

Blind Dates - Potential Killers: Jujube Kernel Caused Enterobrosis Need to be Differentiated with Acute Appendicitis – A Chinese Single Center Case Series Study

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Abstract

Background: Accidentally swallowed date kernels are high risk factors for enterobrosis. Most patients showed no obvious symptoms at the beginning but later developed lower abdominal pain, which should be differentiated with acute appendicitis, especially in elder patients without a clear medical history. This study investigated the clinical features, diagnosis and treatment of enterobrosis caused by accidentally swallowed kernel of Chinese date in adults.

Methods: A retrospective analysis was performed on 14 cases of adult patients suffered from date kernel - induced enterobrosis during June 2016 to June 2019. All these patients received treatment in the first hospital of China medical university.

Results: Eleven female and three male patients were diagnosed, and they were mainly in the middle to elderly age, with 12/14 patients (86%) above 50 years old. The main clinical manifestations were abdominal pain, with onset times from seven hours to four days, and all patients visited the emergency department. Physical signs of local or diffuse peritonitis were presented as guarding tenderness, rebounding, and increased rigidity. Through full-abdominal enhanced CT examination, high density linear objects were identified at the terminal or distal ileum segments in 11/14 (78%) patients. During emergent laparotomy, enterobrosis were found in all patients. Secondary perforations were also detected in 6/14 (42%) patients on the opposing side of the first puncturing sites. The fusiform kernels with two sharp tips were extracted by minimal enterotomies in 13 patients. In one patient with colonic perforation, sigmoid colostomy was performed. All patients were cured and 93% of them were discharged within two weeks.

Conclusions: Full-abdominal enhanced CT examination is of great diagnostic value for the intestinal perforation caused by date kernels, and patients can benefit from early surgical treatment after definite diagnosis. Thorough exploration should be performed to detect whether a second perforation was formed on the contrary site of first piercing site. Caution should be taken to void "blind dates" ingestion, and special tools such as seeders and slicers are recommended to removal kernels in advance, thus prevent the potential killing threats of enterobrosis.

Background

Perforation in digestive tracts is pretty common acute abdominal diseases, while delay in treatments may lead to severe intra-abdominal infection, septic shock or even death [1,2]. Because Chinese dates are generally taken in dietary field, date kernels have been identified as the most leading (58%) cause of food-borne intestinal perforations [3]. Previously, date kernel induced esophageal perforations have been reported [4,5] but enterobrosis are far less published. Unlike fish bone or toothpicks, immediate symptoms are unobvious in patients who accidentally swallowed date kernels. Adequate vigilance is not usually taken and ignorance may lead to serious consequences. In this report, 14 cases of date kernel induced enterobrosis during recent three years in our hospital were retrospectively analyzed to study the clinical features, diagnosis, treatment, and prevention methods of this disease.

Methods

Clinical data

All patients were administrated in first hospital of China medical university from June 2016 to June 2019. Informed consent was obtained from all patients in this report. Demographic characteristics, onset durations, clinical manifestations, and body temperatures, as well as preoperative blood test were analyzed. Radiological findings and preoperative diagnosis were described. Once diagnosis was completed, emergent laparotomy was performed. The full length of digestive tract was explored. Site of perforations and number of perforations were recorded and the lengths of extracted date kernels were measured. Postoperative morbidities and durations of hospital stay were compared as treatment outcomes.

Results

Clinical features of 14 cases of date kernel induced enterobrosis were listed in **Table 1**. There are 11 female and 3 male patients, mainly in middle to elderly age—12/14 (86%) above 50, and the other two patients are 31, and 36 years old respectively. In 12 of total patients (86%), food history revealed eating of fresh dates, congee or rice pudding. The onset time is from seven hours to four days. The main clinical manifestations were abdominal pain and all patients visited the emergency department. All patients showed physical signs of local or diffuse peritonitis, presented with guarding tenderness, rebounding, and increased rigidity. Elevated white blood cell counting accompanied with fever was seen in several patients. All patients received full-abdominal enhanced CT examination, while in 11/14 (78%) patients, high density spindle shaped foreign objects were identified in the ileum or colonic cavities. Free intra-abdominal gas or liquid gas interfaces were seen in other cases—Fig. 1 A-I.

