

Monorchidism with ipsilateral renal agenesis in a cat

Jinyoung Choi¹ Sungin Lee^{1*}

Abstract

A 1-year-old intact male ragdoll weighing 5.9 kg was presented for general wellness examination and castration. Upon physical examination, neither testes could be palpated in the scrotum. Blood test results (complete blood cell count, serum biochemistry and electrolyte analysis) showed no remarkable findings. Radiographic and ultrasound examination did not detect the right kidney and testis in the abdominal cavity. However, we were unable to visualize the right kidney and testis in the abdominal cavity. An exploratory laparotomy for cryptorchidism revealed that although the left testis was intact, there was no right kidney, ureter and ipsilateral testis in the abdominal cavity. There were no remarkable findings upon histopathology of the left testis. Moreover, despite the presence of a unilateral kidney, blood analysis results were normal and the kidney was not enlarged due to compensatory hypertrophy. In females, there have been several case reports of urogenital agenesis or aplasia with compensatory hypertrophy of the contralateral kidney. This is the first case report of ipsilateral urogenital agenesis in a male cat without renal enlargement.

Keywords: cat, cryptorchidism, monorchidism, ipsilateral renal and testis agenesis

¹Department of Veterinary Surgery, College of Veterinary Medicine, Chungbuk National University, Cheongju, Republic of Korea

*Correspondence: sunginlee@cbnu.ac.kr (S. Lee)

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Introduction

Cryptorchidism is one of the most widespread congenital reproductive disorders (Lyle, 2007). Cryptorchidism in cats is defined as the failure of a unilateral or bilateral testicle to descend to the scrotum, thereby remaining in the abdominal cavity by 7-8 months age (Little, 2011). In cats with cryptorchidism, testes have been reported to be located in the inguinal region, abdominal cavity and inguinal ring. In one study, 33% of retained testes in cats with cryptorchidism were located in the abdominal cavity (Little, 2011).

Monorchidism or unilateral anorchidism is a rare abnormality that results in the total absence of one of the testes (Lamesch, 1994; Little, 2011): it is very uncommon in cats and affected cats show no clinical signs of illness (Little, 2011). The incidence rate of monorchidism is 0.1% in male presenting cats (Friend, 2014). On the side of the absent testis, rudimentary spermatic cord, blood vessels for the testis and epididymis may be found (Little, 2011; McEntee, 1990).

Unilateral renal agenesis in cats is an uncommon urogenital abnormality (Diez-Prieto *et al.*, 2001; Ferreira *et al.*, 2022). Patients with bilateral renal agenesis die during the perinatal period; however, unilateral renal agenesis is usually asymptomatic (Ferreira *et al.*, 2022; Greco, 2001). Some patients with unilateral renal agenesis have clinical signs, such as anorexia and nervousness due to azotemia (Goo *et al.*, 2009). Furthermore, the contralateral kidney may be enlarged as compensatory hypertrophy (Chang *et al.*, 2008). If the contralateral kidney does not compensate adequately, the patient is likely to have clinical signs related to renal dysfunction (Ferreira *et al.*, 2022). Renal agenesis is associated with agenesis and abnormality of the ureter, vas deferens, epididymis and uterine horns (Greco 2001; McEntee, 1990). To clearly identify renal agenesis, computed tomography (CT) and magnetic resonance imaging (MRI) may be required, rather than radiography and ultrasound examination (Diez-Prieto *et al.*, 2001).

Several research papers and case reports have documented urogenital abnormalities in female cats. However, in this paper, we report a rare case of a male cat with monorchidism and ipsilateral renal agenesis.

Case description

A 1-year-old intact male ragdoll weighing 5.9 kg was presented for general wellness examination and castration. The patient was physically examined. Laboratory blood tests (complete blood cell count, serum biochemistry and electrolyte analysis) and abdominal and thoracic radiography and ultrasound examinations were performed. No remarkable findings were observed upon a general blood screening test.

Thoracic radiographic examination revealed that there were no significant abnormalities. In the ventrodorsal view of the abdomen, the right kidney was not detected in the normal region in addition to the right testis that had been thought to be in abdominal cavity (Fig.1). No abdominal masses that were similar in size, shape and margin of right kidney and testicle were revealed upon abdominal

radiography. Despite the absence of the right kidney, the size of the left kidney was within normal range ($2.5 \times$ length of the 2nd lumbar vertebra) and located in its normal position.

