# Pelvic CT Angiography in Trauma: When and How?

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## Disclosure:

Grant Support from GE Healthcare

## Facts about Pelvic Fractures

- Pelvic Fxs: 4 to 9% of blunt trauma patients
- Associated organ injury: 15 to 25%
- Mortality
  - Overall 5 to 15%
  - + hemorrhagic shock: up to 50%
- Death from hemorrhage usually in first 24 hs
- Hemodynamic stability: deceiving, shock develops rapidly

## Bleeding in Pelvic Trauma

- Major bleeding: 40% of patients with pelvic fractures
- Sources:
  - Bone
  - Pelvic venous plexus
  - Major veins

  } Treated effectively with external fixation

  - Arterial branches ⟶ No response to fixation

## Imaging of Pelvic Trauma

- Polytrauma patients upon admission:
  - Portable Chest, Portable Pelvis
- Multi-trauma CT:
  - Characterization of pelvic fractures
  - Detection of pelvic hematoma
  - Active extravasation (portal venous phase)
- DSA + TAE: Fx, hemodynamically unstable, active extrav

## PVP CT in Pelvic Bleeding

- Hematoma alone is not good predictor of positive angiogram
- Active extrav on PVP alone:
  - Limited sensitivity *
  - Limited specificity *
    - ? Source: arterial, venous, osseous, combination
  - If present, ? Rate of bleeding

**Brown CV et al, Am Surg 2005*
*Cerva DS et al, AJR 1996*

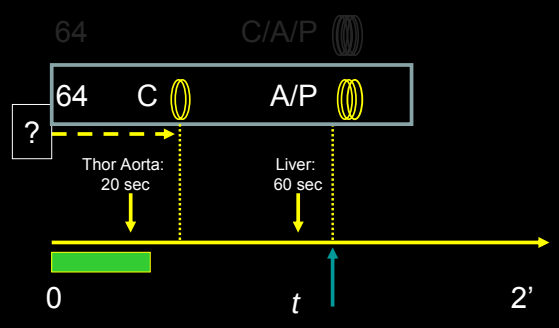
## Why Pelvic CTA?

- Unequivocal detection of arterial source of bleeding
- Differentiates between active arterial and active venous hemorrhage (and others)
- Predicts urgency of need for DSA and embolization, before hemodynamic instability ensues (may be too late…)

## Who Receives Pelvic CTA?

- Patients with displaced pelvic fractures on admission portable pelvic radiograph
- Discretion of trauma surgeon:
  - Hemodynamically unstable or marginally unstable patients
  - Mechanism of trauma
- Can be integrated with CT C/A/P, CTA extremities