Treatment and outcomes

Intestinal perforations were found in all patients—Fig. 1 J-L. Most perforations (13/14, 93%) occurred at distal or terminal ileum and in 6/14 (42%) of who secondary perforations on the contrary side of piercing intestinal wall were also detected. In one patient, the sigmoid colon was punctured. The fusiform kernels with two sharp tips were extracted in 13 patients while in one patient, the kernel entered colon and was defecated later. These extracted kernels were measured as from 2.5 to 3.2 cms with an average length of 2.8 (Fig. 1M). Perforating walls were fixed by thorough stitching; two drainage tubes were placed after thorough peritoneal exploration and lavage. In the patient with colon perforation, sigmoid colostomy was applied. Temporary fast, intravenous feeding, close monitoring and antibiotics were applied following the surgery. All patients were cured and 13/14 of them (93%) were discharged within two weeks.

Discussion

With an archaeological history for over 4000 years in China, Chinese dates, were recognized as a member of jujube species, zizyphus genus, buckthorn family, rhamnales order, dicotyledoneae class, angiospermae phylum, and plant kingdom [6]. According to the size, color and shape of their fruits, over 400 cultivars of Chinese dates can be sub classified as big or small, red or green, spherical, oval, flat, horse tooth-shaped, dog head-shaped, pear-shaped and apple-shaped types. For a long time, Chinese dates are mainly grown in the middle-north China, including Hebei, He nan, Shan dong, Shanxi, Shaan xi, Gan shu and Xin jiang provinces (Fig. 2). Centuries ago they were introduced beyond Asia and are sporadically grown in southern Europe, northern Africa, and the southwestern United States. Currently, fruits of Chinese dates are commonly seen in the food markets all over the world. Dates palm, also called Persian dates, are planted mainly in the Middle East and belong to phoenix genus, palmae family.

Nutritional constituents of dates are determined as saccharides, vitamins, saponins, triterpenes, as well as alkaloids, flavonoids, glucosides, nucleosides, amino acids, amides, organic acids, and steroids [7,8]. Due to its plentiful bioactive compounds, dates are praised as natural vitamin pills and mineral element depot. In Chinese traditional medicine, multiple functions were described for dates, such as appetizing and invigorating the spleen, removing exhaustion and supplementing stamina, quieting heart and nourishing blood, improving appearance, and delaying senility, etc. Mounting evidences from modern pharmaceutical studies also indicates health benefits of dates, including the increase of intracellular cAMP, prevention of allergic reactions, inhibition of abnormal nerve conduction, protection of liver function, decrease of the sclerosis of vascular walls, modification of blood pressure, improvement of muscle power, induction of sedative-hypnotic effects, blockade of genetic mutation, alleviation of lipid per oxidation, and delay of tumor genesis [9,10].

Except eaten in fresh as snacks, dates are widely added as components in different types of foods, including candy, preserve, pudding, cake, paste, puree, honey, syrup, congee, porridge, soup, wine, and tea. Generally, date fruits are green and smooth when immature, turn dark red and wrinkle when ripe. Under the thin crisp coat there is rich fibrous pulp and a single hard Kernel(Fig. 3). Without enough cautions, the sharp ends of these kernels may cause severe injury to the human body. Especially in these big sized dates, their kernels are also correspondingly longer than average and are more easily detained in the digestive tract [11]. For instance, the kernel of extra-grade *HETIAN* dates can reach 3-4 centimeters in size. It is always recommended to remove the kernels by tools like seeders and slicers before ingestion. Once the kernel was accidentally swallowed, perforation of digestive tract can be fairly expected.

Although most patients in our center are fully cured following the immediate operation, misdiagnosis may lead to peritonitis, intra-abdominal infection, bowel obstruction, septic shock or even death. The recovery period is pretty long and there is challenge for adhesive obstruction in the long term. Considering more cases of esophageal perforation is caused by accidentally swallowed date kernels, the economic cost are quite massive.

It were reported that old people or children are more jeopardized by date kernels induced perforations [12,13]. Consistently, patients in our report are more elder people (86% above 50) with an average of 58

years old. No children were reported as there is no pediatric surgical department in our hospital. Teeth loss, discordination of masticators, and malfunction of nervous reflex all contribute the high incidence of swallow accident when compared with young people. Besides the three natural strictures in esophagus, there are additional narrow sites including preentriculus, pylorus, anus, and ileocecal valve. Our report showed that most perforation led by date kernels occurred at distal or terminal ileum (93%). One explanation maybe the kernel tips were still wrapped with residual pulps when swallowing, while they were gradually exposed after decomposition by digestion. Also, the narrower cavity, less folds and thinner mucosa layer of ileum make it more vulnerable compared with jejunum. In addition, tonic contraction, segmental compress, rhythmic movement, peristaltic rush of small intestine, and the existence of ileocecal valve all help to increase local enteric pressure, leading to the puncture and incarceration of kernel tips in the ileum wall.

