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— Abstract —

Acquired Huge Calyceal Diverticulum After Renal Injury

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The calyceal diverticulum is a cystic cavity lined by a transitional epithelium, is encased within the renal substance, and is situated peripheral to a minor calyx, to which it is connected by a narrow channel. Both congenital and acquired factors have been suggested to explain the formation of a calyceal diverticulum. We experienced a case of a huge calyceal diverticulum that was newly developed after a renal injury. (J Korean Soc Traumatol 2009;22:264-268)

Key Words: Kidney, Diverticulum, Injury

Calyceal diverticula are cystic cavities that are lined by a non-secretory transitional epithelium and are enclosed within the renal parenchyma.[1,2] Such diverticula are filled with urine and communicate with the renal pelvis or calyx through a narrow channel or isthmus.[3] Both congenital and acquired factors have been suggested to explain the formation of a calyceal diverticulum; however, we suggest that the majority of the factors are congenital.[4] A localized cortical abscess draining into calyx, and an obstruction secondary to stone formation or infection within the calyx have been postulated as being acquired factors.[5] We report a case in which the cystic lesion, which had newly developed after a renal injury, was misdiagnosed as a renal cyst or urinoma, but was later confirmed to be huge calyceal diverticulum.

I. Case Reports

A 38 years old man presented to the emergency room complaining of continuous right-sided flank pain and gross hematuria. Five hours before admission, he fell down from second floor. On past history, he had no specific finding in the abdominal ultrasonography 2 years ago. Physical examination revealed whole abdomen rigidity, severe right direct

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tenderness, right flank bruise, subcutaneous bleeding and costovertebral angle tenderness. His vital was relatively stable. his blood pressure was stayed above 86/43 mmHg. Urine analysis showed many red blood cell (RBC). his hemoglobin stayed above 10.1 g/dl according to an hourly complete blood count test. The emergent contrast-enhanced CT scan showed liver injury, deep parenchymal laceration of the right kidney and perirenal extensive hematoma. But, any urine leakage was not observed. He was diagnosed as grade IV renal injury with mild liver injury and rib fracture (Fig. 1). He was decided to receive a conservative therapy.

At a month follow up CT scan revealed no change in size of the lesion which was thought to be renal and perirenal hematoma but the internal hounsfield unit dropped to 14～26 compared to 27～70 at a month ago and the enhanced contrast of periphery of the hematoma made us to think that the hematoma was liquifying and undergoing a cystic change. He was instructed to rest quietly at home. The right flank pain did not decrease 3 months after injury. At 3 months follow up CT scan, the size of the lesion which was thought to be cystic change of the hematoma had slightly increased(Fig. 2).

