

## Renal Rupture by Cystadenocarcinoma in a Yorkshire Terrier

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(Accepted: December 13, 2007)

**Abstract :** A 13-year-old, spayed female, Yorkshire terrier was presented with a history of vomiting and diarrhea. Radiographic and ultrasonographic studies suggested rupture of right renal cyst. Left kidney had increased cortical echogenicity with indistinct corticomedullary junction on sonogram. Unilateral nephroureterectomy of right kidney was performed. Histopathologic examination of the resected renal mass confirmed a renal cystadenocarcinoma. To the best of our knowledge, it is the first case report of renal cystadenocarcinoma in a small breed dog in Korea.

**Key words :** Yorkshire terrier, renal, cystadenocarcinoma, rupture

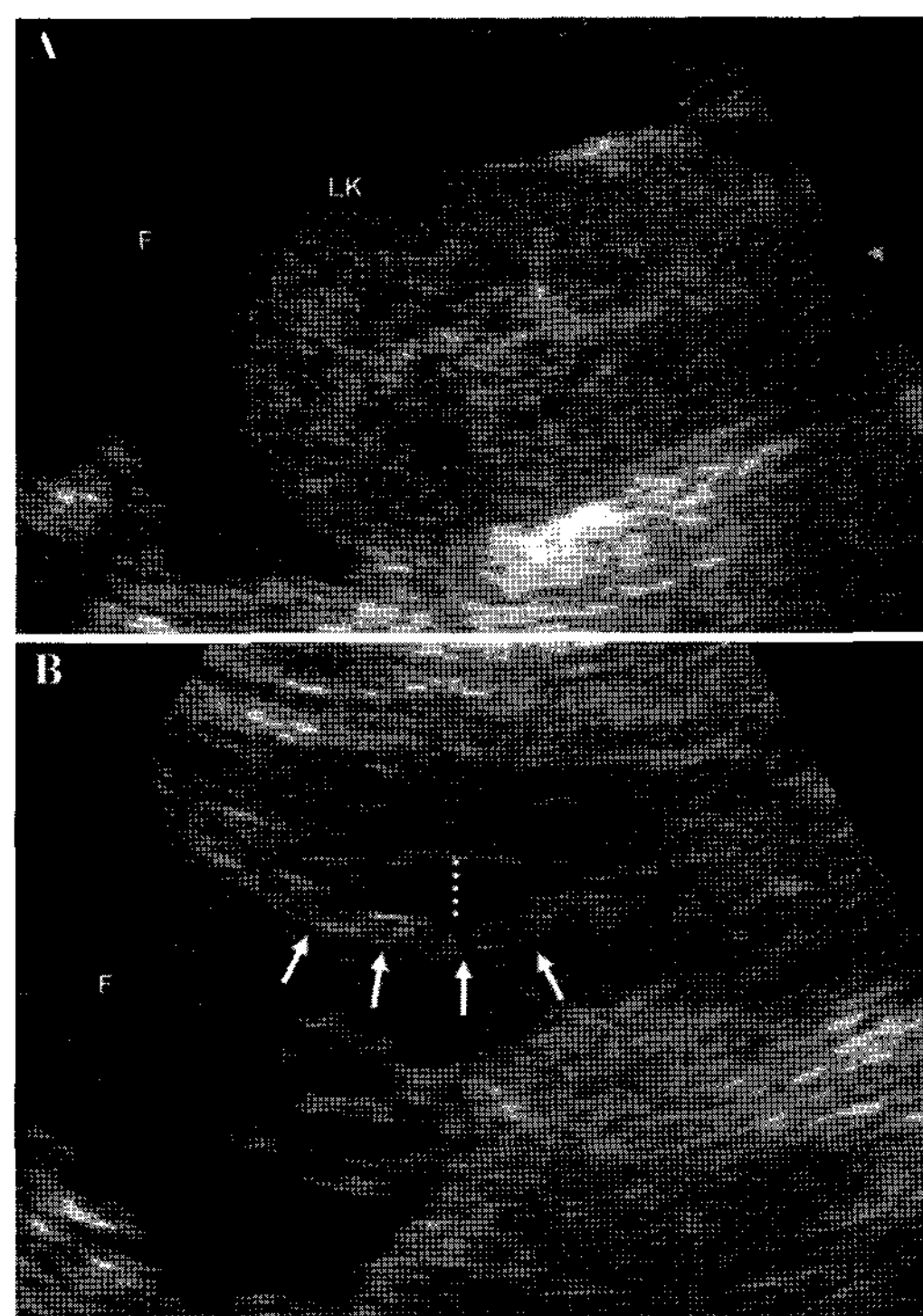
### Introduction

Renal cystadenocarcinoma (RC) and nodular dermatofibrosis are one of the canine cancer syndromes. RC has been reported mainly in German Shepherds and some other breeds (5,9,11). RC is characterized by bilateral, multifocal cystic tumors in kidneys (2). Although the exact etiology of RC has not been clearly identified, genetic etiologies have been proposed (1,3,6,8). However, non-genetic