Infection of Previously Closed Urachus Mimicking Malignancy: A Case Report and Literature Review of Radiological Findings to the Diagnosis

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ABSTRACT: The urachus is a vestigial structure of the allantois and cloaca. It involutes as fetal development progresses to become a fibrous cord, which courses between the umbilicus and bladder dome within the retropubic space. Infection occasionally occurs in patients with congenital patent urachus. Here, we report a patient with infection of a previously closed urachal tract presenting as an abdominal mass. This has rarely been described in the literature. Current knowledge on imaging findings to the diagnosis is discussed.

KEYWORDS: Urachus, abscess, malignancy, diagnosis

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Introduction

The urachus is a vestigial structure of the allantois and cloaca. It involutes as fetal development progresses to become a fibrous cord, the median umbilical ligament, which courses between the umbilicus and bladder dome within the space of Retzius. Urachal mass is often diagnosed as an incidental finding in patients presenting with abdominal or urinary tract symptoms. Reliable differentiation between benign and malignant urachal lesions using imaging modalities is of importance for the choice of therapy, as illustrated by the presented case.

Case Report

An 81-year-old man was referred to our hospital with complaints of lower abdomen discomfort and laxative-resistant constipation. Abdominal ultrasonography (US) showed an 8 cm mass with mixed echogenicity in caudal umbilical region (Figure 1). Subsequent abdominal computed tomography (CT) scan confirmed a complex septated mass with solid and cystic components in the midline lower abdomen (Figure 2). There were no locoregional or distant metastases. A tubular connection between the mass and bladder dome suggested an urachal origin. Of note, no urachal anomalies were seen on an abdominal CT scan 5 years earlier (Figure 3). In view of the probability of malignancy, our patient underwent resection of the mass and partial cystectomy. Histology showed inflammation of urachal remnants without malignancy. Microbiology of resected specimens and fluid content showed *Escherichia coli*, fitting the diagnosis of urachal infection.

Discussion

Urachal anomalies can be classified into congenital or acquired. Congenital urachal anomalies resulting from incomplete regression of the urachus include patent urachus (also referred to as urachal fistula), umbilical-urachal sinus, vesicourachal diverticula, and urachal cysts. Acquired urachal pathology includes infection and malignancy. Infection may present in patients with congenital urachal anomalies. Among urachal cancer, mucinous adenocarcinoma is the most common histological type (up to 42%) followed by non-mucinous adenocarcinoma (30%), transitional cell carcinoma (10%), and squamous cell carcinoma (3%).[1] Distant metastases of colon cancer or breast cancer to the urachal region has been described.[2] Metastases of urachal carcinoma at initial diagnosis are common (50%). Preferential sites of metastasis include pelvic lymph node, omentum, liver, lung, and bone.[3]

Clinical symptoms of patients with an urachal mass are generally non-specific and mainly occur due to compression of adjacent structures. Hematuria has been reported to be present in >70% of patients with urachal malignancy[4], although this may be caused by diverse clinical conditions. In another study including 130 patients with urachal mass of which 66 had urachal carcinoma, the presence of hematuria and age >55 years were associated with malignancy.[5] Serum inflammation markers in relation to urachal anomalies have not been well studied. Elevated or normal inflammation markers including C-reactive protein (CRP) and white blood count have been reported in urachal carcinoma as well as other benign urachal anomalies.[6,7] Serum carcinoembryonic antigen (CEA) may be elevated in some cases of urachal carcinoma.[8]

Most urachal masses are discovered as an incidental finding on routine imaging in patients with gastrointestinal or urinary tract symptoms. Ultrasonography is particularly suitable for diagnosis and visualization of urachal masses. The typical location in the lower abdomen along the midline course between umbilicus and bladder renders the diagnosis of urachal mass by US straightforward in most cases. It does, however, not allow for the differentiation between malignant and benign urachal lesions. Urachal abscesses can appear solid with thick septa and

irregular borders on US, hereby mimicking urachal carcinomas.[9] Thus, additional imaging modalities to reliably differentiate between benign and malignant process would be helpful for more specific diagnosis of urachal abnormalities. Computed tomography (CT) scan is a commonly used imaging modality for confirmation of US findings and further specification of urachal mass, including possible other related abnormalities in the abdomen. Urachal abscesses exhibit heterogeneous enhancement on CT with intravenous (IV) contrast,[6,10,11] whereas this is also commonly observed in malignancies. Certain CT features associated with urachal carcinomas have been reported, which may point toward malignant potential when present. These include calcifications (50%-70%)[9,12] and invasion of bladder wall (up to 92%).[3] Foci of low attenuation representing mucinous content of urachal carcinoma may be present.[9]

As compared with CT scan, magnetic resonance imaging (MRI) scan may allow a better delineation of soft tissue structure and assessment of local invasion. Urachal abscesses appear as T1 hypointense masses on MRI and show heterogeneous enhancement after administration of gadolinium contrast agent.[10,11] An irregular thickened wall may be present. Urachal carcinomas, however, may demonstrate similar features on MRI.[13] Recent advances in novel MRI scan sequences such as diffusion-weighted MRI sequences may further improve the ability to differentiate between these 2 entities. Few studies on positron emission tomography (PET)/CT imaging report an increase in uptake of 2-[^{18}F]-fluoro-2-deoxy-d-glucose (FDG) in urachal abscesses,[10,11] presumably caused by activated inflammatory cells. Urachal carcinomas, however, display variable FDG uptake ranging from high to low or absent uptake in urachal adenocarcinoma of mucinous subtype.[14] The authors concluded that the role of PET imaging in the diagnostic workup for urachal mass may be limited.

