Ureteral Intussusception: A Case Report and Literature Review

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Abstract: We present the case of a 64-year-old man with intussusception of the right ureter as a complication of an underlying transitional cell carcinoma. To our knowledge, this is the first case report that illustrates ureteral intussusception by both multidetector computerized tomography and magnetic resonance imaging. Although ureteral intussusceptions are thought to be associated with benign masses, our comprehensive review of the literature demonstrates that almost half of the cases are associated with underlying malignancy.

Key Words: ureter, ureteral intussusception, ureteral mass

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CASE REPORT

A 64-year-old man presented to the emergency department with the complaint of chronic nausea and vomiting. He denied abdominal pain, flank pain, fever, or chills but did recall a remote history of hematuria, thought to be secondary to a urinary tract infection. An extensive smoking history was also noted. On examination, the patient had mild epigastric tenderness. Urinalysis result was negative for red blood cells.

Portal venous phase contrast-enhanced computed tomography (CT) of the abdomen and pelvis (70-second delay) was performed on a 64-slice multidetector CT (MDCT; GE Healthcare, Waukesha, Wis) with 0.625-mm collimation and 2.5-mm reconstruction slice thickness. Coronal and sagittal reformatted images were created, showing moderate to severe right hydronephrosis associated with a 2.5-cm right midureteral mass. In light of this finding, the patient was recalled from the emergency department for 45-minute-delayed images (Fig. 1). The coronal and sagittal reformats now demonstrated excreted contrast in the right ureter terminating in a V-shaped configuration, flanked by contrast-enhanced urine outlining the intussuscepted proximal ureter (Figs. 2A, B).

The urology department requested further magnetic resonance (MR) imaging. T1 fat-saturated coronal 1.5-mm-thick slab precontrast and postcontrast and T2 fat-saturated coronal 3-mm-thick multi–breath hold postcontrast and T2 fat-saturated axial 4-mm-thick Half-Fourier Acquired Single Turbo Spin-Echo (HASTE) multi–breath hold postcontrast imaging (Siemens Verio 3T scanner, Erlangen, Germany) were performed. The postcontrast MR images demarcated the enhancing right ureteral mass from the ureter (Fig. 3). Moreover, T2 axial and coronal MR sequences identified a 5-cm-long antegrade right ureteral intussusception with trapped urine outlining the periphery of the mass (Figs. 4 and 5). No ureteral excretion of contrast was appreciated on 15-minute-delayed images, likely related to a decrease in glomerular filtration rate and decreased contrast excretion secondary to ureteral obstruction.

The patient underwent surgical resection of the right kidney and ureter. Pathologic examination confirmed that the tumor, measuring 2.5 × 2.0 × 1.5 cm, was isolated to the ureter. Histopathologic finding was consistent with stage I urothelial (transitional cell) carcinoma.

DISCUSSION

Intussusception of the ureter is a rare complication of a ureteral mass or ureteral calculus in which the proximal ureter telescopes into the distal segment of the ureter. Intussusception is thought to be caused by the weight of the ureteral mass along with forced parietal sliding[1–3]; the tumor is pulled downstream by normal urinary flow and ureteral peristalsis, with the attachment of the mass serving as a lead point for intussusception.[2,4] The prolapsing proximal ureteral segment is referred to as the intussusceptum, whereas the receiving distal ureteral portion is called the intussuscipiens.

Our review of the literature confirms that patients with ureteral intussusception commonly present with the triad of hematuria, colicky pain, and ureteral dilation.[3,5] Patients may also present with a history of prior episodes of pain or hematuria. The size of associated mass is variable, ranging from 1 to 10 cm. The intussusception is usually antegrade and usually right sided.

In 1986, the first case of a carcinoma causing ureteral intussusception was reported. Before the aforementioned report, ureteral intussusception was thought to be associated with a benign mass.[4–6] However, our current review of all accessible prior reported cases shows that almost half were associated with transitional cell carcinoma (Table 1).[15] This is compatible with current thought that intussusception is linked to a slowly growing mass.[12] The transitional cell carcinoma cases were

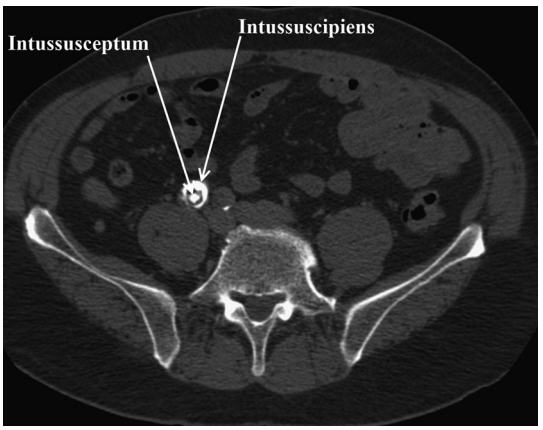

FIGURE 1. Axial post-contrast CT with 45-minute-delay showing ureteral intussusception: the contrast opacified proximal ureter (intussusceptum) prolapses into the distal ureter (intussuscipiens), which is also contrast opacified forming a bull's-eye appearance on axial imaging.