causes of RCs have been also found in recent case studies (4,10). The prognosis of RC is usually poor, since it eventually progresses to renal failure or metastasis to other organs (7). This case describes a rare case of RC complicated with renal rupture in a small breed dog.

### Case History

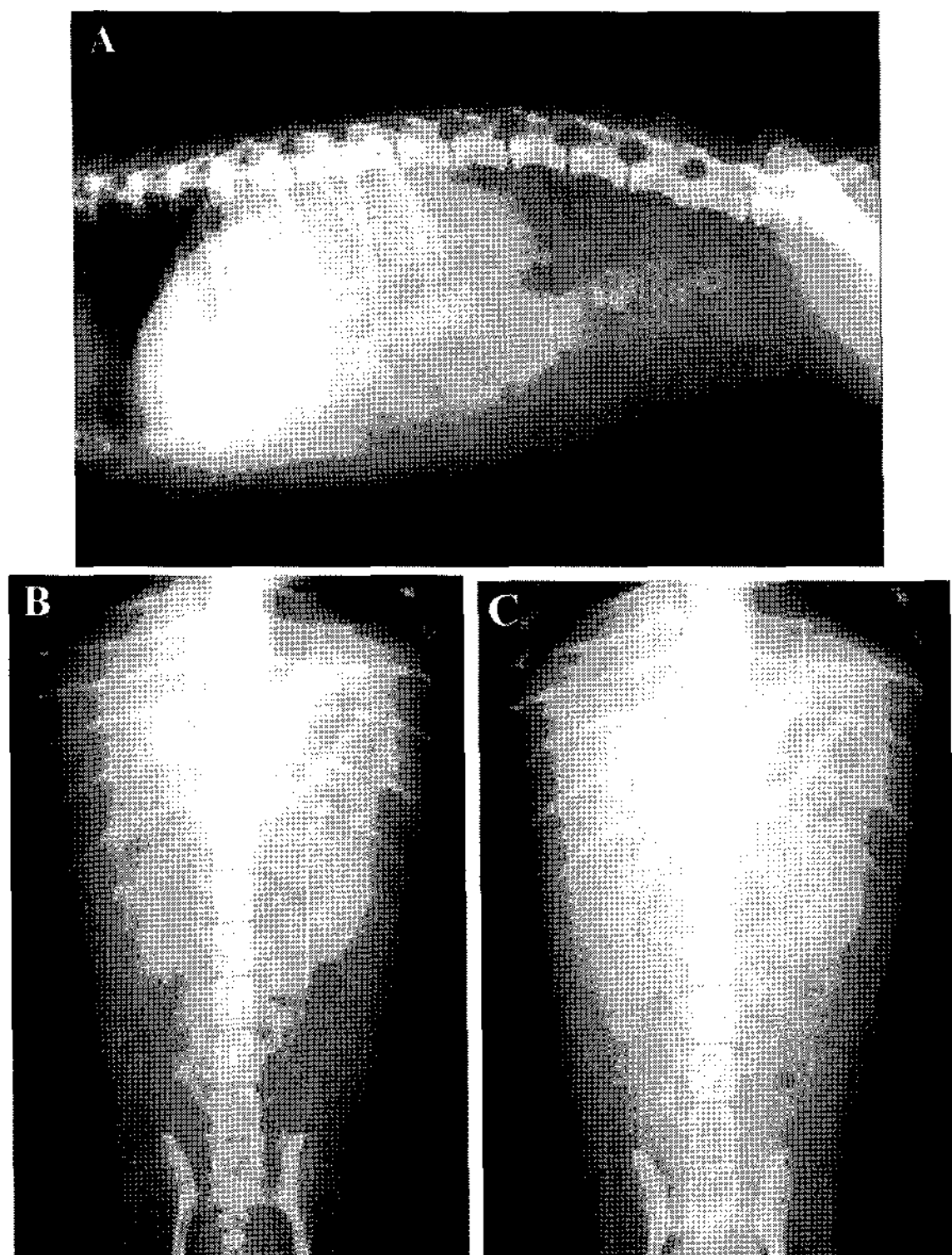
A thirteen-year old, spayed female Yorkshire terrier was presented with primary clinical signs of vomiting and diarrhea. About 3 months ago, this dog was examined by referring veterinarian due to distention of right cranial abdomen and cyst-like mass in right cranial abdomen confirmed by ultrasonography and no remarkable findings were observed in blood profile. At presentation to Haemaru Referral Animal Hospital, the entire abdominal cavity was filled with echogenic fluid and this lesion presented septic and/or non-septic exudates such as urine, blood, and pus. And, mesentery at right cranial abdomen was hyperechoic and swollen in ultrasonography. Right kidney lost most parenchyma but preserved renal pelvis measured about 3 mm diameter and showed irregular indistinct border (Fig 1). Hyperechoic change of left renal cortex and loss of distinct corticomedullary junction

