Volume 21, No 2 | International Journal of Radiation Research, April 2023

Digital 320-slice volume computed tomography scanning in the diagnosis of gastrointestinal lipoma

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► ***Technical note***

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Received: May 2022
Final revised: October 2022
Accepted: November 2022

Int. J. Radiat. Res., April 2023; 21(2): 349-352

DOI: 10.52547/ijrr.21.2.25

Keywords: *Lipoma, digital 320-slice volume, computed tomography, endoscopy.*

ABSTRACT

Background: To explore the diagnostic value of digital 320-slice volume computed tomography (CT) scanning in gastrointestinal lipoma. ***Materials and Methods:*** The clinical data and CT features of 21 gastrointestinal lipoma cases confirmed by pathology were analyzed retrospectively. The tumor location, size, density, and clinical manifestations were summarized. ***Results:*** Among 21 patients, nine, four, three, and three cases occurred in the duodenum, descending colon, stomach, and ascending colon, respectively; one case each occurred in the jejunum and sigmoid colon. Tumors located in the duodenum were asymptomatic, while those located in the colon presented with abdominal pain and diarrhea. CT images demonstrated round, oval, and short intestinal fat-like density masses in the gastrointestinal tract with varying sizes. The CT value was in the range of -80 to -120 HU. Routine enhanced scans revealed no enhancements. Three cases were accompanied by intussusception. Pathological examination showed prominent fibrovascular septa. ***Conclusion:*** Digital 320-slice volume CT scans have advantages over other modalities in the diagnosis of gastrointestinal lipoma and may help evaluate the tumor and surrounding tissues, supporting clinical practice.

INTRODUCTION

Gastrointestinal lipoma is a rare benign tumor of the gastrointestinal tract, originating from the interstitial tissue [1, 2]. It grows slowly and is often solitary. It can occur anywhere in the gastrointestinal tract, presenting in the colon in approximately 70% of cases, followed by the small intestine (25%) and stomach (5%) [3]. It is usually diagnosed during routine examinations. Tumors smaller than 2 cm tend to be asymptomatic; however, some patients may present with acute abdomen, intussusception, and gastrointestinal bleeding [4, 5]. The uptake of multi-slice spiral computed tomography (CT) technology has improved the disease diagnosis rate. This disease is associated with small lesions, which make it difficult to diagnose. Accurate diagnosis is required for early treatment and good outcomes. To improve the accuracy of gastrointestinal lipoma diagnosis by CT scanning, we aimed to retrospectively examine the clinical and CT scanning characteristics of 21 patients with gastrointestinal lipomas confirmed by pathology. This study included 320 digital slice volume CT scans of gastrointestinal lipoma.

MATERIALS AND METHODS

The clinical and CT data of 21 (12 women; mean age, 61.8 [range, 31 to 82] years) gastrointestinal lipoma patients confirmed by surgery and pathology from 2018 to 2020 were retrospectively analyzed. Three and nine cases occurred in the stomach and duodenum (seven descending, one horizontal, one multiple), respectively. One case occurred in the jejunum. Three and four cases occurred in the ascending colon (including one case of liver curvature) and descending colon (including three cases of spleen curvature), respectively. One case occurred in the sigmoid colon (table 1).

Scanning protocols

We used 20 routine Aquilion ONE Toshiba 320 row CT (Siemens, Germany) plain sweep inspection scanners with enhancement inspection. Before scanning, patients were instructed to drink 500-1000 ml of boiled water. Scan range was from the diaphragm to pubic symphysis. Scanning parameters were as follows: tube voltage 120 kV, current 250 mA, 5 mm thickness, 5 mm spacing, continuous image (5 mm thickness, 5 mm spacing). During enhanced scanning, a high-pressure syringe was used to inject 80 ml of 370 mg/ml of ioversol into the cubital vein at a rate of 4 ml/s. The location, size, density, secondary lesion, and post-enhancement manifestations of this group were observed, and 13 patients underwent gastrointestinal endoscopy, combined with surgery and pathological control analysis.

[DOI: 10.52547/ijrr.21.2.25]

Table 1. General data.