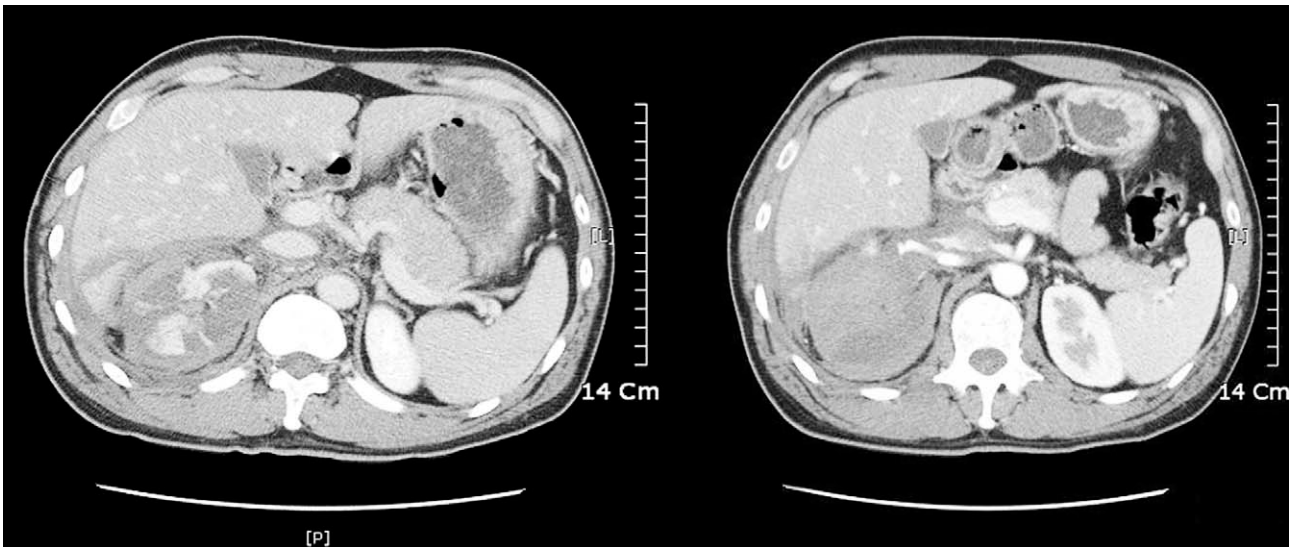

Fig. 1. Initial CT scan shows right renal injury with massive hemorrhage at intrarenal, perirenal, and pararenal spaces, and liver injury with small amount hemoperitoneum at perihepatic space.

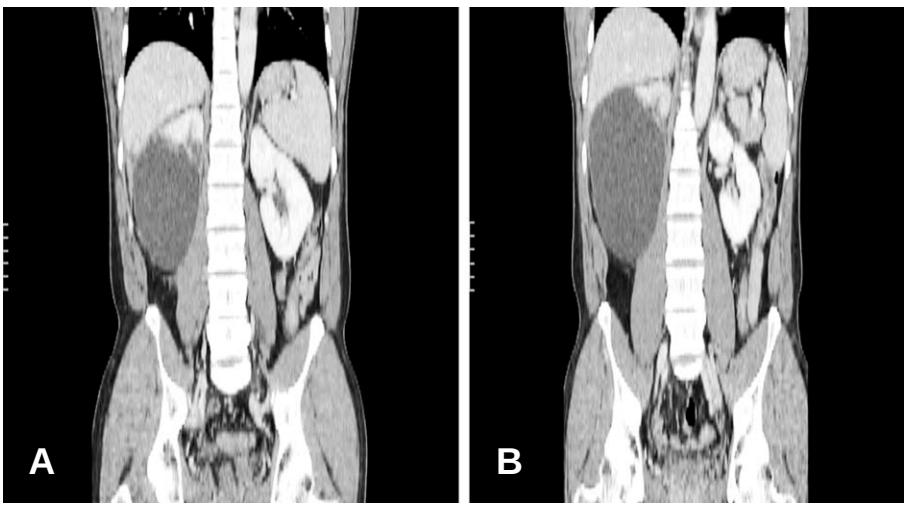

Fig. 2. (**A**) Follow-up CT scan at 1 month after injury shows large cystic mass at right perirenal with enhanced thick wall and hounsfield unit inside mass is 14~26. (**B**) Follow-up CT scan at 3 months after injury shows large cystic mass at right perirenal with enhanced thin wall and hounsfield unit inside mass is -12~2

Percutaneous aspiration of the cyst was performed under USG-guided and 650cc of serous fluid was aspirated. And then we inserted percutaneous drainage tube into the cyst. Creatinine of aspirated fluid was 4.18 mg/dl and films of the cyst after introduction of a water soluble contrast medium showed that there was no contrast leakage. 150～200 cc of fluid was drained every day through the percutaneous drainage tube so the creatinine was rechecked and it was 20.49 mg/dl. Indigocarmine was injected intravenously, and then, suspicious indigocamine containing bluish urine was drained through the percutaneous drainage tube. We thought it was a urinoma connected to the collecting system and renal exploration was performed because the amount of the fluid drained didn't decrease.

After flank incision, The renal cystic mass was dissected and cap portion of the cystic mass was incised. Indigocarmine was injected intravenously and the leak point of bluish urine at the innermost part of the cyst was observed(Fig. 3). The leak point was surrounded with papillary processes and it looked like renal papillae. Tissue biopsy was taken from the papillary process and the wall of the cystic mass. We followed the process of calyceal diverticulectomy to excise the mucosa surrounding the leakage and the part which was thought to be the collecting system was stitched then the mucosa at the cystic mass was stitched. Indigocarmine was injected to confirm there is no leakage at the stitches and operation ended.