100 mL @ 4 mL/sec: 25 sec

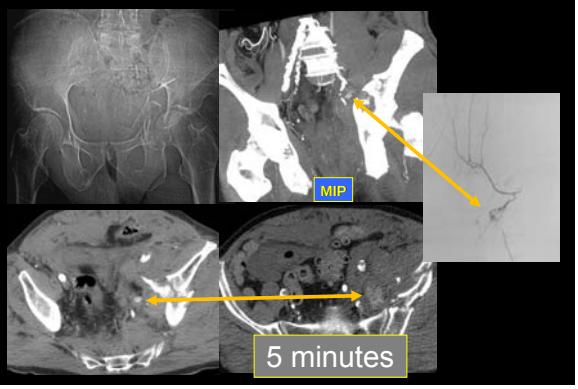


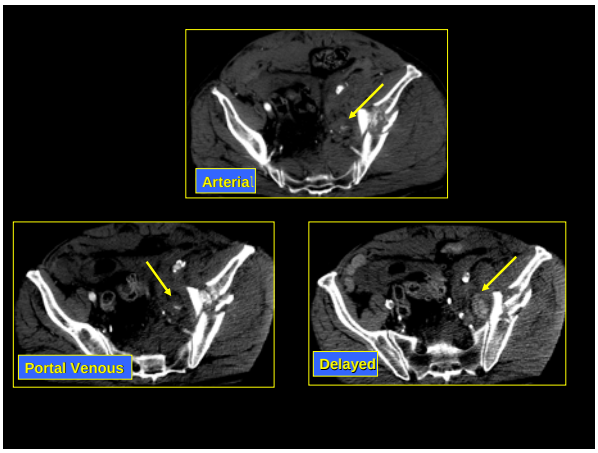

## Technique

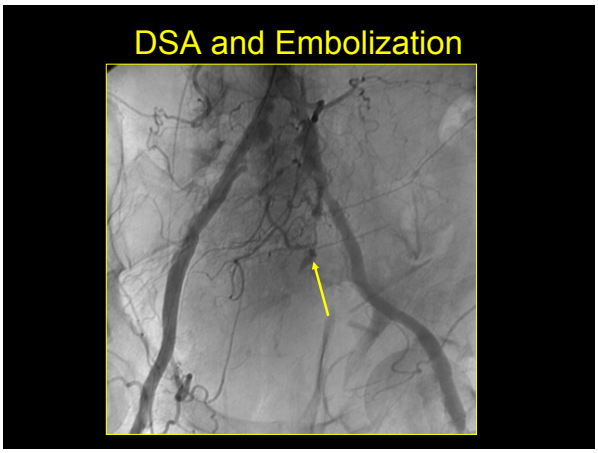
- Pelvic CTA
  - 23 sec
  - 1.25 mm / 3.75 mm
  - Noise index 29
- Delayed Images
  - 5 min
  - 1.25 mm / 3.75 mm
  - Noise index 29
- Chest
  - 30 sec
  - 1.25 mm / 3.75 mm
  - Noise index 19
- Abdomen / Pelvis
  - 70 sec
  - 1.25 mm / 3.75 mm
  - Noise index 19