Group	Location (%)			Shape (%)			
	gastroduodenum	jejunum	colorectal	round	oval	blocky	cord
symptomatic group (n=10)	3 (30)	1 (10)	6 (60)	6 (60)	2 (20)	1 (10)	1 (10)
asymptomatic group (n=9)	9 (100)	0 (0)	0 (0)	4 (44)	2 (22)	2 (22)	1 (11)
P	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Image analysis

Imaging analysis was conducted by two attending physicians. Discrepancies were resolved by consensus. Imaging characteristics of interest included tumor location, size, morphology, margin, plain CT scan value, and enhancement performance.

Pathological evaluation

After local disinfection of the specimens, an 8-gauge ordinary (0.8 mm outer diameter) needle was inserted vertically into the lesion mass, lifted, and then re-inserted more than 10 to 30 times. The needle was pulled out with little negative pressure until the desired specimen entered the barrel. We used pressure to spray the puncture specimen in the needle tube onto the glass slide, placing the upper and lower slides to flatten the puncture object; the glass slide was pulled horizontally, spreading the puncture object evenly, and was immediately placed in 95% ethanol. After fixation for 30 min, routine Hematoxylin-Eosin (HE) staining was performed. The remaining puncture specimens in the needle tube were sprayed onto the glass slide with some pressure, and the specimens on the glass slide were aggregated into small clusters with a puncture needle. The glass slides were immersed in 95% ethanol for 2 min. We used the puncture needle to gather the specimens on the slide into smaller clumps; once the specimen clumps were tightly agglomerated, we moved the coagulated specimens to 10% neutral formalin for 2 h. The specimens on the slides were cut with a sampling blade and moved to a common embedding box to complete dehydration and dipping in wax. The cell blocks were embedded, serially sectioned at 3-μm thickness, and stained with HE.

Statistical processing

SPSS 22.0 (SPSS Inc, version 22.0, Chicago, IL) software was used for statistical analysis of the data. Enumeration data were expressed as rate (%). The χ^2 test was used for comparisons between groups. P-values of <0.05 were considered statistically significant.

RESULTS

Ten cases presented with different degrees of abdominal pain and discomfort. Three cases presented with stool (2 cases of colon liver curvature, 1 case of ascending colon near ileum). Two patients had diarrhea (respectively in ascending colon and colon liver curvature). Four cases had other types of malignant tumors (colorectal cancer, colorectal cancer, and prostate cancer, and lymphoma, one case each). One patient had cirrhosis. Nine patients had no obvious clinical symptoms. Two patients had suspected space attendance.

CT findings and endoscopic findings

Twenty patients were diagnosed with lipoma and one patients had a missed diagnosis. Plain CT scans showed a regular round, elliptical, clumpy, or short-intestinal fat-like low-density shadow in the gastrointestinal lumen, with a CT value in the range of -80 to -120 HU, without enhancement in the lesion, and with an enhanced vessel shadow in the lesion in one case (figure 1). On the pedicle, five patients had fibrous spacing and 14 had fibrous spacing (mean tumor length, 3.5 cm) (figure 2). Three cases had combined intussusception (one in the liver curvature and two in the spleen area, with an average diameter of 4.4 cm) (figure 3A and 3B). Endoscopy revealed nine cases of lesions and four cases of no lesions.

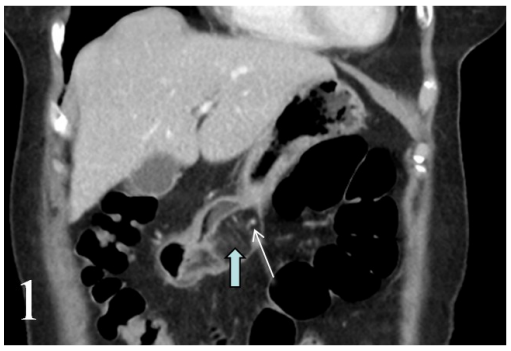

Figure 1. Computed tomography enhanced coronal reorganization image, visible fiber interval (short thick arrow), and enhanced vascular shadow (long arrow) in a female aged 67 years and with large curved gastric lipoma.

