

Gadolinium-Enhanced Computed Tomography Cystogram to Diagnose Bladder Augment Rupture in Patients with Iodine Sensitivity

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Anaphylactic reaction to iodinated contrast is a potentially life-threatening complication of diagnostic imaging studies. We report the successful use of gadolinium as an alternative contrast agent for computed tomography cystogram in a patient with a history of anaphylactic reaction to iodinated contrast. This technique allowed us rapidly to diagnose a rupture of her bladder augmentation and pursue operative repair. *UROLOGY* 71: 984.e9–984.e11, 2008. © 2008 Elsevier Inc.

Anaphylactic reaction to iodinated contrast is a potentially life-threatening concern that may limit the utility of diagnostic procedures in those with documented contrast allergy. In those with a history of prior contrast reaction, the risk of a severe reaction on repeat exposure is increased 4 to 8 times.¹ We discuss the elimination of iodinated contrast reaction risk in a susceptible patient through the use of gadolinium, a commonly used contrast agent for magnetic resonance imaging (MRI). This allowed us rapidly to perform a computed tomography (CT) cystogram in an acutely ill patient and confirm a preoperative diagnosis of a ruptured bladder augmentation.

CASE PRESENTATION AND MANAGEMENT

A 29-year-old woman with a history of myelomeningocele, neurogenic bladder managed by augmentation cystoplasty, and anaphylactic reaction to iodinated contrast was admitted to the general surgical service with hypotension, metabolic acidosis, and abdominal pain. A foley catheter had been placed without difficulty and drained clear urine; hence, urologic consultation was not initially requested. Continued clinical deterioration ensued, and a noncontrast CT was obtained. It revealed ascites, as well as a nonobstructing renal stone that did prompt urologic consultation. Although the stone appeared to be an asymptomatic, incidental finding, we were concerned for an unrelated possible rupture of her augmented bladder. She initially refused exploratory laparotomy and subsequently refused iodinated contrast cystogram. MRI was

unavailable at that time. Therefore, we infused 20 mL of the gadolinium chelate dtpa-gadodiamide (Omniscan) in 500 mL normal saline via the foley catheter by gravity drip to perform a CT cystogram. Contrast enhancement of the pelvic ascites (Figs. 1 and 2) confirmed our diagnosis of ruptured augment, and she consented to and underwent exploratory laparotomy. We identified a 7-mm rent in the posterior aspect of the augment and repaired it. She was ultimately discharged and has had no further sequelae.

DISCUSSION

Life-threatening adverse reactions to iodinated contrast media have a reported incidence in the range of 0.031% for low-osmolality agents to 0.157% for conventional agents.² Such reactions contraindicate further use of these agents in affected patients. Gadolinium chelates have a proven safety profile and are the agents of choice in MR contrast imaging. The incidence of anaphylactic reactions to these agents has been reported to be as low as 0.001% to 0.01%, approximately one-tenth as likely as a life-threatening reaction to iodinated contrast media.²

Although typically employed for contrast enhanced MR imaging, gadolinium also attenuates x-rays and can produce sufficient image contrast to be used in various radiographic examinations. Therefore, the use of gadolinium as an alternative radiographic contrast agent may be an attractive option in patients with sensitivity to iodinated media. Routine MR imaging employs a typical intravenous dose of 20 mL gadolinium.³ Doses of gadolinium chelates as low as 2 mL have been used to produce radiographic contrast in the imaging of the parotid gland and duct system.⁴ Doses as high as 40 mL used intravascularly during coronary angiography produced adequate images and were well tolerated. Oral administration of 40 mL gadolinium has been successfully used to assess for

