Renal Endometriosis Mimicking Cystic Renal Tumor: Case Report and Literature Review

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Background: Endometriosis mainly affects female pelvic tissues and organs, and the presence of endometriosis in the kidney is extremely rare.

Case Presentation: We report a case of a 48-year-old woman who presented with intermittent hematuria. She was found to have a cystic mass on renal ultrasonography, and contrast-enhanced computed tomography (CT) showed slight enhancement of the cystic wall and septa. These findings were indicative of cystic renal tumor. The patient subsequently underwent partial right nephrectomy. Histopathology revealed endometriosis of the right renal parenchyma. The patient recovered well and had no evidence of a recurrent renal mass at the 3 months’ follow up.

Conclusion: The possibility of renal endometriosis should be considered in a female patient with a cystic renal mass and clinical symptoms related to the menstrual cycle.

Keywords: endometriosis, renal endometriosis, computed tomography, cystic renal tumor, ultrasonography

INTRODUCTION

Endometriosis is a common disease occurring in women of reproductive age. Most lesions occur in the reproductive system (1), and endometriosis of the kidneys is rare (2). Because of the insufficient knowledge of renal endometriosis, it can be easily misdiagnosed. Herein, we report our experience with renal endometriosis with the goal of increasing the scholarly awareness of this rare entity.

CASE PRESENTATION

A 48-year-old married woman presented to our hospital with intermittent gross hematuria for 3 months. She had regular menstrual cycle of 28 days without pain around her waist line or abdominal pain and no history of gynecologic surgery. She denied a family history of cancer, endometriosis, genetic and psychosocial diseases.

There was no obvious mass on the palpation of the bilateral kidney area, and no percussion pain. An ultrasound of the urinary system was recommended first. Conventional ultrasound examination was performed under standardized settings using Toshiba ultrasound systems (Apio500, Tokyo, Japan) (ultrasound transducer: PVT-375BT, frequency 3.5 MHz). Ultrasonography showed a cystic mass in the lower pole of the right kidney with septa and well-circumscribed. The thickness of the cystic mass wall is about 4 mm. Doppler color flow imaging showed a small signal in the wall of the mass, but no blood flow was detected in the cystic part. Contrast-enhanced computed tomography (CT) of the kidney was then performed. It showed a heterogeneous hypodense mass...
in the lower pole of the right kidney, measuring ~1.8 × 1.5 × 1.4 cm (Figure 1). The mass was polycystic, with slight enhancement of the wall and septa and no enhancement of the cystic area. Contrast filling of the mass was not observed during the excretory phase. The right lower pole of the kidney was partially depressed, and there was some local thinning of the renal cortex during cortical enhancement. (A) Unenhanced images. (B–D) With contrast. (B) Renal cortical phase. (C) Renal corticomedullary phase. (D) Renal excretory phase.

FIGURE 1 | Computed tomography (CT) shows a hypodense mass of 1.8 × 1.5 × 1.4 cm in the lower pole of the right kidney. Contrast-enhanced CT scan shows a polycystic mass with slight enhancement of the wall and septa and no enhancement in the cystic part. The right lower pole of the kidney is partially depressed, and contrast-enhanced images show local thinning of the renal cortex during cortical enhancement. (A) Unenhanced images. (B–D) With contrast. (B) Renal cortical phase. (C) Renal corticomedullary phase. (D) Renal excretory phase.

FIGURE 2 | The microscopic pathology proved the diagnosis of renal endometriosis characterized by endometrial glands and embedded stromal cells [hematoxylin and eosin stain (H and E), × 200 magnification].

of renal endometriosis characterized by endometrial glands and embedded stromal cells (Figure 2). Immunohistochemical analysis revealed that the stromal cells and epithelial cells were positive for estrogen receptor (ER), progestin receptor (PR), and vimentin, which further supported the diagnosis of renal endometriosis. Histopathology was reviewed by two senior pathologists separately, without any atypia. The patient recovered well after the surgery, and there were no obvious space-occupying lesions by ultrasonography in the kidney at the 3 months follow-up. The patient is very satisfied with the treatment of this disease.

