Chronic penetrating renal trauma due to iron wire ingestion
An unusual case report

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Abstract
Foreign body ingestion is a common presentation in the emergency room. However, the complication such as penetrating renal trauma due to sharp objects ingestion is relatively rare. We herein describe an unusual case of penetrating renal trauma in the absence of any other urinary symptoms. A 53-year-old man who had a history of iron wire ingestion went to our hospital, on examination, he only had slight abdominal tenderness due to swallowing a ball pen and 1 cap nut 1 day before, radiological imaging showed penetrating renal trauma, the blood test showed his renal function is normal. Surgical strategies were recommended to remove the pen and the iron wire simultaneously, nonetheless the patient eventually agreed to only receive surgical removal of the swallowed ball pen and cap nut, meanwhile leave the kidney untreated. During 30 months follow-up by phone and regular outpatient examination, he recovered unevenly and had no special complaint. Such cases remind us that chronic penetrating renal trauma due to foreign object ingestion may have no obvious symptoms. It is easily to be neglected. We should try to minimize the possibility of missed lesions by adhering to a meticulous examination technique.

Abbreviation: CT = computer tomography.

Keywords: foreign body ingestion, penetrating wound, renal trauma

1. Introduction
Foreign body ingestion is a common presentation in the emergency room, when it comes to sharp objects, the complication rate, such as perforation/obstruction could be up to 35%.[1] However, penetrating renal trauma due to foreign body ingestion is relatively rare. Up to now, totally 18 cases have been reported, while the majority of these patients were accompanied with urinary symptoms such as flank pain, proteinuria, hematuresis, or perinephric abscess. Therefore, we report an unusual case of chronic penetrating renal trauma due to iron wire ingestion in the absence of any other urinary symptoms. For the present study, a formal approval from the ethical committee was obtained, and the principles of the Declaration of Helsinki followed. Written informed consent was obtained from this patient for his data to be used for research purposes.

2. Case report
A 53-year-old man complaining a moderate upper abdominal pain presented to the emergency room after he swallowed a ball pen and 1 cap nut 1 day before. Besides, the patient had a history of another suicidal act by swallowing an iron wire 6 months ago which had not been taken out. The iron wire was approximately 100 mm in length and 2 mm in diameter. At that time, the X-ray showed the iron wire was in the stomach, he refused any recommended surgical or psychological treatment and walked home. The patient had no melena, vomiting, or gross hematuria. He also denied any history of psychiatric disorders. Physical examination detected upper abdomen tenderness and percussion tenderness on right kidney region. Blood test demonstrated normal level of creatinine and urine nitrogen, and urinalysis showed no microscopic hematuria. Abdominal computer tomography (CT) scan demonstrated that a linear hyperdense foreign body was penetrating into the right renal parenchyma, closed to the renal pedicle (Fig. 1) with no sign of subdiaphragmatic air (Fig. 2). No subcapsular or perirenal hematoma was found either. After fully interpretation of the medical condition, we attempted to remove the pen by gastroscopy but failed. Surgical strategies were recommended to remove the pen and the iron wire simultaneously, nonetheless the patient eventually agreed to only receive surgical removal of the swallowed ball pen and cap nut, meanwhile leave the kidney untreated. Finally, he only underwent open gastroscopy and removed the ball pen, as the cap nut was already in the colon and may pass automatically, it was left untreated. During 30 months follow-up by phone and regular outpatient examination, he recovered unevenly and had no special complaint.

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3. Discussion

The patient refused our aggressive suggestion of nephrectomy and accepted the conservative recommendation. Leaving the kidney unoperated may lead to secondary damage. As the iron wire was longer than the transverse diameter of the kidney, and closed to the pedicle, plus, the kidney normally moves vertically by 39 mm in 1 respiratory cycle, mild transposition of the iron wire may injure the renal collecting system, resulting in perirenal hematoma/extravasation/calculus, etc. What’s worse, renal pedicle rupture may cause severe consequences.

The special concern of this case is the mechanism of how the iron wire inserted the kidney and stayed there for 6 months or even longer. A possible explanation is that when the iron wire was proceeding along the relatively fixed descending duodenum, the combined effect of intestinal peristalsis and pressure fluctuation caused duodenum perforation and penetration of the kidney. The chronic inflammation around the wound site,

Table 1
Summary of the previously published literatures concerning renal foreign body.