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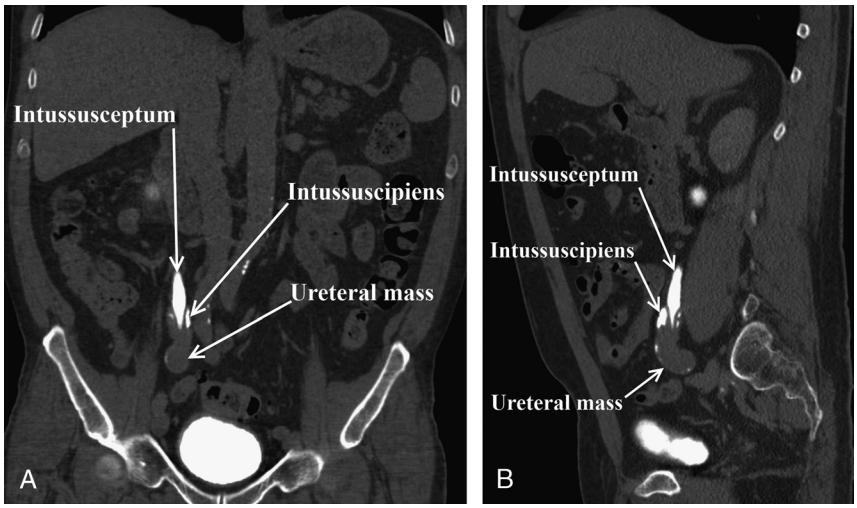

FIGURE 2. Coronal post-contrast CT with 45-minute-delay showing ureteral intussusception: the contrast-opacified proximal ureter (intussusceptum) prolapses into the distal ureter (intussuscipiens), which is also contrast opacified, forming a stalk-of-corn appearance on coronal (A) and sagittal (B) imaging.

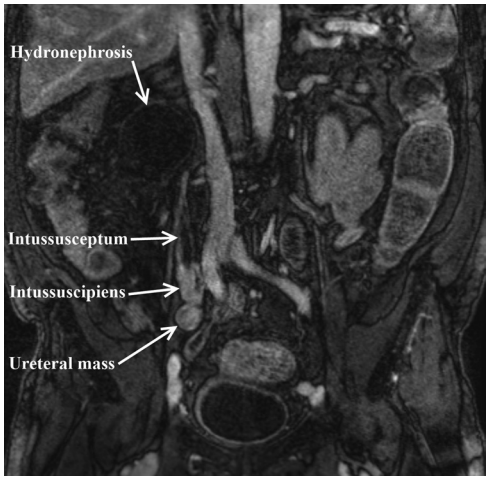

FIGURE 3. Coronal fat-saturated post-contrast T1 MR shows enhancing ureteral mass, ureteral intussusception, and hydronephrosis. The proximal ureter (intussusceptum) prolapses into the distal ureter (intussuscipiens). Ureteral mass is seen at the inferior end of the intussusceptum.

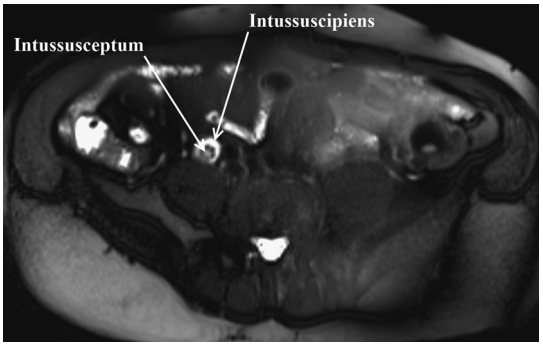

FIGURE 4. Axial multi–breath hold HASTE MR shows target sign of ureteral intussusception. The proximal ureter (intussusceptum) prolapses into the distal ureter (intussuscipiens) forming a bull's-eye appearance on axial imaging.

uniformly seen in older patients (at least 50 years old), were smaller in size (the largest was 2.5 cm in one dimension versus up to 10 cm in benign pathologies), and involved the mid- to distal ureter. These cases were also less likely to present with traditional flank pain and were more often asymptomatic when compared to the intussusception that occurred owing to a benign mass.