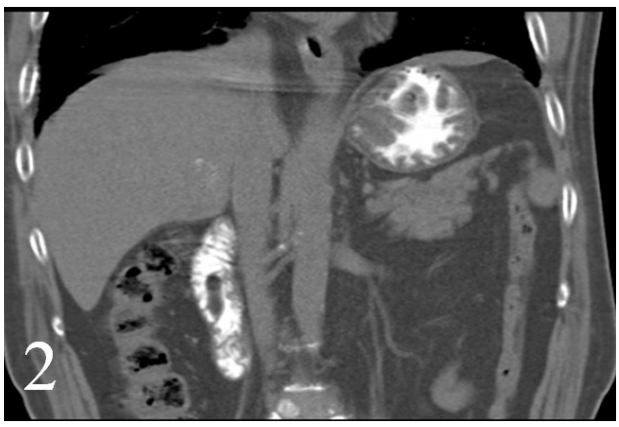

Figure 2. Duodenal descending lipoma with endoscopic confirmation of the duodenal mastoid in a male aged 75 years.

[DOI: 10.52547/ijrr.21.2.25]

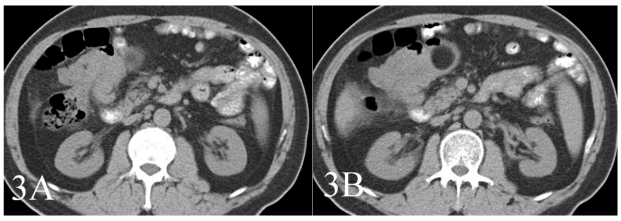

Figure 3. Secondary intussusception, proximal colon into the distal colon, significant thickening of the intestinal wall (3A), and an oval fat density mass (3B) at the head end of the mantle with clear state and uniform density in a male aged 60 years.

Surgical pathology

In 21 cases, surgical pathology evaluations confirmed benign lipoma. One case presented with evidence of a submucosal lesion with necrosis and inflammatory cell infiltration. One case showed evidence of chronic inflammation of the mucosa with polypoid hyperplasia.

Pathological result

Pathological examination revealed a prominent fibrovascular septum, which was captured on a CT scan as a line shadow. The observed intervals may be enlarged by the drainage of inflammation associated with the ulcer. The presence of a non-fatty basal line in homogeneously swollen fat tissue may indicate intussusception, constipation, or blood in the stool. Blood in the stool is often chronic; however, it may be acute in ulcerated benign lipomas. This type of lipoma should not be confused with liposarcoma, which is extremely rare in the digestive tract (figure 4).

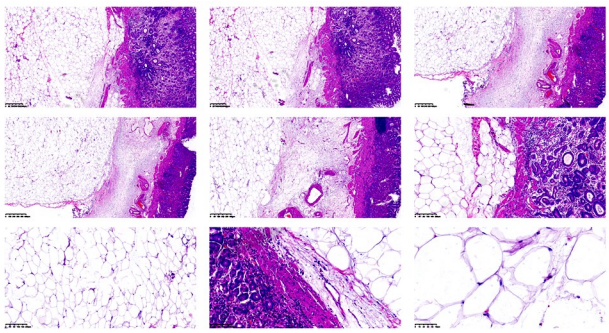

Figure 4. Lipoma of the greater curvature of the stomach, pathological results (40 times, 50 times, 100 times, 200 times, and 400 times, respectively) in a female aged 67 years.

DISCUSSION

Lipoma is slow-growing, presents with very few malignant changes, and tends to be a single rather than a multiple tumor, with unclear pathogenesis. It may be associated with fat metabolism or distribution disorders, chronic inflammation, or blocked local circulation [6, 7]. Herein, we retrospectively analyzed the clinical data and CT images of 20 gastrointestinal lipoma cases. We evaluated the clinical and CT characteristics of these cases, exploring the value of 320 row volume CT scans in the diagnosis of gastrointestinal lipoma.

Gastric lipoma is a relatively rare, slow-growing benign tumor, histologically composed of well-differentiated adipose tissue and surrounding fibrous capsule, accounting for approximately 3% of benign gastric tumors and 5% of all gastrointestinal lipomas [1, 8, 9]. In 75% of cases, it occurs in the gastric antrum. In this study, 12 patients presented with tumors in the stomach and duodenum, which is consistent with previous studies [8-10]. The average age of gastrointestinal lipoma onset is approximately 50 years [1]. The average age of the patients in this study was 61.8 years; the sample showed a predominance of women. It seems that the incidence was related to abnormal gastrointestinal fat metabolism in the elderly, especially in female patients. Due to the small number of cases, body mass index, triglyceride values, and fecal findings were not evaluated; future studies should account for them.