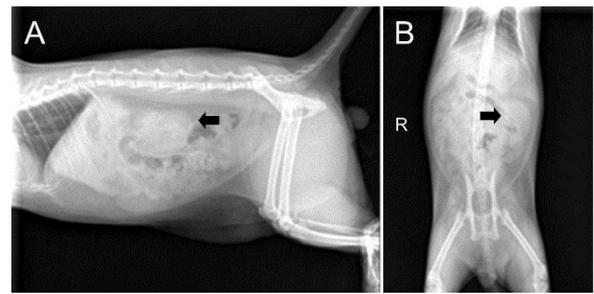


Figure 1 Radiographic view of the right lateral and ventrodorsal view of the abdomen. A; left kidney (black arrow) in the abdominal cavity from the right lateral view. B; left kidney (white arrow) in the abdominal cavity from the ventrodorsal view. Although the right kidney is not visualized, the left kidney is of anatomically normal shape and size.

Ultrasonography showed that the left kidney was normal in size, shape and margin in the abdominal cavity (Fig.2). However, it failed to detect the right kidney, ureter or testis, both in the inguinal canal or in the abdominal cavity. A hyperechoic middle line on mediastinum was visualized on the testes. The left testis was detected in the abdominal cavity (Fig.3A). Despite the absence of the right kidney and ureter, the urinary bladder was intact in the abdominal cavity.

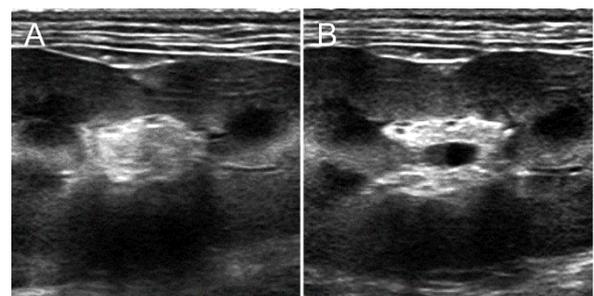


Figure 2 A, B; Ultrasound image of the left kidney characterized in the abdominal cavity. There are no verifiable lesions of the left kidney.

Surgery for cryptorchidism and exploratory midline laparotomy for the right kidney and testis was performed under general anesthesia and the left testis in the abdominal cavity was removed (Fig.3B). At that time, our surgical team considered that the right kidney had not been visualized upon ultrasound examination due to severe renal hypotrophy and aplasia. However, of note, there was no right kidney, testis or ureter in the abdominal cavity. Instead, connective tissue, blood vessels and a rudimentary spermatic cord were found at the site of the right kidney and ureter (Fig.4).

Post-operative gross and histopathologic examination revealed that the left testis in the abdominal cavity was normal. The testis, epididymis, seminiferous tubules and pampiniform plexus showed

normal histologic appearance without atrophy or aplasia (Fig.5).

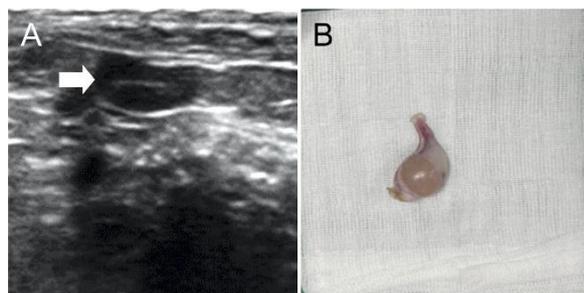


Figure 3 Left testis in the abdominal cavity. A; Ultrasound image of left testis (white arrow). The hyperechoic midline is clearly visualized. B; Left testis after exploratory laparotomy for cryptorchidism. It is intact and reveals a normal appearance.

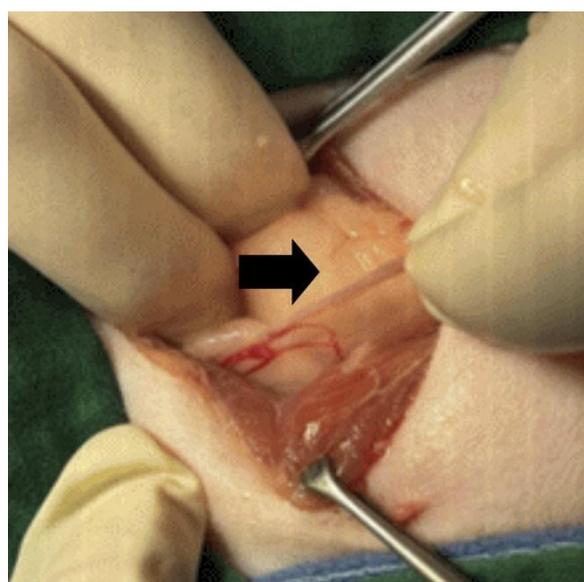


Figure 4 Intraoperative photograph of the cat. A rudimentary spermatic cord and connective tissue (black arrow) are found in the normal region of the right kidney and ureter.