were observed. Serum biochemistry revealed increased levels of urea nitrogen (UN; 130 mg/dl, reference range; 7.0-27.0 mg/dl), creatinine (6.8 mg/dl, reference range; 0.5-1.8 mg/dl) and phosphorus (16.1 mg/dl, reference range; 2.5-6.8



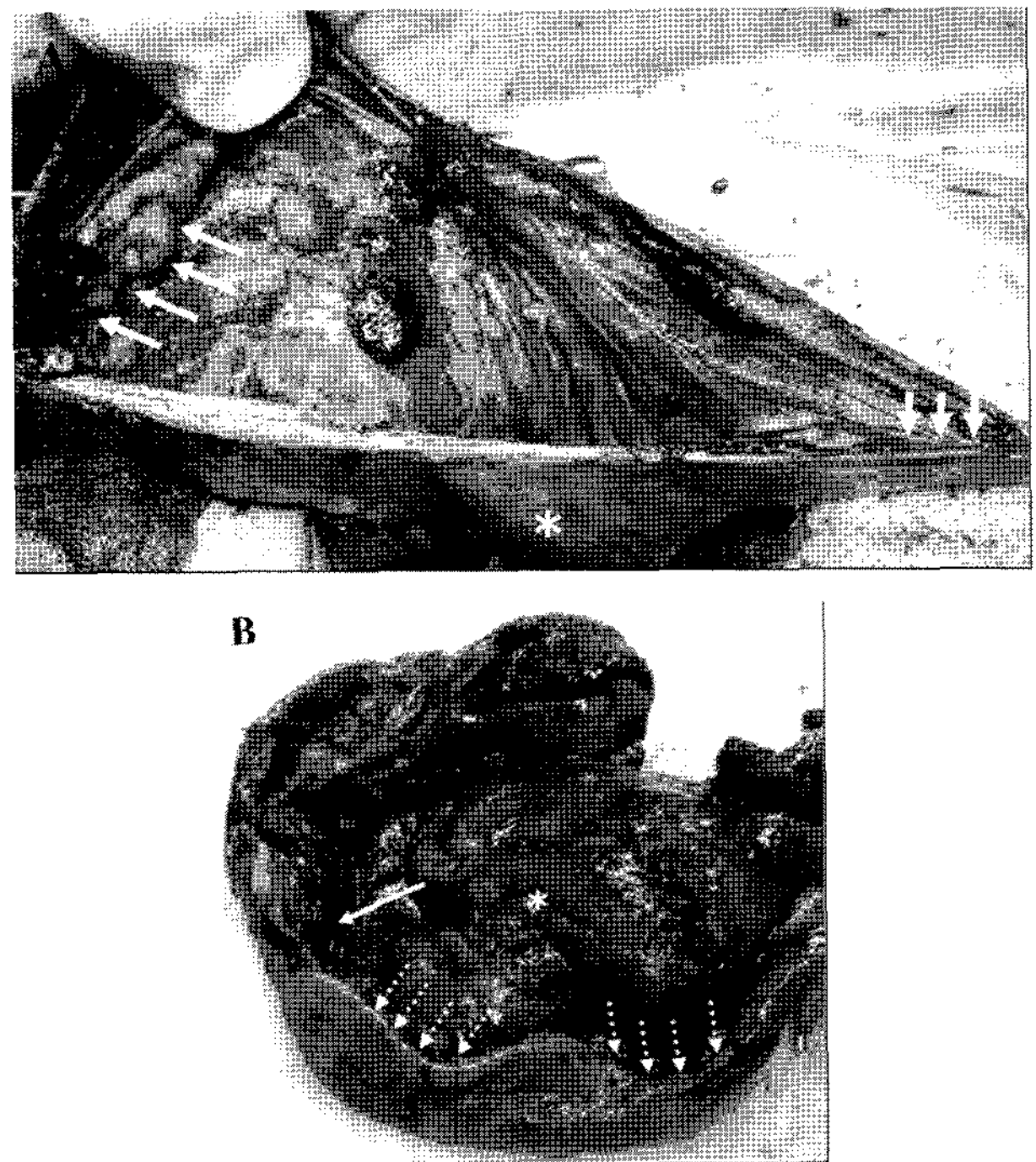
**Fig 1.** Ultrasonography of left (A) and right (B) kidney. (A) Left kidney (LK) was surrounded by echogenic fluid (F). Cortex of left kidney showed hyperechoic change and indistinct corticomedullary junction was found. (B) Irregular border and loss of normal shape of right kidney (arrows) were observed. Renal pelvis (dotted line) was anechoic and sized about 3 mm.