DISCUSSION

Endometriosis is a common gynecologic disease, occurring in up to 10% of women, mainly of reproductive age (1). The main pathologic changes are cyclic shedding of the ectopic endometrium and surrounding tissue fibrosis with the formation of heterotopic nodules. Endometriosis usually affects pelvic tissues and organs (3), but extragenital endometriosis can occur anywhere in the body (4–40), as shown in Table 1. Urinary tract involvement is uncommon and primarily manifests in the bladder, followed by the ureters and kidneys, at a ratio of 40:5:1 (41). Marshall first reported renal endometriosis in 1943 (20), and only 16 pathologically confirmed cases have been reported in the past 30 years (Table 2) (42–56). The median age was 37 years (range, 23–53 years).

The mechanism of extragenital endometriosis remains controversial. The main theories can be categorized as migratory, embryonic, and immunologic, these theories have been discussed in previous literature (43, 44, 46, 48, 50–54, 56, 57). Migratory theories propose that retrograde menstruation, lymphovascular metastasis, and direct extension allow the endothelial cells to transplant into ectopic sites (46, 48, 50–54, 56, 57). Embryonic theories suggest that endometriosis results from metaplastic changes of Wolffian, Mullerian, and occasionally peritoneal
### TABLE 1 | Extragenital endometriosis.

| References                  | Lesion location | Size (cm) | Age (years) | Symptom                                      | Endometrial history | Preoperative diagnosis | Diagnosis method            | Treatment                  | Outcome     |
|-----------------------------|-----------------|-----------|-------------|------------------------------------------------|---------------------|------------------------|---------------------------|---------------------------|-------------|
| **Digestive system**        |                 |           |             |                                                |                     |                        |                           |                           |             |
| Fluegen et al. (4)          | Liver           | 12 × 9.5  | 32          | Right upper quadrant abdominal tenderness     | No                  | Hepatic cyst           | Histopathology            | Percystectomy             | Not mentioned |
| Saldarriaga et al. (5)      | Gallbladder     | 3.5 × 2.5 | 28          | Right upper quadrant abdominal pain           | Not mentioned       | Intramural lesions     | Histopathology            | Cholecystectomy           | Not mentioned |
| Monrad-Hansen et al. (6)    | Pancreas        | Not mentioned | 43          | Acute epigastric pain                         | Yes                 | Endometriosis          | Histopathology            | Laparoscopy               | Recovery     |
| Anaf et al. (7)             | Stomach         | 6         | 28          | Abdominal pain                                | Not mentioned       | Endometriosis          | Histopathology            | Laparotomy                | Recovery     |
| Buldari et al. (8)          | Colon           | 3.5       | 40          | Abdominal pain                                | Not mentioned       | Not mentioned          | Histopathology            | Surgery                   | Recovery     |
| Choi and Yunaev (9)         | Appendix        | Not mentioned | 29          | Abdominal pain                                | No                  | Distal small bowel     | Histopathology            | Appendicectomy            | Recovery     |
| Pramateftakis et al. (10)   | Sigmoid         | Not mentioned | 47          | Acute onset of pain in the left lower abdomen | Not mentioned       | Rectosigmoid mass      | Histopathology            | Surgery                   | Recovery     |
| Shi and Fan (11)            | Rectum          | 0.8 × 0.6 | 37          | Anal mass prolapse accompanied by bloody stools | Not mentioned       | Rectum mass            | Histopathology            | Surgery                   | Not mentioned |
| Kolodziejczak et al. (12)   | Anus            | 3.5 × 2.1 | 34          | Painful perianal mass                         | Not mentioned       | Anal abscess           | Histopathology            | Surgery                   | Recovery     |
| **Peritoneum**              |                 |           |             |                                                |                     |                        |                           |                           |             |
| Wang et al. (13)            | Peritoneum      | 1.86      | 24          | Rapidly enlarging abdominal                    | Not mentioned       | Massive hemorrhagic    | Histopathology            | GnRHα                     | Improvement  |
| Sima et al. (14)            | Mesentery       | 9         | 29          | Infertility                                    | Not mentioned       | Cystic mass            | Histopathology            | Laparoscopy               | Recovery     |
| Athwal et al. (15)          | Lesser omentum  | Not mentioned | 37          | Crampy abdominal pain                         | Yes                 | Not mentioned          | Histopathology            | No                        | Not mentioned |
| **Retroperitoneal**         |                 |           |             |                                                |                     |                        |                           |                           |             |
| Lu et al. (16)              | Retroperitoneal | 3.7 × 3.6 | 30          | Intermittent upper abdominal pain              | Not mentioned       | Retroperitoneal cystic lesion | Histopathology            | Surgery                   | Not mentioned |
| **Respiratory system**      |                 |           |             |                                                |                     |                        |                           |                           |             |
| Mignemi et al. (17)         | Nasal mucosa    | Not mentioned | 35          | Epistaxis and nasal pain                       | Yes                 | Mucosal lesions        | Histopathology            | GnRHα                     | Improvement  |
| Tong et al. (18)            | Pulmonary lobe  | Not mentioned | 29          | Catamenial hemoptysis                          | No                  | Pulmonary endometriosis | Histopathology            | Thoracoscopic resection   | Recovery     |
| Nizami et al. (19)          | Pleura          | Not mentioned | 32          | Catamenial hemotorax                           | Not mentioned       | Not mentioned          | Histopathology            | Parietal pleurectomy      | Recovery     |