Discussion

During fetal development, the urinary tract and genital system are derived from the mesonephric duct in the intermediate mesoderm under the effect of testosterone from fetal testes (Cascio *et al.*, 1999; Kumar *et al.*, 2011). Furthermore, the vas deferens, epididymis and rete testis originate from the Wolffian duct. Uretic buds or metanephric diverticulum are derived from mesonephric duct form permanent kidneys. Therefore, renal agenesis is closely linked with ipsilateral internal genital abnormalities (Trigaux *et al.*, 1991). In humans, abnormalities of the urinary tract and genital system are associated in 20-70% of cases (Wiersma *et al.*, 1976). Although the exact etiology of unilateral urogenital agenesis is unknown, a human medicine article has indicated that the cause might be related to ischemia due to torsion of the intrauterine mesonephric duct (Lamesch, 1994). In human medicine, the combination of absence or agenesis of testis, kidney and rectus on

the right side is called "The right sided syndrome" (Kumar *et al.*, 2011).

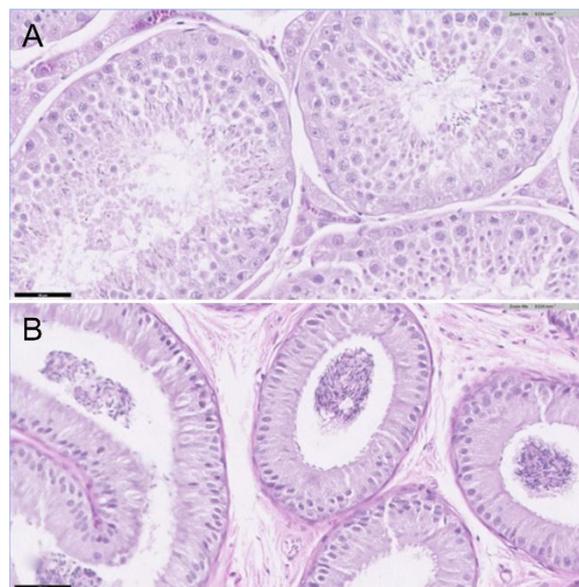


Figure 5 Photomicrograph of the left testis in the abdominal cavity (Hematoxylin and eosin stain, $\times 40$). A; Seminiferous tubules show a normal appearance with Sertoli cells, Leydig cells and spermatocytes. B; Spermatozoa in the lumen of the epididymis and normal appearance of the epithelium of the epididymis.

In other case reports and articles on unilateral renal agenesis, compensatory hypertrophy of the contralateral kidney and azotemia have often been reported (Chang *et al.*, 2008; Greco, 2001). In our case, although the patient had a unilateral kidney, the contralateral kidney was of normal size, shape and margin, without abnormal clinical signs. Blood tests revealed no azotemia, with blood urea nitrogen (BUN) levels of 18.8 mg/dl and creatinine levels of 1.4 mg/dl. Regular follow-ups were necessary to check for compensatory hypertrophy and BUN, creatinine level; however, the patient did not present to follow-up.

Although there have been some case reports of unilateral renal agenesis with ipsilateral female genital aplasia or agenesis, reports and research papers describing this in male cats are rare (Chang *et al.*, 2008; Goo *et al.*, 2009). This patient presented for castration and general examination and was diagnosed with unilateral renal agenesis with ipsilateral absence of testis upon radiography and ultrasound examination. The patient subsequently underwent exploratory laparotomy. It was concluded that the patient had unilateral renal and testicular agenesis through examinations and operation. However, diagnosis would be easier using CT or MRI if these were cost-efficient. Furthermore, for identification of renal agenesis, excretory urography could have been performed.

In conclusion, unilateral renal and testis agenesis is rare and its etiology of association with renal and genital malformations remains unclear, even in human medicine. In the case of unilateral renal agenesis, it is likely that compensatory enlargement of contralateral kidney and azotemia are present. In addition, the testes in the

abdominal cavity are more likely to develop testicular tumors (Wood and Elder, 2009). Therefore, it is necessary to diagnose this condition accurately through various examinations and consider adequate treatments at an early stage. Patients diagnosed with monorchidism, should be examined for ipsilateral renal agenesis. Additionally, concomitant evaluation of the urogenital system using CT or MRI should be performed. There have been several case reports of unilateral urogenital agenesis in human medicine. This is the first report of complete agenesis of a unilateral kidney and testis in a male cat.

Acknowledgements

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