The result of the biopsy showed the papillary process and the inner surface of the cystic mass was covered with transitional epithelium and necrotic tissue with the remnant of renal stroma was observed below it(Fig. 4). After 3 months of surgery the patient did not complain any symptoms and there was no proof of calyceal diverticulum recurrence in the follow up kidney ultrasonography.

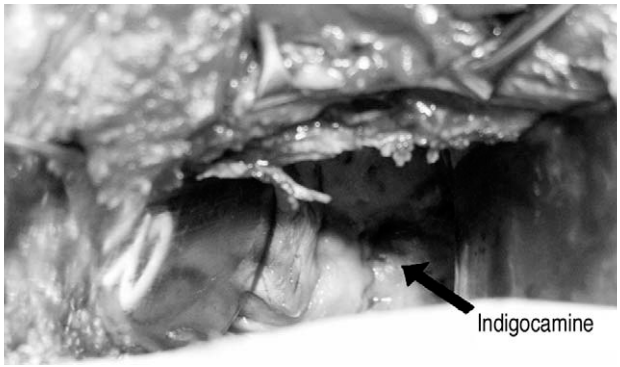

Fig. 3. After indigocamine injection, We find a pinpoint indigocamine leakage site in a cavity during the operation procedure.

II. Discussion

Several cases of calyceal diverticulum, which was first described by Rayer in 1841, have been reported in Korea since Lee et al(6) had reported a case in 1971. A calyceal diverticulum is a cystic cavity lined by non-secretory transitional epithelium,(1,2) encased within the renal parenchyma, and situated peripheral to a minor calyx. Such diverticula are filled with urine(1,2) and communicate with adjoining renal pelvis or calyx through a narrow channel.(3) An incidence of 2.1～4.5 per 1,000 excretory urograms has been reported.(7)

Both congenital and acquired factors have been suggested to explain the formation of calyceal diverticulum(1,3) and the similarity in incidence in children and adult is con-

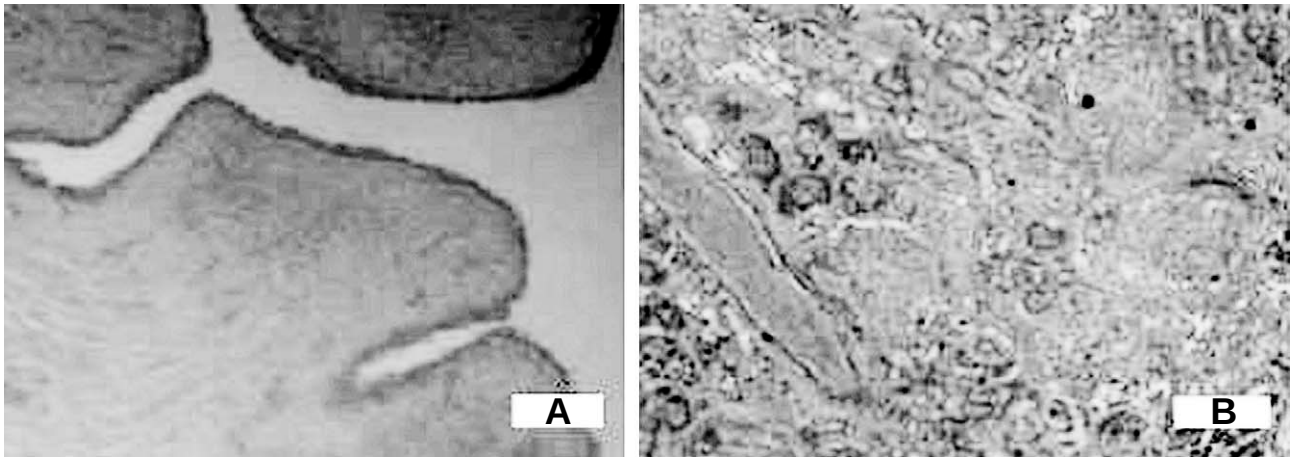

Fig. 4. (**A**) Transitional epithelium with collapse (×4) (**B**) Remnant renal parenchyma is observed in the necrotic tissue. (×10)

sistent with an embryologic etiology.(7) A localized cortical abscess draining into a calyx has also been postulated as an etiologic factor. Other proposed causes include obstruction secondary to stone formation or infection within a calyx, progressive fibrosis of an infundibular stenosis, renal injury, achalasia, and spasm or dysfunction of one of the supposed sphincters surrounding a minor calyx.(5)