Ureteral intussusception is rarely diagnosed. A literature search for "ureteral intussusception" (a search for "intussusception" associated with the word "ureter" added no additional entries) yielded only 14 cases of ureteral intussusception (also referred to as prolapse or invagination in some of the older articles) associated with a mass (some of the 44 results refer to the procedure ureteral intussusception, which is also used to create a valve or nipple). Ureteral intussusception may be less commonly discussed than bowel intussusception because of

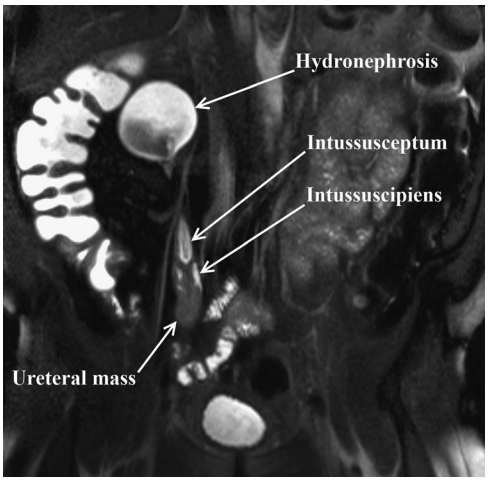

FIGURE 5. Coronal fat-saturated multi–breath hold T2 MR shows ureteral intussusception. The proximal ureter (intussusceptum) prolapses into the distal ureter (intussuscipiens) forming a stalk of corn appearance on coronal imaging.

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TABLE 1. Review of Accessible Previous Cases of Ureter Intussusception

	Author	Location of Pain	Hematuria	Prior Episodes	Hydronephrosis	Age/Sex	Pathologic Finding	Size (cm)	Ureteral Location
1	Fukushi et al[2]	Flank pain	Yes	No	Yes	59 F	Inflammatory polyp	7	Left midureter
2	de La Taille et al[3]	Not applicable	Yes	Yes	Yes	59 M	Transitional cell carcinoma	5	n/a
3	Vogelzang et al[4]	Left flank, colicky	Yes	Yes	Yes	27 M	Fibrous ureteral polyp	10	Distal ureter
4	Duchek et al[6]	Right flank	Yes	Yes	Yes	24 M	Papilloma	n/a	Midureter
5	Png et al[7]	Right flank	Yes	Yes	Yes	26 F	Fibroepithelial polyp	10	Right upper third
6	Fiorelli et al[1]	Left flank pain	No	No	Yes	25 F	Fibroepithelial polyp	6	Left ureteropelvic junction
7	Gerdes et al[8]	Diffuse abdomen	Yes	Yes	No	34 F	Angiofibromatous polyp	9	n/a
8	Xu et al[9]	Right flank	Yes	Yes	No	49 M	Fibroepithelial polyp	10	Midureter
9	Morley et al[10]	Right flank	No	Yes	Yes	19 M	Fibrous ureteral polyp	10 × 2	Mid ureter (7 cm from ureteropelvic junction)
10	Bonomini et al[11]	Left flank	Yes	Yes	Yes	20 M	Benign pedunculated polyp	2 × 6	Mid ureter
11	Gabriel et al[5]	Right lower quadrant	No	No	Yes	74 M	Transitional cell carcinoma	1.5 × 1.0 × 0.5	Distal ureter
12	Moretti et al[12]	Not applicable	Yes	Yes	n/a	59 M	Transitional cell carcinoma	1.5	Right distal third ureter
13	Mazer et al[13]	Not applicable	Yes	Yes	Yes	66 M	Transitional cell carcinoma	1 × 2	Right midureter
14	Compton et al[14]	Not applicable	Yes	No	No	50 M	Transitional cell carcinoma	n/a	Right midureter
15	This study	Epigastric	No	Yes	Yes	64 M	Transitional cell carcinoma	2.5 × 2.0 × 1.5	Right mid- to distal third

difficulty of diagnosis secondary to lack of air interphase,[13] lack of sufficiently delayed images, or lack of awareness or suspicion for this diagnosis.[8] Moreover, ureteral intussusception is thought to be rare because the makeup of the ureteral wall lends itself poorly to antegrade invagination.[13] Other factors thought to limit the phenomenon of ureteral intussusception include the small ratio between ureteral wall thickness and lumen caliber, limited range of mobility of the ureter itself, and decrease in urinary flow due to ureteral obstruction.[2]

The intussusceptum has been identified on imaging as a cylindrical, oval, or bell-shaped ureteral filling defect[9,12] or a concentric sign.[9] During retrograde pyeloureterogram contrast material outlines the intussusceptum but typically does not reach the proximal ureter.[12] On coronal CT imaging, excreted contrast in the ureter fills the intussusceptum, which has been described as the line sign.[9] Our study shows that the contrast-filled dilated intussusceptum terminates abruptly in a V-shape and is characteristically flanked by trapped contrast in intussuscipiens. The overall appearance on coronal and sagittal imaging is analogous to a "stalk of corn" with adjacent leaves. The stalk or base of the corn represents the ureteral mass, the ear of corn represents the proximal dilated intussusceptum containing contrast-enhanced urine, and the leaves represent trapped urine in the intussuscipiens (Figs. 2 and 5). Axial imaging demonstrates the concentric[9] or target sign where the central bull's-eye represents the proximal dilated intussusceptum containing contrast-enhanced urine and the outer ring represents trapped urine in the intussuscipiens (Figs. 1 and 4).

