Large hydrocalyx mimicking as renal cyst and treated by Thulium fiber laser infundibulotomy

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ABSTRACT

We report a large hydrocalyx with multiple calculi resembling renal cyst with milk of calcium. A 15-year-old female presented with intermittent colicky right flank pain for 10 years with recent increase in pain severity and frequency. Renal ultrasound and CT abdomen revealed right upper pole renal cyst. To further evaluate, retrograde pyelogram was done which delineated a hydrocalyx with narrow infundibulum filling and draining slowly causing renal colic. Thulium Fiber Laser (TFL) was used to perform laser infundibulotomy and stone fragmentation. TFL has lower depth of penetration and hence was useful for ureteroscopic endoincision in this case.

1. Introduction

Hydrocalyx is an obstructed renal calyx caused by infundibular stenosis. It’s a rare condition that usually affects the upper pole of the calyx in younger women. Most cases of hydrocalyx are asymptomatic and managed with observation. Some cases may present with flank pain, hematuria, infection, or stone formation that necessitate surgical intervention. Hydrocalyx can rarely grow in size, becoming exophytic and present as a large renal cyst. We present a similar large hydrocalyx with multiple calculi, that resembles a renal cyst with milk of calcium.

2. Case presentation

A 15-year-old girl presented with complaints of intermittent colicky right flank pain for 10 years. The pain was frequently associated with nausea and vomiting. Over the last few months, the pain has increased in severity and frequency, requiring analgesics.

When she presented to the emergency department with acute renal colic, renal ultrasound revealed large right upper pole renal cyst, and non-contrast CT abdomen revealed right upper pole renal cyst with milk of calcium [Fig. 1A, 1B]. Since renal cysts rarely cause acute renal colic, we suspected a blocked or narrow infundibulum with a dilated calyx. To further evaluate this, we performed a right retrograde pyelogram. During the initial phase of injecting retrograde contrast, pelvicalyceal system appeared normal. There was no splaying of calyces expected with a large renal cyst. On further injecting the contrast with pressure, we noticed gradual filling of a large, dilated calyx arising from the junction of the upper and middle pole [Fig. 1C]. On retrograde pyelogram, infundibular ostium of the dilated calyx was not obvious thus raising suspicion of either an aberrant hydrocalyx or calyx with a very narrow infundibulum. Four days after the retrograde pyelogram, she returned to the emergency with severe colicky right flank pain. Non-contrast CT abdomen reveals that the contrast used during the retrograde study was still present in the dilated calyx, confirming poor drainage of the hydrocalyx [Fig. 1D]. We planned for ureteroscopic endoincision/dilation of the narrow infundibulum, with the possibility of antegrade percutaneous access if the ureteroscopic approach failed to find the ostium. During ureteroscopy, we discovered an abnormally narrow, pinpoint infundibular opening between the upper and middle calyces [Fig. 2E]. After several attempts, we were able to negotiate the curved glide wire (Terumo™) and get it coiled in the Hydrocalyx through the infundibular ostium. Afterward, we passed a 6Fr ureteral balloon dilator and dilated the narrow infundibulum. To further widen the narrow infundibulum, we performed laser infundibulotomy using a Thulium Fiber laser at 1Jx20 Hz. This opened up the infundibulum with easy access to the hydrocalyx to allow drainage and fragmentation of the multiple secondary stones within the calyx [Fig. 2F]. In the end, we placed a 6Fx26cm stent with the upper end coiled in the hydrocalyx and

Abbreviations: TFL, Thulium Fiber Laser; CTU, CT Urogram; IVP, Intravenous pyelogram.

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the lower end coiled in the bladder traversing through the infundibulum. Stent was removed at 4 weeks. Patient remained asymptomatic at 3 months follow up and renal ultrasound revealed decompressed calyx.