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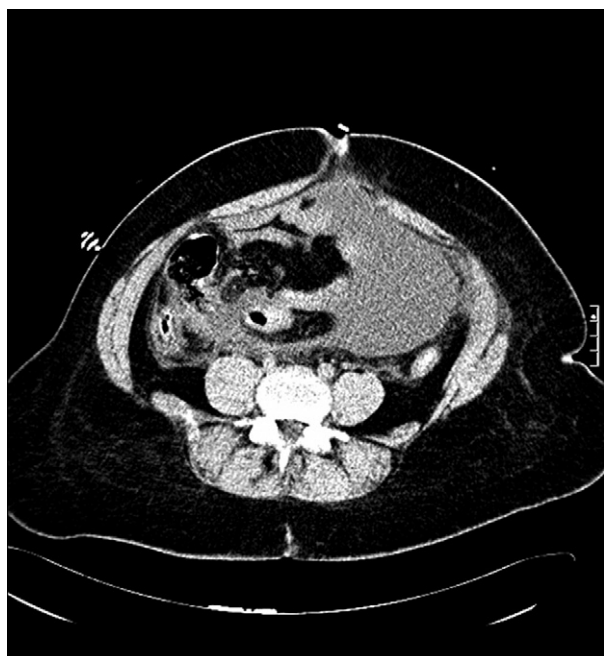


Figure 1. CT revealing intra-abdominal free fluid.



Figure 2. CT cystogram after intravesical administration of gadolinium, revealing gadolinium dependent contrast enhancement of fluid collection (arrows).

anastomotic leak after a bariatric procedure in a patient weighing approximately 500 lb.⁵ Conversely, in an obese woman with a BMI of 41.8 kg/m², only 5 to 6 mL of gadolinium was required to perform hysterosalpingography successfully.⁶

To assess for bladder rupture, our patient received an approximate 15- to 20-mL dose of gadolinium intravesically. Even upon extravasation, this volume provided sufficient density for clear image interpretation and sur-

gical planning. The CT attenuation of the fluid before instillation of contrast was 10 Hounsfield units (HU). Immediately after instillation this increased to 35 HU and on delayed films it was as high as 44 HU, a more than fourfold increase in attenuation. In the presence of ascites, instillation of a fluid with CT attenuation was necessary to confirm our diagnosis. Alternatively, one could consider instilling air or carbon dioxide, although confirmation of the perforation may not be as clear. Because systemically administered gadolinium has a well-recognized safety profile in those with normal renal function, extravasation of gadolinium was accepted since it spared our patient intraperitoneal exposure to iodinated contrast and the subsequent risk of an anaphylactic reaction. To our knowledge, this is the first reported use of gadolinium in a CT cystogram to identify bladder rupture in a patient with a history of a severe reaction to iodinated contrast media.

When considering the use of gadolinium as an alternative contrast agent, several caveats bear mentioning. The x-ray attenuation of gadolinium is less than that of iodinated contrast media; hence, iodinated contrast media should produce superior images in those who can tolerate it. Gadolinium chelates are typically more expensive than most low-osmolar, iodinated contrast materials. Finally, the use of gadolinium is not without inherent risks. A three- to fourfold greater risk of adverse reaction to intravenous gadolinium has been reported in those who previously experienced anaphylaxis to iodinated contrast media.⁷ Overall, adverse reactions to gadolinium occur with an estimated incidence of 1% to 2%, and it has been reported that up to 45% of mild reactions may occur more than 1 hour after the administration of the agent.^{2,3} Reactions include nausea, vomiting, urticaria, rash, and dyspnea, in addition to anaphylaxis. Practitioners must remain vigilant for severe reactions to gadolinium. More recently, intravenous gadolinium administration in those with end-stage renal disease (ESRD) has been implicated as a trigger for nephrogenic systemic fibrosis (NSF).⁸ To date there have been no reports of NSF related to peritoneal administration of gadolinium, and in fact gadolinium-enhanced MRI peritoneography has been performed to diagnose peritoneal leak in a child with ESRD undergoing peritoneal dialysis without mention of any complications, including NSF.⁹ Regardless, with the expanding recognition of NSF, it would be prudent to avoid any potentially systemic (including intraperitoneal) exposure to gadolinium in those with ESRD until the safety profile in this population can be better defined. Nevertheless, in the appropriate clinical setting gadolinium may prove a useful contrast agent in the urologic armamentarium.

CONCLUSIONS

Gadolinium CT cystography represents an alternative diagnostic technique in the evaluation of suspected bladder rupture. This technique may be particularly useful in

those with a history of anaphylactic reaction to iodinated contrast, and was successfully used to diagnose rupture of an augmented bladder in such a patient without adverse sequelae.

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