Our case study is the first study to our knowledge to demonstrate ureteral intussusception by MDCT and MR imaging.[9] We show that ureteral intussusception has a characteristic stalk-of-corn appearance on coronal and sagittal CT and MR imaging and a target or concentric appearance on axial imaging. Although imaging alone cannot distinguish malignant or benign masses, delayed postcontrast MR imaging can clearly elucidate the extent of the associated mass, which will aid in presurgical planning.

To adequately opacify the ureteral intussusception, it may be necessary to perform imaging more delayed images than usual owing to delayed excretion of contrast in an obstructed system. In our case, the ureteral intussusception was opacified on the 45-minute-delayed images from the MDCT but not on the 15-minute-delayed images on MRI. However, MRI can demonstrate intussusception without intravenous contrast by using fluid sensitive sequences such as T2 and Fast Imaging Employing Steady-state Acquisition. This has potential benefit in patients with poor renal function or intravenous contrast allergies and where sufficiently delayed images cannot be obtained.

REFERENCES

1. Fiorelli C, Durval A, Di Cello V, et al. Ureteral intussusception by a fibroepithelial polyp. *J Urol*. 1981;126:110–112.
2. Fukushi Y, Orikasa S, Takeuchi M. A case of ureteral intussusception associated with ureteral polyp. *J Urol*. 1983;129:1043–1044.
3. de La Taille A, Bertrand P, Mahe P, et al. Ureteral Intussusception by invasive transitional cell carcinoma. *J Urol*. 1998;159:505.
4. Vogelzang RL, Calenoff L, Bulkley GJ. Ureteral intussusception caused by fibrous ureteral polyp. *Urol Radiol*. 1981;3:47–49.
5. Gabriel JB Jr, Thomas L, Guarin U, et al. Ureteral intussusception by papillary transitional cell carcinoma. *Urology*. 1986;28:310–312.
6. Duchek M, Hallmans G, Hietala SO, et al. Inverted papilloma with

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intussusception of the ureter: case report. *Scan J Urol Nephrol*. 1987;21:147–149.

7. Png JC, Tung KH. Intussusception of a ureteric polyp causing acute hydronephrosis. *Br J Urol*. 1995;75:801–802.
8. Gerdes G, Nordqvist L. Intussusception of the ureter caused by a primary benign tumor. *Acta Chir Scand*. 1966;132:397–402.
9. Xu W, Yu CS, Yang L, et al. Ureteral intussusception due to a polyp. *Abdom Imaging*. 2007;32:675–677.
10. Morley HV, Shumaker EJ, Gardner LW. Intussusception of the ureter associated with a benign polyp. *J Urol*. 1952;67:266–271.
11. Bonomini B. The radiological picture of ureteral intussusceptions. *Urol Int*. 1963;16:168–179.
12. Moretti KL, Jose JS. Ureteral intussusception owing to a malignant ureteral polyp. *J Urol*. 1987;137:493–494.
13. Mazer MJ, Lacy SS, Kao L. "Bell-shaped ureter," a radiographic sign of antegrade intussusception. *Urol Radiol*. 1979;1:63–65.
14. Compton JS, Drummond M. Intussusception of the ureter by a polypoid transitional cell carcinoma. *Br J Urol*. 1985;58:725–726.
15. The following cases were not accessible: (1) Aoun N, Haddad-Zebouni S, Karam R, et al. What is it? Uretero-ureteral invagination caused by a malignant urothelial tumor. *J Radiol* 1999;80:317–318; (2) Acimi S, Hadjeb N, Haouari H, et al. Hydronephrosis due to retrograde ureteric intussusception. *Prog Urol* 2005;15:517–518; (3) Haupert S, Janin-Mercier A, Camillieri L, et al. Ureteral invagination caused by a fibroepithelial polyp of the ureter. Apropos of a case. *Ann Urol* 1985;19:403–405. The following case had incomplete information and was not included: Radhi JM. Ureteral intussusception by a transitional cell carcinoma. *Can J Surg* 1992;35:122–124.

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