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**Fig 2.** Survey abdominal radiography and intravenous pyelonephrogram of the dog. (A) In survey radiography, loss of abdominal detail was caused by large amount of ascites. (B) Immediately after iodine contrast medium injection and (C) after 30 minutes, nephrogram of left kidney (\*) was found as nearly normal timing and right kidney was not detected. The density of abdomen was increased due to contrast medium leakage over time, but the origin of the leakage was not determined.

mg/dl). Abdominal fluid analysis revealed urine accumulation. And, bacterial culture ruled out bacterial infection. Intravenous pyelonephrogram revealed leakage of contrast medium in right cranial abdomen, although the origin of leakage was not determined (Fig 2). The right kidney was not detected during excretory urogram, while the left kidney was appeared as normal with slightly decreased density. According to these results, rupture of right kidney was diagnosed which may be caused by neoplasm, hematoma, perirenal cyst, or polycystic lesions. At surgery, marked bloody fluid accumulation, damaged right kidney with ruptured cyst and adhesion to adjacent structures such as caudal vena cava and mesentery were discovered (Fig 3). After unilateral nephroureterectomy, the removed right kidney was committed to Antech Diagnostics, Inc. (Memphis, USA) for histopathologic examination and renal cystadenocarcinoma with rupture accompanying chronic hemorrhage was diagnosed. After surgery, the condition of patient was stabilized, and no metastatic lesion was identified in thoracic radiography. The dog is still survived with healthy condition and there is no remarkable change in left kidney and no skin lesion compatible with nodular dermatofibrosis.



**Fig 3.** Right kidney during laparotomy (A) and extracted right kidney (B). (A) Short arrows indicate cranial pole and long arrows caudal pole of kidney. Most parenchyma of right kidney changed to cystic structure and it was ruptured. Small part of renal medulla and intact renal pelvis were remained (\*). (B) The renal cyst (dotted arrows) in renal cortex and medulla was ruptured and small part of medulla (\*) and intact renal pelvis (long arrow) were observed.

## Discussion

Renal cystadenocarcinoma (RC) is the naturally occurring canine kidney cancer syndrome that was originally described in mainly German Shepherds. However, RC has been reported in other breeds such as Golden retrievers, Boxers and mixed dogs (5,9,11). RC is characterized by bilateral, multifocal cystic tumors in kidneys and sometimes occurred with uterine leiomyomas and multiple cutaneous nodular dermatofibrosis (2). In the previous study, nodular dermatofibrosis and RC arised independently, so genetic involvement in pathogenesis was suggested (2). However, RC has also accompanied without nodular dermatofibrosis, as seen in our case (6).

The exact etiology of RC has not been clarified yet, although a dominant autosomal inheritance pattern has been identified in German Shepherds. Therefore, the exclusion of carrier dogs from breeding is strongly recommended, based on diagnostic tests including renal biopsy and computed tomography (1,3,6,8). Recent study found mutation(s) of gene located at chromosome 5 might be responsible for RC, although non-genetic cause of RC had been also identified (4,10). Due to lack of pedigree analysis, we could not determine whether the genetic etiology was involved or not in our case.