| No. | Refs. | Year | Sex | Age | Side involved | Symptom | Type of treatment | Type of foreign body | Indwelling time |
|-----|-------|------|-----|-----|---------------|---------|------------------|---------------------|-----------------|
| 1   | Middledorf[4] | 1935 | Female | 39 | Right | Right flank pain | Nephrectomy | Sewing needle | 3 y |
| 2   | Capon and Wells[4] | 1938 | Female | 4 | Right | Frequency/hematuria/perforated duodenum | Nephrectomy | Bobby pin | 10 mo |
| 3   | Boeninghau[4] | 1942 | Male | 30 | Right | Frequency/dysuria/right periurethral abscesses | Nephrectomy | Paper clip | 10 y |
| 4   | O Economos[4] | 1945 | Male | 38 | Right | Pain/fever | Laparotomy | Sewing needle | 6 y |
| 5   | Lando[4] | 1946 | Male | 56 | Right | Backache/perforated colon? | Abscess drained | Toothpick | 5 mo |
| 6   | McNerney and Fox[4] | 1946 | Male | 2 | Right | Pyuria/perforated duodenum | Extraction through duodenum | Bobby pin | 9 mo |
| 7   | Mackby[4] | 1948 | Female | 3 | Right | Urinary symptoms for 6 mo/persistent albuminuria | Extraction through duodenum | Not sure |
| 8   | Bilger and Greiner[4] | 1949 | Male | 5 | Right | Pyuria | Nephrectomy | Hairpin | 2–3 y |
| 9   | Osmond[4] | 1953 | Male | 40 | Right | Pain in the right costovertebral angle/frequency | Pyelotomy | Toothpick | Not sure |
| 10  | Macaulay and Moon[4] | 1955 | Female | 3.5 | Right | Fever and flank pain | Extraction through duodenum | Sewing needle | 7 d |
| 11  | Mitnik et al[4] | 1969 | Male | 2 | Right | Not mentioned | Extraction through duodenum | Not mentioned | Not mentioned |
| 12  | Abe et al[4] | 1984 | Female | 12 | Right | Proteinuria and hemoptysis | Nephrectomy | Bobby pin | Not sure |
| 13  | Iwai et al[4] | 2011 | Male | 75 | Right | Pain in the right flank | Nephrectomy | Fish bone | 1 d |
| 14  | Singh et al[4] | 2013 | Male | 33 | Left | Left flank pain and dysuria | Laparoscopic | Copper wire (4.5 cm) | Not sure |
| 15  | Zheng et al[33] | 2014 | Male | 49 | Right | Hematuria/upper abdominal pain | Exploratory laparotomy and duodenorrhaphy | Toothpick (6.5 cm) | 5 d |
| 16  | Upadhyay et al[41] | 2015 | Male | 20 | Right | Gross hematuria/colliey right flank pain | Retрогrade percutaneous nephrostomy | Metallic object | 1 y |
| 17  | Armaian et al[42] | 2015 | Male | 4 | Right | Right upper quadrant and right flank pain/intermittent fever and chill | Nephrectomy | Bobby pin | 3 mo |
| 18  | Our patient | 2015 | Male | Right | No symptoms | Conservative management | Iron wire (about 8 cm) | 6 mo |

Figure 1. Abdominal CT shows an iron wire penetrates the right kidney and duodenum which was closely related to the pedicle. CT = computer tomography.

Figure 2. X-ray shows there is no sign of subdiaphragmatic air.
plus the slow penetration of the duodenal wall and into right kidney might act as mechanism for buffering of the iron wire’s sharp end. Therefore, the patient only presented with a moderate abdominal pain, with no signs of subdiaphragmatic air or gross hematuria.

Foreign body ingestion is a common presentation in the emergency room. Although, spontaneous passage may occur to more than 80% of the patients, when it comes to sharp object, the risk of perforation ranges from 15% to 35%. The guideline on management of swallowed foreign bodies and food impactions released by American Society for Gastrointestinal Endoscopy recommend urgent endoscopy if the ingestion object is sharp-ended or longer than 60 mm, for it many not surpass the “C-loop” of the duodenum. The main reasons that foreign bodies dwelling in kidney may be iatrogenic cause, self-insertion, external injury, or migration from the gastrointestinal tract. Regarding a sharp foreign body penetrating the duodenum and reaching the kidney, there are few cases reported. A literature review was performed and the results are listed in Table 1. Totally 18 cases have been reported so far, with right kidney being the main target organ. The latent period ranged from days to years. And the most common foreign bodies were toothpick and metal wire. Clinical manifestations may vary according to severity of the damage and whether infection coexists.

Foreign object ingestion is sometimes difficult to diagnose, as many patients may forget the swallowing history, and symptoms could be vague while imaging studies may not be able to identify certain materials (wood, plastics, etc.). It should be emphasized that doctors should bear in mind that diagnosis of foreign body intake should be considered when dealing with indistinct acute abdomen. In addition, chronic penetrating renal trauma due to foreign object ingestion may have no obvious symptoms. It is easily to be neglected. We should try to minimize the possibility of missed lesions by adhering to a meticulous examination technique.

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