3. Discussion

In this case report, we discussed how a large hydrocalyx can grow exophytically, mimicking a simple renal cyst, posing a diagnostic and therapeutic challenge. Usually asymptomatic, hydrocalyx or caliectasis is discovered incidentally during imaging. On rare occasions, patients may experience flank pain, hematuria, recurrent infection, stone formation, or pyocolicosis that requires surgical intervention.

Hydrocalyx, Calyceal diverticulum, Fraley’s syndrome, and Renal cysts have similar symptoms and appearances on standard imaging studies. In most radiological centers, CT Urogram (CTU) has replaced intravenous pyelography (IVP) as the investigation of choice for distinguishing these diagnoses. Renal cysts have no communication with the pelvicalyceal system and cause calyceal splaying. Calyceal diverticulum are non-secretory and, depending on the diverticulum ostium, are rarely delineated on IVP or CTU. Very large hydrocalyx fill slowly on IVP or CTU, as in our case, and are difficult to detect on initial images. Although an invasive procedure, retrograde pyelogram is invariably needed to distinguish between Hydrocalyx, Calyceal diverticulum, and renal cyst. Studies have discussed the difficulties in distinguishing between hydrocalyx and calyceal diverticulum because both present with similar signs and symptoms, including stone formation. Fraley’s
syndrome is a rare condition in which the calyx becomes dilated from compression of a calyceal infundibulum by an artery or vein. CTU with CT angiography is the investigation of choice.

Morris and Frank et al. reported that an important radiologic feature in hydrocalyx is a smooth, regular, round, or oval cavity in the renal parenchyma that fills with contrast medium on intravenous or retrograde pyelography. The contrast tends to remain in the cavity after been drained from the rest of the collecting system.

The treatment of hydrocalyx with infundibular stenosis is determined by two factors: severity of symptoms and extent of renal damage. Patients with minimal symptoms and no signs of infection can be managed with close observation. In our case, surgical intervention was needed for severe persistent symptoms. The goal of surgery is to improve caliceal urine flow by opening up the stenosed calyx. In cases of significant renal damage or pyocalicosis, partial or simple nephrectomy has also been advocated. The standard treatment for narrow infundibulum is a ureteroscopic laser incision. In cases with completely blocked calyx, percutaneous access is needed to dilate or incise the infundibulum. Ho: YAG lasers have traditionally been used for laser infundibulotomy. In our case, we performed the laser infundibulotomy with the most recent Thulium fiber laser (FiberDust, Quanta). TFL has a lower depth of penetration and is more hemostatic than Ho: YAG. We were able to incise the narrow infundibulum with the TFL with no bleeding. Good hemostasis with the TFL is especially beneficial in ureteroscopic cases, where minimal bleeding can compromise vision and drastically reduce procedure efficiency. Furthermore, as in our case, TFL can be used for laser lithotripsy of secondary calculi as well.

4. Conclusion

Hydrocalyx due to infundibular stenosis can grow exophytically and appear as renal cysts. This can be a diagnostic challenge, necessitating a retrograde pyelogram for confirmation. Thulium Fiber Laser Infundibulotomy can effectively treat them.

Consent

Written informed consent obtained from the patient and her mother. All patient identifiers removed from all the images.

Declaration of competing interest

None.

References

1. Bayne CE, Peters CA. Congenital infundibulopelvic stenosis: indications for intervention, surgical technique, and review of literature. *J Pediatr Urol*. 2016;12(6):389.e1–389.e5.
2. Stuart WJ. Caliceal diverticulum and hydrocalyx: laparoscopic management. *Urol Clin*. 2000;27(4):655–660.
3. Waingankar N, Hayek S, Smith AD, Okeke Z. Calyceal diverticula: a comprehensive review. *Rev Urol*. 2014;16(1):29–43.
4. Morris L. Hydrocalycosis and calyceal diverticulum. *S Afr Med J*. 1957;31(34):847–850.
5. Frank RG, Lefkon BW, Sanders L, Gerard PS. Thirty-nine-year-old woman with abdominal pain on right side. *Clinical Uroradiologic Conference, Urology*. 1993;41:266, 1993.