Kernel-induced perforation should be differentiated with appendicitis, especially for some old patients with amnesia who can not provide clear food history. Metastatic right lower abdominal pain, fixed tenderness at McBurney points , peritonitis, fever, and increased WBC counting are typical evidences for appendicitis, which can be confirmed as appendiceal thickening and stercoral obstruction by ultrasound or CT examinations [14]. Another differential disease is bowel obstruction and CT is of great value for the determination [15-18]. Not only the high density foreign object is too obvious in the CT image to confirm the diagnosis, but also the unique spindle shape of date kernels assist to the design and implements of the surgical plan. In our reports, two patients did not mention swallowing history of date kernel, thus were suspected as appendicitis at the beginning—but fortunately corrected by meticulous reading of CT images and supplemental inquiry of dietary history.

All patients diagnosed with kernel induced perforation require emergent surgery. Early operation decrease the leakage and intra- abdominal contamination, as the punctures are generally small because the impaction of sharp ends—but intestinal edema is not rare. Kernels should be extracted as intact as possible to avoid secondary injury and the puncture should be fixed carefully. No enterectomy and anastomosis were needed in our patients but they are sometimes required in severe situations [19]. It is critical to carefully check the full length of digestive tract, especially the contrary side of intestinal wall of first perforation to identify additional injuries, as detected by 6/14—42%—in our patients. Open procedures were performed in our center to ensure the thorough exploration and integral extraction of kernels. Laparoscopic approach has the advantages of less invasion and rapid recovery, and might be attempted in the future once the etiologic diagnosis and the kernel location were confirmed.

Conclusions

People especially old female should pay more attention when taking dates-related foods to avoid accidentally swallowing of their kernels. Special tools such as seeders or slicers are commercially available and recommended to remove the date kernels in advance. If the accident did happen, professional advices should be consulted and early treatments to extract these kernels are supported. Immediate operation to treat perforation is both simple and safe, eliminating the occurrences of

short/long term complications. Detailed investigation of the food history and meticulous reading of CT image are suggested for old patients with lower right abdominal pain, in order to prevent the misdiagnosis of kernel induce perforation as appendicitis. Intact kernels should be extracted and the full-length digestive tract should be inspected to avoid missing additional defects, which most likely occurred on the contrary side of the first perforations.

Abbreviations

N: number, G: gender, WBC: white blood cell, NOP: Number of perforation, DOH: Duration of hospitalization

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

All authors have read the final manuscript and agreed for its publication in the present form.

Availability of data and materials

All data generated or analyzed during this study are included in this published article.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

All authors participated in the writing of the final manuscript. All authors read and approved the final manuscript.

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Table

Due to technical limitations, table1 is only available as a download in the Supplemental Files section.