(Continued)
| References | Lesion location | Size (cm) | Age (years) | Symptom | Endometrial history | Preoperative diagnosis | Diagnosis method | Treatment | Outcome |
|------------|----------------|-----------|-------------|---------|---------------------|-----------------------|-------------------|-----------|---------|
| **Urinary system** | | | | | | | | | |
| Marshall (20) | Kidney | 9 | 40 | Swelling and pain in the left flank | Not mentioned | Left kidney mass | Histopathology | Surgery | Recovery |
| Rajaian et al. (21) | Ureter | 0.7 | 26 | Left lower quadrant abdominal pain | No | Polypoidal mass | Histopathology | Surgery | Recovery |
| Alsinan et al. (22) | Bladder | 2.8 × 2 × 3.1 | 25 | Intermittent right flank pain | Yes | Bladder mass | Histopathology | Surgery, GnRHa | Recovery |
| **Circulatory system** | | | | | | | | | |
| Ceccaroni et al. (23) | Pericardium | Not mentioned | 28 | Abdominal pain with irradiation up to the right shoulder | Yes | Pericardium mass | Histopathology | Surgery | Recovery |
| **Nervous system** | | | | | | | | | |
| Maniglio et al. (24) | Cerebrum | Not mentioned | 39 | Catamenial epilepsy with hallucinations | Yes | Cerebral hemosiderosis deposits in the globus pallidus | Images and treatment responses | GnRHa | Remission of the disease |
| Motamedi et al. (25) | Lumbosacral plexus | 4.5 | 37 | Pelvic pain | Yes | Lesion involving the Sciatic nerve | Images and treatment responses | Hormone therapy with Decapeptide | Pain subsided completely |
| Steinberg et al. (26) | Conus medullaris | 2.5 × 1 | 29 | Progressive difficulty voiding and lower-extremity radiating radicular pain | Yes | Conus medullaris lesion | Histopathology | Surgery | Not mentioned |
| Teixeira et al. (27) | Sciatic nerve | Not mentioned | 26 | Pain and weakness in the lower left limb | Not mentioned | Left sciatic nerve cystic lesion | Histopathology | Microsurgery | Not mentioned |
| **Bone** | | | | | | | | | |
| Dongxu et al. (28) | Spinal vertebrae | Not mentioned | 33 | Lower back pain | Not mentioned | Vertebral body tumor-like lesion | Histopathology | Surgery | Recovery |
| **Articulation** | | | | | | | | | |
| Jelsma et al. (29) | Knee joint | Not mentioned | 17 | Left knee pain and swelling | Not mentioned | Thickened synovium | Images and treatment responses | Hormonal treatment | Symptoms completely resolved |
| **Muscle** | | | | | | | | | |
| Akhtar Haseeb (30) | Rectus sheath | 4.1 × 2.8 | 47 | Lower abdominal pain | No | Rectus sheath lesion | Histopathology | Surgery | Recovery |
| Zhao et al. (31) | Psoas muscle | 12 | 28 | Lower left abdominal and back pain | Not mentioned | Psoas abscess | Histopathology | GnRHa, surgery | Alleviation of symptoms |

