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Case Report

Mucinous cystadenoma with calcification arising from renal pelvis radiologically resembled renal calculus with hydronephrosis: report of a rare case and review of the literature

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Abstract: Primary mucinous cystic tumors occurring in the renal pelvis or the entire pyelocaliceal system are uncommon. Most are mucinous cystadenomas and less frequently mucinous cystadenocarcinomas. In fact, the publications on these neoplasms are limited to a few cases. Because mucinous cystadenomas of kidney are exceedingly rare, little is known about their natural history, pathogenesis and clinicopathologic features. Herein, we describe 1 case of mucinous cystadenoma arising from the renal pelvis with calcification, which resembled hydronephrosis with renal calculus radiologically. The patient presented with a history of intermittent dull pain on the right waist since 10 years ago. He had no history of removing urinary calculus or long-standing chronic infection in urinary system. The histopathology was unique since the inner surface of the cyst was covered by a mucinous epithelium connected to a urothelium, a transition from nonneoplastic urothelium to mucinous epithelium was demonstrated by immunohistochemical staining for GATA-binding protein 3 (GATA3). This suggests that mucinous cystadenoma of renal pelvis, like its malignant counterpart, maybe arises in foci of metaplastic mucinous areas.

Keywords: Kidney neoplasm, mucinous cystadenoma, hydronephrosis, calculus, metaplasia

Introduction

Tumors of the renal pelvis are uncommon, and the most common neoplasms are urothelial in origin. Mucinous cystic neoplasms of kidney are exceedingly rare primary renal neoplasm, with only 21 cases of mucinous cystadenoma and 5 cases of mucinous cystadenocarcinoma have been reported in English literature [1, 2]. Mucinous cystadenocarcinoma of renal pelvis was first described in 1956 by Arcadi *et al* [3]. Because knowledge about renal mucinous cystic neoplasms is extremely limited and they have not been recognized in the WHO Classification of Tumors of the Urinary System and Male Genital Organs [4]. Here we reported a case of mucinous cystadenoma of kidney, which maybe arising from extensive mucinous metaplasia of renal pelvic urothelium secondary to chronic hydronephrosis in a 75-year-old patient.

Clinical history

A 75-year-old man presented with a history of intermittent dull pain on the right waist since 10 years ago. Recently the patient complained from aggravation of abdominal pain, so he came to the local hospital for medical help. Ultrasonographic examination of the abdomen revealed “renal calculus with severe hydronephrosis in the right kidney”. He neither had history of removing urinary calculus, nor had hematuria, dysuria, frequent micturition or fever during the past 10 years. He was treated with antibiotics for several days but the uncomfortable symptoms didn’t alleviated significantly, then he came to our hospital for surgical treatment. The diagnosis upon admission was right kidney calculus accompanying with hydronephrosis.

Contrast-enhanced abdominal CT scans showed that the right renal enlarged, the cortex

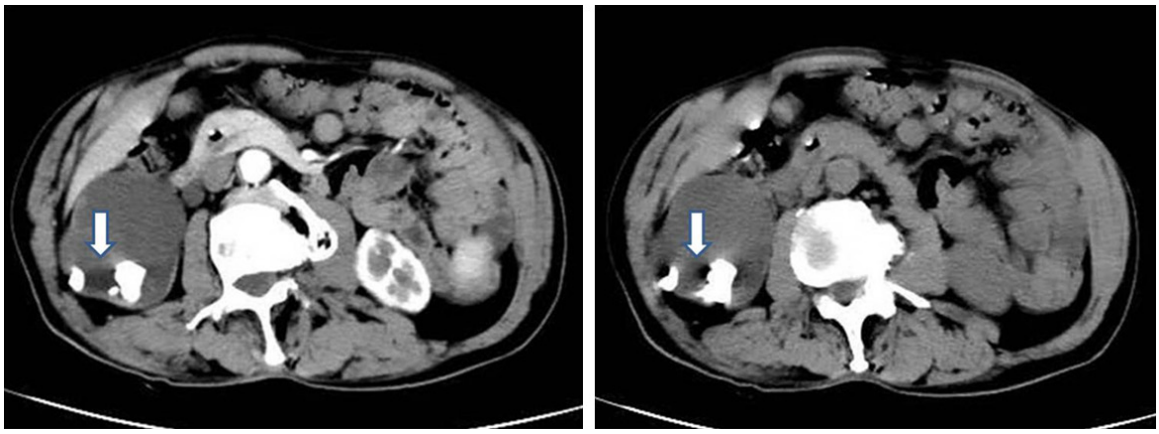

Figure 1. Computed tomography (CT) of the abdomen showed that the right renal pelvis, caliceal dilated and hydronephrosis formed; multiple patchy consolidations with high density were seen in renal pelvis (arrowhead point).