The clinical symptoms of gastric lipoma include abdominal pain, diarrhea, constipation, and indigestion. Larger lipomas can cause serious complications, such as bleeding, ulcers, gastric obstruction, or intussusception; these symptoms are nonspecific. Therefore, the diagnosis of gastric lipoma mainly relies on imaging and endoscopy. The clinical symptoms of this group were consistent with those reported in the literature [11, 12]. The risk of colon lesions intussusception was 37.5%. Large lesions were observed in the transverse, ascending, and descending colon. The trigger tended to be increased activity and fixed intestine junction; these characteristics should be evaluated to prevent underdiagnosis of intussusception. In addition, several patients in this group had underlying lesions or other malignancies, which should be noted in clinical work.

Routine examination methods of gastrointestinal tumors include endoscopy (including gastroscopy and colonoscopy), and CT scanning, and gastrointestinal angiography. Endoscopy tends to be the method of choice for diagnosing gastrointestinal tumors. However, endoscopy has high specificity and low sensitivity for gastrointestinal lipoma [13]. Gastrointestinal fat is usually located under the mucosa, making it difficult to detect by endoscopy, especially when the lesion is small; consequently, qualitative diagnosis remains a challenge [14]. In this group, 13 patients underwent endoscopy with a diagnostic accuracy of approximately 69% (9/13). Gastrointestinal angiography can only confirm the presence of a tumor; however, it cannot evaluate its internal or external environment, precluding any qualitative diagnosis [15]. Currently, 320 slice volume CT scanning speed, high density, and spatial resolution, can help locate the lesion site as well as distinguish its fat components, supporting gastrointestinal examination. Methods such as multiplanar reconstruction (MPR), curve planar

[DOI: 10.52547/ijrr.21.2.25]

reconstruction (CPR), and maximum/minimum/average intensity projection (MIP) during post-processing help visualize both the lesion and the adjacent intestinal. Typical CT scan manifestations of gastrointestinal lipomas are well-defined, very low-density occupancy lesions, and CT values in the range from -80 to -120 HU [16]. Some gastrointestinal lipomas can appear as cable-shaped shadow due to the presence of the fiber septum, along with coriform in the fat density shadow [17]. In this group, 14 (70%) cases had a few cables, including a fiber interval (average diameter of 3.5 cm). In this group, one patient had a flat scan interval, which was missed during the enhancement examination; this observation is consistent with the literature. Enhanced CT scans of gastrointestinal lipomas rarely show enhancements, helping differentiate this presentation from colon cancer, stromal tumor, and liposarcoma, among others. However, CT scans may also miss benign tumors. Leakage rate and lipoma size are correlated [18]. Smaller lipomas caused by different filling state of gastrointestinal diagnosis may occur due to gastrointestinal lipoma covered by a low-density gas shadow, leading to a missed diagnosis. Filling the gastrointestinal tract can benefit smaller lesion detection; appropriate adjustment window width can help distinguish gas and fat shadows.

In conclusion, gastrointestinal lipoma is a rare benign gastrointestinal tumor, which occurs mostly in women aged ≥50 years. Using 320 slice volume CT scanning for gastrointestinal lipoma diagnosis helps evaluate this tumor type and its surroundings in a non-invasive manner, including postprocessing, supporting diagnosis and treatment.

ACKNOWLEDGMENTS

The authors are very grateful to all the associated personnel that contributed to this research.

***Funding*:** This study was supported by the Natural Science Basic Research Program of Shaanxi Province (2021JQ-914 and 2021JQ-916) and the Shaanxi Provincial People's Hospital Science and Technology Talent Support Program for Elite Talents (2021JY-38 and 2021JY-50).

Conflicts of interest: The authors declare no conflicts of interest, financial or otherwise.

Ethics approval and consent to participate: The study was approved by the Medical Ethical Committee of Shaanxi Provincial People's Hospital of Xian Province, China.

***Availability of data and materials*:** The authors confirm that the data supporting the findings of this study are available within the article.

***Author contribution*:** Zhehui Zhu, male, born in May 1996, of the Han nationality, mainly engaged in research on imaging of gastrointestinal tumors.

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[DOI: 10.52547/ijrr.21.2.25]