(Continued)
**TABLE 1 | Continued**

| References | Lesion location | Size (cm) | Age (years) | Symptom | Endometrial history | Preoperative diagnosis | Diagnosis method | Treatment | Outcome |
|------------|----------------|-----------|-------------|---------|---------------------|------------------------|---------------------|-----------|---------|
| Niro et al. (32) | Iliopsoas | 4.2 × 2.9 | 29 | Chronic pelvic pain No | Iliopsoas endometriotic lesion | Histopathology | GnRHa, surgery | Recovery |
| Ferhatoglu and Senol (33) | External oblique muscle fascia | 4 × 3 | 29 | Left lower-quadrant pain Not mentioned | Superficial soft tissue mass | Histopathology | Surgery | Recovery |
| Anderson et al. (34) | Diaphragm | not mentioned | 38 | Cyclic shoulder pain No | Diaphragm lesion | Histopathology | Surgery | Recovery |
| **Visual organ** | | | | | | | | |
| Sharghi et al. (35) | Eyelid | 0.1 × 0.2 | 41 | A growth on her right upper eyelid Not mentioned | Non-blanching macule of telangiectasias | Histopathology | Surgery | Follow-up |
| **Other locations** | | | | | | | | |
| Fernández Vozmediano et al. (36) | Surgical scar | Not mentioned | 32 | A tumor of 3 years’ evolution on the abdomen Not mentioned | Abdomen lesion | Histopathology | Surgery | Not mentioned |
| Dashratt et al. (37) | Umbilicus | 2.5 × 2.0 × 2.0 | 30 | Enlarging umbilical nodule Not mentioned | Umbilical nodule | Histopathology | Surgery, GnRHa | Not mentioned |
| Fong et al. (38) | Inguinal | 3 | 41 | Right groin swelling No | Inguinal hernia and abscess | Histopathology | Surgery | Not mentioned |
| Jiménez et al. (39) | Round ligament | 3 | 35 | Constant mass grew and became painful No | Inguinal endometriosis | Fine-needle aspiration cytology | Surgery | Recovery |
| Schuster and Mackeen (40) | Fetal | 6.5 × 4.8.5.2 | 18 | A large fetal pelvic mass at 35 weeks’ gestation Not mentioned | Fetal pelvic mass | Histopathology | Surgery | Recovery |

