UROGENITAL TRAUMA

Retrograde urethrocystography impairs computed tomography diagnosis of pelvic arterial hemorrhage in the presence of a lower urologic tract injury

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Background: There is controversy about the appropriate sequence of urologic investigation in patients with pelvic fracture. Use of retrograde urethrography or cystography may interfere with regular pelvic CT scanning for arterial extravasation.

Study design: We performed a retrospective study at a regional trauma center in Toronto, Canada. Included were adult blunt trauma patients with pelvic fractures and concomitant bladder or urethral disruption who underwent initial pelvic CT before operation or hospital admission. Exposure of interest was whether retrograde urethrography (RUG) and cystography were performed before pelvic CT scanning. Main outcomes measures were indeterminate or false negative initial CT examinations for pelvic arterial extravasation.

Results: Sixty blunt trauma patients had a pelvic fracture and either a urethral or bladder rupture. Forty-nine of these patients underwent initial CT scanning. Of these 49 patients, 23 had RUG or conventional cystography performed before pelvic CT scanning; 26 had cystography after regular CT examination. Performing cystography before CT was associated with considerably more indeterminate scans (9 patients) and false negatives (2 patients) for pelvic arterial extravasation (11 of 23 versus 0 of 26, $p < 0.001$) compared with performing urologic investigation after CT. In the presence of pelvic arterial hemorrhage, indeterminate or false negative CT scans for arterial extravasation were associated with a trend toward longer mean times to embolization compared with positive scans ($p = 0.1$).

Conclusions: Extravasating contrast from lower urologic injuries can interfere with the CT assessment for pelvic arterial extravasation, delaying angiographic embolization.

Editorial Comment

This article brings up important points about the proper technique for performing retrograde urethrography for suspected traumatic urethral disruption injuries and for cytography for suspected bladder injuries. In this day and age, we only perform CT cystograms (instead of conventional cystography) to evaluate the patient with a pelvic fracture and gross hematuria. It was not clear from the article their criteria for deciding on bladder imaging, yet in our experience, the yield is small unless there is gross hematuria and a pelvic fracture.

The other point that this article raises, is that patients die after blunt trauma because of the “fatal triad”, namely being cold, coagulopathic and acidotic. In the initial time period after injury, adequate resuscitation and control of bleeding is key, to prevent the patient from spiraling downward. A bladder and/or urethral injury will not harm the patient or push him over the edge in the first few hours after a trauma. There is strong support for damage control of urologic injuries. It is reasonable that in a patient with a pelvic fracture who is hemodynamically unstable, the bleeding takes precedence and evaluating the urethra and bladder can wait.

As to pelvic fractures in general, the keys are to decrease the volume of the pelvis and so decrease the potential space for blood to collect. A small increase in radius increases volume by a great amount. By placing an external fixator a pelvic ring disruption, the true pelvis is reduced and cancellous bone re-approximated and in so doing allows venous bleeding to tamponade. Significant arterial bleeding, however will not stop with just true pelvis volume reduction. Arterial bleeding requires angiography and embolization. The most common arteries injured with pelvic fracture are the superior gluteal and the pudendals. Clearly, having significant

contrast extravasated from the bladder evaluation can potentially interfere with visualization of small pelvic arterial bleeders on subsequent angiography -however, the article is somewhat deceptive in that there was no statistical difference in the time to embolization in their two study populations. Perhaps, the study did not have the power to prove such- or the contrary, it may make no difference clinically.

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Three-dimensional analysis of pelvic volume in an unstable pelvic fracture

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Background: A model was developed to predict changes in pelvic volume associated with increasing pubic diastasis in unstable pelvic fractures.
Methods: Intact and postfracture pelvic volumes were calculated in 10 cadavers using computerized axial tomography (CT). The true pelvis was assumed to be either a sphere, a cylinder, or a hemi-elliptical sphere. Using the appropriate equations for calculating the volume of each of these shapes, pelvic volume was predicted and then compared with the measured values.
Results: The observed volume changes associated with increasing pubic diastasis were much smaller than previously reported. The mean difference between the measured and predicted volume was 20.0 +/- 9.9% for the sphere, 10.7 +/- 6.5% for the cylinder, and 4.5 +/- 5.9% for the hemi-elliptical sphere. The differences between these means were statistically significant ($p < 0.001$).
Conclusions: This data suggests that the hemi-elliptical sphere best describes the geometric shape of the true pelvis and better predicts quantitative changes in pelvic volume relative to an increasing pubic diastasis as the radius has little effect on the change in volume. Due to the small changes in volume observed with increasing diastasis, factors other than the absolute change in volume must account for the clinically observed effects of emergent pelvic stabilization.

Editorial Comment

This article is a complement to the above article on pelvic fracture. Reducing the absolute pelvic volume by pelvic reduction and stabilization is critical to helping venous bleeders to tamponade. Traditionally, the true pelvis is thought to be a sphere in shape, where an increase in pubis diastasis results in a marked volume increase, proportional to the radius cubed. They contend from their cadaveric experiments that the true pelvis is actually a hemi-elliptical sphere. Therefore, pelvic rind disruptions only increase the volume by the radius squared. This study suggests that reduction and stabilization of the pelvic ring disruption is more important then the reduction in volume.

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