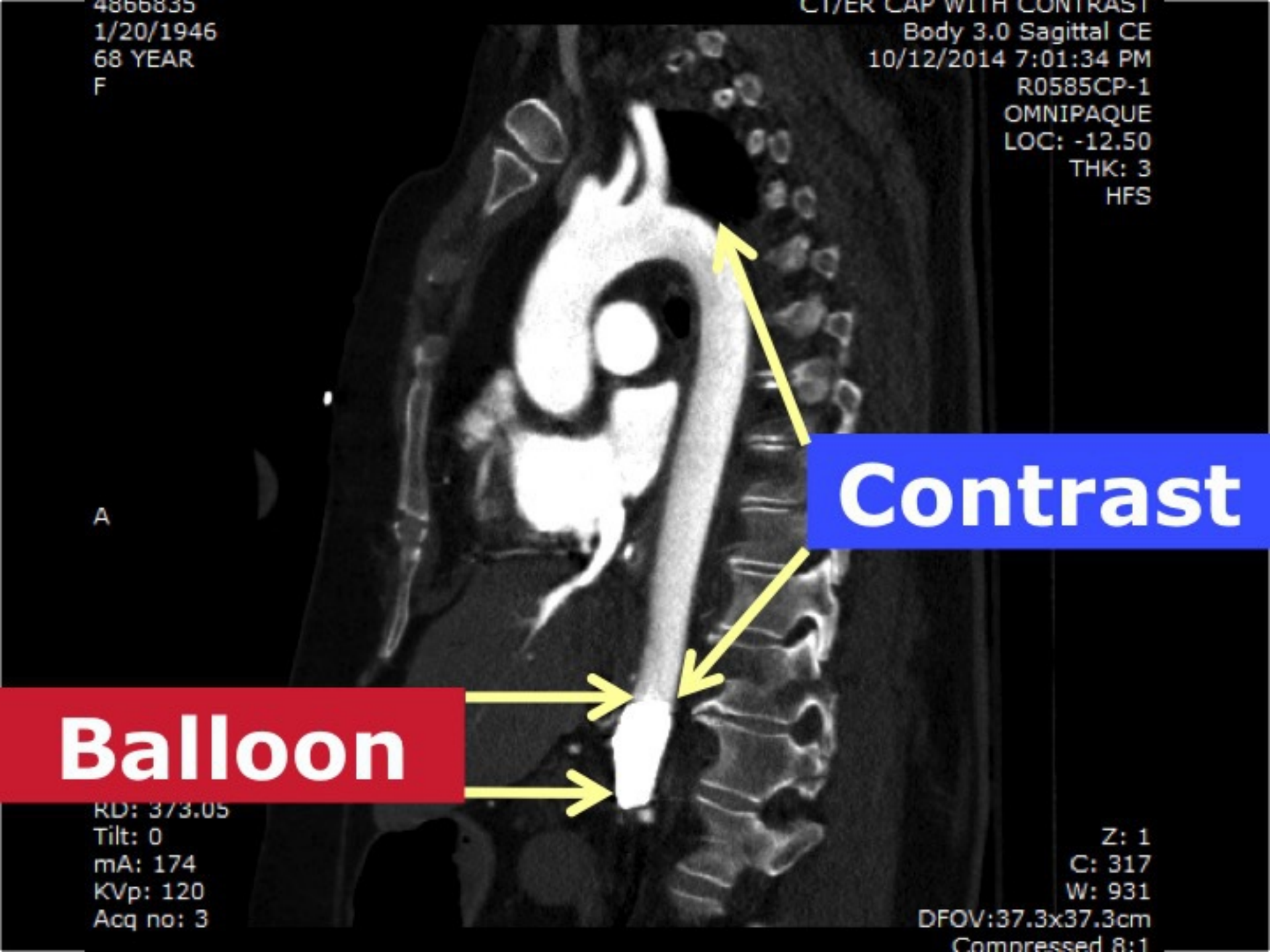
2011

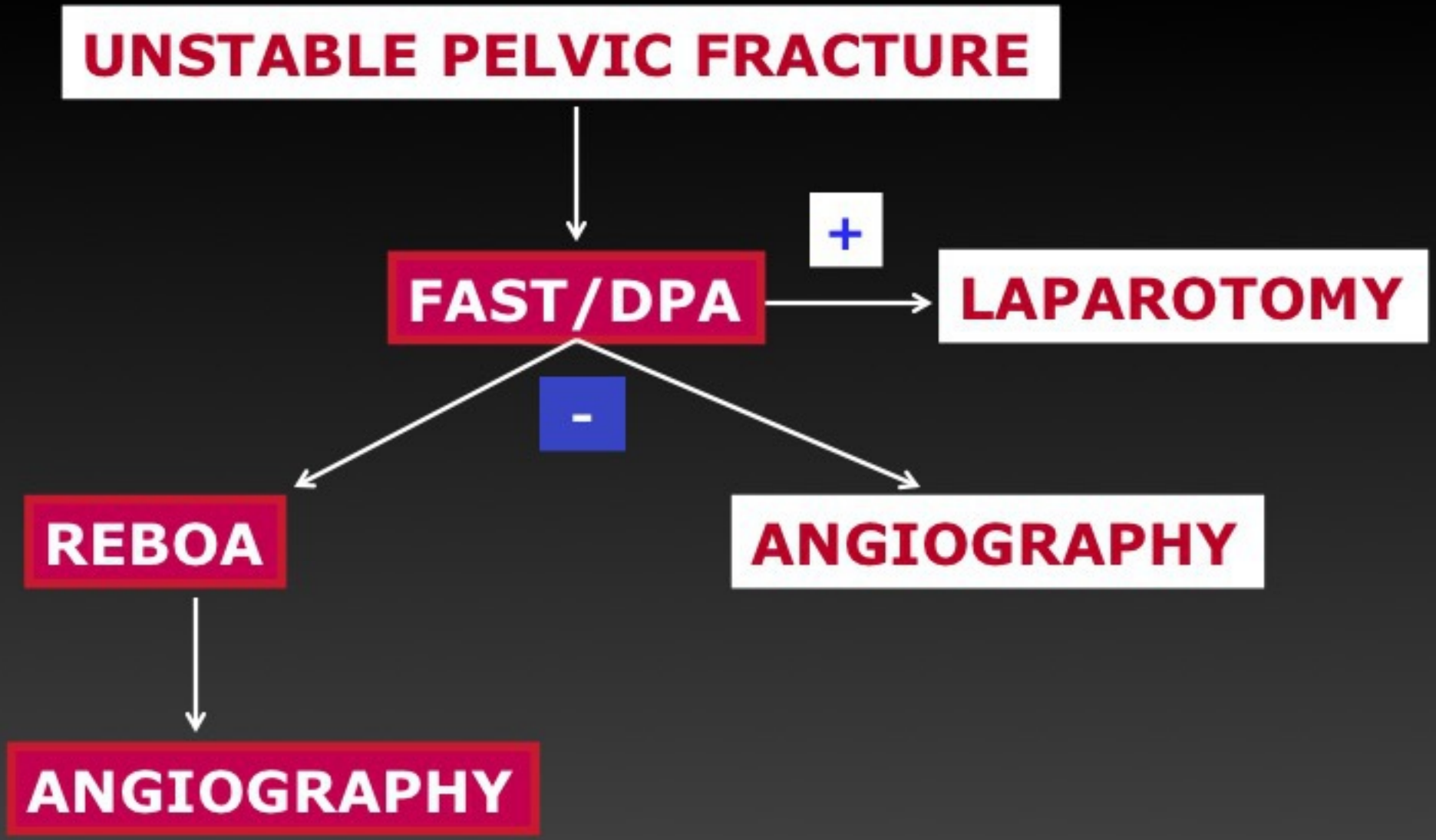


Resuscitative Endovascular Balloon Occlusion of the Aorta


Balloon


Contrast
Balloon


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