GnRHs, gonadotrophin releasing hormone agonist.
| References                        | Age (years) | Kidney involvement | Endometrial history | Number of lesions | Maximum size (cm) | Symptom                                      | Preoperative diagnosis | Diagnosis method                | Treatment                  | Outcome            |
|----------------------------------|-------------|---------------------|---------------------|-------------------|-------------------|----------------------------------------------|------------------------|---------------------------------|----------------------------|--------------------|
| Hajdu and Koss (42)              | 49          | Left kidney         | No                  | 1                 | 1.5 × 1.0         | Low back pain and gross hematuria            | No                     | Microscopic examination        | Nephrectomy               | Die                |
| Gauperaa and Stalsberg (43)      | 23          | Right kidney        | Not mentioned       | 1                 | 2                 | Tender to palpation in the region of the right kidney | No                     | Histopathology                 | Nephrectomy               | Recovery           |
| Bazaz-Malik et al. (44)          | 40          | Upper pole of the right kidney | Not mentioned      | 2                 | 2                 | Dull aching pain in the right loin           | Hydatid cyst           | Histopathology                 | Nephrectomy               | Not mentioned   |
| Hellberg et al. (45)             | 25          | Upper pole of the left kidney | Endometriotic cyst of left ovary | 1                 | 4                 | Macroscopic haematuria and back-pain         | Cystic tumour          | Ultrasound-guided GnRHa FNA   | Nephrectomy               | Effective         |
| Benchekroun et al. (46)          | 35          | Left kidney         | Not mentioned       | 1                 | Not mentioned    | Fever and pyuria                             | Pyelonephritis         | Histopathology                 | Nephrectomy               | Not mentioned   |
| Gupta et al. (47)                | 40          | Right kidney        | Endometriotic cyst of right ovary | Multiple          | 2                 | Pain in the lower abdomen                    | No                     | Ultrasound-guided FNA          | Nephrectomy               | Not mentioned   |
| Dutta et al. (48)                | 38          | Right kidney        | Endometriotic cyst of left ovary | Multiple          | 1                 | Abdominal pain                               | No                     | FNA                            | GnRHa                      | The lesions regressed slowly |
| Yaqub et al. (49)                | 25          | Left kidney         | Not mentioned       | 1                 | 25 × 15           | Lower abdominal pain                         | Mesenteric cyst, hydronephrotic kidney or a retroperitoneal tumour | Histopathology                 | Nephrectomy               | Recovery            |
| Dirim et al. (50)                | 46          | Lower pole of the left kidney | No                  | 1                 | 15 × 9.7 × 9.5    | Left lumbar pain and lumbar mass             | Subcapsular hematoma   | Histopathology                 | Nephrectomy               | Recovery            |
| Jiang et al. (51)                | 42          | Middle and lower of the right kidney | No                  | 1                 | 13.5 × 12 × 12    | Right flank pain and hematuria               | Angiomyolipoma         | Histopathology                 | Nephrectomy, GnRHa         | Recovery            |
| Yang et al. (52)                 | 37          | Lower pole of the right kidney | Not mentioned       | 1                 | 7.5 × 5 × 3.5     | Dull pain in the right lower back            | Renal tumor            | Histopathology                 | Nephrectomy               | Not mentioned   |
| Cheng et al. (53)                | 53          | Right kidney        | Not mentioned       | Multiple          | Not mentioned    | Intermittent/recurrent right flank pain      | Right kidney abscess   | Histopathology                 | Nephrectomy after drainage | Recovery           |
| Giambelluca et al. (54)          | 40          | Upper and lower poles of the left kidney | Ovarian endometriosis | Multiple          | 1.8              | No                                           | Hemorrhagic cysts      | Histopathology                 | No                        | No clinical changes |
| Giambelluca et al. (54)          | 39          | Mid pole of the left kidney | Ovarian endometriosis | Multiple          | <1.0             | No                                           | Haemorrhagic cysts      | Histopathology                 | No                        | No clinical changes |
| Badri et al. (55)                | 45          | Upper pole of the left kidney | No                  | 1                 | 2.8 × 2.6 × 1.7   | Flank pain and intermittent gross hematuria  | Renal mass             | Histopathology                 | Partial nephrectomy         | Not mentioned   |
| Umair et al. (56)                | 30          | Right kidney        | Not mentioned       | 1                 | 6.5 × 5.9 × 5.7   | Dull pain in the right lower back            | Renal tumor            | Histopathology                 | Nephrectomy               | Not mentioned   |

GnRHa, gonadotrophin releasing hormone agonist; FNA, fine-needle aspiration.
(celomic) structures (43, 44, 46, 48, 50, 51, 53, 54). Immunologic theories suggest that a suboptimal immune response may result in ectopic endometrial implantation (46, 50–54). In these literatures, Bazaz-Malik et al., Dutta et al., and Cheng et al. believe that the pathogenesis of their cases of renal endometriosis is rationally explained by embryonic theory (44, 48, 53).