Figures

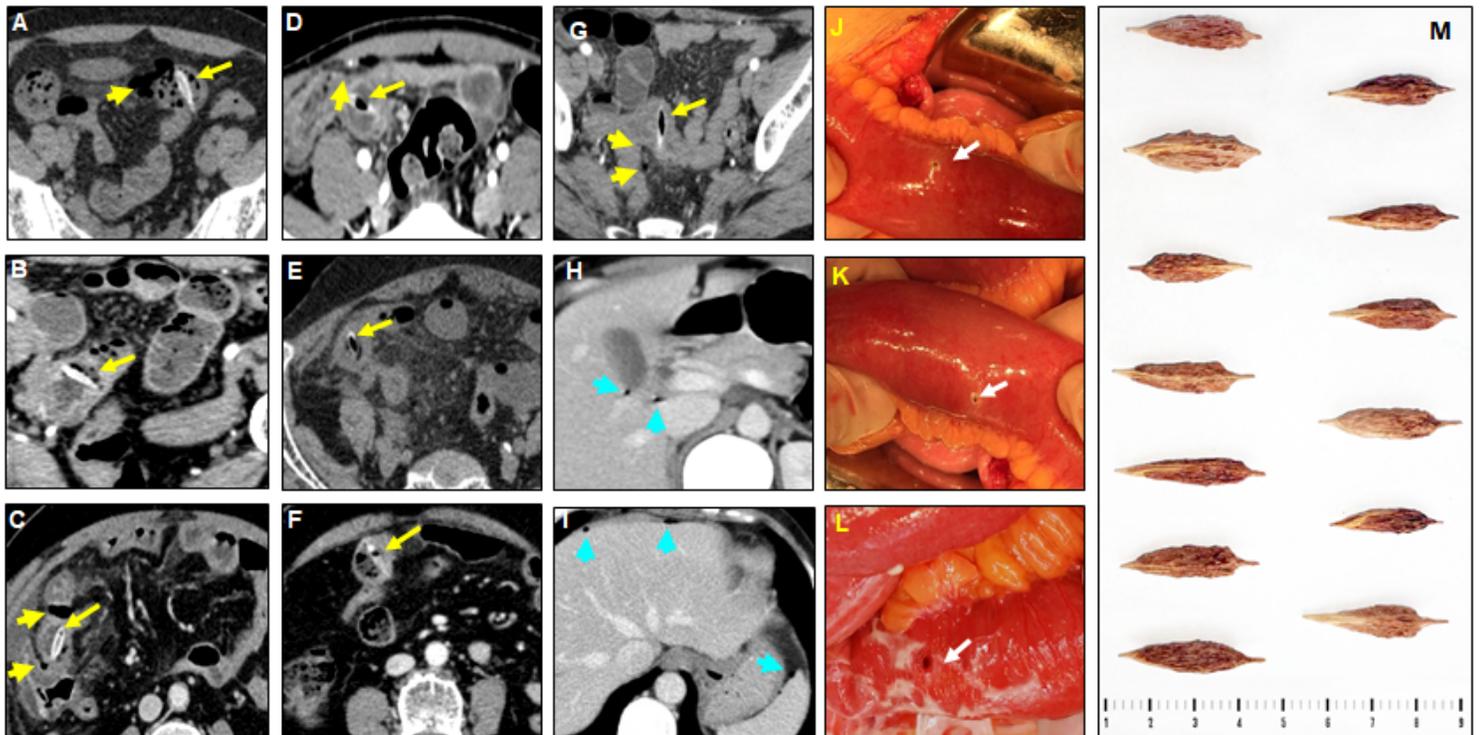


Figure 1

Representative CT image and intraoperative photos of date kernel - induced enterobiosis. A-G, High density linear objects in the intestinal cavities are indicated with yellow arrow. Gas accumulations in the

neighboring area of perforations were indicated with yellow arrow head. H,I, Free gas in the periphery of liver and spleen were shown in blued arrowheads. J-L. Representative intraoperative photos were shown. Intestinal perforations (indicated with white arrows) were identified on contrary sides of intestinal wall. Membrane of pus substances were attached to the surrounding walls (L). M, Date kernels extracted from 13 patients were shown.

