Spontaneous rupture of a bladder diverticulum is a rare condition, and only a few such case reports have been published (1-4). We report on a case of spontaneous rupture of a bladder diverticulum that was diagnosed on cystography and the subsequent CT scanning with three-dimensional reformation. To our knowledge, there has been no radiologic report in the English medical literature concerning spontaneous rupture of a bladder diverticulum.

Case Report

A 36-year-old woman was admitted to the hospital via the emergency room due to her sudden onset of lower abdominal pain and the subsequent voiding difficulty. There was no history of trauma when the symptoms had developed. She was diagnosed as having juvenile rheumatoid arthritis at the age of six, and she had been treated with oral steroid ever since.

She had a very small body stature; she was 126 cm in height and 20 kg in weight, and she had severe limitation of motion due to the sequelae of juvenile rheumatoid arthritis. She had no fever. The white blood cell count was 8,930cells/µl (segmental neutrophils: 90.6%), the erythrocyte sedimentation rate was elevated to 85 mm/hr, and the blood urea nitrogen and creatinine level were increased to 67 mg/dl and 1.9 mg/dl, respectively. The urine analysis findings showed one to four red blood cells and less than one leukocyte per high power field, and the urine culture was negative. Urethral catheterization was performed.

Ultrasonography revealed the increased cortical echogenicity of both contracted kidneys, which suggested the presence of chronic renal parenchymal disease. There was a large amount of multiseptated ascites in the lower abdomen and the perivesical space. CT was done without use of intravenous contrast material due to the possibility of renal failure, and the CT showed an extensive retroperitoneal fluid collection with a small air bubble on the right side of the bladder. Ascites due to spontaneous bladder perforation was suspected. Cystography showed a diverticulum on the right side of the bladder (Fig. 1A) and leakage of the contrast material from the upper portion of the diverticulum into the sur-
rounding extraperitoneal space (Fig. 1B). There was no radiographic evidence of neurogenic bladder. Nonenhanced CT was performed immediately after cystography, and then three-dimensional reformation of the images was done via the computer software program at our institution (Rapidia; 3DMED, Seoul, Korea). As a result, a small pit on the superior part of the bladder diverticulum and the extravasation of the contrast material into the extraperitoneal space was demonstrated on the volume rendering image and also on the virtual cystoscopic image [Figs. 1C-1E]. Conventional cystoscopy was not performed for this patient.

After two weeks’ observation with a Foley catheter placed in the urinary bladder, she had no complaints of urinary symptoms, and there was no leakage of contrast material from the bladder diverticulum on the follow up cystography. The Foley catheter was removed and she underwent training for self-voiding.

Discussion

The causes of the spontaneous rupture of the bladder include bladder wall lesion (malignant tumor, inflammatory lesion, diverticulum, irradiation and calculus) or distention of the bladder wall (neurogenic bladder, alcohol intoxication, outlet obstruction and distention therapy) [5]. On review of the nine cases of spontaneous rupture of bladder diverticulum by Keeler and Sant, bladder outlet obstruction and urinary tract infection was present in most of the cases [1]. Burns suggested that infection coupled with a sudden increase in bladder wall tension creates the proper milieu for perforation of a diverticulum [6]. Edema at the neck of a diverticulum may also create a closed space infection and so contribute to rupture [7]. In our case, the rupture may have been associated with urinary stasis and the resultant temporarily increased intravesical pressure, and this
was possibly because the patient had limitation of motion when moving by herself; there are no other causes that could possibly explain the rupture of the bladder diverticulum from the past medical history of this patient. The patient was treated with conservative care because the rupture site was extraperitoneal. This patient underwent a good clinical course, and the follow-up cystography after two weeks showed spontaneous closure of the previous perforation site. Although conservative therapy is often successful for treating extraperitoneal ruptures, surgical repair is usually required for the intraperitoneal ruptures [8].

Many factors may delay the prompt diagnosis of spontaneous rupture of the bladder diverticulum; they are this condition's rarity, and the mildness and lack of specificity of the subjective symptoms when the extravasated urine is sterile [2]. On the diagnostic imaging, the results of studies that have compared the efficacy of enhanced CT and cystography have suggested that neither method was completely reliable [9]. Itoh et al [2] have reported on a case of spontaneous bladder diverticular rupture that was diagnosed by abdominal ultrasonography with the instillation of saline and air, which dynamically demonstrated extravasation from the ruptured diverticulum.

In our case, a bladder diverticulum could be promptly diagnosed by cystography and the subsequently performed axial CT scan, but the definite localization of the perforation site was not easy because the extravasated contrast material that was used during cystography was in close contact with both the bladder wall and the diverticulum. However, the three dimensional imaging clearly demonstrated that the extravasation was from the ruptured bladder diverticulum and not from the bladder wall. The virtual cystoscopic view was particularly useful for directly visualizing the perforation site, and it also saved inconvenience to the patient when undergoing cystoscopy.

In conclusion, the CT image created by three dimensional reformation can help in detecting the definite perforation site of a spontaneously ruptured bladder diverticulum when it is not easily demonstrated on a conventional imaging modality such as cystography or an axial CT scan.

References