Calyceal diverticula are usually asymptomatic(3) and are found incidentally at excretory urography or renal ultrasonography. They can become symptomatic when urinary stasis in the blind cyst leads to infection or calculi formation.(8) Manifestations of diverticula include hematuria, signs of infection (especially chronic or recurrent urinary tract infections) or pain in the abdomen, flank, or back.(2,3) Estimates of the frequency of stone formation in pyelocalyceal diverticula range from 9.5% to approximately 50%.(1,8) Stones may lead to diverticulum obstruction, as in the case above, with typical colicky pain, or may promote urinary stasis and secondary infection. Indeed, a calyceal diverticulum should be one of the differential diagnostic considerations in patients who have chronic urinary infections.

The diagnosis is best made by excretory urography or CT.(5) On sonogram, a diverticulum will often appear to be a simple cyst . Alternatively, since diverticula have a thicker outer wall than most benign cysts, the sonographic appearance may also mimic a malignant or infected cyst.(2) The pyelographic appearance of diverticula may include a filling defect early in the IVP, delayed subsequent filling of the diverticulum or retention of radiographic contrast within the cystic cavity after completion of the study.(1,2) On CT scan, diverticula will appear as regular cystic masses, possibly with a thick outer wall.(2)

In general, treatment of asymptomatic diverticula is not necessary. Persistent pain, resistant urinary tract infections, hematuria, and milk of calcium or true calculus formation are indications for surgery.(3) Partial nephrectomy was the treatment of choice in the past, but now percutaneous removal of the stones and ablation of the mucosal surface and communication with the collecting system, and laparoscopic stone removal with marsupialization of the diverticulum have been reported as successful nephron-sparing alternatives.(9) In Korea, calyceal diverticula were also treated by partial nephrectomy in the past, but now calyceal diverticular stones are treated by endourologic management, extracorporeal shock wave lithotripsy and percutaneous removal of the stones.(10)

Case report of calyceal diverticulum caused by acquired factors can rarely be found. To our knowledge, no report on calyceal diverticulum due to renal injury has been made yet. We also misdiagnosed it was an urinoma caused by renal injury until the renal exploration had been made. During the surgery the papillary processes within the cystic mass surrounding the urine leak point, looked like a renal infundibulum, so we assumed it could be calyceal diverticulum. The result of biopsy showed the inner surface of the cystic mass was lined with transitional epithelium so diagnosis had been made as huge calyceal diverticulum due to renal injury.

According to the development of new radiologic techiques, conservative treatment for patients with trauma has been improved recently. Grade IV and V injuries more often require surgical exploration, but even these high-grade injuries can be managed without renal operation if carefully staged and selected. Currently, conservative treatment, rather than surgical treatment, is becoming the first treatment of choice for renal injury. Complications seldom observed during the follow up after the conservative treatment but a few cases of urinoma caused by urine leakage, delayed bleeding, and perirenal abscess have been reported.(11) Our case reports that a huge cystic mass was developed as a complication of renal injury and it was diagnosed not urinoma but a calyceal diverticulum. A huge cystic mass developed as a complication of renal injury have been thought as urinoma. If huge cystic mass is urinoma, amount of the fluid drained would decrease gradually. When the huge cystic mass developed as a complication of renal injury was not recovered by percutaneous drainage, it would be recommended to consider the possibility of calyceal diverticulum communicated with adjoining renal pelvis through a narrow channel. Our report may help a additional diagnosis and treatment of a cystic mass caused by renal trauma.

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