The qualitative features of Bosniak III cystic masses: cystic masses with one or more thick or irregular enhancing walls or septa without nodular enhancement. The Bosniak Classification, version 2019 defines “thick” as 4 mm or thicker (58). In our case, the thickness of the cystic mass wall is 4 mm and with enhancement. It was classified as Bosniak III according to Bosniak Classification of Cystic Renal Masses, Version 2019 (58). Approximately 50% of Bosniak III masses are malignant (59). The imaging features of multilocular cystic renal neoplasm of low malignant potential are different from benign renal cystic masses. In general, necrosis of carcinoma tends to be central, with a thickened solid peripheral “rind” and a central ill-defined area of non-enhancement (60). Different imaging modalities may have some roles in the diagnosis of renal endometriosis. Shedding of the ectopic endometrium may result in a heterogeneous mass density on CT scan (52). The hyperplastic fibromuscular tissue surrounding the lesion is unevenly enhanced and may show protrusion into the central part (49). The continuous proliferation of muscle fibers around the lesion can distort the surrounding renal parenchyma and change the shape of the kidney. Unlike the CT scan, MRI can show renal pelvis compression or displacement. Mixed cystic-solid masses with fibromuscular hyperplasia and residual blood will produce heterogeneous MRI signals (49). The location, size, and composition (solid vs. cystic) of a renal mass can also be visualized using ultrasound. Ultrasound color Doppler flow imaging can demonstrate blood flow signals in the wall and septa. Ultrasound can also be used to facilitate tissue diagnosis. Ultrasound-guided fine needle aspiration (FNA) biopsy is an accurate and minimally invasive method that can greatly help in the diagnosis of endometriosis. To date, three cases of renal endometriosis have been confirmed by FNA (45, 47, 48). Ultrasound is very useful for detecting endometriosis in the uterus and ovary (61), and most importantly, it is cheap, especially suitable for developing countries.

Pain and hematuria are often intermittent and associated with the menstrual cycle in patients with renal endometriosis. Our patient had no abdominal pain, but her hematuria was cyclical and corresponded to her menstrual cycle. This important information was overlooked at the time of her initial presentation.

The histopathology of renal endometriosis is characterized by endometrial glands and stromal cells involving renal cortex and medulla (62). Immunohistochemical analysis shows stromal cell and epithelial cell positivity for CD10, ER, and PR (62). In our case, the stromal cells and epithelial cells were positive for ER, PR, and vimentin, which further supported the diagnosis of renal endometriosis.

As there are no treatment guidelines for renal endometriosis because of its rarity (51), the treatment should be based on the patient's clinical symptoms, characteristics of the lesion, and the patient's reproductive plans (41). Although renal endometriosis is a benign lesion, surgical treatment is usually considered due to its invasiveness (63). The feasibility of laparoscopic management is now widely proven and may reduce the length of hospital stay (64). Asymptomatic patients with multiple small lesions unchanged during subsequent imaging examinations generally do not require any definitive therapy for renal lesions (54). Hormone therapy, such as GnRH agonists and oral contraceptives, can be used for symptom management (45, 48, 51). Hormonal treatment reduces the pain in the short-term follow up and is the best treatment for patients of reproductive age (64).

**CONCLUSION**

We report a patient who presented with a single small cystic kidney mass and was found to have endometriosis. Although imaging can be helpful, the final diagnosis of endometriosis relies on histopathologic findings. The possibility of renal endometriosis should be considered in a female patient with a cystic renal mass and clinical symptoms related to the menstrual cycle.

**DATA AVAILABILITY STATEMENT**

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

**ETHICS STATEMENT**

Written informed consent was obtained from the participant for the publication of this case report. Ethical approval was given by the Medical Ethics Committee of our hospital.

**AUTHOR CONTRIBUTIONS**

YY and YH diagnosed the patient. All authors wrote and revised the manuscript.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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