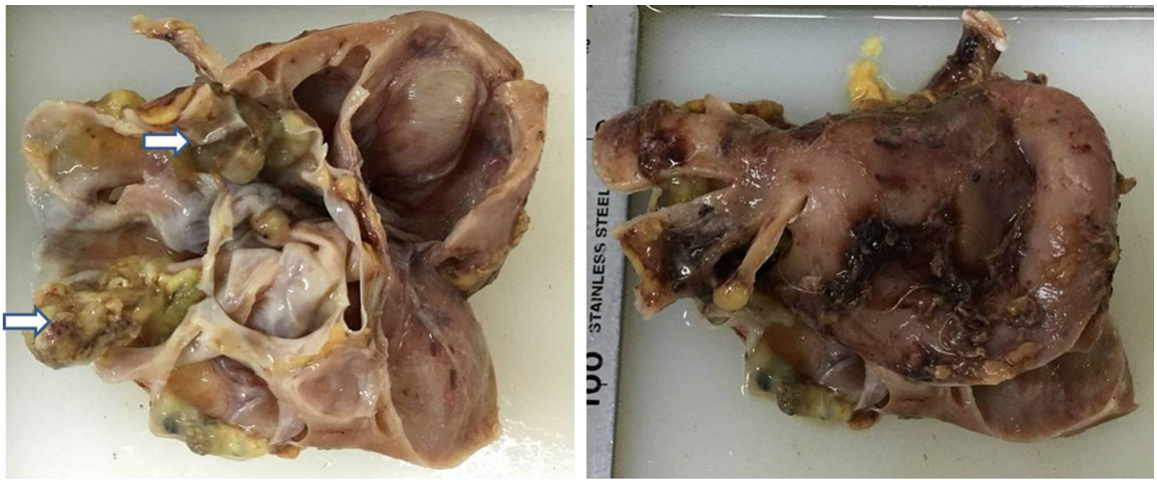

Figure 2. Grossly, a complicated cystic mass replaces the entire kidney, which was filled with greyish-green gelatinous mucus, the cortex was thinned out to a fibrous rim, two calcified protuberances on the wall of the cystic mass were found (arrowhead point); the upper part of right ureter was markedly dilated.

became thinner, while the renal pelvis, caliceal dilated and hydronephrosis formed; Multiple patchy consolidations with high density were seen in renal pelvis, the upper part of right ureter was dilated, while the middle and lower parts were normal, showing multiple renal calculi with severe hydronephrosis in right kidney (**Figure 1**). It did not reveal any other mass lesions or ascites in the abdomen. The glomerular filtration rate (GFR) test displayed no obvious tracer in the right renal parenchyma, showing almost nonfunctional state. Urine culture was negative. As for laboratory examination, including routine peripheral blood test, urine test and biochemical examination were all within the normal ranges. In May 2016, the patient underwent right nephrectomy for the kidney lesion. During the 13-month follow-up, the patient was well and no recurrence of the neoplasm occurred.

Pathologic findings

Grossly, the kidney was markedly enlarged measuring 15 cm in greatest dimensions. On cut section of the kidney, it was totally replaced by a complicated cystic mass involving the renal pelvis and calyces, which was filled with greyish-green gelatinous mucus. The cortex was thinned out to a fibrous rim. Two calcified protuberances on the wall of the cystic mass were found, 3×2 cm and 2×1.5 cm in size respectively, which projected into the lumen of the renal pelvis, and the upper part of right ureter was markedly dilated (**Figure 2**).