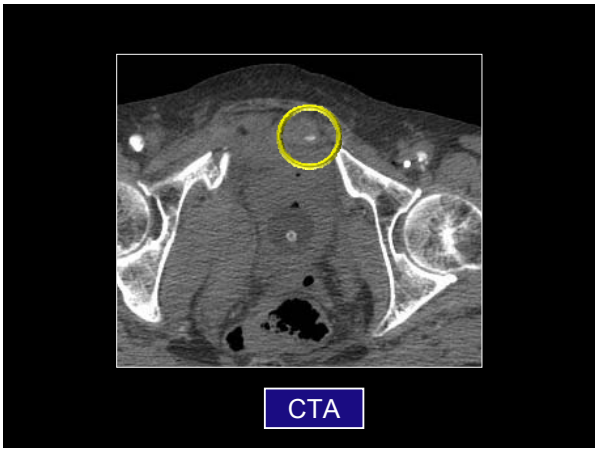
## Estimating Rate of Hemorrhage

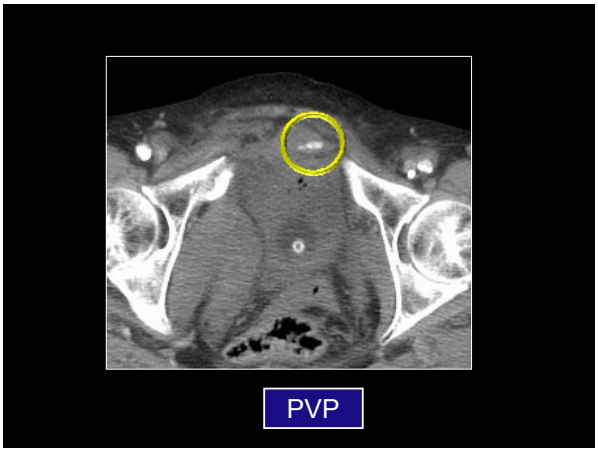
## Pelvic CTA

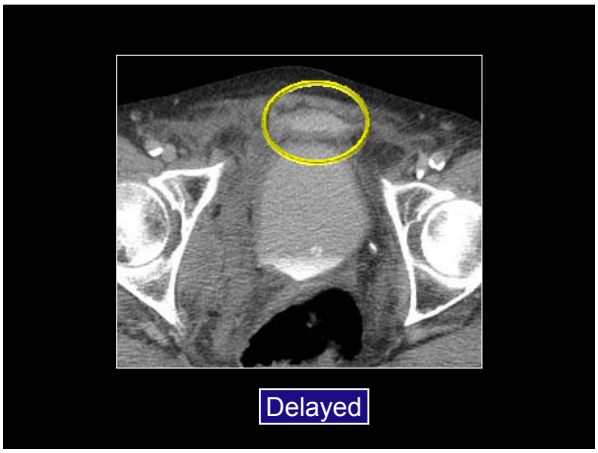


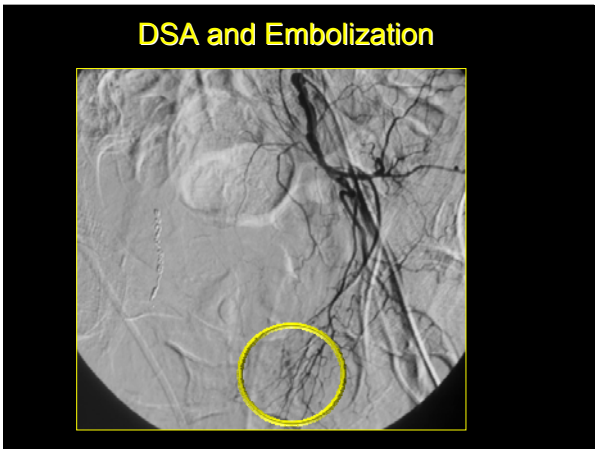

Arteria
Portal Venous
Delayed


DSA and Embolization

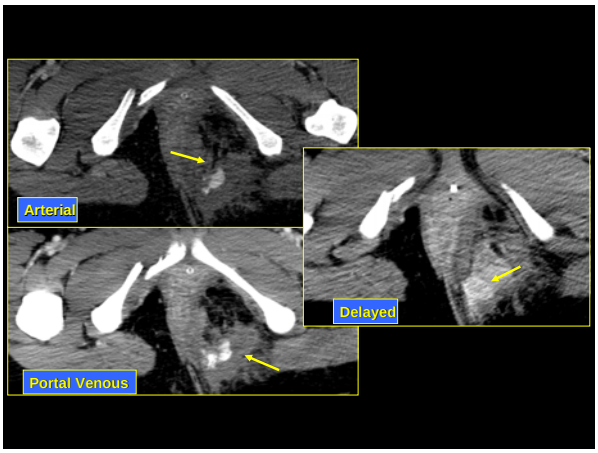

CTA


PVP

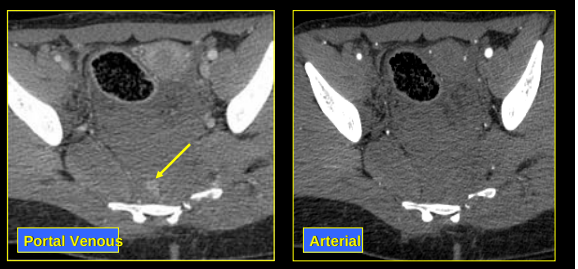

Delayed


DSA and Embolization

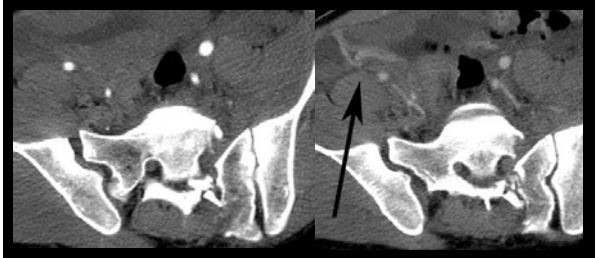
## Differentiating Between Arterial and Venous Hemorrhage



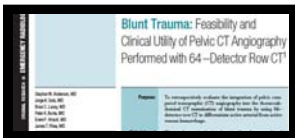
## Same Patient, Second (Venous) Bleed




## Venous Bleed



## Pelvic CTA pre-CT A/P




- 53 patients
  - 21 pts with vascular injury: arterial blush and growth: good predictors of need for TAE
  - 32 patients without vascular injury managed conservatively
- Separates arterial from venous bleeding
- Successful integration with CT C/A/P

*Anderson SW et al, Radiology (Feb '08)*

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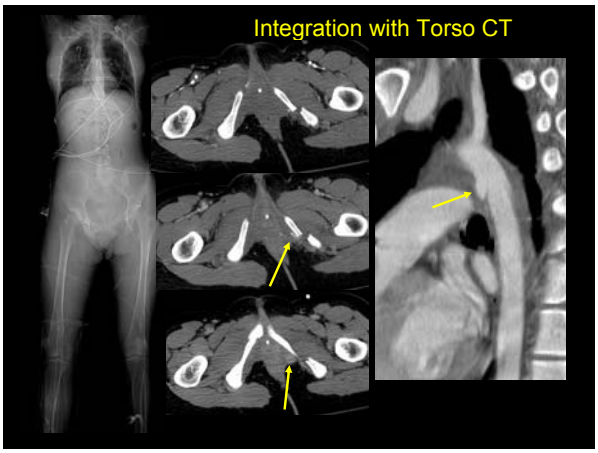


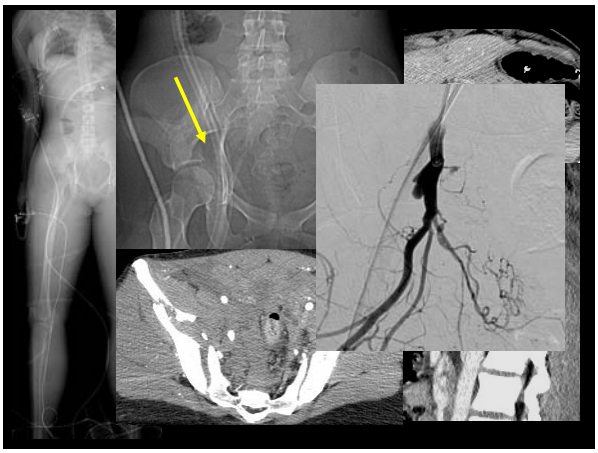

## Radiation Considerations

- Careful selection of patients: most important
- Reduce tube current
  - 250 to 100 mAs
  - Increase noise index: 19 to 29
- Combine series: delayed phase with CT cystogram