Planting distribution of dates

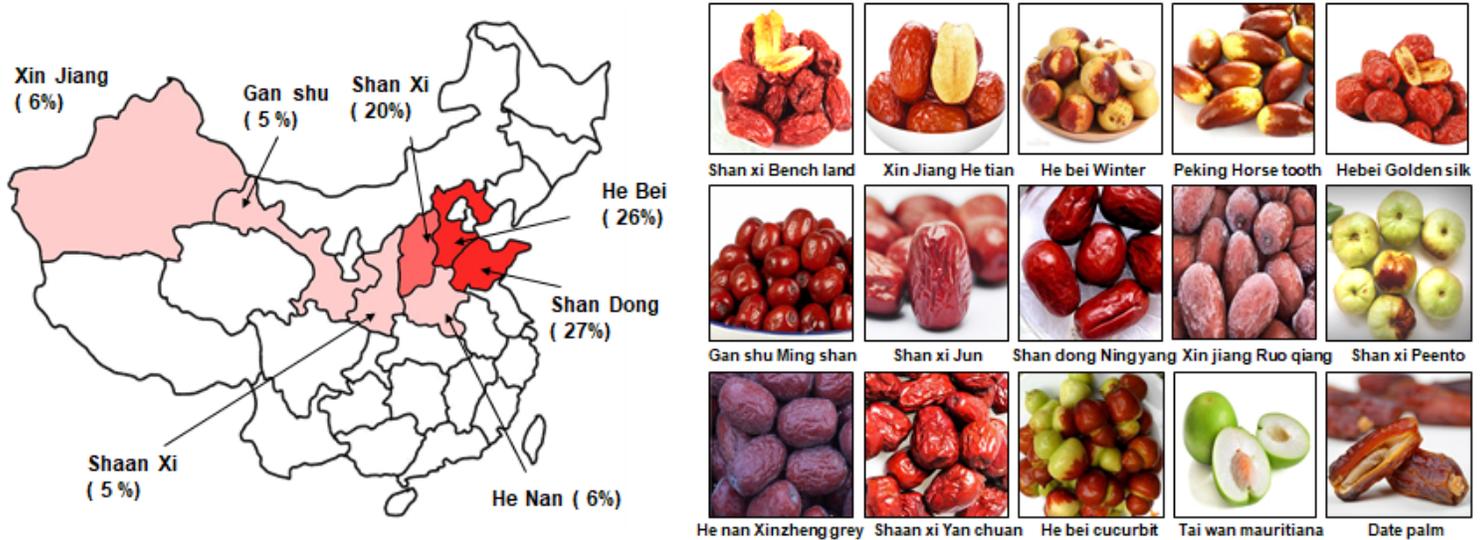


Figure 2

Planting distribution of Chinese dates and representative cultivars of dates

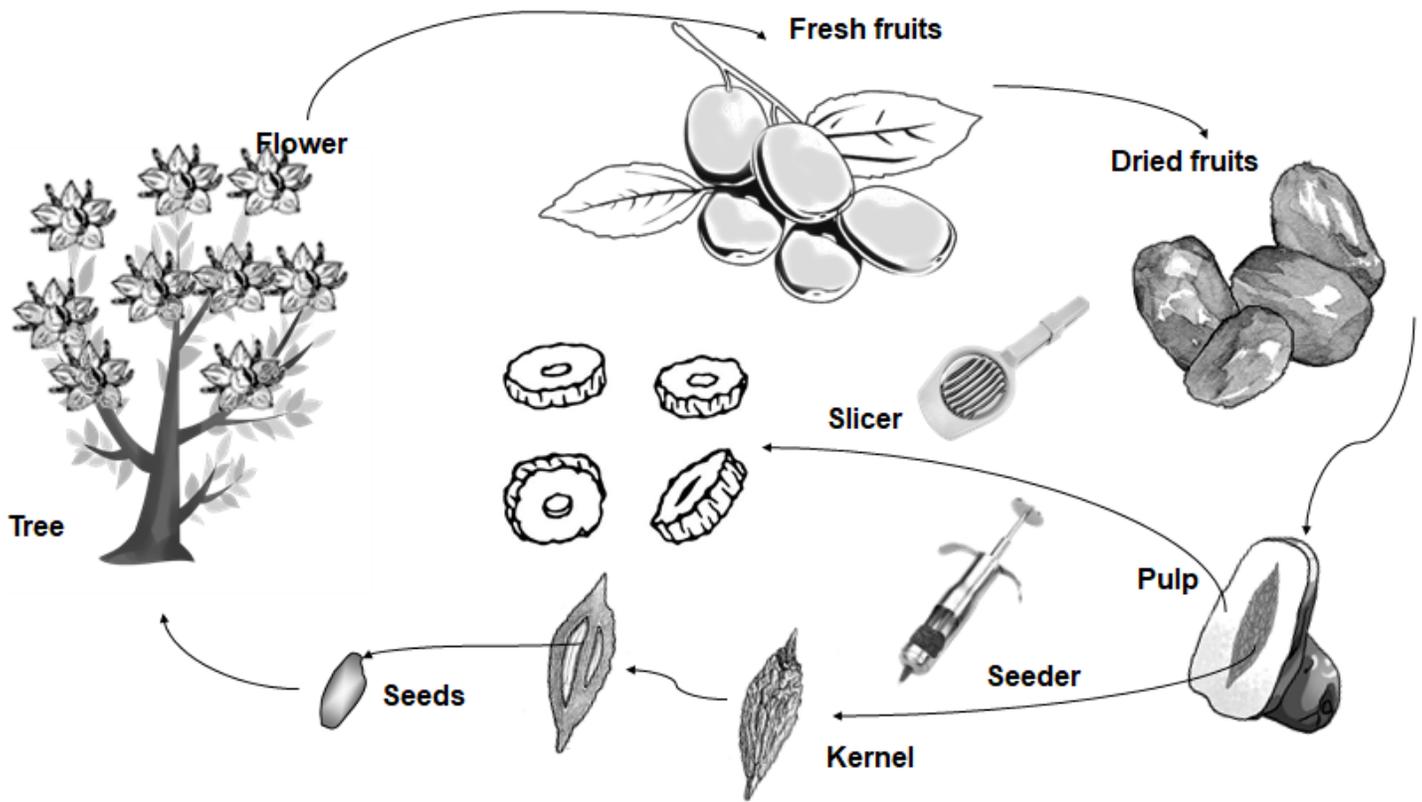


Figure 3

Life cycles of Chinese dates

Supplementary Files

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- [Table1.ppt](#)
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