

CT urography of a vesicourachal diverticulum containing calculi

Nilgün Işıksalan Özbülbul, Mustafa Dağlı, Gökçen Akdoğan, Tülay Ölçer

ABSTRACT

Urachal remnant disease is a relatively rare urological condition that presents a variety of clinical problems in adult patients. Contrast-enhanced multi-detector row computed tomography (MDCT) urography is a new diagnostic imaging technique providing comprehensive evaluation of the upper and lower urinary tract. MDCT urography performed with a combination of unenhanced, nephrographic phase, and excretory-phase imaging can demonstrate a wide spectrum of disease in these patients with a single study. We report a case of vesicourachal diverticulum containing calculus, which was diagnosed by MDCT urography.

Key words: • computed tomography • urography • urinary tract • urachus

The urachus is an embryonic remnant resulting from involution of the allantois and the ventral cloaca. Joining the bladder dome to the umbilicus, the duct is progressively obliterated during fetal life to become a fibrous channel. Urachal anomalies are rarely observed clinically. They present a variety of clinical problems with complications that include infection, calculi, or even malignant degeneration (1–4). To the best of our knowledge, there have been no reports in the English-language literature on the diagnostic features of multi-detector row computed tomography (MDCT) urography for this condition. Here, we report a case of a vesicourachal diverticulum containing urinary calculus, diagnosed by MDCT urography.

Case report

A 60-year-old man was referred to our hospital for evaluation of liver cysts. On admission, clinical examination showed no abnormalities. Blood biochemistry, routine complete blood count, and urinalysis were within normal ranges. Abdominal ultrasonography (US) showed multiple variably-sized simple cysts in the liver. A localized hypoechoic outpouching communicating with the upper portion of the bladder was noted incidentally. This extraluminal, protruding, fluid-filled sac did not communicate with the umbilicus, and contained a hyperechoic calculus.

MDCT urography was performed with a 16-row multislice computed tomography unit (Lightspeed 16, GE Medical Systems, Milwaukee, Wisconsin, USA). Scans were obtained in three phases (unenhanced, nephrographic, and excretory phase). No oral contrast material was administered. Pre-contrast images were obtained from the diaphragm to the symphysis pubis, with a section thickness of 2.5 mm and reconstruction interval of 2.5 mm. After the insertion of an 18 G catheter into an antecubital vein, 130 mL of ioversol 300 mgI/mL (Optiray, Mallinckordt, St. Louis, Missouri, USA) was injected with an automatic injector at a rate of 3 mL/s. Nephrographic phase images were acquired 100 seconds after initiation of injection from the superior portion of the diaphragm to the end of the kidneys, with a section thickness of 2.5 mm and reconstruction interval of 2.5 mm. Excretory phase images were obtained 10 minutes after initiation of injection from kidneys to the symphysis, with a section thickness of 1.25 mm and reconstruction interval of 1.25 mm. All CT data were transferred to a workstation (Advantage Windows 4.2, GE Medical Systems) for three-dimensional (3D) reconstructions (multiplanar reformat, maximum intensity projection, and volume rendering).

Sagittal and curved reformatted images, both unenhanced and in the excretory phase, demonstrated a midline cystic lesion just above the anterosuperior aspect of the bladder which contained two calculi (Figure).

From the Department of Radiology (N.I.Ö. ✉ nilgunisiksalan@yahoo.com), Türkiye Yüksek İhtisas Hospital, Ankara, Turkey.