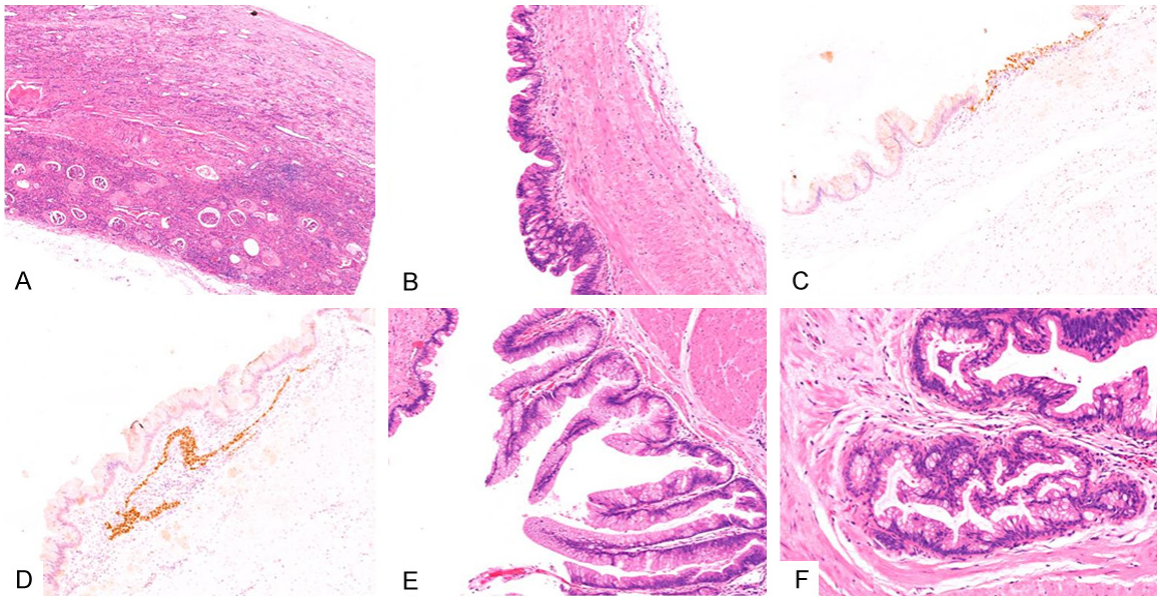

Figure 3. Histologic and immunohistochemical findings. Low-magnification microscopic examination showed the parenchyma of kidney became thin obviously, some glomeruli revealed hyaline degeneration, renal mesenchyme fibrous tissue proliferation accompanied with focal infiltration of lymphocytes and plasma cells (A); pseudostratified epithelia with mucinous metaplasia were observed at some palces (B); a transition from nonneoplastic urothelium to mucinous epithelium was demonstrable by GATA3 immunohistochemical staining (C); GATA3 immunohistochemical staining also domenstrated that mucous membranes of renal pelvis around the capsule wall were compressed (D); papillary structures were observed lined by columnar epithelium without dysplasia in some areas in high- power microscopy (E); intestinal metaplasia was observed in some fields (F). (A ×50; B-D ×100; E and F ×200).

Low-magnification microscopic examination showed the parenchyma of kidney became thin obviously, some glomeruli revealed hyaline degeneration, renal mesenchyme fibrous tissue proliferation accompanied with focal infiltration of lymphocytes and plasma cells (**Figure 3A**). Chronic inflammatory cells infiltration not been observed in renal pelvis mucosa. Histopathological examination of the renal cyst wall revealed that the lining epithelium was formed by a single layer of urothelium in some foci in high power microscopy, but largely, the cystically dilated areas were lined by single layers of mucin secreting cells with basally located nuclei. There was minimal architectural complexity. At some places, these lining epithelia showed pseudostratification and were thrown into delicate papillary folds (**Figure 3B**). The epithelium was reminiscent of the lining epithelium of mucinous cystadenoma of the ovary. The nuclei were bland looking, and foci of stromal invasion were absent. A transition from nonneoplastic urothelium to mucinous epithelium was demonstrable by immunohistochemical study, because nonneoplastic urothelium was positive for GATA-binding protein 3 (GATA3) (HG3-35, 1:200, Santa Cruz, CA, USA), while mucinous epithelium was negative for it (**Figure 3C**). GATA3 immunohistochemical staining also demonstrated that mucous membranes of renal pelvis around the capsule wall were compressed (**Figure 3D**). In some areas, papillary structures were observed lined by columnar epithelium without dysplasia (**Figure 3E**). Intestinal metaplasia was seen in some fields (**Figure 3F**). Focal squamous metaplasia not observed. In the upper part of right ureter, the lining epithelium still was made of a single layer of urothelium, no metaplasia into squamous, mucinous or intestinal form been observed. A diagnosis of mucinous cystadenoma arising from the renal pelvis was made.

Discussion

Kidney primary mucinous epithelium tumor is an extremely rare neoplasm, only isolated cases report were documented in the English literature. Chablé-Montero F *et al* once reported 3 cases of mucinous cystadenoma of the pyelocaliceal system in 2013. They analyzed previously published cases in English language

as well and only found 17 cases of renal mucinous cystadenoma. In addition, they also found 5 cases of primary mucinous cystadenocarcinoma of kidney in literature [1]. Mitome T *et al* reported another case of mucinous cystadenoma in a horseshoe kidney in 2015 [2]. Of the 22 cases of mucinous cystadenoma, including our case, most tumors occurred in native kidney; however, 3 cases of mucinous cystadenoma were occurred in horseshoe kidney [2, 5, 6]. The neoplasms were unilocular or multilocular with abundant mucin deposits. Some cases showed focal calcifications, granular, nodular or papillary structures attached to the inner surface of the cystically dilated areas. Forty-five percent cases were associated with renal lithiasis [1].