According to literatures, the size of cyst in RC could be variable and RC usually progressed to renal failure (7,8). The majority of dogs died, because of the renal failure and complications associated with the rupture of a cyst. Pain and dyspnea were mainly caused by peritonitis resulting from rupture of cysts and/or metastasis. In this case, despite the large size of renal cyst, there was no clinical sign until the cyst was growing to be ruptured and caused severe deterioration of the clinical condition. The long term prognosis of RC is usually poor, although some dogs affected with RC can live for years with slow progression (7). This case was diagnosed as RC about 5 months ago, after that there was no remarkable change in left kidney and the clinical condition of this dog is maintained well.

The non-hereditary renal cyst, which is usually observed in old patient, is far more common than RC. However, inherited kidney cancer syndrome should be suspected when bilateral renal cysts and / or nodular dermatofibrosis in the skin is observed. In ultrasonography, left kidney showed indistinct corticomedullary junction and this lesion may be caused by small size cysts. However, histopathologic evaluation of left kidney was not performed, so the existence and progression of RC can not be clarified clearly. Therefore, regular checkup is performed to monitor that any onset of nodular dermatofibrosis and further clinical sign by RC in left kidney continuously.

### Conclusion

In this case, renal cyst was ruptured by RC, and it is a relatively rare case especially in small breed dog. RC can be presented with nodular dermatofibrosis as a kidney cancer syndrome but there may be no skin lesion like this case. Renal cystic lesion can be identified through ultrasonography and is usually caused by geriatric, degenerative change. However, it is necessary that RC is involved in the differential diagnosis for bilateral renal cysts and especially concurred with skin lesion.

### References

1. Castellano MC, Idiart JR, Ruager J, Zohil AM. Generalized Nodular Dermatofibrosis and Cystic Renal Disease in Five German Shepherd Dogs. *Canine Pract* 2000; 25: 18-21.
2. Cosenza SF, Seely JC. Generalized nodular dermatofibrosis and renal cystadenocarcinomas in a German Shepherd dog. *J Am Vet Med Assoc* 1986; 189: 1587-1590.
3. Lium B, Moe L. Hereditary multifocal renal cystadenocarcinomas and nodular dermatofibrosis in the German shepherd dog: Macroscopic and histopathologic changes. *Vet Pathol* 1985; 22: 447-455.
4. Lingaas F, Comstock KE, Kirkness EF, Sørensen A, Aarskaug T, Hitte C, Nickerson ML, Moe L, Schmidt LS, Thomas R, Breen M, Galibert F, Zbar B, Ostrander EA. A mutation in the canine BHD gene is associated with hereditary multifocal renal cystadenocarcinoma and nodular dermatofibrosis in the German Shepherd dog. *Hum Mol Genet* 2003; 12: 3043-3053.
5. Marks SL, Farman CA, Peaston A. Nodular dermatofibrosis and renal cystadenomas in a golden retriever. *Vet Dermatol* 1994; 4: 133-137.
6. Moe L, Gamlem H, Jónasdóttir TJ, Lingaas F. Renal microcystic tubular lesions in two 1 year-old dogs - an early sign of hereditary renal cystadenocarcinoma?. *J Comp Pathol* 2000; 123: 218-221.
7. Moe L, Lium B. Hereditary multifocal renal cystadenocarcinomas and nodular dermatofibrosis in 51 German Shepherd dogs. *J Small Animal Pract* 1997; 38: 498-505.
8. Moe L, Lium B. Computed tomography of hereditary multifocal renal cystadenocarcinomas in German Shepherd dogs. *Vet Radiol Ultrasound* 1997; 38: 335-343.
9. Suter M, Lott-Stolz G, Wild P. Generalized nodular dermatofibrosis in six Alsations. *Vet Pathol* 1983; 20: 632-634.
10. Vercelli A., Bellone G, Abate O, Emanuelli G, Cagnasso A. Expression of transforming growth factor-beta isoforms in the skin, kidney, pancreas and bladder in a German Shepherd dog affected by renal cystadenocarcinoma and nodular dermatofibrosis. *J Vet Med A Physiol Pathol Clin Med* 2003; 50: 506-510.
11. White SD, Rosychuk RAW, Schultheiss P, Scott KV. Nodular dermatofibrosis and cystic renal disease in three mixed-breed dogs and a Boxer dog. *Vet Dermatol* 1998; 9: 119-126.