A Case Summary of Gadolinium Contrast For CT Cystography

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A patient presented to the emergency department with level 1 trauma injuries after being struck by a truck while riding a motorcycle. The patient reported an allergy to iodinated contrast, so noncontrast trauma computed tomography (CT) scans of the chest, abdomen, and pelvis were obtained. A CT scan of the head and cervical spine also were obtained. The noncontrast CT scans showed a 3 cm pelvic compression injury, pubic diastasis, sacral fracture, pelvic hematoma, and probable partial extrusion of the urinary bladder. Trauma surgery requested CT cystography to evaluate for a bladder rupture. Because of the reported iodinated contrast allergy and the high suspicion for bladder rupture, the radiologist asked for an alternative method, so gadolinium-based contrast was used.

The contrast was prepared with an initial dose of 1 mmol/mL gadolinium, 30 mL of gadolinium diluted in saline to make 100 mL total volume. The contrast was administered according to a routine cystography procedure. The contrast was delivered via foley catheter using gravity, and a CT scan was performed on a SOMATOM Force CT scanner (Siemens Healthineers) using dual-energy technology. For this scan, the A tube was set at 100 kV and the B tube at Sn150 kV. The images were reconstructed initially with a 0.9 dual-energy mix ratio. The scan showed the contrast in the bladder was more than sufficiently dense, so the decision was made to further distend the bladder (see **Figure 1**).

Before a second scan, another 100 mL of saline was introduced to the bladder using an irrigation method by a trauma physician to prevent layering of contrast and saline. This brought the contrast mixture to 30 mL of gadolinium diluted in saline for 200 mL total volume. A second CT scan was performed with the A tube set at 100 kV and the B tube set at Sn150 kV. The images were reconstructed with a 0.9 dual-energy mix ratio. The bladder was distended, and the density of the contrast was more than sufficient (see **Figure 2**). Additional

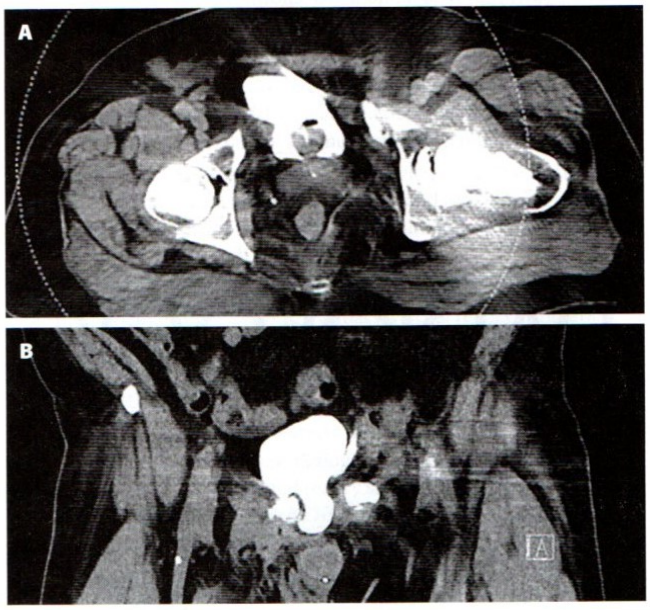

Figure 1. *Axial (A) and coronal (B) computed tomography (CT) images demonstrating bladder with 30 mL of gadolinium diluted in saline for a total volume of 100 mL. Images courtesy of Geisinger Medical Center.*

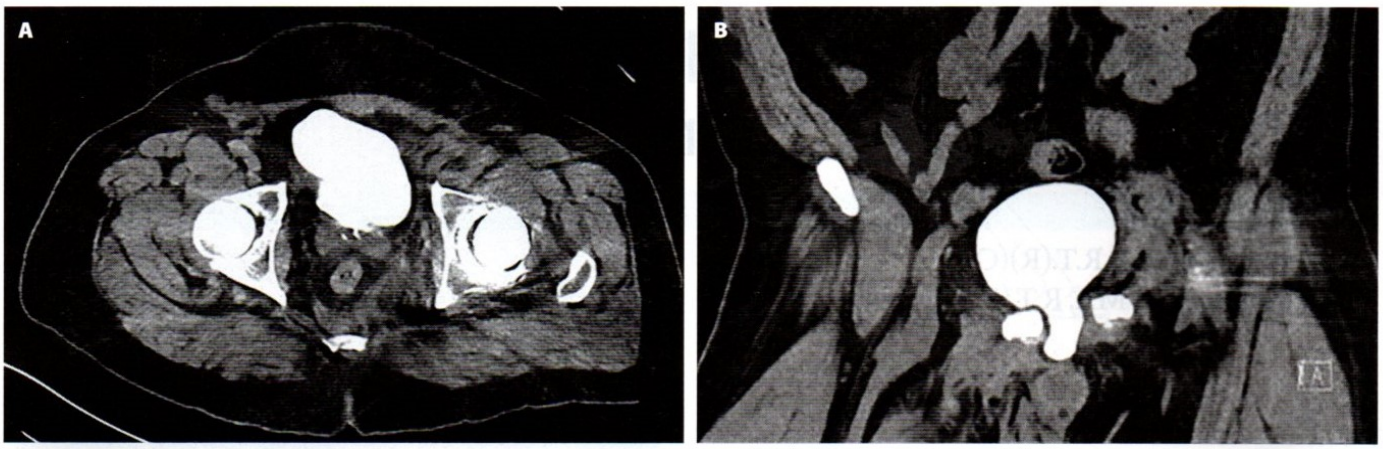

Figure 2. *Axial (A) and coronal (B) CT images showing bladder with an additional 100 mL of saline introduced to dilute 30 mL of gadolinium in saline for a total volume of 200 mL. Images courtesy of Geisinger Medical Center.*

images were reconstructed using monoenergetic reconstruction at 60 keV and 80 keV, which provided no extra information and ultimately were unnecessary.

Then, as per routine CT cystography protocol, the bladder was drained, and images after voiding were obtained. A small amount of residual contrast remained in the bladder, but no extravasated contrast was appreciated. Images were reconstructed in axial, sagittal, and coronal planes on all series. The gadolinium contrast images showed a partial extrusion of the urinary bladder, but no bladder rupture or tear occurred.

Conclusion

In this case summary, gadolinium was effectively used as a substitute for iodinated contrast in CT cystography. The methods described in this case might be applied to other cases in which a patient has an iodinated contrast allergy. For greater bladder distension, 30 mL of gadolinium diluted in saline for 300 mL total volume can be used. Single-energy CT scanners also could be used, but lower kilovoltage at or near 100 kV might be more appropriate in that situation.

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