In the previous reports, mucinous cystadenomas occurred mainly in men (male to female ratio was 11:7), ranging in age from 27 to 79 years (median age, 59 years; mean age, 54 years). The mean size of the tumors was 15.6 cm (range, 2.4-37 cm). Some patients had symptoms related to renal lithiasis, pyelonephritis or lumbar and abdominal pain, the others were asymptomatic during the course of disease.

The normal urothelial epithelium is capable of metaplasia into squamous, columnar, or cuboidal form [7]. Mucin producing adenocarcinoma is exceedingly uncommon, as conversion of urothelial epithelium to colonic type of epithelium is rare. Gangane N and colleagues thought that mucinous cystadenoma, like its malignant counterpart, arises in foci of intestinal metaplasia, because histological transition from urothelial epithelium to metaplastic mucinous areas in the same lesion was observed [8]. In the present case, we were able to demonstrate the transition from nonneoplastic urothelium to mucinous epithelium by immunohistochemical staining for GATA3. A few cases of mucinous cystadenoma arising from the renal pelvis had progressed to mucinous adenocarcinomas [9, 10]. Gangane N *et al* reported one case of mucinous cystadenoma arising from renal pelvis, which lining pseudostratified epithelium with mucinous metaplasia and were thrown into delicate papillary folds in some places. This epithelium was reminiscent of the lining epithelium of mucinous cystadenoma of the ovary, pancreas and biliary tree; however, renal mucinous cystadenomas lack ovarian-like stroma characteristic of the ovarian, pancreatic, and biliary mucinous cystic tumors [8]. We also observed such foci in the current case. It seems no correlation between such epithelium metaplasia and suffer's sex. Ross DG *et al* suggested that the same criteria used for evaluating mucinous ovarian tumors might also be appropriate for mucinous tumors of the kidney [11]. Based on the clinical and morphological findings, we consider this case as a mucinous cystadenoma arising from the renal pelvis with calcification.

Long-standing chronic inflammation and renal calculi have been invoked as possible etiologic factors in mucinous adenocarcinoma of the pelvis [12]. It seems that the same hypothesis holds true for mucinous adenomas as well. In fact, renal calculi were reported in 10 cases primary renal mucinous cystadenoma in the previous reports [1]. However, this theory is not likely to be valid for the present case, because there is no prior history of urolithiasis or pyelonephritis. Arakawa *et al* believe in the theory that relies on glandular metaplasia in the kidney associated with urolithiasis and pyelonephritis [13]. By contrast, Liwinicz and associates have postulated that the formation of stones is secondary to the mucin secretion by the tumor. They have proposed that the mucins fused with sodium, calcium, and magnesium cations leading to the formation of stones. Thus, calculi may be the result, and not the cause of the neoplasm [14]. Interestingly, three cases of renal mucinous cystadenomas were discovered in horseshoe kidneys and all were of parenchymal origin. Such anomalous kidneys may have a tendency to have mucinous tumors of parenchymal origin. Some authors suggested that it was possible for such tumors to originate from a sequestered segment of renal pelvic epithelium in renal parenchyma, especially in an anomalous kidney [2, 5, 11].

It's very difficult to distinguish a mucinous cystadenoma from a simple renal parenchymal cyst based on routine imaging studies, including ultrasonography, CT, and MRI, and mucinous cystadenoma of the kidney may be more frequent than is diagnosed. It seems that treatment of renal mucinous cystadenoma should be individualized according to the radiological findings, since there are no definite diagnostic radiological criteria and treatment may not be necessary in some cases. Radiological studies

may not be able to identify malignant mucinous cystic neoplasms of kidney, so complex renal cystic lesions should be carefully followed for early detection of malignancy [15]. If there is suspicion of malignancy, total or partial nephrectomy should be performed accordingly, the final diagnosis was made only after tumor excision.

In summary, it suggests that mucinous cystadenoma, like its malignant counterpart, maybe arises in foci of metaplastic mucinous areas. The significance of this current special case lies in its radiologic features, which resembles hydronephrosis with renal calculus. It is difficult to suspect the diagnosis before surgery. Further follow-up is needed to determine the prognosis for such extremely rare renal neoplasm.

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Disclosure of conflict of interest

None.

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