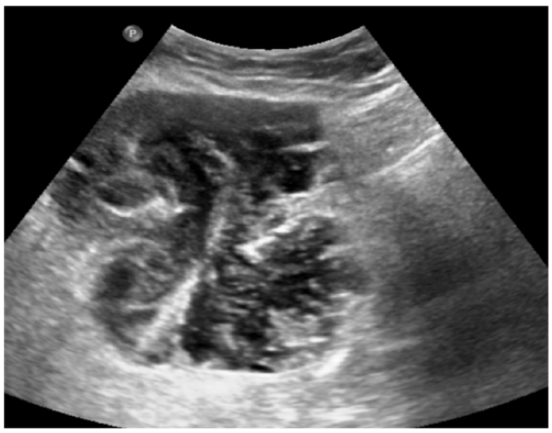

Figure 1. Sagittal US image (C9-2 curved array transducer; Philips, The Netherlands) of the lower abdomen shows a large, mixed hypoechoic and hyperechoic mass with an irregular shape and an ill-defined border and multiple locules. US indicates ultrasonography.

Fine needle aspiration or cystoscopy with biopsy is often mandatory for the diagnosis of urachal malignancy prior to surgery,[12,14,15] although sampling error should be taken into account.[16] Of note, Meeks et al[17] showed preoperative diagnostic modalities including cytology, examination under anesthesia and transurethral resection of bladder tumor provided high specificity to differentiate between benign and malignant urachal mass, but the overall sensitivity was low to reliably exclude the diagnosis of urachal neoplasia.

In our case, our patient had infection of previously closed urachus, which has rarely been reported in the literature. This case suggests that partial reopening of previously closed urachal tract with subsequent infection is possible, although the precise mechanism remains speculative. Newly developed lower abdominal mass in adult patient strongly suggests malignancy, although other causes may be considered as well. Imaging modalities such as US and CT were able to diagnose urachal anomalies, but were insufficient to differentiate between benign and malignant process.

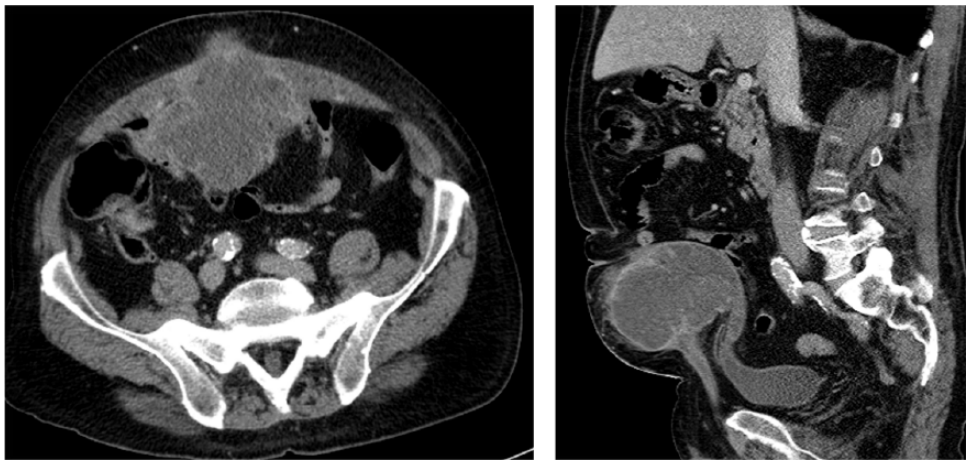

Figure 2. Enhanced CT scan revealed a large, multiloculated mass in the midline of lower abdomen with thick septa and irregular border. The mass demonstrates mixed cystic and solid elements with area of low attenuation surrounded by high attenuating wall. Note the presence of multiple thick enhancing septa and fat stranding adjacent to the mass. No apparent calcifications were present. CT indicates computed tomography.

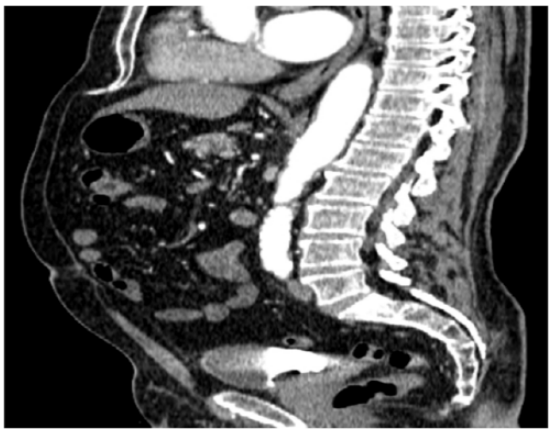

Figure 3. A routine CT scan performed 5 years previously showed no patent urachal remnants (sagittal reconstruction is shown here). CT indicates computed tomography.

Management

As the precise origin of urachal mass is difficult to ascertain in most cases, surgery is recommended in patients with suspected urachal mass for definitive histological diagnosis. Primary incision and drainage followed by surgical excision at later stage can be considered in apparent urachal abscess.[7] The benefit of adjuvant chemotherapy or radiotherapy for urachal carcinomas remains unclear.[18]

In conclusion, reliable differentiation between benign and malignant urachal lesions using current imaging modalities remains challenging with a large overlap of benign and malignant features. Differentiation between both is very important because of the clinical implications and therapeutic approach as exemplified by the presented case.

Author's Note

All authors had access to the data and a role in writing the manuscript.

Author Contribution

SWL wrote the first draft. All authors reviewed and approved the final manuscript.

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