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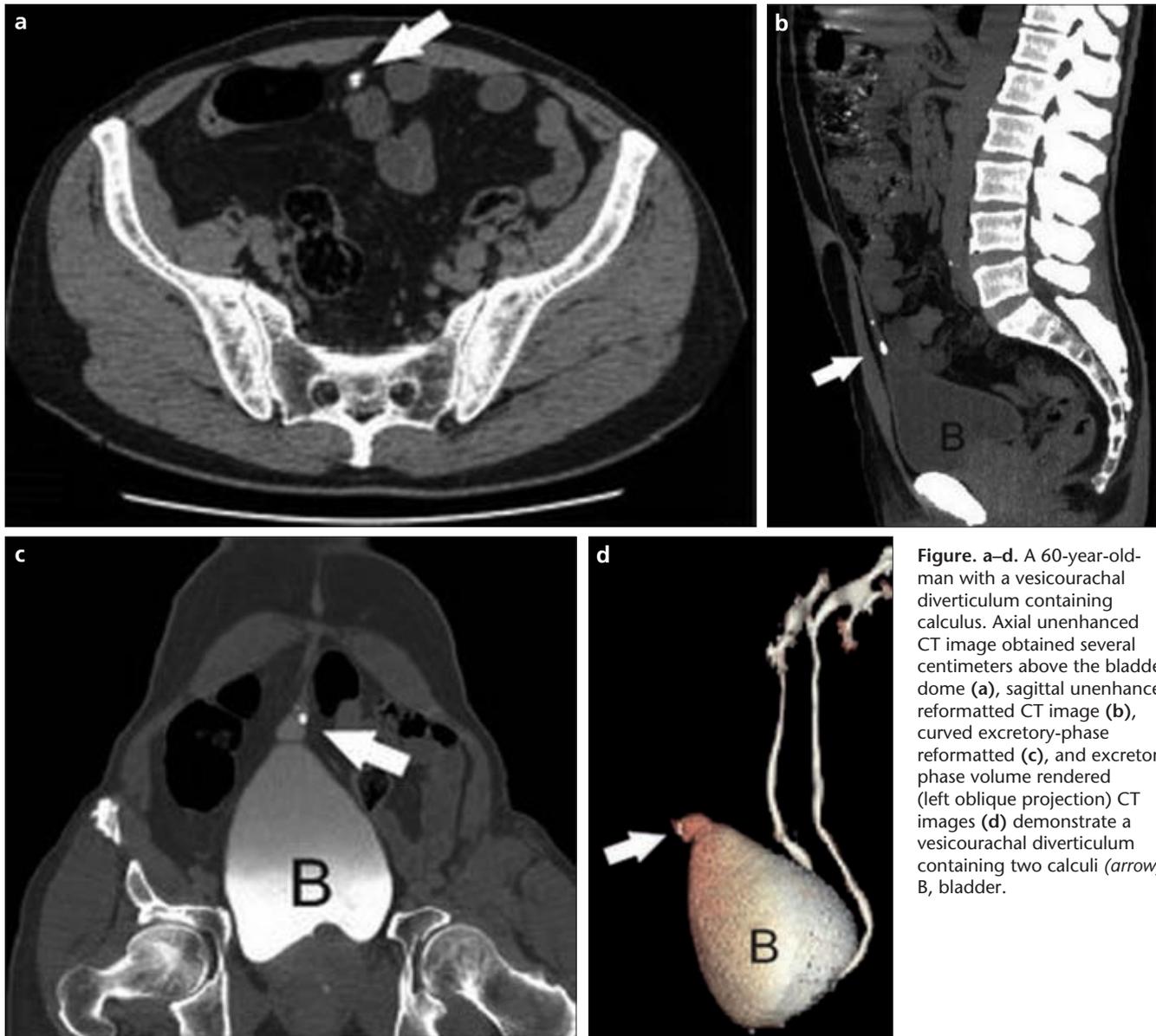


Figure. a–d. A 60-year-old-man with a vesicourachal diverticulum containing calculus. Axial unenhanced CT image obtained several centimeters above the bladder dome (a), sagittal unenhanced reformatted CT image (b), curved excretory-phase reformatted (c), and excretory-phase volume rendered (left oblique projection) CT images (d) demonstrate a vesicourachal diverticulum containing two calculi (arrow). B, bladder.

In addition, excretory phase images revealed a communication between the urachal remnant and the bladder, which allowed contrast material to flow into the urachal lesion. No solid mass or calcification was found along the course of the urachal remnant. MDCT urography confirmed the diagnosis.

Discussion

The urachus, or median umbilical ligament, is a midline tubular structure that extends upward from the anterior dome of the bladder toward the umbilicus. It is a vestigial remnant of at least two embryonic structures: the cloaca, which is the cephalic extension of the urogenital sinus (a precursor of the fetal bladder), and the allantois, which is

a derivative of the yolk sac. The tubular urachus normally involutes before birth, remaining as a fibrous band with no known function. However, persistence of an embryonic urachal remnant can give rise to various clinical problems, not only in infants and children but also in adults. Because urachal remnant anomalies are uncommon and manifest with nonspecific symptoms, definitive presurgical diagnosis is not easily made (1–5).

Congenital urachal anomalies are twice as common in men as in women. There are four types of congenital urachal anomalies: patent urachus, umbilical-urachal sinus, vesicourachal diverticulum, and urachal cyst. An umbilical-urachal sinus, vesicourachal di-

verticulum, or urachal cyst may close normally after birth but reopen in association with pathologic conditions that are often categorized as acquired diseases. The majority of patients with urachal abnormalities are asymptomatic; however, they may become symptomatic if these abnormalities are complicated by infection (3).

In vesicourachal diverticulum, the urachus communicates only with the bladder dome. This condition results when the vesical end of the urachus fails to close. Vesicourachal diverticulum is asymptomatic in most cases and is usually discovered incidentally on axial CT performed for unrelated reasons, appearing as a midline cystic lesion just above the anterosuperior aspect of

the bladder. US readily demonstrates an extraluminally protruding, fluid-filled sac that does not communicate with the umbilicus. This lesion tends to be found in patients with chronic bladder outlet obstruction, and may be complicated by urinary tract infection, intraurachal stone formation, and an increased incidence of adenocarcinoma after puberty (3). Sonography is a valuable diagnostic tool for detecting various urachal anomalies. CT and magnetic resonance imaging are additional diagnostic procedures that are used to confirm the urachal lesion, and to assess the extent of the disease and possible involvement of adjacent structures (6). A routine search should be made for other anomalies of the urinary tract (4).

In our case, the presence of an intracavitary urinary calculus suggested the possibility of a communication between the urachal remnant and the bladder which allowed urine to flow into the urachal lesion, and resultant formation of the calculi (1, 6). The patient had never had any urological symptoms, which is possibly due to the absence of a functional connection between the urachal remnant and the skin orifice at the umbilicus (1).

Infection is the most common complication of urachal anomalies. Vesicourachal diverticula are less often complicated by infection, as long as the neck of the diverticulum is wide open. Other major complications include perforation and abscess formation in the Retzius space, and malignant tumor development. The tumors can mimic an adenocarcinoma of the bladder apex (2).

Understanding the anatomy and embryology of urachal cysts and remnants is critical in making the correct diagnosis and choosing an effective management strategy, which can avoid the complications of intraperitoneal rupture, or subsequent malignancy (1–4).

MDCT urography is a relatively new diagnostic imaging technique providing comprehensive evaluation of the upper and lower urinary tract. MDCT urography performed with a combination of unenhanced, nephrographic phase, and excretory-phase imaging can demonstrate a wide spectrum of disease in these patients with a single study. MDCT enables isotropic or near-isotropic high quality multiplanar image reconstruction, and provides more diagnostic information than does conventional CT. As MDCT has become more widely available, MDCT urography has begun to replace other imaging techniques, especially intravenous urography (7–9). MDCT urography is a promising technique; however, there are several disadvantages: at the present time, there is no consensus of opinion as to which patients should undergo MDCT urography. As there may be over 1000 transverse images to review per examination, interpretation is labor- and time-intensive. Furthermore, the radiologist must take the time to evaluate other imaged intra-abdominal organs for pathology on each imaging phase. In addition, MDCT urography exposes patients to approximately 1.5 times as much radiation as would a combination of IVU and conventional single-phase CT (6).

In conclusion, urachal remnant disease is a relatively rare urological condition that presents various clinical problems, even in adult patients. MDCT urography with multiplanar reformatted images (sagittal and curved) can help to identify urachal remnant and its complications.

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